TORONTO TRANSIT COMMISSION

TO Senior Management Team

FROM J. O'Grady

DATE April 12, 2018

SUBJECT TTC Subway Air Quality Study – Interim Report – Non Maintenance

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As a result of a study by Health Canada on TTC air quality that was published in April 2017, the Occupational Hygiene and Environment Section initiated its own Subway Air Quality Study in the summer of 2017.

The purpose of the study was to:

- Provide current information on the air quality in the underground portions of the subway during revenue service;
- Determine employee exposures to airborne contaminants and verify compliance with Ontario Regulation 833 – Control of Exposure to Biological or Chemical Agents, made under the Occupational Health and Safety Act;
- Evaluate the effectiveness of current controls;
- Make recommendations regarding both compliance with the Occupational Health and Safety Act (OHSA) and opportunities for general improvement.

The first round of air sampling has been completed by Third Party Consultants and focussed on job titles that generally spend the greatest amount of time in the subway during revenue service, including:

- Maintenance Mechanics;
- Line Mechanics;
- Sunset Corridor Services;
- Fare Enforcement Officers;
- Subway Operators (Line 1, 2 and 4);
- Subway Janitors;
- Signals Technicians;
- Escalator Mechanics;
- Special Constables;
- Track Patrollers;
- End Terminal Cleaners;
- Traffic Checkers.

Attached is the interim report that provides all study details to date for 'Non-Maintenance' employees (Special Constables, Fare Enforcement Officers, Track Patrollers, Subway Operators, End Terminal Cleaners, Subway Janitors, and Traffic Checkers).

Please discuss these results with the JHSC. A copy of this report should also be posted in a common area for employees to view

Further sampling will be conducted throughout 2018, followed by final reports.

If you have any questions, please contact Stephanie Fortin at 416-393-3262.

Chief Safety Officer
Safety and Environment Department

13.23
Attachments

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File: Document ID #05104-92-748
http://ceo.int.ttc.ca/dc/safetyande/corporates/environmen/ssvs/Subway%20Air%20Quality%20-%20Non%20Maintenance%20April%2010%202018.doc

OHE CONSULTANTS
Occupational Hygiene & Environment

TORONTO TRANSIT COMMISSION SUBWAY AIR QUALITY STUDY
INTERIM REPORT

Toronto Transit Commission Subway System
Toronto, Ontario

Presented to:

Toronto Transit Commission
Safety and Environment Department
1920 Yonge Street, Suite 600
Toronto, Ontario
M4S 3E2

March 2018

OHE Project No.: 22152

Submitted by:

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OHE Consultants (OHE) was retained by Toronto Transit Commission (TTC) to conduct a study to assess the air quality in the underground portions of the subway system (herein referred to as the "Subway Air Quality Study") by conducting personal and area air sampling for various airborne contaminants. The purpose of the study is to provide current information on the air quality, determine employee exposures, verify compliance with Ontario Regulation 833 for Control of Exposure to Biological and Chemical Agents (Reg. 833), made under the Occupational Health and Safety Act, and assess the effectiveness of current controls.

OHE was retained to review occupational exposures to contaminants inherent in the subway system, either through the employees' physical presence in the system or minor disturbance of existing surfaces. It does not address specific maintenance activities that generate their own contaminants which are addressed under the "normal" occupational hygiene evaluations.

The scope of work performed as part of the Subway Air Quality Study included the following:

Personal and area air sampling for various airborne contaminants to determine employee exposures during regular work shifts. The airborne contaminants studied are listed below:

a. Asbestos;
b. Respirable dust and crystalline silica;
c. Respirable metals (aluminum, cadmium, iron oxide, molybdenum, and zinc oxide);
d. Inhalable dust and inhalable metals (beryllium, magnesium oxide, molybdenum, nickel, thallium, and vanadium pentoxide);
e. Total metals (antimony, arsenic, barium, beryllium, cadmium, calcium oxide, chromium, cobalt, copper, lead, manganese, and selenium);
f. Hexavalent chromium;
g. Particulate Matter 2.5 ($PM_{2.5}$);
h. Diesel exhaust markers (carbon monoxide (CO) and nitrogen dioxide (NO_2)); and
i. Carbon dioxide (CO_2).

None of the 40 sample sets collected to date exceeded the OELs specified in Reg. 833. Based on the interim sampling results, the subway air quality is not expected to affect the health of employees in work positions assessed who do not have pre-existing serious respiratory conditions.

Based on the results of the air sampling obtained to date, the use of respiratory protection during the work shifts studied is not required. Limited recommendations are provided at this time as the study is not yet completed and all the pertinent data is not yet available.

This executive summary provides a brief overview of the findings. It is not intended to substitute for the complete study report, nor does it discuss specific issues documented in the report. The executive summary should not be used as a substitute to reading the complete report.

1. BACKGROUND

Health Canada published a public health subway air quality study on April 25, 2017 which was the source of great media attention, employee concern and four employee work refusals.

The Toronto Transit Commission (TTC) has conducted subway air quality studies in 1977, 1980, and 1995. These were performed to provide information on the air quality in the underground portions of the subway and determined both employee and customer exposures to airborne contaminants.

Previous air quality results reflected the improvements made over the years. The total dust levels at selected stations were reduced 40 to 80% on average. Airborne lead levels were lowered almost to the detection limit of the analytical method used. Airborne asbestos was reduced to a level well below the Ministry of Environment and Energy Guideline for the general public. The most recent subway air quality study performed in 1995 found that not one of the more than 280 samples taken were above the former and current occupational exposure limits for employees. Based on the air quality results and professional judgement, it was determined that the air quality in the system would not affect the health of employees or patrons who do not have pre-existing serious respiratory conditions.

Initiatives such as corridor cleaning program, station/tunnel washing, and the T1 air duct cleaning program have been undertaken since the last study and are expected to have improved the air quality.

2. PURPOSE

OHE Consultants (OHE) was retained by TTC to conduct a study to assess the air quality in the underground portions of the subway system (herein referred to as the "Subway Air Quality Study") by conducting personal and area air sampling for various airborne contaminants. The purpose of the study is to provide current information on the air quality, determine employee exposures, verify compliance with Ontario Regulation 833 for Control of Exposure to Biological and Chemical Agents (Reg. 833), made under the Occupational Health and Safety Act, and assess the effectiveness of current controls.

OHE was retained to review occupational exposures to contaminants inherent in the subway system, either through the employees' physical presence in the system or minor disturbance of existing surfaces. It does not address specific maintenance activities that generate their own contaminants which are addressed under the "normal" occupational hygiene evaluations.

3. SCOPE OF WORK

The scope of work performed as part of the Subway Air Quality Study included the following:

- Personal and area air sampling for various airborne contaminants to determine employee exposures during regular work shifts. The airborne contaminants studied are listed below:
    j. Asbestos;
    k. Respirable dust and crystalline silica;
    l. Respirable metals (aluminum, cadmium, iron oxide, molybdenum, and zinc oxide);
    m. Inhalable dust and inhalable metals (beryllium, magnesium oxide, molybdenum, nickel, thallium, and vanadium pentoxide);
    n. Total metals (antimony, arsenic, barium, beryllium, cadmium, calcium oxide, chromium, cobalt, copper, lead, manganese, and selenium);
    o. Hexavalent chromium;
    p. Particulate Matter 2.5 ($PM_{2.5}$);
    q. Diesel exhaust markers (carbon monoxide (CO) and nitrogen dioxide (NO_2)); and
    r. Carbon dioxide (CO_2).

The field work was conducted by Yunny Desiana Lee, Project Coordinator / Occupational Hygienist, Larysa Kokarovtseva, Project Consultant / Occupational Hygienist, Romain Mathevet, Project Specialist / Occupational Hygienist, Abbie Alcon, Senior Project Specialist / Occupational Hygienist, and Koena Thoahlane, Senior Project Specialist / Occupational Hygienist, of OHE with assistance provided by the Safety and Environmental Department and the Joint Health and Safety Committee (JHSC) worker representatives of TTC. The details regarding each sampling event are summarized in Appendix A.

4. METHODOLOGY

The Subway Air Quality Study is being conducted over a one year period (2017 to 2018), focusing primarily on the underground portions of the subway system (tunnels and platform levels) during revenue service. To make effective use of sampling time, job titles that were likely to work in similar environments had been grouped into a number of Similar Exposure Groups (SEGs). The job titles to be studied from each SEG were selected by the TTC Subway Air Quality Working Group comprised of Union Safety Representatives, relevant JHSC members, and members of the TTC Safety and Environment Department. The job titles were selected based on risk, professional judgement, and previous JHSC input. The station locations were selected to duplicate previous studies for comparison purposes. The JHSC was consulted about the sampling that was undertaken and was invited to be present at the beginning of the testing to fulfill the requirements under the Occupational Health and Safety Act.

4.1 Air Sampling

The air quality was evaluated using a combination of traditional occupational hygiene sampling methods and contemporary direct reading instrumentation. Both personal and area air samples were collected during regular work shifts. For personal sampling, the air sampling equipment was affixed to the employee's lapel in the breathing zone. Due to a large number of equipment used during the study, one (1) or two (2) OHE occupational hygienists (or TTC occupational hygienists for the sampling conducted on track level) were assigned to shadow the employees for the duration of the work shifts and to assist in wearing the air sampling equipment. For area sampling, the air sampling equipment was placed on a stationary fixture at the breathing zone level. Laboratory analysis of the samples was performed by SGS Galson Laboratories, an independent, accredited third party laboratory.

The results of the air sampling were compared to the Occupational Exposure Limits (OELs) specified in Reg. 833. For extended work shifts longer than eight (8) hours, the 8-hour Time-Weighted Average (TWA) exposure was calculated by dividing the cumulative daily exposure by eight as per Reg. 833, Schedule 1, Section 5. The 8-hour TWA exposures were compared to the OELs specified in Reg. 833.

In addition, for extended work shifts longer than eight (8) hours, the Brief and Scala model was also used to analyze the results of the air sampling. The model is regarded as the simplest and most conservative model which reduces the OELs by a factor in proportion to the increase in exposure time and reduction in recovery (non-exposure) time, to ensure that the daily peak body burden does not exceed the one that would occur during a normal 8-hour shift.

4.1.1. Air Sampling for Asbestos

Air samples for asbestos were collected by drawing a constant volume of air through a filter using a battery operated pump. A 25mm 0.8um Mixed Cellulose Ester (MCE) filter cassette with conductive cowl was connected to a Gillian GilAir 5 personal air sampling pump, drawing air through the filter at a flow rate of 1 litre per minute (L/min). The pumps were calibrated with a Bios DryCal DC-Lite Primary Air Flow Calibrator. Pre- and post-calibrations were completed to ascertain an average flow rate due to typical fluctuations in flow rates during sampling. The samples, including field blank samples, were submitted to the laboratory for analysis. The samples were analyzed for asbestos and other fibres by Phase Contrast Microscopy (PCM) following the National Institute for Occupational Safety and Health (NIOSH) Method 7400. It was decided about one month into the study, that, in the event that the fibre concentrations exceed 0.01 fibre/cc, further analysis for asbestos fibres by Transmission Electron Microscopy (TEM) would be performed following NIOSH Method 7402 to effectively distinguish asbestos fibres from other fibrous material.

4.1.2. Air Sampling for Respirable Dust and Crystalline Silica

Air samples for respirable dust and crystalline silica were collected by drawing a constant volume of air through a filter using a battery operated pump. A pre-weighed 37mm 5um Polyvinyl Chloride (PVC) filter in SKC Disposable Respirable Parallel Particle Impactor (PPI) was connected to a Gillian GilAir 5 personal air sampling pump, drawing air through the filter at a flow rate of 2 L/min. The pumps were calibrated with a Bios DryCal DC-Lite Primary Air Flow Calibrator. Pre- and post-calibrations were completed to ascertain an average flow rate due to typical fluctuations in flow rates during sampling. The samples, including field blank samples, were submitted to the laboratory for analysis. The samples were analyzed for respirable dust by gravimetric analysis following NIOSH Method 0600 and for crystalline silica (quartz, cristobalite, and tridymite) by X-ray Powder Diffraction (XRD) following modified NIOSH Method 7500.

4.1.3. Air Sampling for Respirable Metals

Air samples for respirable metals were collected by drawing a constant volume of air through a filter using a battery operated pump. A 37mm 0.8um MCE filter in SKC Disposable Respirable PPI was connected to a Gillian GilAir 5 personal air sampling pump, drawing air through the filter at a flow rate of 2 L/min. The pumps were calibrated with a Bios DryCal DC-Lite Primary Air Flow Calibrator. Pre- and post-calibrations were completed to ascertain an average flow rate due to typical fluctuations in flow rates during sampling. The samples, including field blank samples, were submitted to the laboratory for analysis. The samples were analyzed for respirable metals, including aluminum, cadmium, iron oxide, molybdenum, and zinc oxide, by Inductively Coupled Argon Plasma, Atomic Emission Spectroscopy or Mass Spectrometry (ICP-AES or ICP-MS) following the modified NIOSH Method 7300.

4.1.4. Air Sampling for Inhalable Dust and Metals

Air samples for inhalable dust and metals were collected by drawing a constant volume of air through a filter using a battery operated pump. A pre-weighed 25mm 5um PVC filter in SKC IOM inhalable sampler was connected to a Gillian GilAir 5 personal air sampling pump, drawing air through the filter at a flow rate of 2 L/min. The pumps were calibrated with a Bios DryCal DC-Lite Primary Air Flow Calibrator. Pre- and post-calibrations were completed to ascertain an average flow rate due to typical fluctuations in flow rates during sampling. The samples, including field blank samples, were submitted to the laboratory for analysis. The samples were analyzed for inhalable dust by gravimetric analysis following NIOSH Method 0500 and for inhalable metals, including beryllium, magnesium oxide, molybdenum, nickel, thallium, and vanadium pentoxide by ICP-AES or ICP-MS following modified NIOSH Method 7300.

4.1.5. Air Sampling for Total Metals

Air samples for total metals were collected by drawing a constant volume of air through a filter using a battery operated pump. A 37mm 0.8um MCE filter 3-piece cassette was connected to a Gillian GilAir 5 personal air sampling pump, drawing air through the filter at a flow rate of 2 L/min. The pumps were calibrated with a Bios DryCal DC-Lite Primary Air Flow Calibrator. Pre- and post-calibrations were completed to ascertain an average flow rate due to typical fluctuations in flow rates during sampling. The samples, including field blank samples, were submitted to the laboratory for analysis. The samples were analyzed for total metals, including antimony, arsenic, barium, beryllium, cadmium, calcium oxide, chromium, cobalt, copper, lead, manganese, and selenium, by ICP-AES or ICP-MS following modified NIOSH Method 7300.

4.1.6. Air Sampling for Hexavalent Chromium

Air samples for hexavalent chromium were collected by drawing a constant volume of air through a filter using a battery operated pump. A 37mm 0.8um MCE filter 2-piece cassette was connected to a Gillian GilAir 5 personal air sampling pump, drawing air through the filter at a flow rate of 2 L/min. The pumps were calibrated with a Bios DryCal DC-Lite Primary Air Flow Calibrator. Pre- and post-calibrations were completed to ascertain an average flow rate due to typical fluctuations in flow rates during sampling. The samples, including field blank samples, were submitted to the laboratory for analysis. The samples were analyzed for hexavalent chromium by Ion Chromatography, UV Detection (IC-UV) following the modified Occupational Safety and Health Administration (OSHA) Method ID-215.

4.1.7. Air Sampling for $PM_{2.5}$

Air sampling for fine particulate matter that is 2.5µm in diameter or less ($PM_{2.5}$) was conducted using a TSI DustTrak DRX Aerosol Monitor 8533. The DustTrak DRX is a portable, battery-operated light-scattering laser photometer capable of simultaneously measuring both mass and size fractions. The DustTrak provides real-time digital readings and is capable of logging data over an extended period of time. Air is drawn into the instrument using an integrated pump. Upon completion of the air sampling, the data was downloaded onto a computer at which point analysis of the collected data was performed.

4.1.8. Air Sampling for Carbon Monoxide (CO) and Nitrogen Dioxide (NO_2)

Air sampling for CO and NO_2 as diesel exhaust markers was conducted using Ventis MX4 Multi-Gas Detector. The MX4 is a portable diffusion monitor capable of detecting and measuring gases present in open space. Two (2) toxic sensors for CO and NO_2 were installed enabling the instrument to simultaneously monitor both gases. The MX4 provides real-time digital readings and is capable of logging data over an extended period of time. The monitor was zeroed and

bump tested prior to use with certified concentrations of calibration gases. Upon completion of the air sampling, the data was downloaded onto a computer at which point analysis of the collected data was performed.

4.1.9. Air Sampling for Carbon Dioxide (CO_2)

Air sampling for CO_2 was conducted using TSI 9565-P VelociCalc Ventilation Meter with TSI IAQ Probe 982. The VelociCalc is a portable, multi-function ventilation test instrument designed to measure a wide range of parameters depending on the type of probes used. With the IAQ probe, the instrument is capable of measuring CO_2, CO, temperature, and relative humidity. The instrument provides real-time digital readings and is capable of logging data over an extended period of time. The display automatically stabilizes while measuring in fluctuating flow applications. Upon completion of the air sampling, the data was downloaded onto a computer at which point analysis of the collected data was performed.

5. OBSERVATIONS

5.1. Transit Enforcement – Special Constables

Transit Enforcement Officers are responsible for protecting the integrity of the transit system, ensuring the system remains safe and reliable and keeping customers and employees safe while they are on the system. There are approximately 36 Transit Enforcement Officers and they typically work in teams of two. Employees rotate shifts (days, afternoons and nights) and the shift durations are 11.5 hours. Work is performed 7 days a week, 24 hours a day. Some enforcement tasks/shifts focus more on surface routes and others on subway.

It was agreed by the Advisory Working Group that subway shifts would be the focus of air sampling to provide an accurate representation of worst case conditions. It was also agreed that, during air sampling, Officers would perform shadow shifts for subway duties (i.e., patrolling the system, following radio calls like they normally do, but in plain clothes) – this was to replicate the worst case continuous subway air exposures they experience in the course of their regular duties in the subway without exposing themselves and OHE to other safety risks e.g., dealing with criminal incidents in the subway system.

August 3, 2017

- The Transit Enforcement Officer was observed to be working from 3:00 PM to 2:30 AM (i.e. 11.5-hour shift).
- The employee was observed to be working in the underground portions of the subway system for approximately 80% of the work shift. The employee was observed to be patrolling across the subway system following radio calls. The areas patrolled included

Yonge-Bloor, Union, St. George, Dundas, High Park, Spadina, Yonge-Sheppard, Don Mills, Wellesley, Bay, Queen, and Wilson Stations.

August 11, 2017

- The Transit Enforcement Officer was observed to be working from 5:00 AM to 4:30 PM (i.e. 11.5-hour shift).
- The employee was observed to be working in the underground portions of the subway system for approximately 75% of the work shift. The employee was observed to be patrolling across the subway system following radio calls. The areas patrolled included Yonge-Bloor, Kennedy, Scarborough Centre, Warden, Victoria Park, Osgoode, Museum, and Union Stations.

5.2. Transit Enforcement – Fare Inspectors

Transit Fare Inspectors are designated as Provincial Offence Officers to enforce the Proof of Payment (POP) fare system and TTC By-law. They make checks to ensure that customers have proof of payment on POP routes. At any point in a streetcar journey, they may ask to show Proof-of-Payment, including at a subway station, on a vehicle, and as customers exit a vehicle.

There are approximately 60 Fare Enforcement Officers and they typically work in teams of two. Some enforcement tasks/shifts focus more on surface routes and others on subway. Employees rotate shifts (days, afternoons and nights) and the shift durations are 10 hours. Work is performed 24 hours a day, 7 days a week.

It was agreed by the Advisory Working Group that subway shifts (i.e., Union and Spadina Streetcar Platforms) would be the focus of air sampling to provide an accurate representation of worst case conditions. For both Union and Spadina Stations, the streetcar platforms were noted to be located on the mezzanine level, one level above the subway platform level. It was also agreed that, during air sampling, Officers would perform shadow shifts for subway duties (i.e., working in the vicinity of uniformed Inspectors who enforce fares of customers exiting the streetcars, but wearing plain clothes) – this was to replicate the worst case subway air exposures they experience in the course of their regular duties in the subway without exposing themselves and OHE to other safety risks e.g., dealing with verbal/physical confrontations in the subway system.

August 14, 2017

- The Transit Fare Inspector was observed to be working from 6:30 AM to 4:30 PM (i.e. 10-hour shift), with a 1-hour break at approximately 10:30 AM.

- The employee was observed to be working in the underground portions of the subway system for approximately 75% of the work shift. The employee was observed to be working at Spadina Station Streetcar Platform for the majority of the morning and at Union Station Streetcar Platform for the majority of the afternoon. The employee was observed to be in the Transit Fare Inspector Spadina Field Office, located adjacent to the Spadina Streetcar Platform, during the break.

August 17, 2017

- The Transit Fare Inspector was observed to be working from 8:00 AM to 6:00 PM (i.e. 10-hour shift), with a 1-hour break at approximately 1:00 PM.
- The employee was observed to be working in the underground portions of the subway system for approximately 75% of the work shift. The employee was observed to be working at Union Station Streetcar Platform for the majority of the morning and at Spadina Station Streetcar Platform for the majority of the afternoon. The employee was observed to be in the Transit Fare Inspector Spadina Field Office, located adjacent to the Spadina Streetcar Platform, during the break.

5.3. Track Patrollers

Track Patrollers' regular duties include patrolling and inspection of the entire subway/SRT track for unsafe conditions – most of this work is performed over approximately 8-hour shifts, during revenue service on days, and involves physically walking at track level. The inspection routes are divided geographically.

There are approximately 26 Track Patrollers in total, and they typically work in teams of two.

It was agreed by the Advisory Working committee that the four first air sampling sessions would focus on Track Patrol routes that would be considered worst-case from a subway air quality perspective.

August 29, 2017 (Finch to Eglinton)

- Two (2) employees were observed to be working from approximately 8:00 AM to 4:00 PM (i.e. 8-hour shift). The employees were observed to have a break at the end of the work shift at approximately 2:30 PM.
- The employees were observed to be working in the underground portions of the subway system for approximately 90% of the work shift. The employees were patrolling along the southbound subway track from Finch to Eglinton Stations.

August 31, 2017 (Dufferin to Donlands)

- Two (2) employees were observed to be working from approximately 8:00 AM to 4:00 PM (i.e. 8-hour shift). The employees were observed to have a break at the end of the work shift at approximately 2:30 PM.
- The employees were observed to be working in the underground portions of the subway system for approximately 90% of the work shift. The employees were patrolling along the eastbound subway track from Dufferin to Donlands Stations.

September 6, 2017 (Eglinton to Union)

- Four (4) employees were observed to be working from approximately 8:00 AM to 4:00 PM (i.e. 8-hour shift). The employees were observed to have a break at the end of the work shift at approximately 2:30 PM.
- The employees were observed to be working in the underground portions of the subway system for approximately 70% of the work shift. The employees were patrolling along the southbound subway track from Eglinton to Union Stations.

September 7, 2017 (St. Clair West to Union)

- Four (4) employees were observed to be working from approximately 8:00 AM to 4:00 PM (i.e. 8-hour shift). The employees were observed to have a break at the end of the work shift at approximately 2:30 PM.
- The employees were observed to be working in the underground portions of the subway system for approximately 65% of the work shift. The employees were patrolling along the southbound subway track from St. Clair West to Union Stations.

5.4. Subway Operators / Guards

Subway Operators provide subway transit service to TTC customers from approximately 6:00 AM to 2:00 AM daily. Work shifts vary in length, and many Operators work split shifts. Operational characteristics specific to each subway line include:

Line 1 (Yonge-University Line)

- U-shaped route, running generally north and south, with 38 stations.
- Total number of Operators is 385.
- Each Toronto Rocket (TR) train on Line 1 is staffed by two Operators at a time. One acts as the train Operator, while the other acts as a Guard, which requires opening and closing the doors, responding to customer concerns, performing safety checks on the platform, and assisting with equipment incidents.

Line 2 (Bloor-Danforth Line)

- Runs generally east and west, with 31 stations.
- Total number of Operators is 340.
- Each T1 Rapid Transit (T1) trains is operated by two Operators at a time. One acts as the train Operator, while the other acts as a Guard, which requires opening and closing the doors, responding to customer concerns, performing safety checks on the platform, and assisting with equipment incidents.

Line 4 (Sheppard Line)

- Runs generally east and west, with 5 stations.
- Total number of operators is 20.
- On Line 4, each TR trains is operated by one Operator, who performs both operating and guarding duties.

The following was agreed to by the Advisory Working committee:

- Line 3 (Scarborough Line) would be excluded from the current study, as the majority of the line is outdoors and would not have the same exposure concentrations/characteristics/ concerns as the other subway lines.
- Where possible, longer duration shifts would be chosen as these would represent realistic worst case scenarios (i.e., longer exposure to subway-related contaminants).
- During the sampling sessions, both the Operator and Guard would be sampled for the duration of their shift.
- Where possible, some additional air sampling would be performed first thing on Monday morning right after weekend subway closures – during these extended subway closures, larger scale maintenance activities on tunnel structure and rails is performed, which can potentially disturb and leave behind higher levels of particulate in the subway system.

September 8, 2017 (Line 1 AM)

- Two (2) employees were observed to be working from approximately 5:00 AM to 2:30 PM (i.e. 9.5-hour shift), with an approximately 30-minute break at 9:50 AM.
- The employees were observed to be working in the underground portions of the subway system for approximately 90% of the work shift. The employees were observed to be operating and guarding TR trains on Line 1. The doors to the operator cabs were noted to be closed at all the times. The employees were observed to be in the Subway Operator lunch room at Eglinton Subway Platform during the break.
- As agreed by the Advisory Working Committee, two (2) air sampling pumps (sampling for respirable dust, crystalline silica, and respirable metals) were worn by the employees for

the duration of the work shift. The remaining equipment was placed in a stationary location adjacent to the employees.

September 12, 2017 (Line 2 AM)

- Two (2) employees were observed to be working from approximately 5:00 AM to 3:00 PM (i.e. 10-hour shift), with an approximately 30-minute break at 11:50 AM.
- The employees were observed to be working in the underground portions of the subway system for approximately 90% of the work shift. The employees were observed to be operating and guarding T1 trains on Line 2. The doors to the operator cabs were noted to be closed for the majority of the time when in driving position. The doors were noted to be open when in guarding position. The employees were observed to be in the Subway Operator lunch room at Coxwell Subway Platform during the break.
- As agreed by the Advisory Working Committee, two (2) air sampling pumps (sampling for respirable dust, crystalline silica, and respirable metals) were worn by the employees for the duration of the work shift. The remaining equipment was placed in stationary locations adjacent to the employees.

September 13, 2017 (Line 2 PM)

- Two (2) employees were observed to be working from approximately 4:00 PM to 2:00 AM (i.e. 10-hour shift), with an approximately 30-minute break at 9:30 PM.
- The employees were observed to be working in the underground portions of the subway system for approximately 90% of the work shift. The employees were observed to be operating and guarding T1 trains on Line 2. The doors to the operator cabs were noted to be closed for the majority of the time when in driving position. The doors were noted to be open when in guarding position. The employees were observed to leave the subway system during the break.
- As agreed by the Advisory Working Committee, two (2) air sampling pumps (sampling for respirable dust, crystalline silica, and respirable metals) were worn by the employees for the duration of the work shift. The remaining equipment was placed in stationary locations adjacent to the employees.

September 15, 2017 (Line 1 PM)

- Two (2) employees were observed to be working from approximately 4:00 PM to 2:00 AM (i.e. 10-hour shift), with an approximately 30-minute break at 10:00 PM.
- The employees were observed to be working in the underground portions of the subway system for approximately 90% of the work shift. The employees were observed to be operating and guarding TR trains on Line 1. The doors to the operator cabs were noted to be closed at all the times. One (1) of the employees was observed to be in the Subway

Operator lunch room at Eglinton Subway Platform, while the other employee was observed to leave the subway system during the break.

- As agreed by the Advisory Working Committee, two (2) air sampling pumps (sampling for respirable dust, crystalline silica, and respirable metals) were worn by the employees for the duration of the work shift. The remaining equipment was placed in a stationary location adjacent to the employees.

October 24, 2017 (Line 4 AM)

- One (1) employee was observed to be working from approximately 5:00 AM to 11:30 AM and from 1:30 PM to 5:00 PM (i.e. 10-hour split shift). The employee was observed to take a break in between the split shifts.
- The employee was observed to be working in the underground portions of the subway system for approximately 90% of the work shift. The employee was observed to be operating TR trains on Line 4. The door to the operator cab was noted to be closed at all the times. The employee was observed to leave the subway system in between the split shifts.
- As agreed by the Advisory Working Committee, two (2) air sampling pumps (sampling for respirable dust, crystalline silica, and respirable metals) were worn by the employee for the duration of the work shift. The remaining equipment was placed in stationary locations adjacent to the employee.

October 26, 2017 (Line 4 PM)

- One (1) employee was observed to be working from approximately 5:30 PM to 2:00 AM (i.e. 8.5-hour shift), with an approximately 30-minute break at 11:10 PM.
- The employee was observed to be working in the underground portions of the subway system for approximately 90% of the work shift. The employee was observed to be operating TR trains on Line 4. The door to the operator cab was noted to be closed at all the times. The employee was observed to leave the subway system during the break.
- As agreed by the Advisory Working Committee, two (2) air sampling pumps (sampling for respirable dust, crystalline silica, and respirable metals) were worn by the employee for the duration of the work shift. The remaining equipment was placed in stationary locations adjacent to the employee.

October 30, 2017 (Line 1 AM – after closure)

- Two (2) employees were observed to be working from approximately 5:00 AM to 3:00 PM (i.e. 10-hour shift), with an approximately 30-minute break at 10:20 AM.
- The air sampling was performed following a weekend subway closure between St. Clair and Lawrence Stations. This was performed in response to a JHSC request to perform air

monitoring first thing on Monday after a weekend subway closure – during these extended subway closures, larger scale maintenance activities on tunnel structure and rails is performed, which can potentially disturb and leave behind higher levels of particulate in the subway system.

- The employees were observed to be working in the underground portions of the subway system for approximately 90% of the work shift. The employees were observed to be operating and guarding TR trains on Line 1. The doors to the operator cabs were noted to be closed at all the times. The employees were observed to be in the Subway Operator lunch room at Eglinton Subway Platform during the break.
- As agreed by the Advisory Working Committee, two (2) air sampling pumps (sampling for respirable dust, crystalline silica, and respirable metals) were worn by the employees for the duration of the work shift. The remaining equipment was placed in stationary locations adjacent to the employees.

5.5. Subway Platforms (Coxwell and Eglinton)

It was agreed by the Advisory Working committee that air sampling would be conducted right in front of the Subway Operator lunch room at Coxwell Subway Platform and the supervisor's office (Room 18Y75) at Eglinton Subway Platform for the duration of revenue service as Subway Operators often report to and take breaks inside or in front of these rooms and historically, dust-related air quality concerns for these rooms have been reported on a number of occasions. The doors to these break rooms were observed to be in the open position for the majority of the time, allowing the subway platform air to enter freely. Sampling performed immediately outside the break rooms was therefore considered to be representative of exposures of 1) employees who take breaks immediately outside the rooms, 2) employees who take breaks inside the rooms, and 3) the supervisor who works inside the room for full shifts, given that the door was opened all (or most) of the time. It should be noted that on Line 1, the break room at Eglinton (i.e., the supervisor's office) switched locations to Wilson Subway Platform as of February 18, 2018.

September 19, 2017

- Area samples were collected at Coxwell Subway Platform from 5:30 AM to 1:30 PM. The samples were collected on the eastbound platform adjacent to the lunch room.
- A number of supervisors and operators were observed to be on the platform level adjacent to the lunch room for the duration of the sampling.

September 21, 2017

- Area samples were collected at Eglinton Subway Platform from 5:30 AM to 1:30 PM. The samples were collected on the middle platform adjacent to the supervisors' office (Room 18Y75).

- A number of supervisors and operators were observed to be on the platform level adjacent to the supervisors' office for the duration of the sampling.
- At the time the sampling, an employee reported a concern regarding wetting down of the tracks. Minor water accumulation was observed on some sections of the tracks, both the northbound and southbound. The source of the water was unknown to OHE.

September 26, 2017

- Area samples were collected at Coxwell Subway Platform from 1:00 PM to 9:00 PM. The samples were collected on the eastbound platform adjacent to the lunch room.
- A number of supervisors and operators were observed to be on the platform level adjacent to the lunch room for the duration of the sampling.

September 28, 2017

- Area samples were collected at Eglinton Subway Platform from 1:00 PM to 9:00 PM. The samples were collected on the middle platform adjacent to the supervisors' office (Room 18Y75).
- A number of supervisors and operators were observed to be on the platform level adjacent to the supervisors' office for the duration of the sampling.

November 7, 2017

- Area samples were collected at Coxwell Subway Platform from 6:00 PM to 2:00 AM. The samples were collected on the eastbound platform adjacent to the lunchroom.
- A number of supervisors and operators were observed to be on the platform level adjacent to the lunchroom from 6:00 PM to approximately midnight.

November 16, 2017

- Area samples were collected at Eglinton Subway Platform from 6:00 PM to 2:00 AM. The samples were collected on the middle platform adjacent to the supervisors' office (Room 18Y75).
- A number of supervisors and operators were observed to be on the platform level adjacent to the supervisors' office from 6:00 PM to approximately midnight.

5.6. End Terminal Cleaners

End Terminal Cleaners clean trains upon arrival at various end terminal stations - normally this includes Kennedy, Finch, and Sheppard stations. Other end terminals are included as required during weekend subway closures (e.g., Vaughan Metropolitan Centre and Kipling). Regular

duties include picking up debris, spill cleanup, anti-draft cleaning, and train ledge dusting. The majority of their work shifts are spent at subway platform level.

There are approximately 50 End Terminal Cleaners. The shift durations are 8.5 hours. Employees work either days (8:00 AM to 4:30 PM), or nights (6:30 PM to 3:00 AM).

October 3, 2017 (Finch AM)

- Six (6) employees were observed to be working at Finch Station Subway Platform from approximately 8:00 AM to 4:30 PM (i.e. 8.5-hour shift), with two (2) 20-minute and one (1) 40-minute breaks.
- The employees were observed to be working in the underground portions of the subway system (i.e., Finch Subway Platform) for approximately 85% of the work shift. The employees were observed to take turns for the breaks ensuring regular cleaning of the trains. The employees were observed to leave the platform level during their breaks.
- As agreed by the Joint Health and Safety Committee, the air sampling equipment was placed in a stationary location in the middle of the platform adjacent to the employees.

October 5, 2017 (Kennedy AM)

- Six (6) employees were observed to be working at Kennedy Station Subway Platform from approximately 8:00 AM to 4:30 PM (i.e. 8.5-hour shift), with two (2) 20-minute and one (1) 40-minute breaks.
- The employees were observed to be working in the underground portions of the subway system (i.e., Kennedy Subway Platform) for approximately 85% of the work shift. The employees were observed to take turns for the breaks ensuring regular cleaning of the trains. The employees were observed to leave the platform level during their breaks.
- As agreed by the Joint Health and Safety Committee, the air sampling equipment was placed in a stationary location in the middle of the platform adjacent to the employees.

October 10, 2017 (Finch PM)

- Nine (9) employees were observed to be working at Finch Station Subway Platform from approximately 6:30 PM to 2:30 AM (i.e. 8-hour shift), with two (2) 20-minute and one (1) 40-minute breaks.
- The employees were observed to be working in the underground portions of the subway system (i.e., Finch Subway Platform) for approximately 85% of the work shift. The employees were observed to take turns for the breaks ensuring regular cleaning of the trains. The employees were observed to leave the platform level during their breaks.
- As agreed by the Joint Health and Safety Committee, the air sampling equipment was placed in a stationary location in the middle of the platform adjacent to the employees.

October 12, 2017 (Kennedy PM)

- Six (6) employees were observed to be working at Kennedy Station Subway Platform from approximately 6:30 PM to 2:30 AM (i.e. 8-hour shift), with two (2) 20-minute and one (1) 40-minute breaks.
- The employees were observed to be working in the underground portions of the subway system (i.e., Kennedy Subway Platform) for approximately 85% of the work shift. The employees were observed to take turns for the breaks ensuring regular cleaning of the trains. The employees were observed to leave the platform level during their breaks.
- As agreed by the Joint Health and Safety Committee, the air sampling equipment was placed in a stationary location in the middle of the platform adjacent to the employees.

October 17, 2017 (Sheppard AM)

- One (1) employee was observed to be working at Sheppard-Yonge Station Eastbound Subway Platform from approximately 8:30 AM to 3:30 PM. The employee reportedly started and completed the work shift at Finch Station at 8:00 AM and 4:30 PM, respectively (i.e. 8.5-hour shift), with two (2) 20-minute and one (1) 40-minute breaks.
- The employee was observed to be working in the underground portions of the subway system (i.e., Sheppard Line 4 Subway Platform) for approximately 85% of the work shift.
- As agreed by the Joint Health and Safety Committee, the air sampling equipment was placed in a stationary location in the middle of the platform adjacent to the employee.

October 19, 2017 (Sheppard PM)

- One (1) employee was observed to be working at Sheppard-Yonge Station Eastbound Subway Platform from approximately 8:00 PM to 9:00 PM and from 10:00 PM to 2:30 AM. The employee reportedly worked from 6:30 PM to 3:00 AM (i.e. 8.5-hour shift) with two (2) 20-minute and one (1) 40-minute breaks. The employee reportedly spent approximately 2.5 hours at the beginning of the shift at Don Mills Subway Platform.
- The employee was observed to be working in the underground portions of the subway system for approximately 85% of the work shift.
- As agreed by the Joint Health and Safety Committee, the air sampling equipment was placed in a stationary location in the middle of the platform adjacent to the employee.

5.7. Janitors

Subway Janitors perform janitorial duties in all subway stations. Regular tasks include sweeping, dusting, scrubbing, mopping, washing, polishing, spill cleanup, removing refuse and recycled materials.

There are approximately 120 employees in the Janitorial group. The shift durations are 8.5 hours, and employees work either days or nights. While employees in this workgroup perform a variety of duties, it was agreed that the focus should be on worst-case exposures i.e., duties that are performed mostly at subway platform level. It was subsequently decided that air sampling should be performed on employees using the floor scrubbing machine at subway platform level – employees were observed to use this machine in teams of two, and during the site assessments were observed to be performing this work solely for subway platform floors. Work was performed in a number of subway platforms that provided a balanced geographic representation of the different TTC subway lines (i.e., north, south, east and west).

October 31, 2017 (Line 2 West)

- Two (2) employees were observed to be working from approximately 6:30 AM to 1:30 PM. According to the employees, the work shift was from 6:30 AM to 3:00 PM (i.e. 8.5-hour shift). The employees were observed to have a break at the end of the work shift at 1:30 PM.
- The employees were observed to be working in the underground portions of the subway system for approximately 80% of the work shift. The employees were observed to be cleaning the floors of the subway platforms at Dundas West, Jane, Old Mill, Royal York, and Kipling Stations using a floor scrubbing machine. Travel to various subway platforms was done via the subway.

November 2, 2017 (Line 1 North)

- Two (2) employees were observed to be working from approximately 7:30 AM to 1:30 PM. According to the employees, the work shift was from 6:30 AM to 3:00 PM (i.e. 8.5-hour shift). The employees were observed to have a break at the end of the work shift at 1:30 PM.
- The employees were observed to be working in the underground portions of the subway system for approximately 70% of the work shift. The employees were observed to be cleaning the floors of the subway platforms at Summerhill, St. Clair, Eglinton, and Lawrence Stations using a floor scrubbing machine. Travel to various subway platforms was done via the subway.

November 9, 2017 (Line 1 South)

- Two (2) employees were observed to be working from approximately 7:30 AM to 1:30 PM. According to the employees, the work shift was from 6:30 AM to 3:00 PM (i.e. 8.5-hour shift). The employees were observed to have a break at the end of the work shift at 1:30 PM.

- The employees were observed to be working in the underground portions of the subway system for approximately 70% of the work shift. The employees were observed to be cleaning the floors of the subway platforms at Dundas, Queen, and King Stations using a floor scrubbing machine. Travel to various subway platforms was done via the subway.

November 14, 2017 (Line 2 East)

- Two (2) employees were observed to be working from approximately 6:30 AM to 12:30 PM. According to the employees, the work shift was from 6:30 AM to 3:00 PM (i.e. 8.5-hour shift). The employees were observed to have a break at the end of the work shift at 12:30 PM.
- The employees were observed to be working in the underground portions of the subway system for approximately 70% of the work shift. The employees were observed to be cleaning the floors of the subway platforms at Pape, Donlands, Greenwood, and Coxwell Stations using a floor scrubbing machine. Travel to various subway platforms was done via the subway.

5.8. Traffic Checkers

Traffic Checkers collect passenger and traffic-related data for the purpose of analysis and planning of transit services using field sheets and a portable computer. Approximately 55% of the total work that Traffic Checkers do is in the subway. Counts performed on subway platforms typically involve extended periods of sitting or standing in one location. There are approximately 17 Traffic Checkers. The shift durations are 8 hours, and employees work either days, afternoons and nights. Traffic Checkers may also work split shifts.

While Traffic Checkers perform work in a number of different locations, it was agreed that the focus here should be on worst-case subway air exposures i.e., counting duties that are performed mostly at subway platform level. Specific subway locations (described in detail below) were selected based on historic reports of dustiness at these locations.

December 4, 2017 (Yonge-Bloor Southbound)

- One (1) employee was observed to be working at Yonge-Bloor Southbound Subway Platform from approximately 7:00 AM to 11:00 AM and from 3:00 PM to 7:00 PM (i.e. 8-hour split shift). The employee was observed to take a break in between the split shifts.
- The employee was observed to be working in the underground portions of the subway system for approximately 95% of the work shift.
- As agreed by the Advisory Working Committee, the air sampling equipment was placed in a stationary location on the platform adjacent to the employee.

December 5, 2017 (Wellesley Northbound)

- One (1) employee was observed to be working at Wellesley Northbound Subway Platform from approximately 7:00 AM to 11:00 AM and from 3:00 PM to 7:00 PM (i.e. 8-hour split shift). The employee was observed to take a break in between the split shifts.
- The employee was observed to be working in the underground portions of the subway system for approximately 95% of the work shift.
- As agreed by the Advisory Working Committee, the air sampling equipment was placed in a stationary location on the platform adjacent to the employee.

December 6, 2017 (St. George Westbound)

- One (1) employee was observed to be working at St. George Westbound Subway Platform from approximately 7:00 AM to 11:00 AM and from 3:00 PM to 7:00 PM (i.e. 8-hour split shift). The employee was observed to take a break in between the split shifts.
- The employee was observed to be working in the underground portions of the subway system for approximately 95% of the work shift.
- As agreed by the Advisory Working Committee, the air sampling equipment was placed in a stationary location on the platform adjacent to the employee.

December 7, 2017 (Spadina Eastbound, Sherbourne Westbound)

- One (1) employee was observed to be working at Spadina Eastbound Subway Platform from approximately 7:00 AM to 11:00 AM and at Sherbourne Westbound Subway Platform from 3:00 PM to 7:00 PM (i.e. 8-hour split shift). The employee was observed to take a break in between the split shifts.
- The employee was observed to be working in the underground portions of the subway system for approximately 95% of the work shift.
- As agreed by the Advisory Working Committee, the air sampling equipment was placed in a stationary location on the platform adjacent to the employee.

6. RESULTS

The terms of reference document for the Subway Air Quality Study is presented in Appendix B.

The results of the air sampling are summarized in Appendix C.

The $PM_{2.5}$ graphs are presented in Appendix D showing the trends and fluctuations in the levels recorded.

The CO_2 graphs are presented in Appendix E showing the trends and fluctuations in the levels recorded.

The laboratory analysis reports are presented in Appendix F.

Examples of result analysis using a Brief and Scala model are presented in Appendix G.

7. ANALYSIS AND DISCUSSION

7.1. Background Information on Airborne Contaminants Studied

Asbestos

Asbestos is a naturally occurring mineral. Asbestos is divided into two mineral groups, serpentine and amphibole. The division between the two types of asbestos is based upon the crystalline structure. The fibers of asbestos are long and thin, easily distinguishable when compared with non-asbestos minerals. The construction industry has been using asbestos for many years because of the ability of asbestos to withstand high temperatures as well as its strength and resistance to corrosive chemicals.

When asbestos-containing material is disturbed, asbestos fibres are released into the air that have the potential to be inhaled into the lungs. Depending on the size of the individual fibres inhaled, some fibres are able to make their way deep into the alveoli of the lungs. Exposure to asbestos fibres may result in scarring of the lung tissue (asbestosis), cancer of the chest cavity (mesothelioma), or other asbestos-related cancers. In Ontario, asbestos is prescribed as a designated substance as per the Ontario Regulation 490/09 for Designated Substances (O. Reg. 490/09), made under the Occupational Health and Safety Act. The exposure to asbestos in the workplace is regulated by Ontario Regulation 833 for Control of Exposure to Biological and Chemical Agents (Reg. 833), made under the Occupational Health and Safety Act.

Dust (Particulates)

Airborne particulates are often a combination of physical and chemical substances that are suspended in the air in the form of liquid or solid droplets. Composition is specific to the environment. Historically, at TTC, bulk samples of dust have been analyzed and have been found to be composed primarily of iron oxide and trace amounts of other metals.

Following inhalation, particulates get into the air ways of the respiratory system and are deposited at different locations within the respiratory tract depending on the size, shape, and density of the dust. In a workplace environment, particulates often range between 0.1 to 10 µm in size as a result of the degradation of larger particles from various activities.

Inhalable dust is the fraction of airborne materials that can be breathed into the nose or mouth and is therefore prone to deposition anywhere in the respiratory tract. Respirable dust is the fraction of the dust that is small enough to be deposited in the gas-exchange region of the respiratory tract. $PM_{2.5}$ describes fine inhalable particles that are 2.5 micrometers or less in diameter. In Ontario, exposure to inhalable and respirable dusts in the workplace is regulated by Ontario Regulation 833 for Control of Exposure to Biological or Chemical Agents (Reg. 833), made under the Occupational Health and Safety Act. $PM_{2.5}$ is not regulated under the Occupational Health and Safety Act.

Crystalline Silica

Silica can be found naturally in two forms, crystalline or amorphous form. It is a basic component of soil, sand, granite, and many other minerals. Crystalline silica is regulated due to its significant toxicity over the amorphous silica. The three most common forms of crystalline silica in the workplace are quartz, cristobalite and tridymite, and the most common form is quartz. The physical properties of silica make it a valuable substance for use in a variety of different industries, processes, and common construction materials such as concrete, cement, stone, and tiles among others.

All forms of crystalline silica may become airborne and respirable when workers refine or process objects that contain crystalline silica. Health effects resulting from exposure to crystalline silica range from eye and skin irritation, coughing and sneezing to silicosis, a progressive lung disease which in severe cases can be disabling, or even fatal. Crystalline silica has also been classified as a human lung carcinogen. In Ontario, crystalline silica is prescribed as a designated substance as per O. Reg. 490/09, made under the Occupational Health and Safety Act. The exposure to crystalline silica in the workplace is regulated by Reg. 833, made under the Occupational Health and Safety Act.

Metals

In a workplace environment, suspended particulate matter may contain some concentrations of metals, including heavy metals. In very small amounts, many of these metals are necessary to support life. However, in larger amounts, they become toxic. Exposure can occur following inhalation of metals or metal compounds, either as fine dust or as fumes. Physical symptoms are dose-dependent and may vary among persons exposed.

The determination of metal components within particulate matter is important from toxicological perspective. Exposure to different types of metals may result in different types of health effects. Certain metals, including arsenic, beryllium, hexavalent chromium, cadmium, cobalt, lead and nickel are suspected or confirmed human carcinogens. In Ontario, some of these metals including arsenic and lead are prescribed as designated substances as per O. Reg. 490/09, made under the

Occupational Health and Safety Act. Exposure to various types of metals in the workplace is regulated by Reg. 833, made under the Occupational Health and Safety Act.

Carbon Monoxide

Carbon monoxide is a colourless, odourless, toxic gas that is a product of incomplete combustion of carbon-containing compounds. Natural sources include photochemical reactions in the troposphere, volcanoes, and forest fires. Other sources of carbon monoxide may include heat and power generators and automotive emissions. Carbon monoxide is one of the major components of diesel exhaust emissions and has been used as a marker or indicator of exposure to diesel exhaust, which is a confirmed human carcinogen. Exposure to carbon monoxide at a lower concentration may cause fatigue. At higher concentrations, exposure to carbon monoxide may impair vision and coordination and cause headache, dizziness, vomiting, confusion, unconsciousness and potentially loss of life by inhibiting oxygen uptake. In Ontario, exposure to carbon monoxide in the workplace is regulated by Reg. 833, made under the Occupational Health and Safety Act.

Carbon Dioxide

Carbon dioxide is a colourless, odourless gas at atmospheric temperatures and pressures. At higher concentrations, it has a sharp and acidic odour. Carbon dioxide is produced by all aerobic organisms during metabolism of carbohydrates and lipids to produce energy by respiration. Carbon dioxide in its gas form is an asphyxiant, which reduces or displaces the normal oxygen concentration in air and cause suffocation. As less oxygen becomes available, health effects such as nausea, vomiting, collapse and convulsions can occur. Exposure to concentrations of 10 percent or more of carbon dioxide may cause unconsciousness and potentially loss of life. In Ontario, exposure to carbon dioxide in the workplace is regulated by Reg. 833, made under the Occupational Health and Safety Act.

Nitrogen Dioxide

Nitrogen dioxide is a reddish-brown gas with a pungent and irritating odour, and is a prominent air pollutant. Nitrogen dioxide is introduced into the environment by natural sources, including intrusion of stratospheric nitrogen oxides, bacterial respiration, volcanic action, and lightning. In urban areas, the most prominent source of nitrogen dioxide is the combustion of fossil fuels, including internal combustion engines in motor vehicles. Along with carbon monoxide, nitrogen dioxide has been used as a marker for diesel exhaust exposure. Depending on the concentration and duration of exposure, exposure to nitrogen dioxide may result in upper respiratory tract irritation, coughing, pulmonary edema, bronchitis, and possible lung damage. In Ontario, exposure to nitrogen dioxide in the workplace is regulated by Reg. 833, made under the Occupational Health and Safety Act.

7.2. Analysis of Results

7.2.1. Transit Enforcement – Special Constables

Two (2) sample sets were collected for the Special Constables. The 8-hour TWA exposures to all airborne contaminants with applicable OELs were found to range from 0.002 to 18.7% of the OELs. The 8-hour TWA exposures were found to be below the OELs specified in Reg. 833. In addition, following the Brief and Scala model, the exposures were found to be below the adjusted OELs.

7.2.2. Transit Enforcement – Fare Inspectors

Two (2) sample sets were collected for the Fare Inspectors. The 8-hour TWA exposures to all airborne contaminants with applicable OELs were found to range from 0.002 to 13.8% of the OELs. The 8-hour TWA exposures were found to be below the OELs specified in Reg. 833. In addition, following the Brief and Scala model, the exposures were found to be below the adjusted OELs.

7.2.3. Track Patrollers

Four (4) sample sets were collected for the Track Patrollers. The 8-hour TWA exposures to all airborne contaminants with applicable OELs were found to range from 0.003 to 16.5% of the OELs. The 8-hour TWA exposures were found to be below the OELs specified in Reg. 833.

7.2.4. Subway Operators / Guards

Six (6) sample sets were collected for the Subway Operators / Guards for Line 1. The 8-hour TWA exposures to all airborne contaminants with applicable OELs were found to range from 0.002 to 26.5% of the OELs. The 8-hour TWA exposures were found to be below the OELs specified in Reg. 833. In addition, following the Brief and Scala model, the exposures were found to be below the adjusted OELs.

Four (4) sample sets were collected for the Subway Operators / Guards for Line 2. The 8-hour TWA exposures to all airborne contaminants with applicable OELs were found to range from 0.002 to 29.1% of the OELs. The 8-hour TWA exposures were found to be below the OELs specified in Reg. 833. In addition, following the Brief and Scala model, the exposures were found to be below the adjusted OELs.

Two (2) sample sets were collected for the Subway Operators / Guards for Line 4. The 8-hour TWA exposures to all airborne contaminants with applicable OELs were found to range from 0.001 to 17.3% of the OELs. The 8-hour TWA exposures were found to be below the OELs

specified in Reg. 833. In addition, following the Brief and Scala model, the exposures were found to be below the adjusted OELs.

7.2.5. Subway Platforms (Coxwell and Eglinton)

Six (6) sample sets were collected for Coxwell and Eglinton Subway Platforms, right in front of the break rooms. The 8-hour TWA exposures to all airborne contaminants with applicable OELs were found to range from 0.004 to 18.2% of the OELs. The 8-hour TWA exposures were found to be below the OELs specified in Reg. 833.

7.2.6. End Terminal Cleaners

Six (6) sample sets were collected for the End Terminal Cleaners. The 8-hour TWA exposures to all airborne contaminants with applicable OELs were found to range from 0.001 to 16.7% of the OELs. The 8-hour TWA exposure were found to be below the OELs specified in Reg. 833. In addition, following the Brief and Scala model, the exposures were found to be below the adjusted OELs.

7.2.7. Janitors

Four (4) sample sets were collected for the Janitors while using the floor scrubbing machine. The 8-hour TWA exposures to all airborne contaminants with applicable OELs were found to range from 0.002 to 20.8% of the OELs. The 8-hour TWA exposures were found to be below the OELs specified in Reg. 833.

7.2.8. Traffic Checkers

Four (4) sample sets were collected for the Traffic Checkers. The 8-hour TWA exposures to all airborne contaminants with applicable OELs were found to range from 0.003 to 25.8% of the OELs. The 8-hour TWA exposures were found to be below the OELs specified in Reg. 833.

8. CONCLUSIONS

Based on the observations made during the study and the results of the air sampling, the following are our conclusions:

Limited conclusions are provided at this time as the study is not yet completed and all the pertinent data is not yet available.

- The exposures of the Special Constables to airborne contaminants studied were below the OELs specified in Reg. 833 and the Brief and Scala adjusted OELs.

- The exposures of the Fare Inspectors to airborne contaminants studied were below the OELs specified in Reg. 833 and the Brief and Scala adjusted OELs.
- The exposures of the Track Patrollers to airborne contaminants studied were below the OELs specified in Reg. 833.
- The exposures of the Subway Operators / Guards to airborne contaminants studied were below the OELs specified in Reg. 833 and the Brief and Scala adjusted OELs.
- The exposures of the End Terminal Cleaners to airborne contaminants studied were below the OELs specified in Reg. 833 and the Brief and Scala adjusted OELs.
- The exposures of the Janitors to airborne contaminants studied were below the OELs specified in Reg. 833.
- The exposures of the Traffic Checkers to airborne contaminants studied were below the OELs specified in Reg. 833.
- The concentrations of airborne contaminants on the subway platforms were below the OELs specified in Reg. 833.
- None of the 40 sample sets collected to date exceeded the OELs specified in Reg. 833. Based on the interim sampling results, the subway air quality is not expected to affect the health of employees in work positions assessed who do not have pre-existing serious respiratory conditions.

9. RECOMMENDATIONS

Limited recommendation is provided at this time as the study is not yet completed and all the pertinent data is not yet available.

- Based on the results of the air sampling obtained to date, the use of respiratory protection during the work shifts studied is not required.

10. GENERAL STATEMENT OF LIMITATIONS

The information and opinions rendered in this report are for use exclusively by the **Toronto Transit Commission (TTC)**. OHE reserves the right to review and comment on any interpretation of the data or conclusions derived by TTC. No other representation, either expressed or implied, is included in this report.

OHE has exercised a degree of thoroughness and competence that is consistent with the profession during the execution of the TTC Subway Air Quality Study. OHE considers the opinions and information as they are presented in this report to be factual at the time of the study of the subject space.

OHE relied on professional judgment while gathering and analyzing the information obtained. OHE cannot warrant or guarantee that the conclusions reached are absolutely complete or accurate. However, OHE commits itself to care and competence in reaching those conclusions.

Dated March 2018

OHE Consultants
Occupational Hygiene & Environment

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Summary of Sampling Events

Table 1. Summary of Sampling Events
August 3, 2017 – December 7, 2017

Date	Description	JHSC Worker Representative Present
August 3, 2017	Special Constables, 3:00PM – 2:30AM	David Moskowitz
August 11, 2017	Special Constables, 5:00AM – 4:30PM	David Moskowitz
August 14, 2017	Fare Inspectors, 6:30AM – 4:30PM	Stephen Barreca
August 17, 2017	Fare Inspectors, 8:00AM – 6:00PM	Stephen Barreca
August 29, 2017	Track Patrollers, Y3 Finch to Eglinton, 8:00AM – 4:00PM	NA
August 31, 2017	Track Patrollers, B2 Dufferin to Donlands, 8:00AM – 4:00PM	NA
September 6, 2017	Track Patrollers, Y5/Y2 King to Eglinton, 8:00AM – 4:00PM	NA
September 7, 2017	Track Patrollers, Y6 Union to St. Clair West, 8:00AM – 4:00PM	NA
September 8, 2017	Subway Operators / Guards, YUS Line (Line 1), 5:00AM – 2:30PM	Brad Pugh
September 12, 2017	Subway Operators / Guards, BD Line (Line 2), 5:00AM – 3:00PM	Daniel Bandelj
September 13, 2017	Subway Operators / Guards, BD Line (Line 2), 4:00PM – 2:00AM	Daniel Bandelj
September 15, 2017	Subway Operators / Guards, YUS Line (Line 1), 4:00PM – 2:00AM	Greg Jackson
September 19, 2017	Coxwell Eastbound Platform by Lunchroom, 5:30AM – 1:30PM	Daniel Bandelj
September 21, 2017	Eglinton Middle Platform by Supervisors' Office, 5:30AM – 1:30PM	None
September 26, 2017	Coxwell Eastbound Platform by Lunchroom, 1:00PM – 9:00PM	None
September 28, 2017	Eglinton Middle Platform by Supervisors' Office, 1:00PM – 9:00PM	None
October 3, 2017	End Terminal Cleaners, Finch Middle Platform, 8:00AM – 4:30PM	Devon Tracey

Table 1 (Continued). Summary of Sampling Events

Date	Description	JHSC Worker Representative Present
October 5, 2017	End Terminal Cleaners, Kennedy Middle Platform, 8:00AM – 4:30PM	Devon Tracey
October 10, 2017	End Terminal Cleaners, Finch Middle Platform, 6:30PM – 2:30AM	Peter Lawryshyn
October 12, 2017	End Terminal Cleaners, Kennedy Middle Platform, 6:30PM – 2:30AM	Peter Lawryshyn
October 17, 2017	End Terminal Cleaners, Sheppard Eastbound Platform, 8:30AM – 3:30PM	Devon Tracey
October 19, 2017	End Terminal Cleaners, Sheppard Eastbound Platform, 6:30PM – 3:00AM	Peter Lawryshyn
October 24, 2017	Subway Operators, Sheppard Line (Line 4), 5:00AM – 11:30AM & 1:30PM – 5:00PM	None
October 26, 2017	Subway Operators, Sheppard Line (Line 4), 5:30PM – 2:00AM	None
October 30, 2017	Subway Operators / Guards, YUS Line (Line 1), 5:00AM – 3:00PM	None
October 31, 2017	Janitors (Dundas West, Jane, Old Mill, Royal York, Kipling), 6:30AM - 3:00PM	Enrico Signore & Alex Amm
November 2, 2017	Janitors (Summerhill, St. Clair, Eglinton, Lawrence), 6:30AM – 3:00PM	Alex Amm
November 7, 2017	Coxwell Eastbound Platform by Lunchroom, 6:00PM – 2:00AM	Daniel Bandelj
November 9, 2017	Janitors (Dundas, Queen King), 6:30AM – 3:00PM	Alex Amm
November 14, 2017	Janitors (Pape, Donlands, Greenwood, Coxwell), 6:30AM – 3:00PM	Enrico Signore & Alex Amm
November 16, 2017	Eglinton Middle Platform by Supervisors' Office, 6:00PM – 2:00AM	None
December 4, 2017	Traffic Checkers (Bloor), 7:00AM – 11:00AM & 3:00PM – 7:00PM	None
December 5, 2017	Traffic Checkers (Wellesley), 7:00AM – 11:00AM & 3:00PM – 7:00PM	None
December 6, 2017	Traffic Checkers (St. George), 7:00AM – 11:00AM & 3:00PM – 7:00PM	None
December 7, 2017	Traffic Checkers (Spadina & Sherbourne), 7:00AM – 11:00AM & 3:00PM – 7:00PM	None

Terms of Reference

Attachment A

Terms of Reference – Subway Air Quality Study

Background

Health Canada recently published a public health subway air quality study which was the source of great media attention, employee concern and four employee work refusals.

The TTC has conducted subway air quality studies in 1977, 1980, and 1995. These were performed to provide information on the air quality in the underground portions of the subway and determined both employee and customer exposures to airborne contaminants.

Previous air quality results reflected the improvements made over the years. The total dust levels at selected stations were reduced by 40 to 80% on average. Airborne lead levels were lowered almost to the detection limit of the analytical method used. Airborne asbestos was reduced to a level well below the Ministry of Environment and Energy Guideline for the general public. The most recent subway air quality study performed in 1995 found that not one of the more than 280 samples taken were above the former and current occupational exposure limits for employees. Based on the air quality results and professional judgment, it was determined that the air quality in the system would not affect the health of employees or patrons who do not have pre-existing serious respiratory conditions.

Initiatives such as the corridor cleaning program, station/tunnel washing, improved air filtration on the TR trains (air conditioning is on roof instead of below) and the T1 air duct cleaning program have been undertaken since the last study and are expected to have improved air quality.

Purpose

Updating the subway air quality study will provide current information on the air quality in the underground portions of the subway and will determine employee exposures to airborne contaminants.

This will be a follow up to previous subway air quality studies.

Scope of Work

The study will characterize employee exposures to airborne contaminants and verify compliance with Ontario Regulation 833 – Control of Exposure to Biological or Chemical Agents, made under the Occupational Health and Safety Act. This regulation sets occupational exposure limits for airborne chemical agents.

PM2.5 dust samples will be collected for future reference. Total and respirable (less than 10 microns) dust samples will be collected and compared to existing exposure limits.

The study will identify and prioritize potential areas of risk and opportunities for managing these risks.

Method

Duration
The study will be conducted over a one-year period (2017 and 2018).

Location
The study will focus primarily on the underground portions of the subway system (tunnels and platform levels) during revenue service (some external stations that were previously used to establish outdoor background comparisons will also be repeated). Station locations have been selected to duplicate previous studies so long term comparisons can be made. Subway Transportation/work groups (i.e. that travel entire lines) will also be assessed.

Time
Sampling will be conducted during regular operating hours, mostly during morning rush hour as this was how the previous study was conducted and would be considered the worst case scenario. It is expected that the morning rush hour presents the highest contamination levels for the following reasons:

- Contaminants from work done in the tunnels overnight may still be present
- The rush hour is concentrated over a short period of time

Sampling Methods
Air quality will be evaluated using a combination of traditional occupational hygiene sampling methods and contemporary direct reading instrumentation. Both personal and area samples will be collected by third party consultants OHE Consultants or Pinchin Ltd. Laboratory analysis of samples will be performed by independent, accredited third party laboratories.

Since 2013, the TTC has had contracts with OHE Consultants and Pinchin Ltd. based on a competitive bid process for occupational hygiene services.

The JHSC will be consulted about the occupational sampling that will be undertaken and will be invited to be present at the beginning of testing to fulfill the requirements under the Occupational Health and Safety Act.

Exposure groups
To make effective use of sampling time, job titles that are likely to work in similar environments have been grouped as follows:

- Employees who work in stations
- Employees who work on trains
- Employees who work in tunnels

The following job titles within each workgroup will be assessed, based on risk, professional judgement and previous JHSC input.

Employees are to be studied in the following order (track level, stations and inside trains) as part of the Subway Air Quality Study. These include:

Similar Exposure Group	Job Title
Track Level	Track Patroller
Stations	Traffic Checker End Terminal Cleaner (Carhouse Helpers) Station Janitor (BD West) Collector/Crash Gate Attendant (Dundas/Queen/Sheppard Line at subway platform) Transportation Supervisor (Subway) Station Supervisors Transit Enforcement Officers (Subway)
Inside Trains	Operators and Guards

Additional respiratory hazard assessments will be conducted for the following groups with specific maintenance activities that may generate/disturb dust.

Similar Exposure Group	Job Title
Track Level	Track Maintainer (afternoon crew) Electrician Wiring and Service – Grade 1 (Track Level Crew) Signals Technician – Grade 1
Stations	Maintenance Mechanic Escalator Mechanic Line Mechanic (Rail Vehicle Analyzers - platform) Communications Technician

The following employees from each similar exposure group and representing each of the unions will be studied during the first round of sampling i.e. Track Patrol, Traffic Checker, Transit Enforcement Officers, Signal Technician – Grade 1 and Operators/Guards. These job titles have been identified as spending the greatest amount of time in the subway.

Contaminants

The updated Subway Air Quality Study will characterize employee exposures to airborne contaminants and verify compliance with Ontario Regulation 833 – Control of Exposure to Biological or Chemical Agents, made under the Occupational Health and Safety Act. This regulation sets occupational exposure limits for airborne chemical agents.

The following chemicals will be evaluated – this is based on professional judgment, and input from both JHSC and public health agencies in previous subway air quality studies.

- Asbestos
- Crystalline respirable silica
- Dust (various respirable occupational fractions and PM2.5)
- Various metals (30 metals including aluminum, antimony, arsenic, barium, bismuth, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, lithium, magnesium, manganese, molybdenum, nickel, potassium, selenium, silver, sodium, strontium, thallium, tin, tungsten, uranium, vanadium, zinc, zirconium)
- Diesel exhaust markers (CO and NOx)

Air Sampling Results

Table 1a. Air Sampling Results

Transit Enforcement – Special Constables

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored											
				Total Metals (mg/m^3)											
				Sb	As	Ba	Be	Cd	CaO	Cr	Co	Cu	Pb	Mn	Se
Occupational Exposure Limits				0.5	0.1	0.5	0.002	0.01	2	0.5	0.02	1	0.05	0.02	0.2
Job Title: Special Constables															
A1, S1, I1, M1, T1	3-Aug-17	Special Constables 3:00 PM - 2:30 AM	640	<0.0007	<0.0002	0.0018	<0.0001	<0.0001	<0.083	<0.0059	<0.0004	<0.0002	<0.0003	0.0004	<0.0018
8-hour TWA				0.00102	0.000345	0.00259	0.000172	0.000172	0.1193	0.00848	0.000517	0.000345	0.000431	0.000575	0.00259
A3, S3, I3, M3, T3	11-Aug-17	Special Constables 5:00 AM - 4:30 PM	615	<0.0007	<0.0002	0.0041	<0.0001	<0.0001	<0.086	<0.0061	<0.0004	0.00035	<0.0003	0.0007	<0.0018
8-hour TWA				0.00105	0.000345	0.00589	0.000172	0.000172	0.1236	0.00877	0.000532	0.000503	0.000446	0.00101	0.00259
		Number of Samples		2	2	2	2	2	2	2	2	2	2	2	2
		Average		0.00103	0.000345	0.00424	0.000172	0.000172	0.1215	0.00862	0.000524	0.000424	0.000438	0.000790	0.00259
		Average % of OEL		0.207	0.345	0.848	8.625	1.725	6.073	1.725	2.623	0.042	0.877	3.953	1.294

Notes: Grey shaded entries denote samples were below the analytical detection limit
NA = not applicable

Table 1b. Air Sampling Results

Transit Enforcement – Special Constables

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored										
				Respirable Metals (mg/m^3)					Inhalable Metals (mg/m^3)					
				Al	Cd	FeO	Mo	ZnO	Be	MgO	Mo	Ni	Tl	V_2O_5
Occupational Exposure Limits				0.5	0.1	0.5	1	0.002	5	3	2	0.00005	10	10
Job Title: Special Constables														
A1, S1, I1, M1, T1	3-Aug-17	Special Constables 3:00 PM - 2:30 AM	640	<0.0059	<0.00012	0.041	<0.00012	<0.0022	NA	<0.0098	<0.00012	<0.00024	<0.0012	<0.00063
8-hour TWA							0.000172	0.003162	NA	0.014087	0.000172	0.000345	0.001725	0.000906
A3, S3, I3, M3, T3	11-Aug-17	Special Constables 5:00 AM - 4:30 PM	615	<0.0061	<0.00012	0.074	<0.00012	<0.0023	NA	<0.010	<0.00012	<0.00024	<0.0012	<0.00065
8-hour TWA				0.008769	0.000172	0.10637	0.000172	0.003306	NA	0.014375	0.000172	0.000345	0.001725	0.000934
Number of Samples				2	2	2	2	2	0	2	2	2	2	2
Average				0.008625	0.000172	0.08265	0.000172	0.003234	NA	0.014231	0.000172	0.000345	0.001725	0.00092
Average % of OEL				0.863	8.625	1.653	0.006	0.162	NA	0.142	0.002	0.035	8.625	1.840

Notes: Grey shaded entries denote samples were below the analytical detection limit
NA = not applicable

Table 1c. Air Sampling Results

Transit Enforcement – Special Constables

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored										
				Respirable Silica (mg/m^3)			Resp. Dust (mg/m^3)	Inh. Dust (mg/m^3)	$PM_{2.5}$ Dust	Asbestos (f/cc)		CO (ppm)	NO_2 (ppm)	CO_2 (ppm)
				Quartz	Cristoballite	Tridymite				PCM	TEM			
Occupational Exposure Limits				0.1	0.05	NA	3	10	NA	0.1	0.1	25	3	5000
Job Title: Special Constables														
A1, S1, I1, M1, T1	3-Aug-17	Special Constables 3:00 PM - 2:30 AM	640	Void	Void	Void	Void	0.11	0.050	0.017	<0.0045	<1	<0.1	NA
8-hour TWA							Void	0.1581	0.0719	0.0244	0.00647	1.437	0.1437	NA
A3, S3, I3, M3, T3	11-Aug-17	Special Constables 5:00 AM - 4:30 PM	615	<0.0041	<0.0041	<0.016	0.11	0.18	0.078	0.009	NA	<1	<0.1	NA
8-hour TWA				0.005894	0.005894	0.023	0.1581	0.2587	0.1121	0.0129	NA	1.437	0.1437	NA
Number of Samples				1	1	1	1	2	2	2	1	2	2	0
Average				0.005894	0.005894	0.023	0.1581	0.2084	0.092	0.0187	0.00647	1.4375	0.1437	NA
Average % of OEL				5.894	11.788	NA	5.271	2.084	NA	18.688	6.469	5.750	4.792	NA

Notes: Grey shaded entries denote samples were below the analytical detection limit
NA = not applicable

Table 2a. Air Sampling Results

Transit Enforcement – Fare Inspectors

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored											
				Total Metals (mg/m^3)											
				Sb	As	Ba	Be	Cd	CaO	Cr	Co	Cu	Pb	Mn	Se
Occupational Exposure Limits				0.5	0.1	0.5	0.002	0.01	2	0.5	0.02	1	0.05	0.02	0.2
Job Title: Fare Inspectors															
A5, S5, I5, M5, T5	14-Aug-17	Fare Inspector 6:30 AM - 4:30 PM	550	<0.0008	<0.0003	0.0057	<0.0001	<0.0001	<0.095	<0.0068	<0.0004	0.00052	<0.0003	0.00088	<0.0020
8-hour TWA				0.001025	0.000337	0.007125	0.000175	0.000175	0.11875	0.0085	0.000512	0.00065	0.000425	0.0011	0.0025
A7, S7, I7, M7, T7	17-Aug-17	Fare Inspector 8:00 AM - 6:00 PM	554	<0.0008	<0.0003	0.0034	<0.0001	<0.0001	<0.093	<0.0067	<0.0004	0.00036	<0.0003	0.00059	<0.0020
8-hour TWA				0.001	0.000337	0.00425	0.000162	0.000162	0.11625	0.00837	0.0005	0.00045	0.000412	0.000737	0.0025
			Number of Samples	2	2	2	2	2	2	2	2	2	2	2	2
			Average	0.001012	0.000337	0.005687	0.000169	0.000169	0.1175	0.00843	0.000506	0.00055	0.000419	0.000919	0.0025
			Average % of OEL	0.203	0.338	1.138	8.438	1.688	5.875	1.688	2.531	0.055	0.838	4.594	1.250

Notes: Grey shaded entries denote samples were below the analytical detection limit
NA = not applicable

Table 2b. Air Sampling Results

Transit Enforcement – Fare Inspectors

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored										
				Respirable Metals (mg/m^3)					Inhalable Metals (mg/m^3)					
				Al	Cd	FeO	Mo	ZnO	Be	MgO	Mo	Ni	Tl	V_2O_5
Occupational Exposure Limits				0.5	0.1	0.5	1	0.002	5	3	2	0.00005	10	10
Job Title: Fare Inspectors														
A5, S5, I5, M5, T5	14-Aug-17	Fare Inspector 6:30 AM - 4:30 PM	550	<0.0069	<0.00014	0.11	<0.00014	<0.0026	NA	<0.011	<0.00014	<0.00027	<0.0014	<0.00073
8-hour TWA							0.000175	0.00325	NA	0.01375	0.000175	0.000337	0.00175	0.000912
A7, S7, I7, M7, T7	17-Aug-17	Fare Inspector 8:00 AM - 6:00 PM	554	<0.0067	<0.00013	0.068	<0.00013	<0.0025	NA	<0.011	<0.00013	<0.00027	<0.0013	<0.00072
8-hour TWA				0.008375	0.000162	0.085	0.000162	0.003125	NA	0.01375	0.000162	0.000337	0.001625	0.0009
Number of Samples				2	2	2	2	2	0	2	2	2	2	2
Average				0.0085	0.000168	0.11125	0.000168	0.003187	NA	0.01375	0.000169	0.000337	0.001687	0.000906
Average % of OEL				0.850	8.438	2.225	0.006	0.159	NA	0.138	0.002	0.034	8.438	1.813

Notes: Grey shaded entries denote samples were below the analytical detection limit
NA = not applicable

Table 2c. Air Sampling Results

Transit Enforcement – Fare Inspectors

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored										
				Respirable Silica (mg/m^3)			Resp. Dust (mg/m^3)	Inh. Dust (mg/m^3)	$PM_{2.5}$ Dust	Asbestos (f/cc)		CO (ppm)	NO_2 (ppm)	CO_2 (ppm)
				Quartz	Cristoballite	Tridymite				PCM	TEM			
Occupational Exposure Limits				0.1	0.05	NA	3	10	NA	0.1	0.1	25	3	5000
Job Title: Fare Inspectors														
A5, S5, I5, M5, T5	14-Aug-17	Fare Inspector 6:30 AM - 4:30 PM	550	<0.0046	<0.0046	<0.018	0.18	0.38	0.118	0.01	NA	<1	<0.1	NA
8-hour TWA							0.225	0.475	0.1475	0.0125	NA	1.25	0.125	NA
A7, S7, I7, M7, T7	17-Aug-17	Fare Inspector 8:00 AM - 6:00 PM	554	<0.0045	<0.0045	<0.018	0.11	0.31	0.069	0.012	<0.0051	<1	<0.1	NA
8-hour TWA				0.005625	0.005625	0.0225	0.1375	0.3875	0.08625	0.015	0.006375	1.25	0.125	NA
Number of Samples				2	2	2	2	2	2	2	1	2	2	0
Average				0.0056875	0.0056875	0.0225	0.18125	0.43125	0.116875	0.01375	0.006375	1.25	0.125	NA
Average % of OEL				5.688	11.375	NA	6.042	4.313	NA	13.750	6.375	5.000	4.167	NA

Notes: Grey shaded entries denote samples were below the analytical detection limit
NA = not applicable

Table 3a. Air Sampling Results

Track Patrollers

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored											
				Total Metals (mg/m^3)											
				Sb	As	Ba	Be	Cd	CaO	Cr	Co	Cu	Pb	Mn	Se
Occupational Exposure Limits				0.5	0.1	0.5	0.002	0.01	2	0.5	0.02	1	0.05	0.02	0.2
Job Title: Track Patrollers															
A9, S9, I9, M9, T9	29-Aug-17	Y3 - Finch to Eglinton 8:00 AM - 4:00 PM	403	<0.0011	<0.0004	0.0041	<0.0002	<0.0002	<0.13	<0.0093	<0.0006	0.00063	<0.0005	0.00099	<0.0028
A11, S11, I11, M1, T11	31-Aug-17	B2 - Dufferin to Donlands 8:00 AM - 4:00 PM	378	<0.0012	<0.0004	0.015	<0.0002	<0.0002	<0.14	<0.099	<0.0006	0.0013	<0.0005	0.0021	<0.0030
A13, S13, I13, M13, T513	6-Sep-17	Y5/Y2 - Eglinton to Union 8:00 AM - 4:00 PM	380	<0.0012	<0.0004	0.0016	<0.0002	<0.0002	<0.14	<0.0097	<0.0006	<0.0004	<0.0005	0.00035	<0.0029
A15, S15, M15, T15	7-Sep-17	Y6 - St. Clair West to Union 8:00 AM - 4:00 PM	370	<0.0012	<0.0004	0.0035	<0.0002	<0.0002	<0.14	<0.010	<0.0006	<0.0004	<0.0005	0.00092	<0.0030
		Number of Samples		4	4	4	4	4	4	4	4	4	4	4	4
		Average		0.001175	0.00039	0.00605	0.000195	0.000195	0.1375	0.032	0.000582	0.00068	0.000485	0.00109	0.002925
		Average % of OEL		0.235	0.390	1.210	9.750	1.950	6.875	6.400	2.913	0.068	0.970	5.450	1.463

Notes: Grey shaded entries denote samples were below the analytical detection limit
NA = not applicable

Table 3b. Air Sampling Results

Track Patrollers

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored										
				Respirable Metals (mg/m^3)					Inhalable Metals (mg/m^3)					
				Al	Cd	FeO	Mo	ZnO	Be	MgO	Mo	Ni	Tl	V_2O_5
Occupational Exposure Limits				0.5	0.1	0.5	1	0.002	5	3	2	0.00005	10	10
Job Title: Track Patrollers														
A9, S9, I9, M9, T9	29-Aug-17	Y3 - Finch to Eglinton 8:00 AM - 4:00 PM	403	<0.0094	<0.00019	0.083	<0.00019	<0.0035	NA	<0.015	0.00041	<0.00037	<0.0019	<0.0010
A11, S11, I11, M1, T11	31-Aug-17	B2 - Dufferin to Donlands 8:00 AM - 4:00 PM	378	<0.0099	<0.00020	0.19	<0.00020	<0.0037	NA	<0.016	<0.00020	<0.00040	<0.0020	<0.0011
A13, S13, I13, M13, T513	6-Sep-17	Y5/Y2 - Eglinton to Union 8:00 AM - 4:00 PM	380	<0.0097	<0.00019	0.037	<0.00019	<0.0036	NA	<0.016	0.00021	<0.00039	<0.0019	<0.0010
A15, S15, M15, T15	7-Sep-17	Y6 - St. Clair West to Union 8:00 AM - 4:00 PM	370	<0.010	<0.00020	0.11	0.00022	<0.0038	NA	<0.017*	0.00041*	<0.00040*	<0.0020*	<0.0011*
		Number of Samples		4	4	4	4	4	0	4	4	4	4	4
		Average		0.00975	0.000195	0.105	0.0002	0.00365	NA	0.016	0.000307	0.00039	0.00195	0.00105
		Average % of OEL		0.975	9.750	2.100	0.007	0.183	NA	0.160	0.003	0.039	9.750	2.100

Notes: Grey shaded entries denote samples were below the analytical detection limit
NA = not applicable
* Samples were collected and analyzed as total fraction

Table 3c. Air Sampling Results

Track Patrollers

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored										
				Respirable Silica (mg/m^3)			Resp. Dust (mg/m^3)	Inh. Dust (mg/m^3)	$PM_{2.5}$ Dust	Asbestos (f/cc)		CO (ppm)	NO_2 (ppm)	CO_2 (ppm)
				Quartz	Cristoballite	Tridymite				PCM	TEM			
Occupational Exposure Limits				0.1	0.05	NA	3	10	NA	0.1	0.1	25	3	5000
Job Title: Track Patrollers														
A9, S9, I9, M9, T9	29-Aug-17	Y3 - Finch to Eglinton 8:00 AM - 4:00 PM	403	<0.0062	<0.0062	<0.025	0.14	0.25	0.096	0.016	<0.0072	<1	<0.1	NA
A11, S11, I11, M1, T11	31-Aug-17	B2 - Dufferin to Donlands 8:00 AM - 4:00 PM	378	<0.0066	<0.0066	<0.026	0.088	0.63	0.102	0.023	<0.0076	<1	<0.1	NA
A13, S13, I13, M13, T513	6-Sep-17	Y5/Y2 - Eglinton to Union 8:00 AM - 4:00 PM	380	<0.0065	<0.0065	<0.026	<0.065	NA	0.040	0.009	NA	<1	<0.1	NA
A15, S15, M15, T15	7-Sep-17	Y6 - St. Clair West to Union 8:00 AM - 4:00 PM	370	<0.0067	<0.0067	<0.027	<0.067	NA	0.229	0.018	<0.0076	<1	<0.1	NA
		Number of Samples		4	4	4	4	4	4	4	3	4	4	0
		Average		0.0065	0.0065	0.026	0.09	0.22	0.11675	0.0165	0.00747	1	0.1	NA
		Average % of OEL		6.500	13.000	NA	3.000	2.200	NA	16.500	7.467	4.000	3.333	NA

Notes: Grey shaded entries denote samples were below the analytical detection limit
NA = not applicable

Table 4a. Air Sampling Results

Subway Operators / Guards – Line 1

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored											
				Total Metals (mg/m^3)											
				Sb	As	Ba	Be	Cd	CaO	Cr	Co	Cu	Pb	Mn	Se
Occupational Exposure Limits				0.5	0.1	0.5	0.002	0.01	2	0.5	0.02	1	0.05	0.02	0.2
Job Title: Subway Operator / Guards – Line 1															
A17, S17, I15, M17, T17	8-Sep-17	Line 1 5:00 AM - 2:30 PM	543	<0.0008	<0.0003	0.0007	<0.0001	<0.0001	<0.098	<0.0070	<0.0004	<0.0003	<0.0003	0.00029	<0.0021
8-hour TWA				0.00105	0.00035	0.000875	0.000175	0.000175	0.1225	0.00875	0.000525	0.00035	0.000437	0.000362	0.002625
A19, S19, I17, M19, T19	8-Sep-17	Line 1 5:00 AM - 2:30 PM	515	<0.0009	<0.0003	0.00073	<0.0001	<0.0001	<0.10	<0.0072	<0.0004	<0.0003	<0.0004	0.00028	<0.0022
8-hour TWA				0.001087	0.000362	0.000912	0.000175	0.000175	0.125	0.009	0.000537	0.000362	0.00045	0.00035	0.00275
A29, S29, I27, M29, T29	15-Sep-17	Line 1 4:00 PM - 2:00 AM	566	<0.0008	<0.0003	0.0005	<0.0001	<0.0001	<0.092	<0.0066	<0.0004	<0.0003	<0.0003	0.00018	<0.0020
8-hour TWA				0.000987	0.000325	0.000625	0.000162	0.000162	0.115	0.00825	0.000487	0.000325	0.000412	0.000225	0.0025
A31, S31, I27, M31, T31	15-Sep-17	Line 1 4:00 PM - 2:00 AM	566	<0.0008	<0.0003	0.00042	<0.0001	<0.0001	<0.092	<0.0065	<0.0004	<0.0003	<0.0001	0.00018	<0.0020
8-hour TWA				0.000987	0.000325	0.000525	0.000162	0.000162	0.115	0.008125	0.000487	0.000325	0.000162	0.000225	0.0025
A57, S57, I55, M57, T57, H11	30-Oct-17	Line 1 Following Closure 5:00 AM - 3:00 PM	540	<0.0008	<0.0003	0.00063	<0.0001	<0.0001	<0.095	<0.0068	<0.0004	<0.0003	<0.0003	0.00021	<0.0020
8-hour TWA				0.001025	0.000337	0.000787	0.000175	0.000175	0.11875	0.0085	0.000512	0.000337	0.000425	0.000262	0.0025
A59, S59, I57, M59, T59, H13	30-Oct-17	Line 1 Following Closure 5:00 AM - 3:00 PM	535	<0.0008	<0.0003	0.00068	<0.0001	<0.0001	<0.099	<0.0071	<0.0004	<0.0003	<0.0003	0.00032	<0.0021
8-hour TWA				0.001062	0.00035	0.00085	0.000175	0.000175	0.12375	0.008875	0.000525	0.00035	0.000437	0.0004	0.002625
			Number of Samples	6	6	6	6	6	6	6	6	6	6	6	6
			Average	0.001033	0.000342	0.000762	0.000171	0.000171	0.12	0.008583	0.000512	0.000343	0.000387	0.000304	0.002583
			Average % of OEL	0.207	0.342	0.153	8.542	1.708	6.000	1.717	2.563	0.034	0.775	1.521	1.292

Notes: Grey shaded entries denote samples were below the analytical detection limit
NA = not applicable

Table 4b. Air Sampling Results

Subway Operators / Guards – Line 1

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored										
				Respirable Metals (mg/m^3)					Inhalable Metals (mg/m^3)					
				Al	Cd	FeO	Mo	ZnO	Be	MgO	Mo	Ni	Tl	V_2O_5
Occupational Exposure Limits				0.5	0.1	0.5	1	0.002	5	3	2	0.00005	10	10
Job Title: Subway Operator / Guards – Line 1														
A17, S17, I15, M17, T17	8-Sep-17	Line 1 5:00 AM - 2:30 PM	543	<0.0069	<0.00014	0.037	<0.00014	<0.0026	NA	<0.012	<0.00014	<0.00028	<0.0014	<0.00075
8-hour TWA				0.008625	0.000175	0.04625	0.000175	0.00325	NA	0.015	0.000175	0.00035	0.00175	0.000937
A19, S19, I17, M19, T19	8-Sep-17	Line 1 5:00 AM - 2:30 PM	515	<0.0072	<0.00014	0.03	<0.00014	<0.0027	NA	<0.012	0.00016	<0.00029	<0.0014	<0.00077
8-hour TWA				0.009	0.000175	0.0375	0.000175	0.003375	NA	0.015	0.0002	0.000362	0.00175	0.000962
A29, S29, I27, M29, T29	15-Sep-17	Line 1 4:00 PM - 2:00 AM	566	<0.0066	<0.00013	0.024	<0.00013	<0.0025	NA	<0.011	<0.00013	<0.00026	<0.0013	<0.00071
8-hour TWA				0.00825	0.000162	0.03	0.000162	0.003125	NA	0.01375	0.000162	0.000325	0.001625	0.000887
A31, S31, I27, M31, T31	15-Sep-17	Line 1 4:00 PM - 2:00 AM	566	<0.0066	<0.00013	0.017	<0.00013	<0.0024	NA	<0.011	<0.00013	<0.00026	<0.0013	<0.00069
8-hour TWA				0.00825	0.000162	0.02125	0.000162	0.003	NA	0.01375	0.000162	0.000325	0.001625	0.000862
A57, S57, I55, M57, T57, H11	30-Oct-17	Line 1 Following Closure 5:00 AM - 3:00 PM	540	<0.0068	<0.00014	0.017	<0.00014	<0.0026	<0.000007	<0.011	0.00019	0.00016	<0.00068	<0.00073
8-hour TWA				0.0085	0.000175	0.02125	0.000175	0.00325	0.0000085	0.01375	0.000237	0.0002	0.00085	0.000912
A59, S59, I57, M59, T59, H13	30-Oct-17	Line 1 Following Closure 5:00 AM - 3:00 PM	535	<0.0069	<0.00014	0.026	<0.00014	<0.0026	<0.000007	<0.011	<0.00007	<0.00014	<0.00068	<0.00073
8-hour TWA				0.008625	0.000175	0.0325	0.000175	0.00325	0.0000085	0.01375	0.000085	0.000175	0.00085	0.000912
			Number of Samples	6	6	6	6	6	2	6	6	6	6	6
			Average	0.008541	0.000171	0.031458	0.000171	0.003208	0.0000085	0.0141667	0.000170	0.000290	0.001408	0.000912
			Average % of OEL	0.854	8.542	0.629	0.006	0.160	17.000	0.142	0.002	0.029	7.042	1.825

Notes: Grey shaded entries denote samples were below the analytical detection limit
NA = not applicable

Table 4c. Air Sampling Results

Subway Operators / Guards – Line 1

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored											
				Respirable Silica (mg/m^3)			Resp. Dust (mg/m^3)	Inh. Dust (mg/m^3)	$PM_{2.5}$ Dust	Asbestos (f/cc)		CO (ppm)	NO_2 (ppm)	CO_2 (ppm)	Cr VI (mg/m^3)
				Quartz	Cristoballite	Tridymite				PCM	TEM				
Occupational Exposure Limits				0.1	0.05	NA	3	10	NA	0.1	0.1	25	3	5000	0.01
Job Title: Subway Operator / Guards – Line 1															
A17, S17, I15, M17, T17	8-Sep-17	Line 1 5:00 AM - 2:30 PM	543	<0.0047	<0.0047	<0.019	0.051	NA	0.062	<0.005	NA	<0.1	<0.1	1089	NA
8-hour TWA				0.005875	0.005875	0.02375	0.06375	NA	0.0775	0.0062	NA	0.125	0.125	1361.25	NA
A19, S19, I17, M19, T19	8-Sep-17	Line 1 5:00 AM - 2:30 PM	515	<0.0048	<0.0048	<0.019	<0.048	NA	0.037	<0.005	NA	0.1	<0.1	952	NA
8-hour TWA				0.006	0.006	0.02375	0.06	NA	0.04625	0.0062	NA	0.125	0.125	1190	NA
A29, S29, I27, M29, T29	15-Sep-17	Line 1 4:00 PM - 2:00 AM	566	<0.0044	<0.0044	<0.018	<0.044	0.092	0.031	0.006	NA	0.2	<0.1	1270	NA
8-hour TWA				0.0055	0.0055	0.0225	0.055	0.115	0.03875	0.0075	NA	0.25	0.125	1587.5	NA
A31, S31, I27, M31, T31	15-Sep-17	Line 1 4:00 PM - 2:00 AM	566	<0.0045	<0.0045	<0.018	<0.045	<0.086	0.032	0.005	NA	<0.1	<0.1	972	NA
8-hour TWA				0.005625	0.005625	0.0225	0.05625	0.1075	0.04	0.0062	NA	0.125	0.125	1215	NA
A57, S57, I55, M57, T57, H11	30-Oct-17	Line 1 Following Closure 5:00 AM - 3:00 PM	540	<0.0046	<0.0046	<0.018	<0.046	0.18	0.027	0.007	NA	<0.1	<0.1	1091	<0.00003
8-hour TWA				0.00575	0.00575	0.0225	0.0575	0.225	0.03375	0.0087	NA	0.125	0.125	1363.75	0.00003
A59, S59, I57, M59, T59, H13	30-Oct-17	Line 1 Following Closure 5:00 AM - 3:00 PM	535	<0.0046	<0.0046	<0.018	<0.046	<0.090	0.033	0.006	NA	<0.1	<0.1	995	<0.00003
8-hour TWA				0.00575	0.00575	0.0225	0.0575	0.1125	0.04125	0.0075	NA	0.125	0.125	1243.75	0.00003
		Number of Samples		6	6	6	6	4	6	6	0	6	6	6	2
		Average		0.00575	0.00575	0.0229167	0.05833	0.14	0.04625	0.0071	NA	0.1458	0.125	1326.87	0.00003
		Average % of OEL		5.750	11.500	NA	1.944	1.400	NA	7.083	NA	0.583	4.167	26.538	0.344

Notes: Grey shaded entries denote samples were below the analytical detection limit
NA = not applicable

Table 5a. Air Sampling Results

Subway Operators / Guards – Line 2

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored											
				Total Metals (mg/m^3)											
				Sb	As	Ba	Be	Cd	CaO	Cr	Co	Cu	Pb	Mn	Se
Occupational Exposure Limits				0.5	0.1	0.5	0.002	0.01	2	0.5	0.02	1	0.05	0.02	0.2
Job Title: Subway Operator / Guards – Line 2															
A21, S21, I19, M21, T21	12-Sep-17	Line 2 5:00 AM - 3:00 PM	551	<0.0008	<0.0002	0.0054	<0.0001	<0.0001	<0.095	<0.0068	<0.0004	0.00044	<0.0003	0.00078	<0.0020
8-hour TWA				0.001025	0.000337	0.00675	0.000175	0.000175	0.11875	0.0085	0.000512	0.00055	0.000425	0.000975	0.0025
A23, S23, I21, M23, T23	12-Sep-17	Line 2 5:00 AM - 3:00 PM	560	<0.0008	<0.0003	0.0058	<0.0001	<0.0001	<0.094	<0.0067	<0.0004	0.00047	<0.0003	0.00083	<0.0020
8-hour TWA				0.001	0.000337	0.00725	0.000162	0.000162	0.1175	0.008375	0.0005	0.000587	0.000412	0.001037	0.0025
A25, S25, I23, M25, T25	13-Sep-17	Line 2 4:00 PM - 2:00 AM	575	<0.0008	<0.0003	0.0066	<0.0001	<0.0001	<0.091	<0.0065	<0.0004	0.00054	<0.0003	0.00095	<0.0019
8-hour TWA				0.000975	0.000325	0.00825	0.000162	0.000162	0.11375	0.008125	0.000487	0.000675	0.0004	0.001187	0.002375
A27, S27, I25, M27, T27	13-Sep-17	Line 2 4:00 PM - 2:00 AM	560	<0.0008	<0.0003	0.0067	<0.0001	<0.0001	<0.092	<0.0066	<0.0004	0.00052	<0.0003	0.00095	<0.0020
8-hour TWA				0.000987	0.000325	0.008375	0.000162	0.000162	0.115	0.00825	0.000487	0.00065	0.000412	0.001187	0.0025
			Number of Samples	4	4	4	4	4	4	4	4	4	4	4	4
			Average	0.000997	0.000331	0.007656	0.000166	0.000166	0.11625	0.008312	0.000497	0.000616	0.000412	0.001097	0.002469
			Average % of OEL	0.199	0.331	1.531	8.281	1.656	5.813	1.663	2.484	0.062	0.825	5.484	1.234

Notes: Grey shaded entries denote samples were below the analytical detection limit
NA = not applicable

Table 5b. Air Sampling Results

Subway Operators / Guards – Line 2

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored										
				Respirable Metals (mg/m^3)					Inhalable Metals (mg/m^3)					
				Al	Cd	FeO	Mo	ZnO	Be	MgO	Mo	Ni	Tl	V_2O_5
Occupational Exposure Limits				0.5	0.1	0.5	1	0.002	5	3	2	0.00005	10	10
Job Title: Subway Operator / Guards – Line 2														
A21, S21, I19, M21, T21	12-Sep-17	Line 2 5:00 AM - 3:00 PM	551	<0.0068	<0.00014	0.098	<0.00014	<0.0025	NA	<0.011	<0.00014	<0.00027	<0.0014	<0.00073
8-hour TWA				0.0085	0.000175	0.1225	0.000175	0.003125	NA	0.01375	0.000175	0.000337	0.00175	0.000912
A23, S23, I21, M23, T23	12-Sep-17	Line 2 5:00 AM - 3:00 PM	560	<0.0066	<0.00013	0.097	<0.00013	<0.0025	NA	<0.011	<0.00013	<0.00027	<0.0013	<0.00071
8-hour TWA				0.00825	0.000162	0.12125	0.000162	0.003125	NA	0.01375	0.000162	0.000337	0.001625	0.000887
A25, S25, I23, M25, T25	13-Sep-17	Line 2 4:00 PM - 2:00 AM	575	<0.0065	<0.00013	0.11	<0.00013	<0.0024	NA	<0.011	<0.00013	<0.00026	<0.0013	<0.00070
8-hour TWA				0.008125	0.000162	0.1375	0.000162	0.003	NA	0.01375	0.000162	0.000325	0.001625	0.000875
A27, S27, I25, M27, T27	13-Sep-17	Line 2 4:00 PM - 2:00 AM	560	<0.0067	<0.00013	0.11	<0.00013	<0.0025	NA	<0.011	<0.00013	<0.00026	<0.0013	<0.00071
8-hour TWA				0.008375	0.000162	0.1375	0.000162	0.003125	NA	0.01375	0.000162	0.000325	0.001625	0.000887
			Number of Samples	4	4	4	4	4	0	4	4	4	4	4
			Average	0.008312	0.000166	0.129687	0.000166	0.003094	NA	0.01375	0.000166	0.000331	0.001656	0.000891
			Average % of OEL	0.831	8.281	2.594	0.006	0.155	NA	0.138	0.002	0.033	8.281	1.781

Notes: Grey shaded entries denote samples were below the analytical detection limit
NA = not applicable

Table 5c. Air Sampling Results

Subway Operators / Guards – Line 2

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored											
				Respirable Silica (mg/m^3)			Resp. Dust (mg/m^3)	Inh. Dust (mg/m^3)	$PM_{2.5}$ Dust	Asbestos (f/cc)		CO (ppm)	NO_2 (ppm)	CO_2 (ppm)	Cr VI (mg/m^3)
				Quartz	Cristoballite	Tridymite				PCM	TEM				
Occupational Exposure Limits				0.1	0.05	NA	3	10	NA	0.1	0.1	25	3	5000	0.01
Job Title: Subway Operator / Guards – Line 2															
A21, S21, I19, M21, T21	12-Sep-17	Line 2 5:00 AM - 3:00 PM	551	<0.0046	<0.0046	<0.018	0.15	0.22	0.07	<0.005	NA	0.3	<0.1	1308	NA
8-hour TWA				0.00575	0.00575	0.0225	0.1875	0.275	0.0875	0.0062	NA	0.375	0.125	1635	NA
A23, S23, I21, M23, T23	12-Sep-17	Line 2 5:00 AM - 3:00 PM	560	<0.0045	<0.0045	<0.018	0.12	0.23	0.082	0.007	NA	0.5	<0.1	1075	NA
8-hour TWA				0.005625	0.005625	0.0225	0.15	0.2875	0.1025	0.0087	NA	0.625	0.125	1343.75	NA
A25, S25, I23, M25, T25	13-Sep-17	Line 2 4:00 PM - 2:00 AM	575	<0.0043	<0.0043	<0.017	0.064	0.14	0.074	0.008	NA	0.1	<0.1	1215	NA
8-hour TWA				0.005375	0.005375	0.02125	0.08	0.175	0.0925	0.01	NA	0.125	0.125	1518.75	NA
A27, S27, I25, M27, T27	13-Sep-17	Line 2 4:00 PM - 2:00 AM	560	<0.0044	<0.0044	<0.018	0.16	0.22	0.079	0.006	NA	<0.1	<0.1	1058	NA
8-hour TWA				0.0055	0.0055	0.0225	0.2	0.275	0.09875	0.0075	NA	0.125	0.125	1322.5	NA
Number of Samples				4	4	4	4	4	4	4	0	4	4	4	0
Average				0.005562	0.0055625	0.0221875	0.15437	0.25312	0.0953125	0.0081	NA	0.3125	0.125	1455	NA
Average % of OEL				5.563	11.125	NA	5.146	2.531	NA	8.125	NA	1.250	4.167	29.100	NA

Notes: Grey shaded entries denote samples were below the analytical detection limit
NA = not applicable

Table 6a. Air Sampling Results

Subway Operators / Guards – Line 4

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored											
				Total Metals (mg/m^3)											
				Sb	As	Ba	Be	Cd	CaO	Cr	Co	Cu	Pb	Mn	Se
Occupational Exposure Limits				0.5	0.1	0.5	0.002	0.01	2	0.5	0.02	1	0.05	0.02	0.2
Job Title: Subway Operator / Guards – Line 4															
A53, S53, I51, M53, T53, H9	24-Oct-17	Line 4 5:00 AM - 11:30 AM & 1:30 PM - 5:00 PM	571	<0.0008	<0.0003	0.00036	<0.0001	<0.0001	<0.091	<0.0065	<0.0004	<0.0003	<0.0003	0.00021	<0.0019
8-hour TWA				0.000975	0.000325	0.00045	0.000162	0.000162	0.11375	0.008125	0.000487	0.000325	0.0004	0.000262	0.002375
A55, S55, I53, M55, T55	26-Oct-17	Line 4 5:30 PM - 2:00 AM	495	<0.0009	<0.0003	0.0006	<0.0001	<0.0001	<0.11	<0.0075	<0.0004	<0.0003	<0.0004	0.00024	<0.0023
8-hour TWA				0.001125	0.000375	0.00075	0.000187	0.000187	0.1375	0.009375	0.000562	0.000375	0.000475	0.0003	0.002875
			Number of Samples	2	2	2	2	2	2	2	2	2	2	2	2
			Average	0.00105	0.00035	0.0006	0.000175	0.000175	0.125625	0.00875	0.000525	0.00035	0.000437	0.000281	0.002625
			Average % of OEL	0.210	0.350	0.120	8.750	1.750	6.281	1.750	2.625	0.035	0.875	1.406	1.313

Notes: Grey shaded entries denote samples were below the analytical detection limit
NA = not applicable

Table 6b. Air Sampling Results

Subway Operators / Guards – Line 4

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored										
				Respirable Metals (mg/m^3)					Inhalable Metals (mg/m^3)					
				Al	Cd	FeO	Mo	ZnO	Be	MgO	Mo	Ni	Tl	V_2O_5
Occupational Exposure Limits				0.5	0.1	0.5	1	0.002	5	3	2	0.00005	10	10
Job Title: Subway Operator / Guards – Line 4														
A53, S53, I51, M53, T53, H9	24-Oct-17	Line 4 5:00 AM - 11:30 AM & 1:30 PM - 5:00 PM	571	<0.0065	<0.00013	0.022	<0.00013	<0.0024	<0.000007	<0.011	0.000078	<0.00013	<0.00064	<0.00068
8-hour TWA				0.008125	0.000162	0.0275	0.000162	0.003	0.000008	0.01375	0.000097	0.000162	0.0008	0.00085
A55, S55, I53, M55, T55	26-Oct-17	Line 4 5:30 PM - 2:00 AM	495	<0.0075	<0.00015	0.027	<0.00015	<0.0028	<0.000007	<0.012	<0.00007	<0.00015	<0.00074	<0.00079
8-hour TWA				0.009375	0.000187	0.03375	0.000187	0.0035	0.0000092	0.015	0.000092	0.000187	0.000925	0.000987
Number of Samples				2	2	2	2	2	2	2	2	2	2	2
Average				0.00875	0.000175	0.030625	0.000175	0.00325	0.0000086	0.014375	0.000095	0.000175	0.000862	0.000919
Average % of OEL				0.875	8.750	0.613	0.006	0.163	17.250	0.144	0.001	0.018	4.313	1.838

Notes: Grey shaded entries denote samples were below the analytical detection limit
NA = not applicable

Table 6c. Air Sampling Results

Subway Operators / Guards – Line 4

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored											
				Respirable Silica (mg/m^3)			Resp. Dust (mg/m^3)	Inh. Dust (mg/m^3)	$PM_{2.5}$ Dust	Asbestos (f/cc)		CO (ppm)	NO_2 (ppm)	CO_2 (ppm)	Cr VI (mg/m^3)
				Quartz	Cristoballite	Tridymite				PCM	TEM				
Occupational Exposure Limits				0.1	0.05	NA	3	10	NA	0.1	0.1	25	3	5000	0.01
Job Title: Subway Operator / Guards – Line 4															
A53, S53, I51, M53, T53, H9	24-Oct-17	Line 4 5:00 AM - 11:30 AM & 1:30 PM - 5:00 PM	571	<0.0043	<0.0043	<0.017	<0.043	<0.085	0.025	<0.005	NA	<0.1	<0.1	697	<0.00003
8-hour TWA				0.005375	0.005375	0.02125	0.05375	0.10625	0.03125	0.0062	NA	0.125	0.125	871.25	0.00003
A55, S55, I53, M55, T55	26-Oct-17	Line 4 5:30 PM - 2:00 AM	495	<0.0050	<0.0050	<0.020	<0.050	0.15	0.028	0.009	NA	<0.1	<0.1	681	NA
8-hour TWA				0.00625	0.00625	0.025	0.0625	0.1875	0.035	0.0112	NA	0.125	0.125	851.25	NA
Number of Samples				2	2	2	2	2	2	2	0	2	2	2	1
Average				0.005812	0.0058125	0.023125	0.05812	0.14687	0.033125	0.0087	NA	0.125	0.125	861.25	0.00003
Average % of OEL				5.813	11.625	NA	1.938	1.469	NA	8.750	NA	0.500	4.167	17.225	0.325

Notes: Grey shaded entries denote samples were below the analytical detection limit
NA = not applicable

Table 7a. Air Sampling Results

Subway Platforms

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored											
				Total Metals (mg/m^3)											
				Sb	As	Ba	Be	Cd	CaO	Cr	Co	Cu	Pb	Mn	Se
Occupational Exposure Limits				0.5	0.1	0.5	0.002	0.01	2	0.5	0.02	1	0.05	0.02	0.2
Subway Platforms															
A33, S33, I31, M33, T33	19-Sep-17	Coxwell Eastbound by Lunchroom 5:30 AM - 1:30 PM	486	<0.0009	<0.0001	0.026	<0.00001	<0.00001	<0.11	<0.0077	<0.00005	0.0019	<0.00008	0.0039	<0.0023
A35, S35, I33, M35, T35	21-Sep-17	Eglinton by Supervisors' Office 5:30 AM - 1:30 PM	485	<0.0009	<0.0001	0.0017	<0.00001	<0.00001	<0.11	<0.0077	<0.00005	0.00043	<0.00008	0.00073	<0.0023
A37, S37, I35, M37, T37, H1	26-Sep-17	Coxwell Eastbound by Lunchroom 1:00 PM - 9:00 PM	480	<0.0009	<0.0001	<0.0001	<0.00001	<0.00001	<0.11	<0.0077	<0.00005	<0.0003	<0.00008	<0.0001	<0.0023
A39, S39, I37, M39, T39, H3	28-Sep-17	Eglinton by Supervisors' Office1:00 PM - 9:00 PM	480	<0.0009	<0.0001	0.0041	<0.00001	<0.00001	<0.11	<0.0077	<0.00005	0.001	0.00016	0.0015	<0.0023
A65A-C, S65, I63, M65, T65	7-Nov-17	Coxwell Eastbound by Lunchroom 6:00 PM - 2:00 AM	481	<0.0009	<0.0003	0.02	<0.0001	<0.0001	<0.11	<0.0077	<0.0005	0.0018	<0.0004	0.003	<0.0023
A71A-B, S71, I69, M71, T71	16-Nov-17	Eglinton by Supervisors' Office 6:00 PM - 2:00 AM	480	<0.0009	<0.0003	0.0024	<0.0001	<0.00001	<0.11	<0.0077	<0.0005	0.00071	<0.0004	0.00085	<0.0023
		Number of Samples		6	6	6	6	6	6	6	6	6	6	6	6
		Average		0.000925	0.000203	0.009058	0.000055	0.000037	0.11	0.0077	0.000184	0.001025	0.000193	0.001688	0.0023
		Average % of OEL		0.185	0.203	1.812	2.757	0.375	5.500	1.540	0.920	0.103	0.387	8.442	1.150

Notes: Grey shaded entries denote samples were below the analytical detection limit
NA = not applicable

Table 7b. Air Sampling Results

Subway Platforms

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored										
				Respirable Metals (mg/m^3)					Inhalable Metals (mg/m^3)					
				Al	Cd	FeO	Mo	ZnO	Be	MgO	Mo	Ni	Tl	V_2O_5
Occupational Exposure Limits				0.5	0.1	0.5	1	0.002	5	3	2	0.00005	10	10
Subway Platforms														
A33, S33, I31, M33, T33	19-Sep-17	Coxwell Eastbound by Lunchroom 5:30 AM - 1:30 PM	486	<0.0078	<0.00016	0.45	<0.00016	<0.0029	<0.000008	<0.013	<0.00008	0.00016	<0.00077	<0.00083
A35, S35, I33, M35, T35	21-Sep-17	Eglinton by Supervisors' Office 5:30 AM - 1:30 PM	485	<0.0077	<0.00015	0.082	0.00028	<0.0029	<0.000008	<0.013	0.00016	<0.00015	<0.00077	<0.00083
A37, S37, I35, M37, T37, H1	26-Sep-17	Coxwell Eastbound by Lunchroom 1:00 PM - 9:00 PM	480	<0.0078	<0.00016	0.46	<0.00016	<0.0029	<0.000008	<0.013	<0.00008	0.00021	<0.00078	<0.00083
A39, S39, I37, M39, T39, H3	28-Sep-17	Eglinton by Supervisors' Office1:00 PM - 9:00 PM	480	<0.0077	<0.00015	0.14	0.00039	<0.0029	<0.000008	<0.013	0.001	0.00017	<0.00077	<0.00082
A65A-C, S65, I63, M65, T65	7-Nov-17	Coxwell Eastbound by Lunchroom 6:00 PM - 2:00 AM	481	<0.0077	<0.00015	0.33	<0.00015	<0.0029	<0.000008	<0.013	<0.00008	0.00069	<0.00077	<0.00082
A71A-B, S71, I69, M71, T71	16-Nov-17	Eglinton by Supervisors' Office 6:00 PM - 2:00 AM	480	<0.0077	<0.00015	0.096	0.00027	<0.0029	<0.000008	<0.013	0.00082	<0.00015	<0.00077	<0.00082
		Number of Samples		6	6	6	6	6	6	6	6	6	6	6
		Average		0.007733	0.000153	0.259667	0.000235	0.0029	0.000008	0.013	0.000369	0.000255	0.000772	0.000825
		Average % of OEL		0.773	7.667	5.193	0.008	0.145	15.433	0.130	0.004	0.026	3.858	1.650

Notes: Grey shaded entries denote samples were below the analytical detection limit
NA = not applicable

Table 7c. Air Sampling Results

Subway Platforms

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored											
				Respirable Silica (mg/m^3)			Resp. Dust (mg/m^3)	Inh. Dust (mg/m^3)	$PM_{2.5}$ Dust	Asbestos (f/cc)		CO (ppm)	NO_2 (ppm)	CO_2 (ppm)	Cr VI (mg/m^3)
				Quartz	Cristoballite	Tridymite				PCM	TEM				
Occupational Exposure Limits				0.1	0.05	NA	3	10	NA	0.1	0.1	25	3	5000	0.01
Subway Platforms															
A33, S33, I31, M33, T33	19-Sep-17	Coxwell Eastbound by Lunchroom 5:30 AM - 1:30 PM	486	<0.0052	<0.0052	<0.021	0.69	0.67	0.297	Void	Void	<0.1	<0.1	587	NA
A35, S35, I33, M35, T35	21-Sep-17	Eglinton by Supervisors' Office 5:30 AM - 1:30 PM	485	<0.0052	<0.0052	<0.021	0.095	0.12	0.075	<0.006	NA	0.2	<0.1	757	NA
A37, S37, I35, M37, T37, H1	26-Sep-17	Coxwell Eastbound by Lunchroom 1:00 PM - 9:00 PM	480	<0.0052	<0.0052	<0.021	0.66	1	0.311	Void	Void	<0.1	<0.1	612	<0.00003
A39, S39, I37, M39, T39, H3	28-Sep-17	Eglinton by Supervisors' Office1:00 PM - 9:00 PM	480	<0.0051	<0.0051	<0.021	0.19	0.48	0.110	<0.006	NA	<0.1	<0.1	791	<0.00003
A65A-C, S65, I63, M65, T65	7-Nov-17	Coxwell Eastbound by Lunchroom 6:00 PM - 2:00 AM	481	<0.0051	<0.0051	<0.020	0.42	0.67	0.229	0.0377	<0.0246	<0.1	<0.1	893	NA
A71A-B, S71, I69, M71, T71	16-Nov-17	Eglinton by Supervisors' Office 6:00 PM - 2:00 AM	480	<0.0051	<0.0051	<0.020	0.097	0.26	0.074	<0.015	<0.0118	<0.1	<0.1	920	NA
		Number of Samples		6	6	6	6	6	6	4	2	6	6	6	2
		Average		0.00515	0.00515	0.0206667	0.35867	0.5333	0.1826667	0.0161	0.0182	0.1167	0.1	760	0.00003
		Average % of OEL		5.150	10.300	NA	11.956	5.333	NA	16.150	18.200	0.467	3.333	15.200	0.310

Notes: Grey shaded entries denote samples were below the analytical detection limit
NA = not applicable

Table 8a. Air Sampling Results

End Terminal Cleaners

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored											
				Total Metals (mg/m^3)											
				Sb	As	Ba	Be	Cd	CaO	Cr	Co	Cu	Pb	Mn	Se
Occupational Exposure Limits				0.5	0.1	0.5	0.002	0.01	2	0.5	0.02	1	0.05	0.02	0.2
Job Title: End Terminal Cleaners															
A41, S41, I39, M41, T41, H5	3-Oct-17	Finch 8:00 AM - 4:30 PM	501	<0.0009	<0.0001	0.00051	<0.00001	<0.00001	<0.10	<0.0075	<0.00004	<0.0003	<0.0001	0.00021	<0.0022
8-hour TWA				0.000946	0.000159	0.000542	0.000008	0.00002	0.10625	0.007969	0.00005	0.000319	0.00008	0.000223	0.002337
A43, S43, I41, M43, T43, H7	5-Oct-17	Kennedy 8:00 AM - 4:30 PM	510	<0.0009	<0.0001	0.0041	<0.00001	<0.00001	<0.10	<0.0073	<0.00004	0.00046	<0.00007	0.00083	<0.0022
8-hour TWA				0.000935	0.000159	0.004356	0.000008	0.00002	0.10625	0.007756	0.000047	0.000489	0.00008	0.000882	0.002337
A45, S45, I43, M45, T45	10-Oct-17	Finch 6:30 PM - 2:30 AM	465	<0.0010	<0.0002	0.00056	<0.00001	<0.00002	<0.11	<0.0080	<0.00005	<0.0003	<0.0001	0.00021	<0.0024
8-hour TWA				0.00102	0.00017	0.000595	0.000008	0.000017	0.116875	0.0085	0.000051	0.00034	0.000085	0.000223	0.00255
A47, S47, I45, M47, T47	12-Oct-17	Kennedy 6:30 PM - 2:30 AM	465	<0.0009	<0.0002	0.0033	<0.00001	<0.00002	<0.11	<0.0078	<0.00004	0.0004	<0.00008	0.00074	<0.0023
8-hour TWA				0.000999	0.00017	0.003506	0.000008	0.000017	0.116875	0.008287	0.00005	0.000425	0.000083	0.000786	0.002444
A49, S49, I47, M49, T49	17-Oct-17	Sheppard-Yonge 8:30 AM - 3:30 PM	435	<0.0010	<0.0003	0.00037	<0.0002	<0.0002	<0.12	<0.0083	<0.0005	<0.0003	<0.0004	0.00029	<0.0025
8-hour TWA				0.001062	0.000351	0.000393	0.000181	0.000180	0.1275	0.008819	0.000531	0.000351	0.000446	0.000308	0.002656
A51, S51, I49, M51, T51	19-Oct-17	Sheppard-Yonge 6:30 PM - 3:00 AM	455	<0.001	<0.0003	0.00061	<0.0002	<0.0002	<0.11	<0.0081	<0.0005	<0.0003	<0.0004	0.00021	<0.0024
8-hour TWA				0.001041	0.000350	0.000648	0.00017	0.00017	0.116875	0.008606	0.00052	0.00035	0.000436	0.000223	0.00255
			Number of Samples	6	6	6	6	6	6	6	6	6	6	6	6
			Average	0.001001	0.000227	0.001673	0.00006	0.00007	0.115104	0.008323	0.000208	0.000379	0.000201	0.000441	0.002479
			Average % of OEL	0.200	0.227	0.335	3.193	0.694	5.755	1.665	1.039	0.038	0.402	2.205	1.240

Notes: Grey shaded entries denote samples were below the analytical detection limit
NA = not applicable

Table 8b. Air Sampling Results

End Terminal Cleaners

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored										
				Respirable Metals (mg/m^3)					Inhalable Metals (mg/m^3)					
				Al	Cd	FeO	Mo	ZnO	Be	MgO	Mo	Ni	Tl	V_2O_5
Occupational Exposure Limits				0.5	0.1	0.5	1	0.002	5	3	2	0.00005	10	10
Job Title: End Terminal Cleaners														
A41, S41, I39, M41, T41, H5	3-Oct-17	Finch 8:00 AM - 4:30 PM	501	<0.0074	<0.00001	0.019	<0.00007	<0.0028	<0.000007	<0.012	0.000094	<0.00015	<0.00074	<0.00079
8-hour TWA				0.007862	0.00002	0.020187	0.000079	0.002975	0.000008	0.01275	0.0001	0.000159	0.000786	0.000839
A43, S43, I41, M43, T43, H7	5-Oct-17	Kennedy 8:00 AM - 4:30 PM	510	<0.0073	<0.00001	0.061	<0.00007	<0.0027	<0.000007	<0.012	<0.00007	<0.00015	<0.00073	<0.00078
8-hour TWA				0.007756	0.00002	0.064812	0.000078	0.002869	0.000008	0.01275	0.00008	0.000159	0.000776	0.000829
A45, S45, I43, M45, T45	10-Oct-17	Finch 6:30 PM - 2:30 AM	465	<0.0080	<0.00002	0.019	<0.00008	<0.0030	<0.00001	<0.013	<0.00008	0.00022	<0.00080	<0.00086
8-hour TWA				0.0085	0.000017	0.020187	0.000085	0.003187	0.0000085	0.0138125	0.000085	0.000234	0.00085	0.000914
A47, S47, I45, M47, T47	12-Oct-17	Kennedy 6:30 PM - 2:30 AM	465	<0.0080	<0.00002	0.059	<0.00008	<0.0030	<0.00001	<0.013	<0.00008	0.00018	<0.00080	<0.00085
8-hour TWA				0.0085	0.000017	0.062687	0.000085	0.003187	0.0000085	0.0138125	0.000085	0.000191	0.00085	0.000903
A49, S49, I47, M49, T49	17-Oct-17	Sheppard-Yonge 8:30 AM - 3:30 PM	435	<0.0084	<0.00017	0.03	<0.00017	<0.0031	<0.00001	<0.014	0.00017	0.00022	<0.00084	<0.0009
8-hour TWA				0.008925	0.000181	0.031875	0.000181	0.003294	0.0000089	0.014875	0.000181	0.000234	0.000892	0.000956
A51, S51, I49, M51, T51	19-Oct-17	Sheppard-Yonge 6:30 PM - 3:00 AM	455	<0.0082	<0.00016	0.021	<0.00016	<0.003	<0.000008	<0.013	<0.00008	<0.00016	<0.00081	<0.00086
8-hour TWA				0.008712	0.00017	0.022312	0.00017	0.003187	0.000009	0.0138125	0.000086	0.00017	0.000861	0.000914
			Number of Samples	6	6	6	6	6	6	6	6	6	6	6
			Average	0.008376	0.000069	0.037010	0.000113	0.003117	0.000008	0.0136354	0.000102	0.000191	0.000836	0.000892
			Average % of OEL	0.838	3.471	0.740	0.004	0.156	16.717	0.136	0.001	0.019	4.179	1.785

Notes: Grey shaded entries denote samples were below the analytical detection limit
NA = not applicable

Table 8c. Air Sampling Results

End Terminal Cleaners

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored											
				Respirable Silica (mg/m^3)			Resp. Dust (mg/m^3)	Inh. Dust (mg/m^3)	$PM_{2.5}$ Dust	Asbestos (f/cc)		CO (ppm)	NO_2 (ppm)	CO_2 (ppm)	Cr VI (mg/m^3)
				Quartz	Cristoballite	Tridymite				PCM	TEM				
Occupational Exposure Limits				0.1	0.05	NA	3	10	NA	0.1	0.1	25	3	5000	0.01
Job Title: End Terminal Cleaners															
A41, S41, I39, M41, T41, H5	3-Oct-17	Finch 8:00 AM - 4:30 PM	501	<0.0050	<0.0050	<0.020	<0.050	<0.098	0.032	0.009	NA	0.2	<0.1	839	<0.00003
8-hour TWA				0.005312	0.0053125	0.02125	0.05312	0.10412	0.034	0.0096	NA	0.2125	0.1062	891.437	0.00003
A43, S43, I41, M43, T43, H7	5-Oct-17	Kennedy 8:00 AM - 4:30 PM	510	<0.0048	<0.0048	<0.019	0.11	0.32	0.055	0.007	NA	<0.1	<0.1	605	<0.00003
8-hour TWA				0.0051	0.0051	0.0201875	0.11687	0.34	0.0584375	0.0074	NA	0.1062	0.1062	642.812	0.00003
A45, S45, I43, M45, T45	10-Oct-17	Finch 6:30 PM - 2:30 AM	465	<0.0053	<0.0053	<0.021	<0.053	<0.11	0.020	0.01	NA	<0.1	<0.1	613	NA
8-hour TWA				0.005631	0.00563125	0.0223125	0.05631	0.11687	0.02125	0.0106	NA	0.1062	0.1062	651.312	NA
A47, S47, I45, M47, T47	12-Oct-17	Kennedy 6:30 PM - 2:30 AM	465	<0.0052	<0.0052	<0.021	0.074	0.2	0.040	0.013	<0.006	<0.1	<0.1	526	NA
8-hour TWA				0.005525	0.005525	0.0223125	0.07862	0.2125	0.0425	0.0138	0.00637	0.1062	0.1062	558.875	NA
A49, S49, I47, M49, T49	17-Oct-17	Sheppard-Yonge 8:30 AM - 3:30 PM	435	<0.0056	<0.0056	<0.020	<0.056	0.12	0.027	0.007	NA	0.1	<0.1	566	NA
8-hour TWA				0.00595	0.00595	0.02125	0.0595	0.1275	0.0286875	0.0074	NA	0.1062	0.1062	601.375	NA
A51, S51, I49, M51, T51	19-Oct-17	Sheppard-Yonge 6:30 PM - 3:00 AM	455	<0.0054	<0.0054	<0.022	<0.054	<0.11	0.027	0.007	NA	<0.1	<0.1	526	NA
8-hour TWA				0.005737	0.0057375	0.023375	0.05737	0.11687	0.0286875	0.0074	NA	0.1062	0.1062	558.875	NA
		Number of Samples		6	6	6	6	6	6	6	1	6	6	6	2
		Average		0.005543	0.00554271	0.0217812	0.07030	0.16965	0.0355937	0.0094	0.00637	0.1240	0.1062	650.781	0.00003
		Average % of OEL		5.543	11.085	NA	2.343	1.696	NA	9.385	6.375	0.496	3.542	13.016	0.319

Notes: Grey shaded entries denote samples were below the analytical detection limit
NA = not applicable

Table 9a. Air Sampling Results

Janitors

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored											
				Total Metals (mg/m^3)											
				Sb	As	Ba	Be	Cd	CaO	Cr	Co	Cu	Pb	Mn	Se
Occupational Exposure Limits				0.5	0.1	0.5	0.002	0.01	2	0.5	0.02	1	0.05	0.02	0.2
Job Title: Janitors															
A61, S61, I59, M61, T61	31-Oct-17	Dundas West, Jane, Old Mill, Royal York, Kipling 6:30AM - 3:00PM	386	<0.0012	<0.0004	0.014	<0.0002	<0.0002	<0.14	<0.0097	<0.0006	0.001	<0.0005	0.0019	<0.0029
A63, S63, I61, M63, T63	2-Nov-17	Summerhill, St. Clair, Eglinton, Lawrence 6:30AM - 3:00PM	358	<0.0013	<0.0004	0.0034	<0.0002	<0.0002	<0.15	<0.011	<0.0006	<0.0004	<0.0005	0.00077	<0.0032
A67, S67, I65, M67, T67	9-Nov-17	Dundas, Queen, King 6:30AM - 3:00PM	334	<0.0013	<0.0004	0.00075	<0.0002	<0.0002	<0.16	<0.011	<0.0007	<0.0004	<0.0006	0.0003	<0.0034
A69, S69, I67, M69, T69	14-Nov-17	Pape, Donlands, Greenwood, Coxwell 6:30AM-3:00PM	341	<0.0013	<0.0004	0.016	<0.0002	<0.0002	<0.15	<0.011	<0.0006	0.0014	<0.0005	0.0025	<0.0032
		Number of Samples		4	4	4	4	4	4	4	4	4	4	4	4
		Average		0.001275	0.000422	0.008537	0.00021	0.00021	0.15	0.010675	0.000632	0.000817	0.00053	0.001367	0.003175
		Average % of OEL		0.255	0.423	1.708	10.500	2.100	7.500	2.135	3.163	0.082	1.060	6.838	1.588

Notes: Grey shaded entries denote samples were below the analytical detection limit
NA = not applicable

Table 9b. Air Sampling Results

Janitors

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored										
				Respirable Metals (mg/m^3)					Inhalable Metals (mg/m^3)					
				Al	Cd	FeO	Mo	ZnO	Be	MgO	Mo	Ni	Tl	V_2O_5
Occupational Exposure Limits				0.5	0.1	0.5	1	0.002	5	3	2	0.00005	10	10
Job Title: Janitors														
A61, S61, I59, M61, T61	31-Oct-17	Dundas West, Jane, Old Mill, Royal York, Kipling 6:30AM - 3:00PM	386	<0.0096	<0.00019	0.17	<0.00019	<0.0036	<0.00001	<0.016	<0.0001	0.00021	<0.00096	<0.0010
A63, S63, I61, M63, T63	2-Nov-17	Summerhill, St. Clair, Eglinton, Lawrence 6:30AM - 3:00PM	358	<0.010	<0.00021	0.065	<0.00021	<0.0039	<0.00001	<0.017	0.00029	<0.00021	<0.0010	<0.0011
A67, S67, I65, M67, T67	9-Nov-17	Dundas, Queen, King 6:30AM - 3:00PM	334	<0.011	<0.00022	0.022	<0.00022	<0.0042	<0.00001	<0.019	0.00036	<0.00022	<0.0011	<0.0012
A69, S69, I67, M69, T69	14-Nov-17	Pape, Donlands, Greenwood, Coxwell 6:30AM-3:00PM	341	<0.011	<0.00022	0.22	<0.00022	<0.0041	<0.00001	<0.018	<0.00011	<0.00022	<0.0011	<0.0012
		Number of Samples		4	4	4	4	4	4	4	4	4	4	4
		Average		0.0104	0.00021	0.11925	0.00021	0.00395	0.0000104	0.0175	0.000214	0.000215	0.00104	0.001125
		Average % of OEL		1.040	10.500	2.385	0.007	0.198	20.800	0.175	0.002	0.022	5.200	2.250

Notes: Grey shaded entries denote samples were below the analytical detection limit
NA = not applicable

Table 9c. Air Sampling Results

Janitors

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored											
				Respirable Silica (mg/m^3)			Resp. Dust (mg/m^3)	Inh. Dust (mg/m^3)	$PM_{2.5}$ Dust	Asbestos (f/cc)		CO (ppm)	NO_2 (ppm)	CO_2 (ppm)	Cr VI (mg/m^3)
				Quartz	Cristoballite	Tridymite				PCM	TEM				
Occupational Exposure Limits				0.1	0.05	NA	3	10	NA	0.1	0.1	25	3	5000	0.01
Job Title: Janitors															
A61, S61, I59, M61, T61	31-Oct-17	Dundas West, Jane, Old Mill, Royal York, Kipling 6:30AM - 3:00PM	386	<0.0065	<0.0065	<0.026	0.23	0.54	0.124	Void	Void	<1	<0.1	NA	NA
A63, S63, I61, M63, T63	2-Nov-17	Summerhill, St. Clair, Eglinton, Lawrence 6:30AM - 3:00PM	358	<0.0070	<0.0070	<0.028	0.092	0.28	0.058	0.019	<0.0079	<1	<0.1	NA	NA
A67, S67, I65, M67, T67	9-Nov-17	Dundas, Queen, King 6:30AM - 3:00PM	334	<0.0075	<0.0075	<0.030	<0.075	0.16	0.053	0.01	NA	<1	<0.1	NA	NA
A69, S69, I67, M69, T69	14-Nov-17	Pape, Donlands, Greenwood, Coxwell 6:30AM- 3:00PM	341	<0.0072	<0.0072	<0.029	0.29	0.62	0.171	<0.027	<0.0168	<1	<0.1	NA	NA
		Number of Samples		4	4	4	4	4	4	3	2	4	4	0	0
		Average		0.00705	0.00705	0.02825	0.17175	0.4	0.1015	0.0186	0.01235	1	0.1	NA	NA
		Average % of OEL		7.050	14.100	NA	5.725	4.000	NA	18.567	12.350	4.000	3.333	NA	NA

Notes: Grey shaded entries denote samples were below the analytical detection limit
NA = not applicable

Table 10a. Air Sampling Results

Traffic Checkers

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored											
				Total Metals (mg/m^3)											
				Sb	As	Ba	Be	Cd	CaO	Cr	Co	Cu	Pb	Mn	Se
Occupational Exposure Limits				0.5	0.1	0.5	0.002	0.01	2	0.5	0.02	1	0.05	0.02	0.2
Job Title: Traffic Checkers															
A73, S73, I71, M73, T73	4-Dec-17	Bloor 7:00 AM - 11:00 AM & 3:00 PM - 7:00 PM	469	<0.0010	<0.0003	0.0029	<0.0001	<0.0001	<0.11	<0.0081	<0.0005	<0.0003	<0.0004	0.00051	<0.0024
A75, S75, I73, M75, T75	5-Dec-17	Wellesley 7:00 AM - 11:00 AM & 3:00 PM - 7:00 PM	453	<0.0010	<0.0003	0.0013	<0.0001	<0.0001	<0.11	<0.0082	<0.0005	<0.0003	<0.0004	0.00051	<0.0025
A77, S77, I75, M77, T77	6-Dec-17	St. George 7:00 AM - 11:00 AM & 3:00 PM - 7:00 PM	458	<0.0010	<0.0003	0.016	<0.0001	<0.0001	<0.11	<0.0081	<0.0005	0.0012	<0.0004	0.002	<0.0024
A69, S69, I67, M69, T69	7-Dec-17	Spadina 7:00 AM - 11:00 AM & Sherbourne 3:00 PM - 7:00 PM	457	<0.0010	<0.0003	0.025	<0.0001	<0.0001	<0.11	<0.0080	<0.0005	0.0016	<0.0004	0.0034	<0.0024
		Number of Samples		4	4	4	4	4	4	4	4	4	4	4	4
		Average		0.00097	0.000322	0.0113	0.00016	0.00016	0.11	0.0081	0.000482	0.000862	0.000402	0.001605	0.002425
		Average % of OEL		0.194	0.323	2.260	8.000	1.600	5.500	1.620	2.413	0.086	0.805	8.025	1.213

Notes: Grey shaded entries denote samples were below the analytical detection limit
NA = not applicable

Table 10b. Air Sampling Results

Traffic Checkers

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored										
				Respirable Metals (mg/m^3)					Inhalable Metals (mg/m^3)					
				Al	Cd	FeO	Mo	ZnO	Be	MgO	Mo	Ni	Tl	V_2O_5
Occupational Exposure Limits				0.5	0.1	0.5	1	0.002	5	3	2	0.00005	10	10
Job Title: Traffic Checkers														
A73, S73, I71, M73, T73	4-Dec-17	Bloor 7:00 AM - 11:00 AM & 3:00 PM - 7:00 PM	469	<0.0079	<0.00018	0.059	<0.00016	<0.0030	<0.00001	<0.013	0.00024	<0.00016	<0.00079	<0.00085
A75, S75, I73, M75, T75	5-Dec-17	Wellesley 7:00 AM - 11:00 AM & 3:00 PM - 7:00 PM	453	<0.0082	<0.00016	0.038	0.00022	<0.0031	<0.00001	<0.014	0.00069	<0.00017	<0.00084	<0.00089
A77, S77, I75, M77, T77	6-Dec-17	St. George 7:00 AM - 11:00 AM & 3:00 PM - 7:00 PM	458	<0.0081	<0.00016	0.24	<0.00016	<0.0030	<0.00001	<0.014	0.00024	0.00051	<0.00082	<0.00087
A79, S79, I77, M79, T79	7-Dec-17	Spadina 7:00 AM - 11:00 AM & Sherbourne 3:00 PM - 7:00 PM	457	<0.0081	<0.00016	0.41	<0.00016	<0.0030	<0.00001	<0.013	0.00013	0.00022	<0.00080	<0.00086
		Number of Samples		4	4	4	4	4	4	4	4	4	4	4
		Average		0.008075	0.000165	0.18675	0.000175	0.003025	0.0000081	0.0135	0.000325	0.000265	0.000812	0.000867
		Average % of OEL		0.808	8.250	3.735	0.006	0.151	16.250	0.135	0.003	0.027	4.063	1.735

Notes: Grey shaded entries denote samples were below the analytical detection limit
NA = not applicable

Table 10c. Air Sampling Results

Traffic Checkers

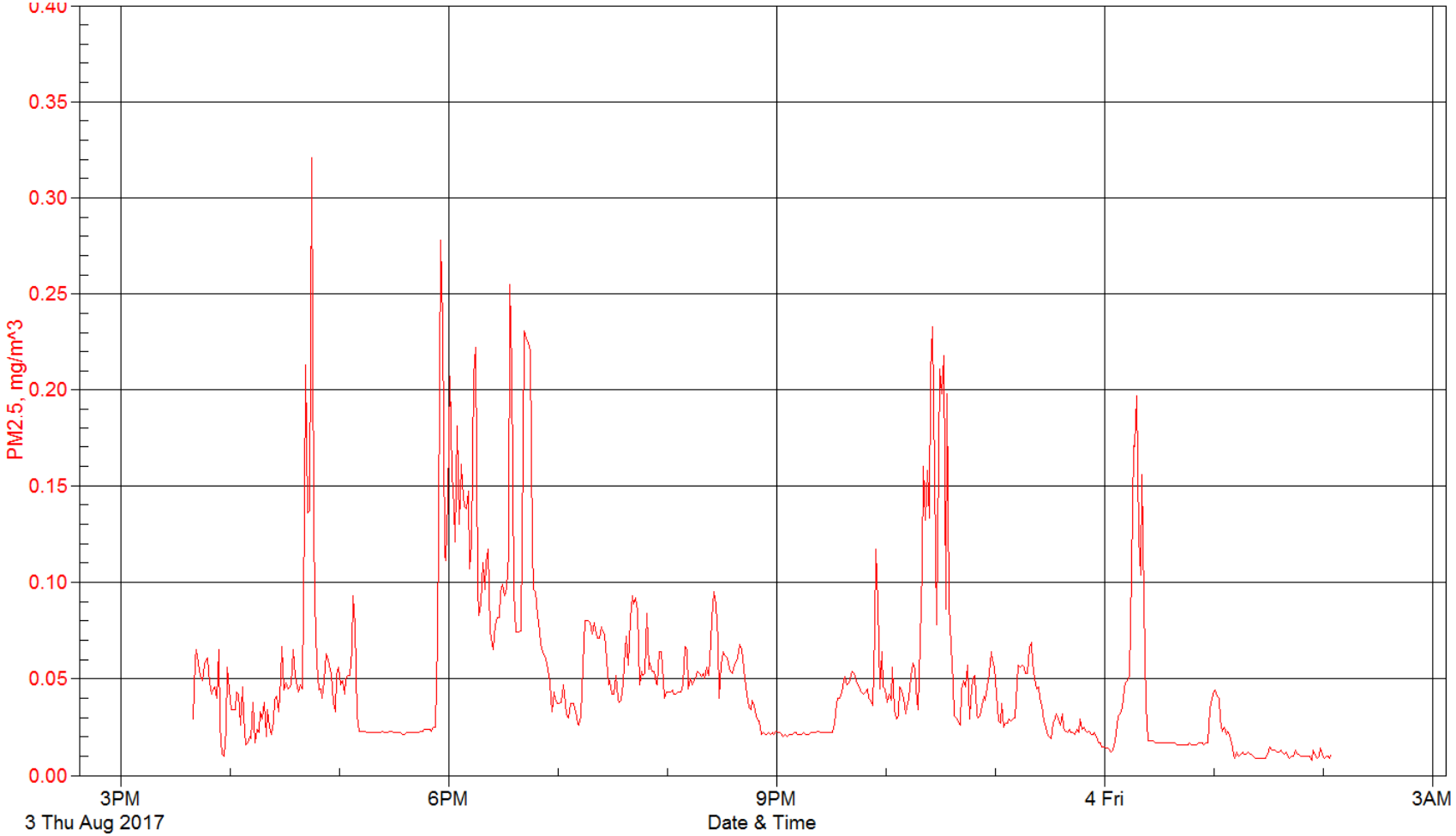
Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored											
				Respirable Silica (mg/m^3)			Resp. Dust (mg/m^3)	Inh. Dust (mg/m^3)	$PM_{2.5}$ Dust	Asbestos (f/cc)		CO (ppm)	NO_2 (ppm)	CO_2 (ppm)	Cr VI (mg/m^3)
				Quartz	Cristoballite	Tridymite				PCM	TEM				
Occupational Exposure Limits				0.1	0.05	NA	3	10	NA	0.1	0.1	25	3	5000	0.01
Job Title: Traffic Checkers															
A73, S73, I71, M73, T73	4-Dec-17	Bloor 7:00 AM - 11:00 AM & 3:00 PM - 7:00 PM	469	<0.0053	<0.0053	<0.021	0.096	0.31	0.085	<0.03	<0.0245	<1	<0.1	NA	NA
A75, S75, I73, M75, T75	5-Dec-17	Wellesley 7:00 AM - 11:00 AM & 3:00 PM - 7:00 PM	453	<0.0055	<0.0055	<0.022	0.089	0.15	0.043	<0.025	<0.0253	<1	<0.1	NA	<0.00003
A77, S77, I75, M77, T77	6-Dec-17	St. George 7:00 AM - 11:00 AM & 3:00 PM - 7:00 PM	458	<0.0054	<0.0054	<0.022	0.33	0.75	0.161	<0.022	<0.025	<1	<0.1	NA	<0.00003
A69, S69, I67, M69, T69	7-Dec-17	Spadina 7:00 AM - 11:00 AM & Sherbourne 3:00 PM - 7:00 PM	457	<0.0055	<0.0055	<0.022	0.43	1.1	0.265	<0.026	<0.0245	<1	<0.1	NA	NA
		Number of Samples		4	4	4	4	4	4	4	4	4	4	0	2
		Average		0.005425	0.005425	0.02175	0.23625	0.5775	0.1385	0.0257	0.02482	1	0.1	NA	0.00003
		Average % of OEL		5.425	10.850	NA	7.875	5.775	NA	25.750	24.825	4.000	3.333	NA	0.330

Notes: Grey shaded entries denote samples were below the analytical detection limit
NA = not applicable

$PM_{2.5}$ Graphs

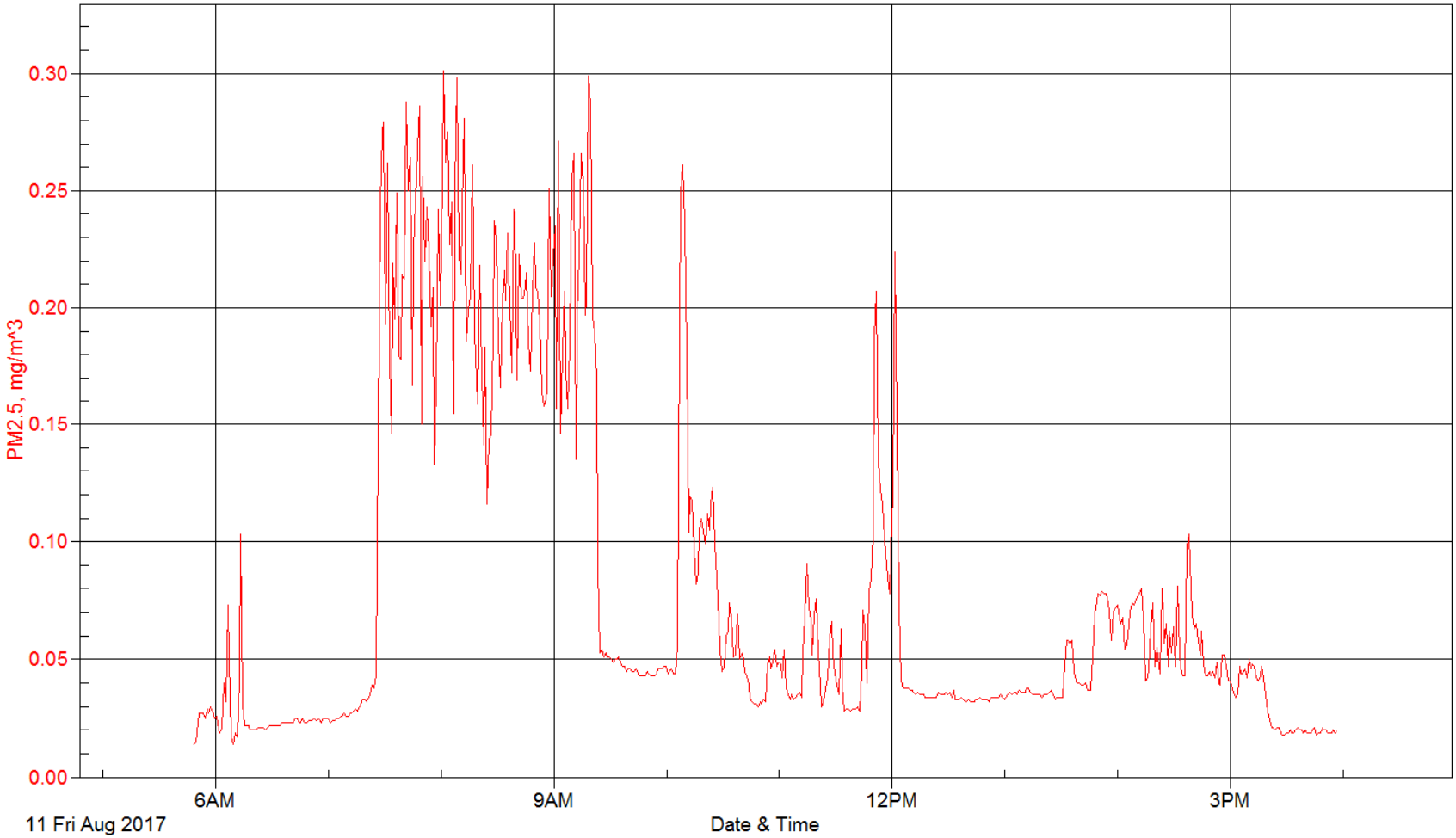
$PM_{2.5}$ Graph

Special Constables – August 3, 2017 – 3:00 PM – 2:30 AM



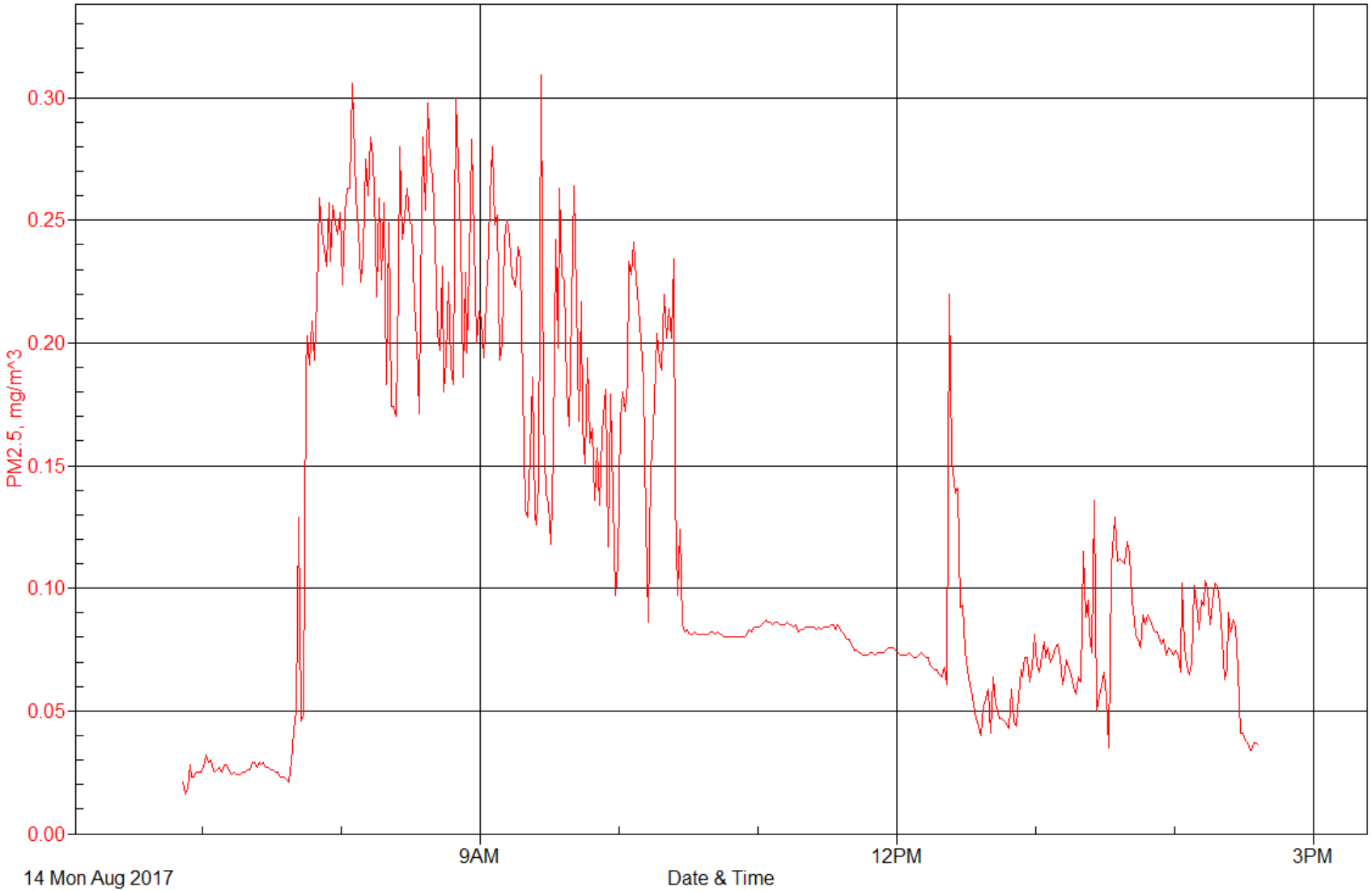
$PM_{2.5}$ Graph

Special Constables – August 11, 2017 – 5:00 AM – 4:30 PM



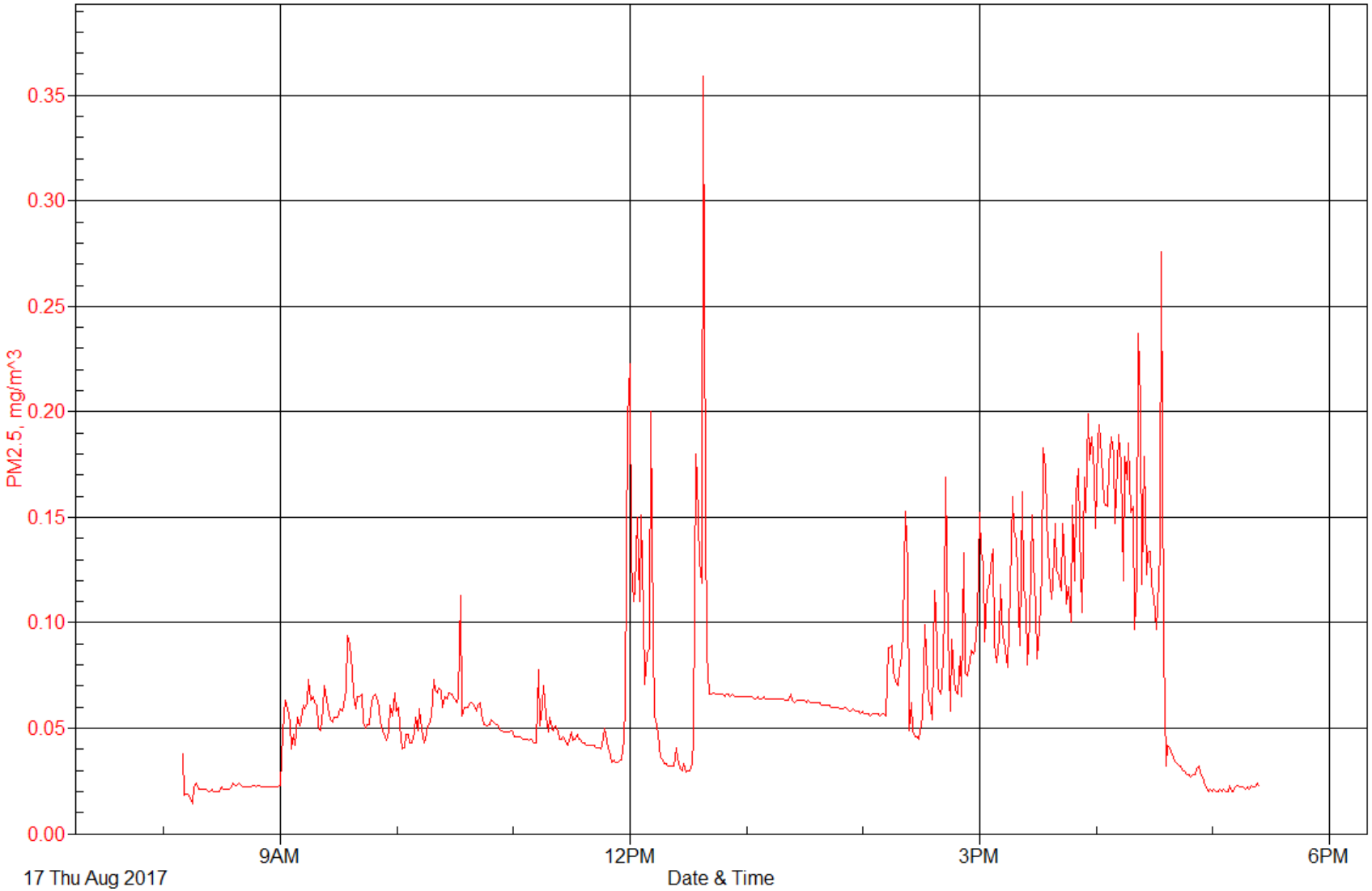
$PM_{2.5}$ Graph

Fare Inspectors – August 14, 2017 – 6:30 AM – 4:30 PM



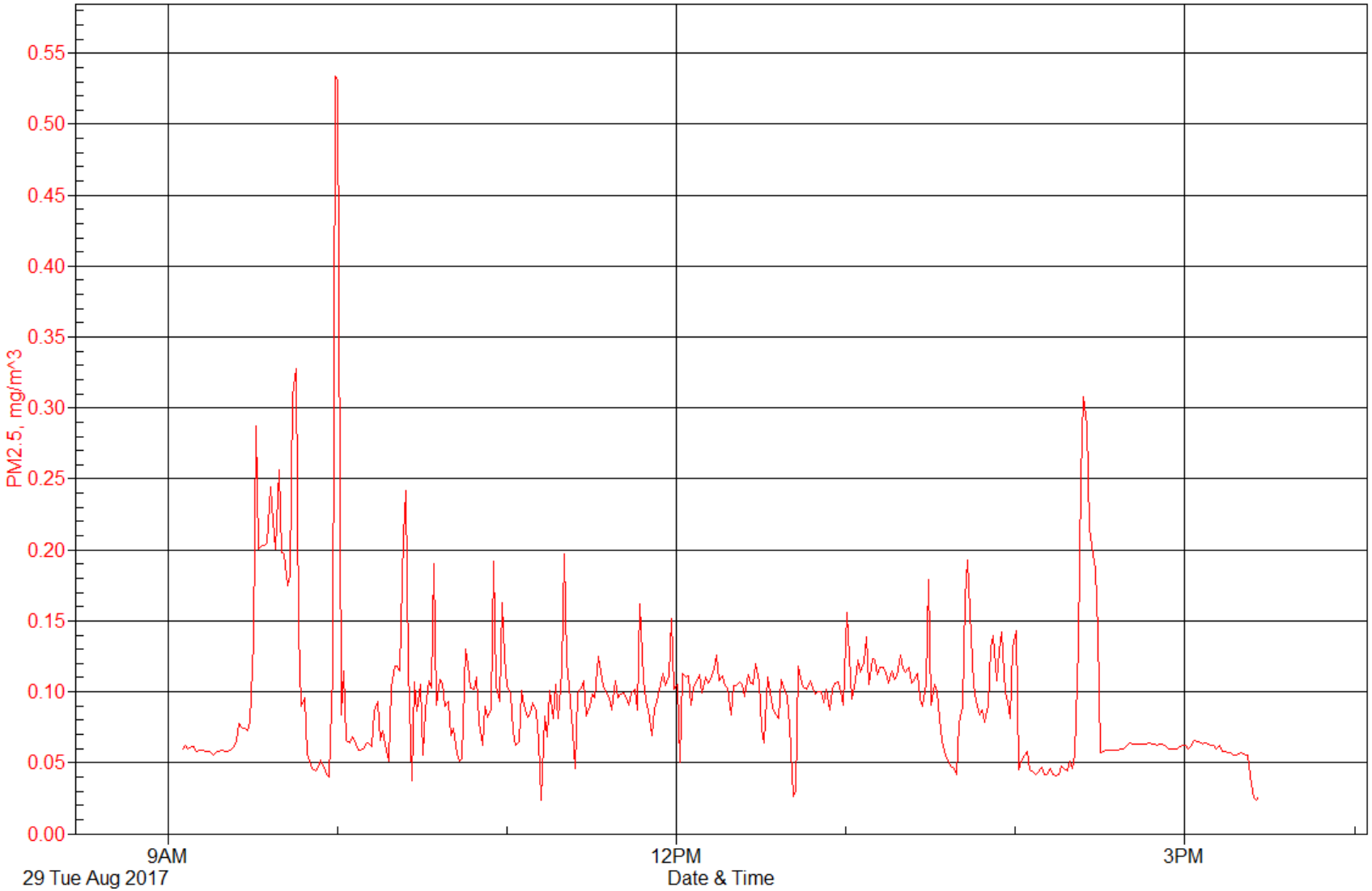
$PM_{2.5}$ Graph

Fare Inspectors – August 17, 2017 – 8:00 AM – 6:00 PM



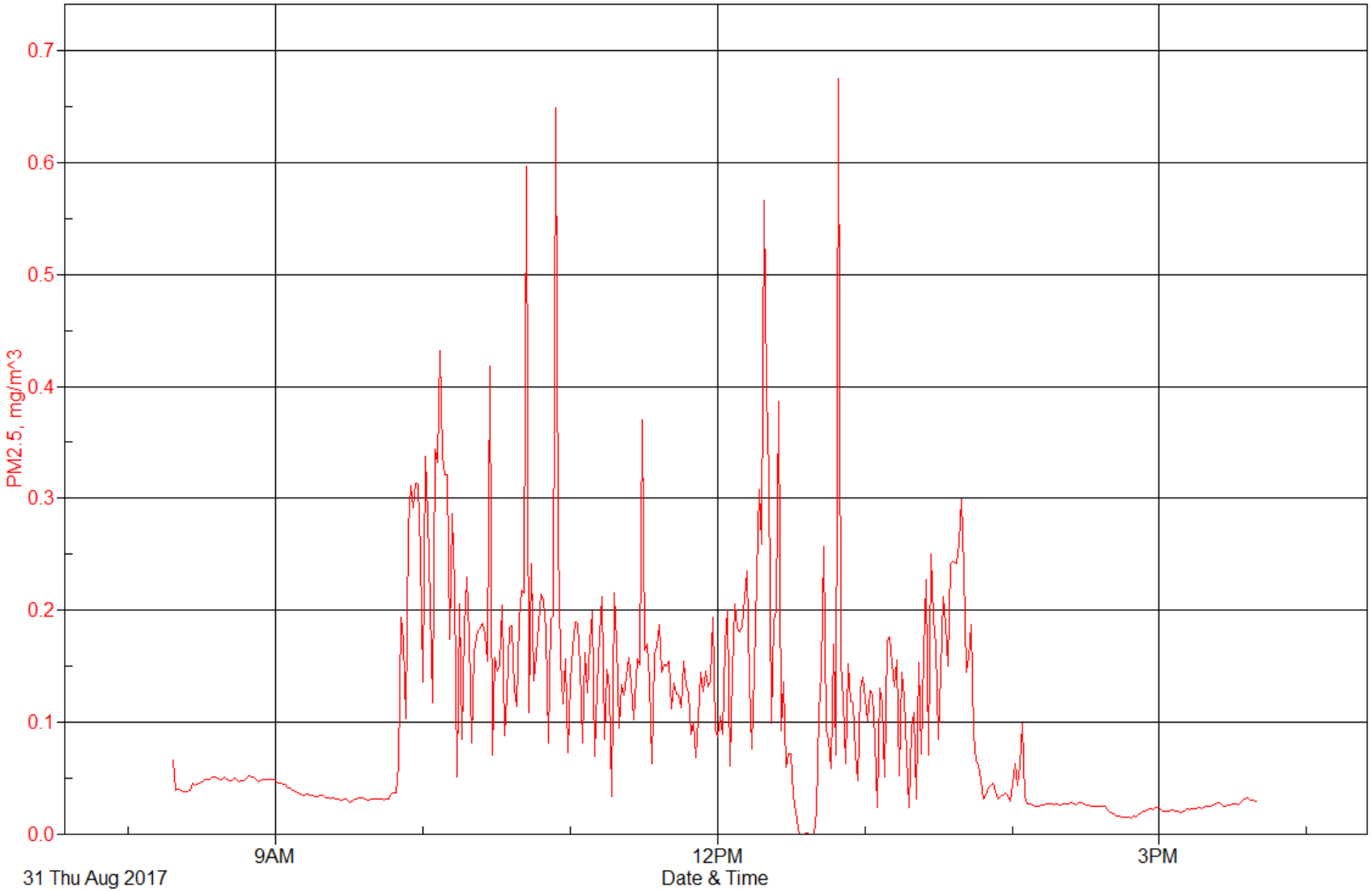
$PM_{2.5}$ Graph

Track Patrollers – August 29, 2017 – Y3 (Finch to Eglinton) – 8:00 AM – 4:00 PM



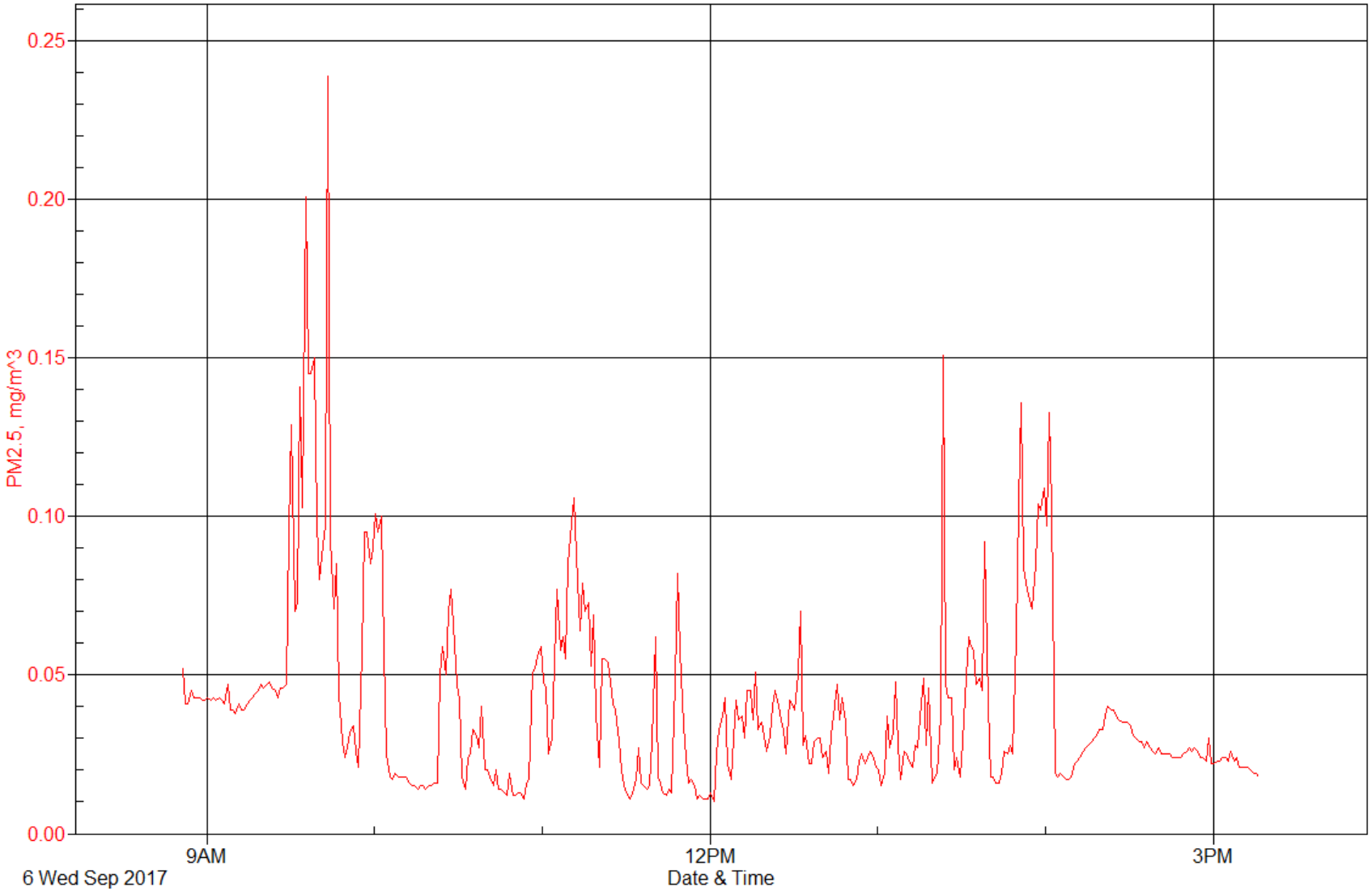
$PM_{2.5}$ Graph

Track Patrollers – August 31, 2017 – B2 (Dufferin to Donlands) – 8:00 AM – 4:00 PM



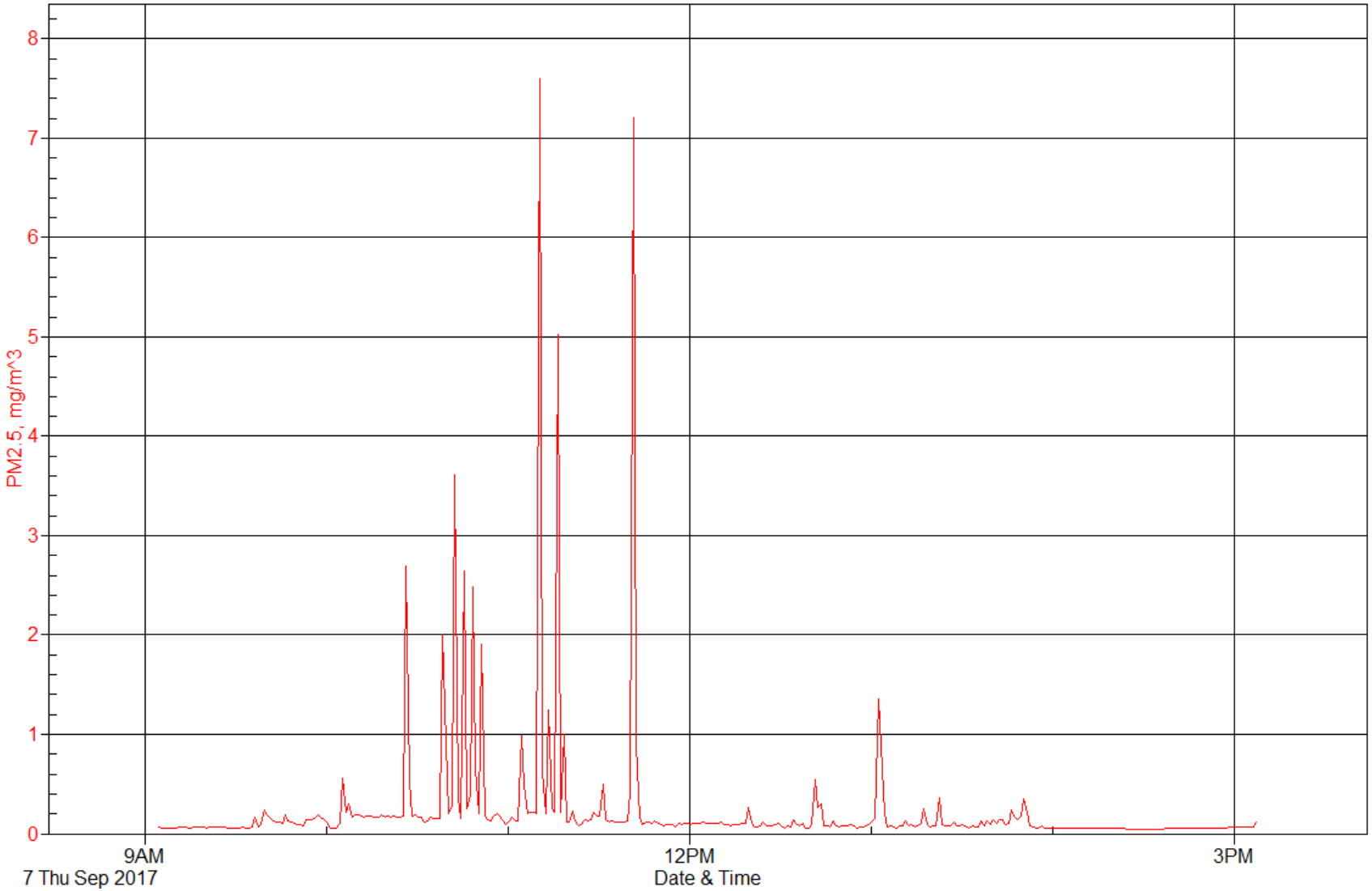
$PM_{2.5}$ Graph

Track Patrollers – September 6, 2017 – Y5/Y2 (King to Eglington) – 8:00 AM to 4:00 PM



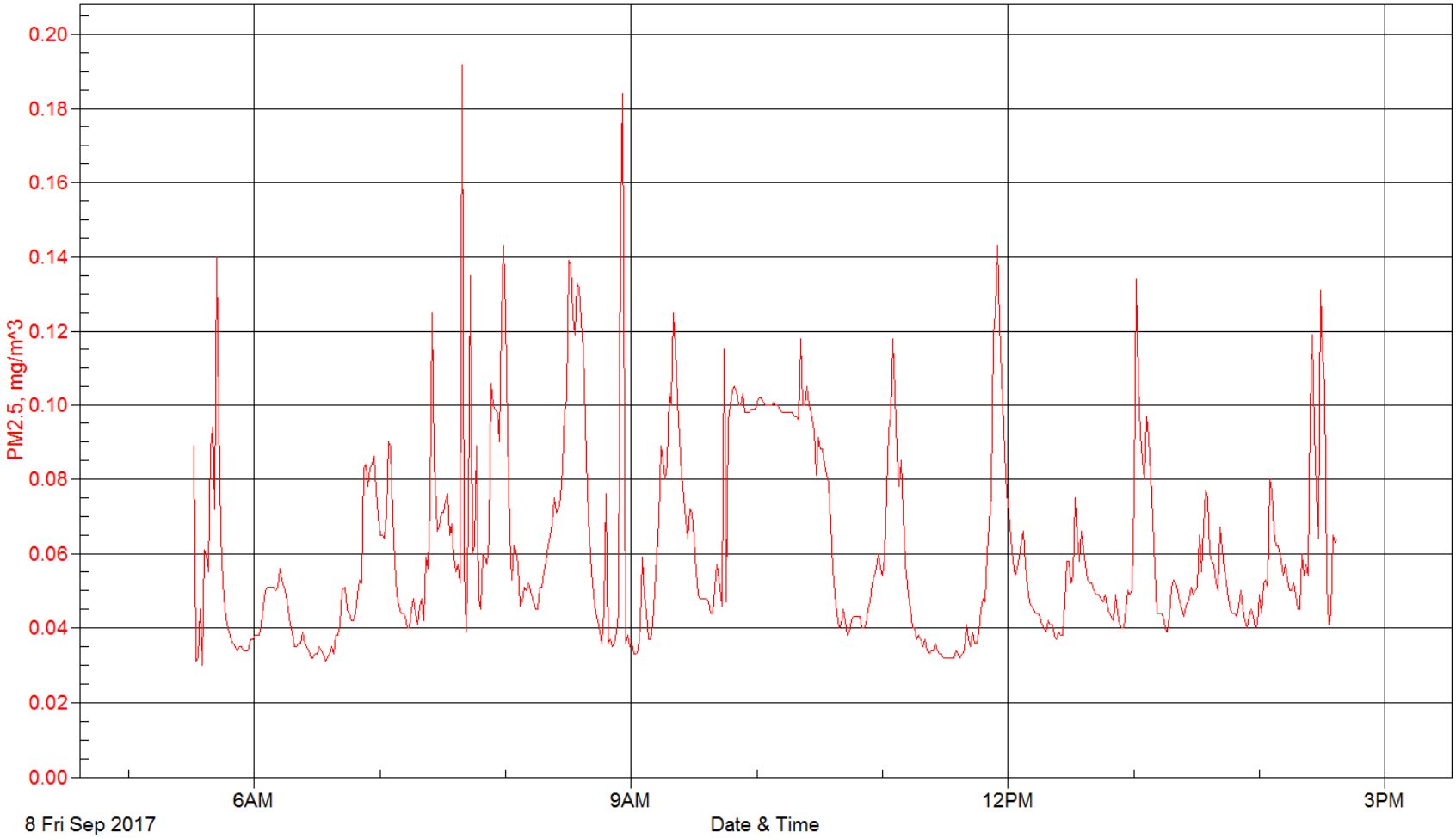
$PM_{2.5}$ Graph

Track Patrollers – September 7, 2017 – Y6 (Union to St Clair West) – 8:00 AM – 4:00 PM



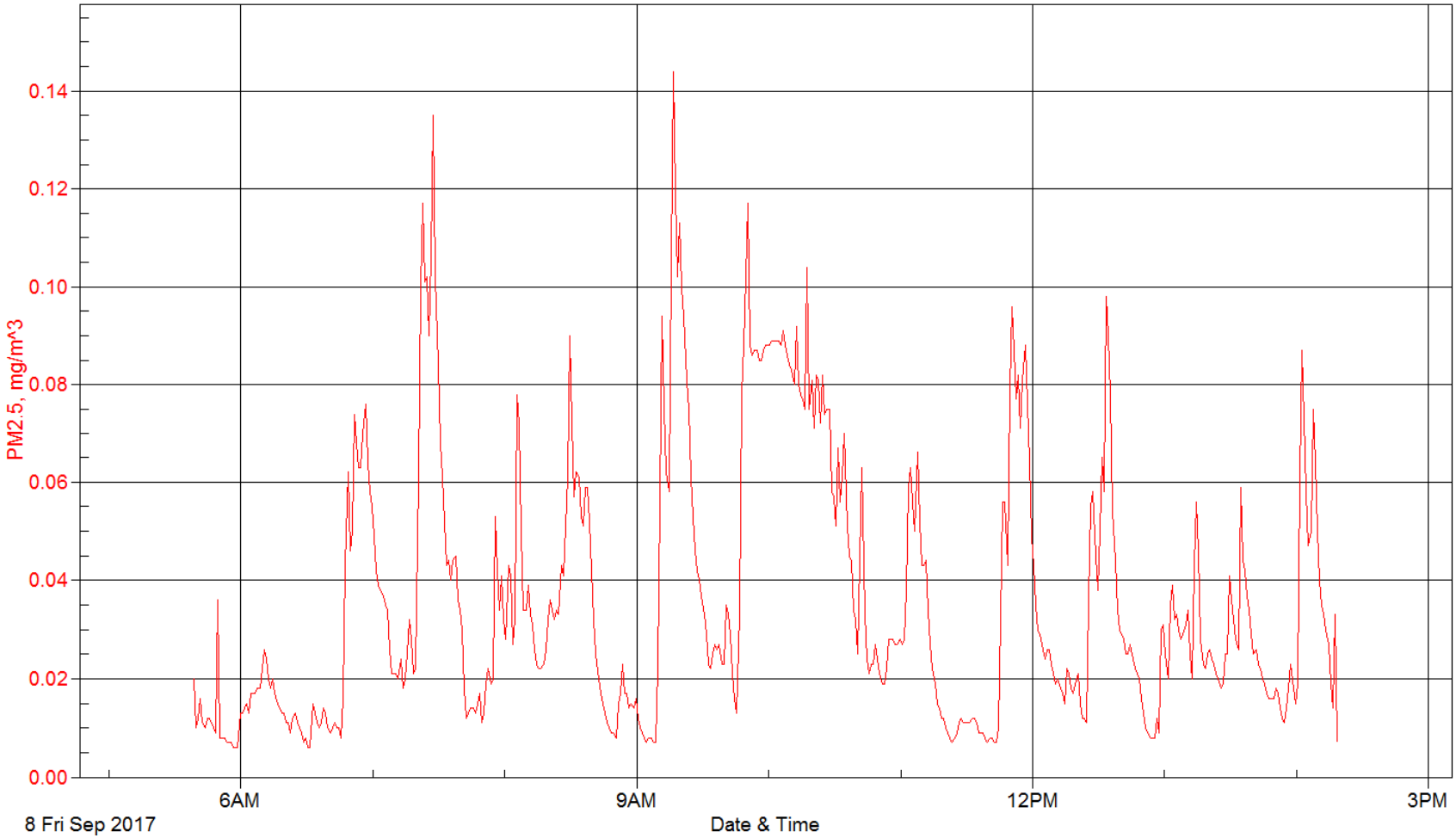
$PM_{2.5}$ Graph

Subway Operators / Guards – YUS Line – September 8, 2017 – 5:00 AM – 2:30 PM (Operator 1)



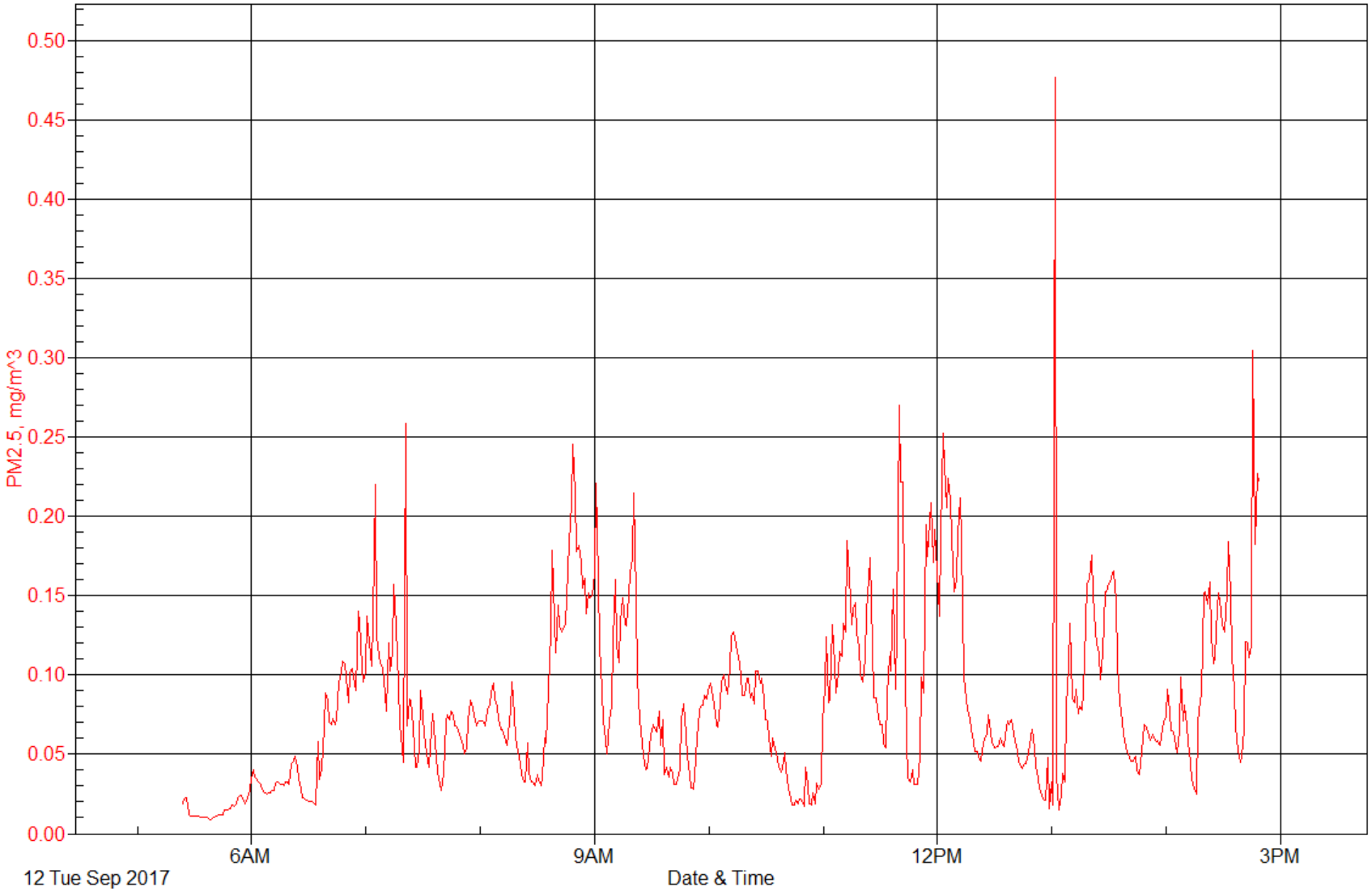
$PM_{2.5}$ Graph

Subway Operators / Guards – YUS Line – September 8, 2017 – 5:00 AM – 2:30 PM (Operator 2)



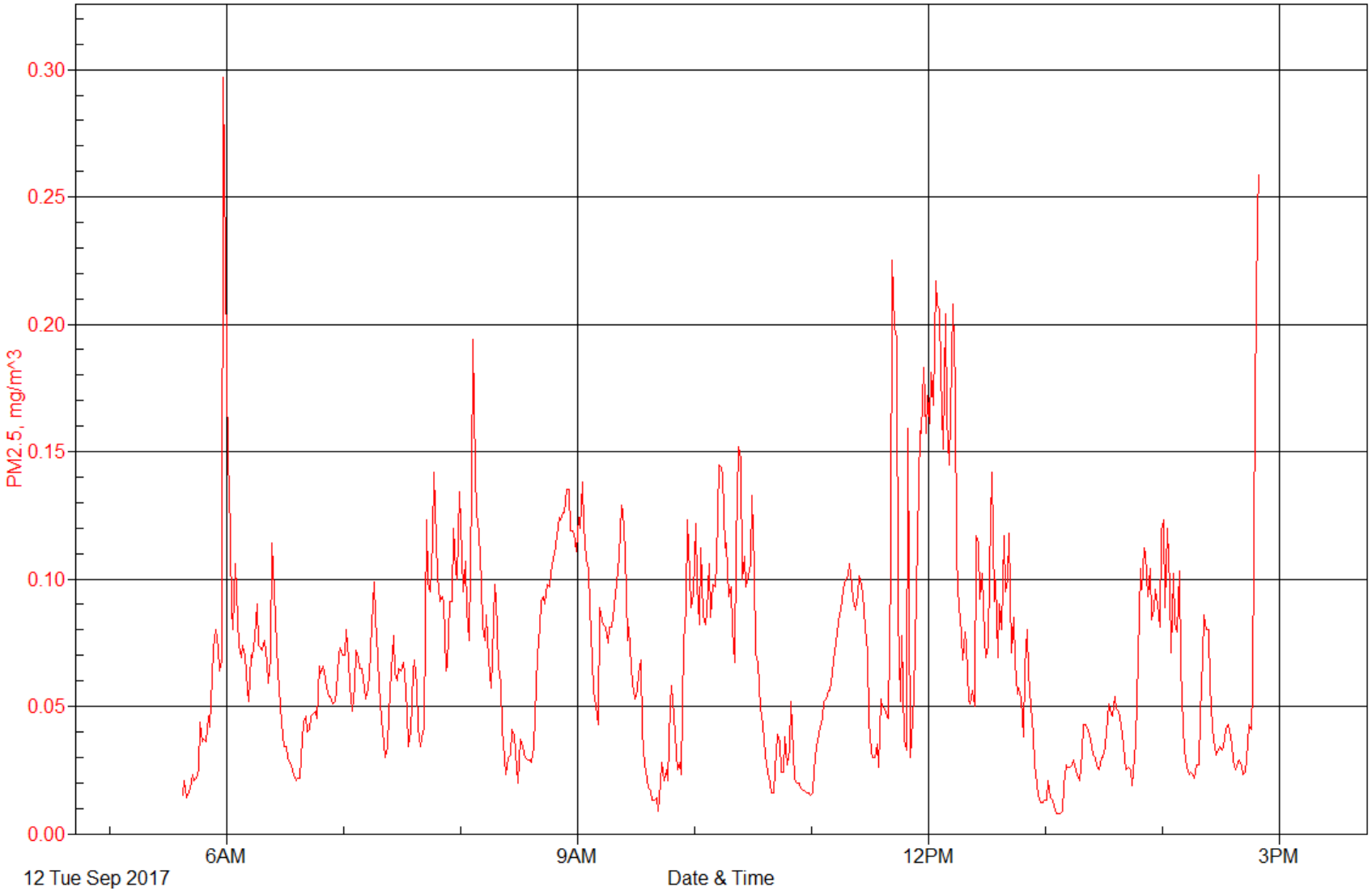
$PM_{2.5}$ Graph

Subway Operators / Guards – BD Line – September 12, 2017 – 5:00 AM to 3:00 PM (Operator 1)



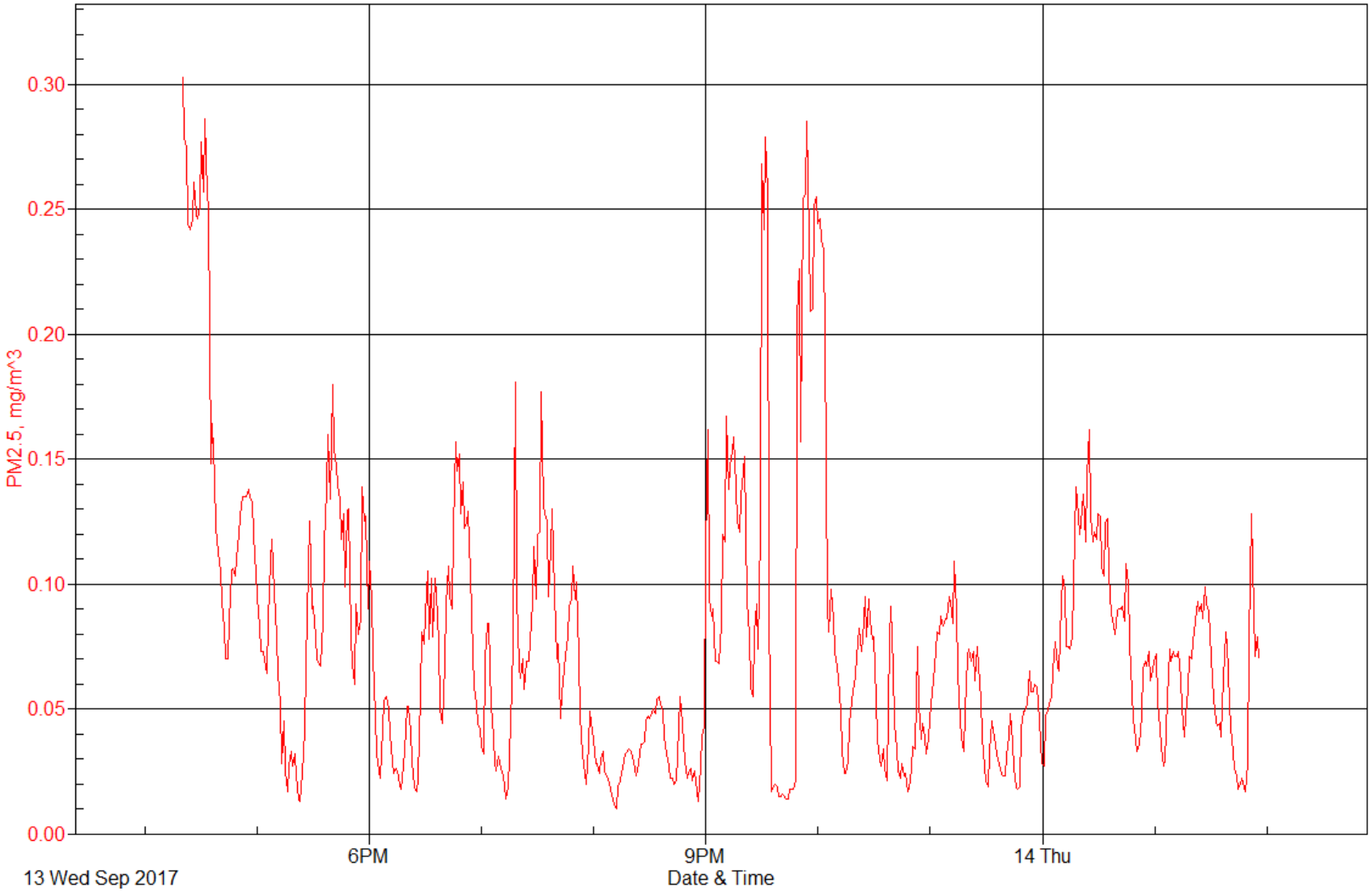
$PM_{2.5}$ Graph

Subway Operators / Guards – BD Line – September 12, 2017 – 5:00 AM to 3:00 PM (Operator 2)



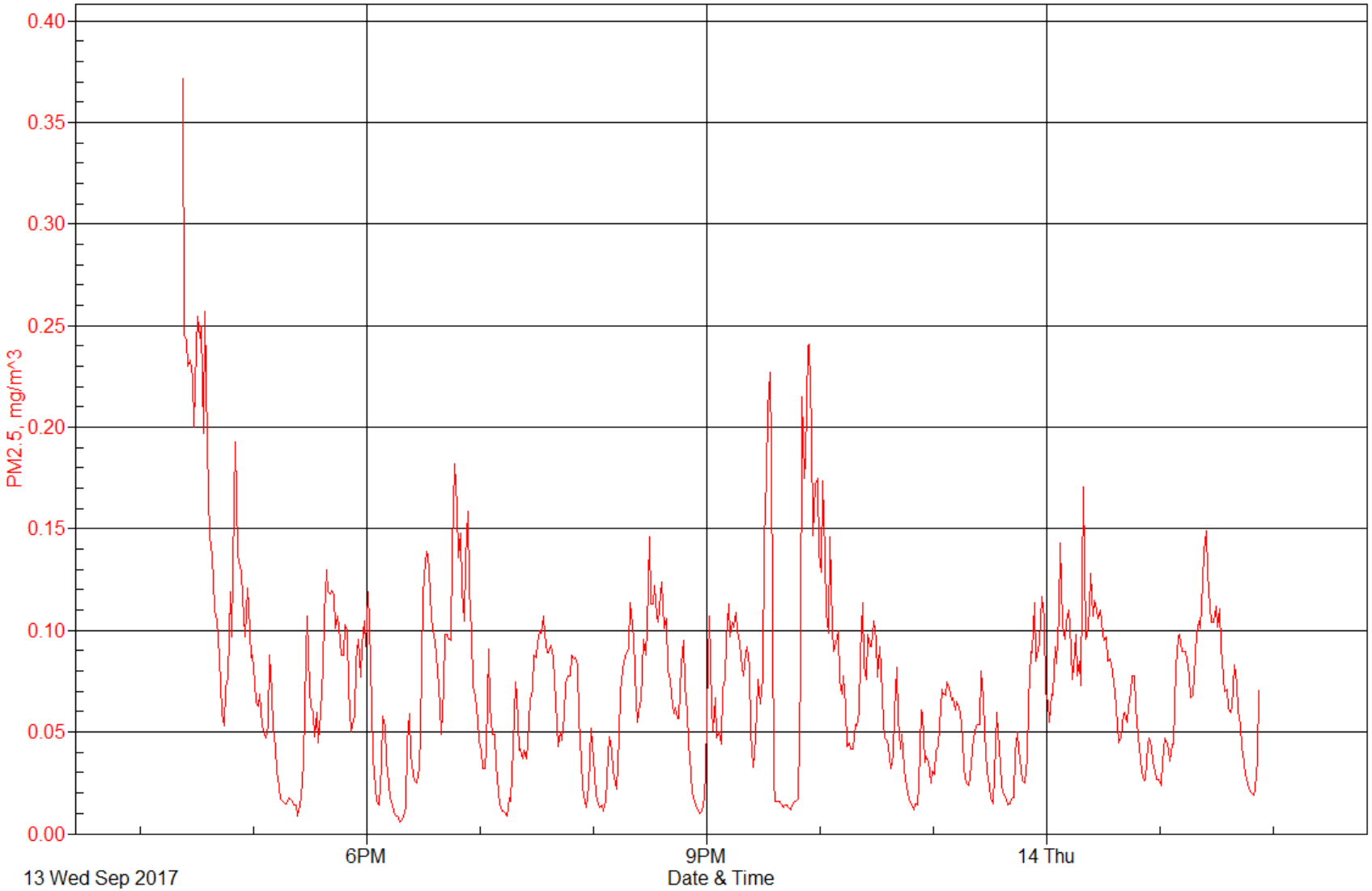
$PM_{2.5}$ Graph

Subway Operators / Guards – BD Line – September 13, 2017 – 4:00 PM – 2:00 AM (Operator 1)



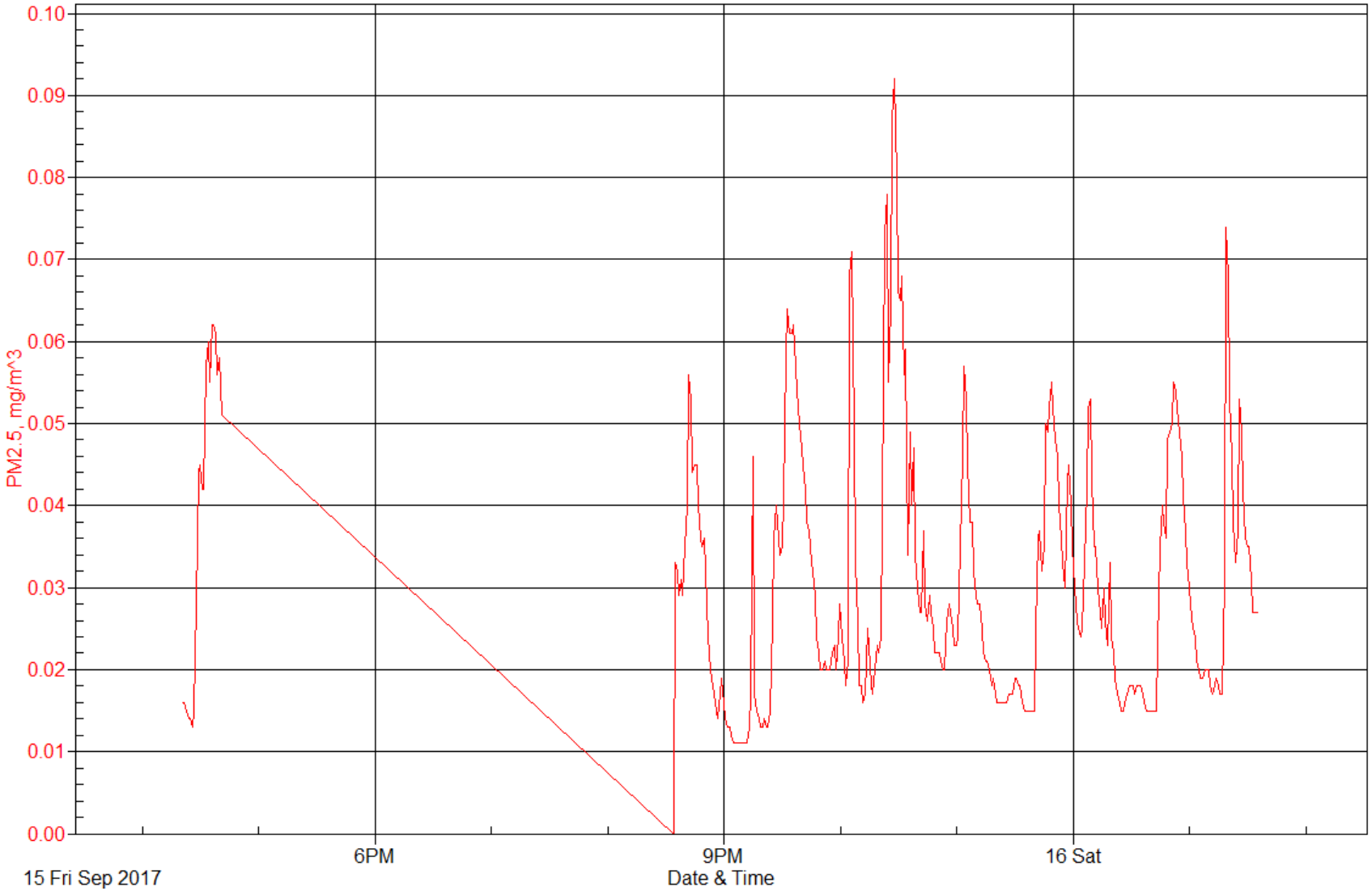
$PM_{2.5}$ Graph

Subway Operators / Guards – BD Line – September 13, 2017 – 4:00 PM – 2:00 AM (Operator 2)



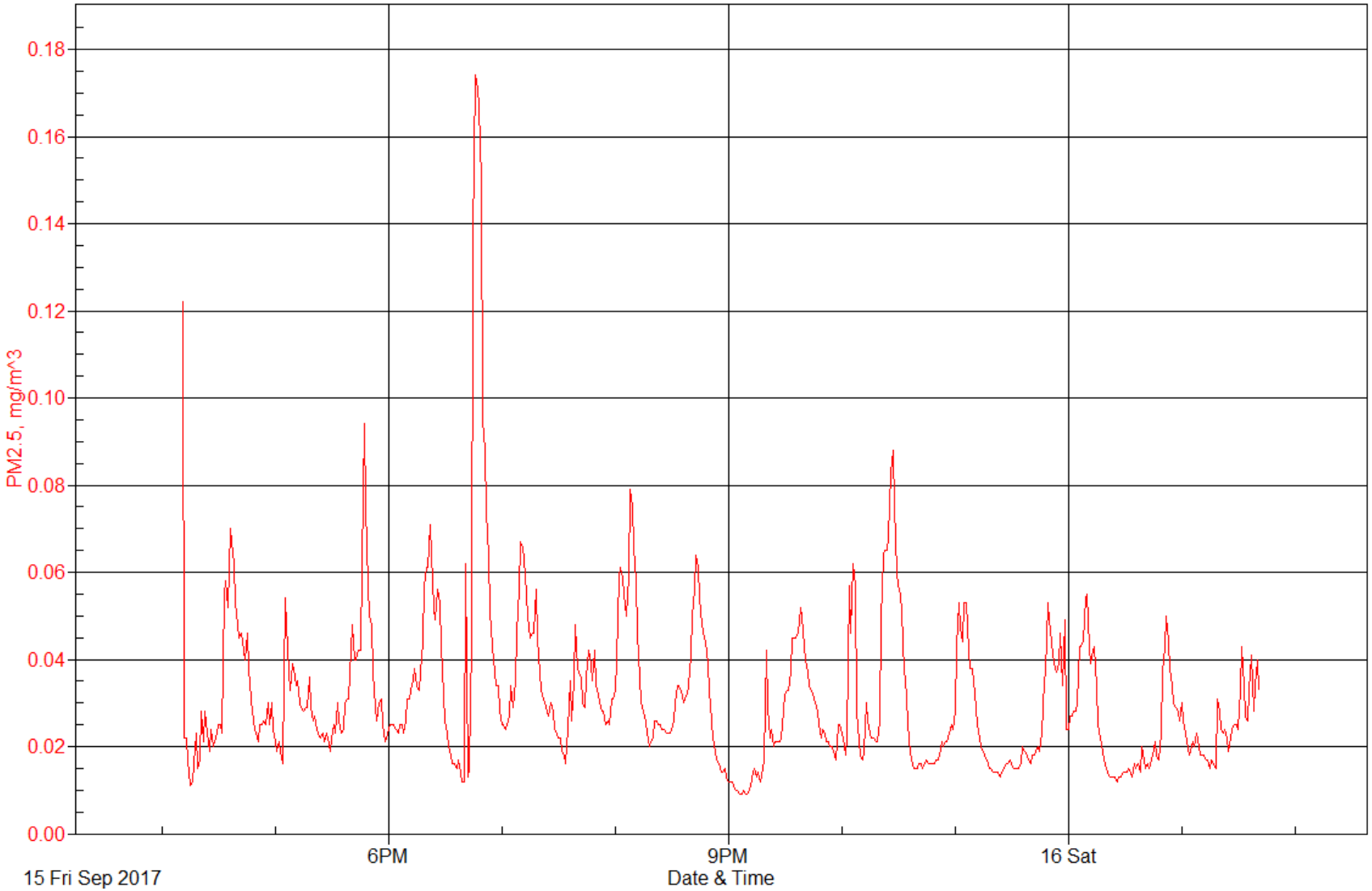
$PM_{2.5}$ Graph

Subway Operators / Guards – YUS Line – September 15, 2017 – 4:00 PM to 2:00 AM (Operator 1)



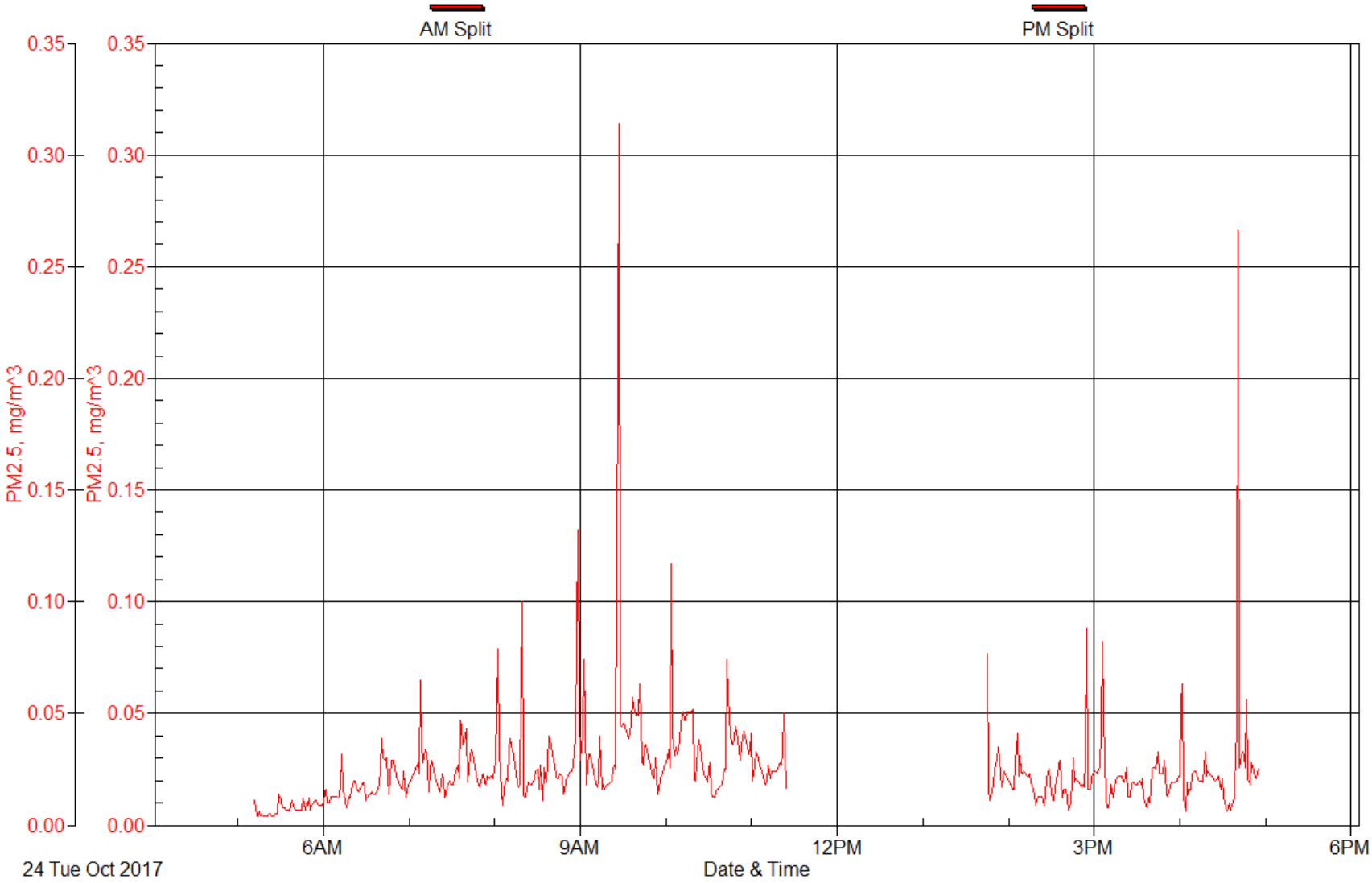
$PM_{2.5}$ Graph

Subway Operators / Guards – YUS Line – September 15, 2017 – 4:00 PM to 2:00 AM (Operator 2)



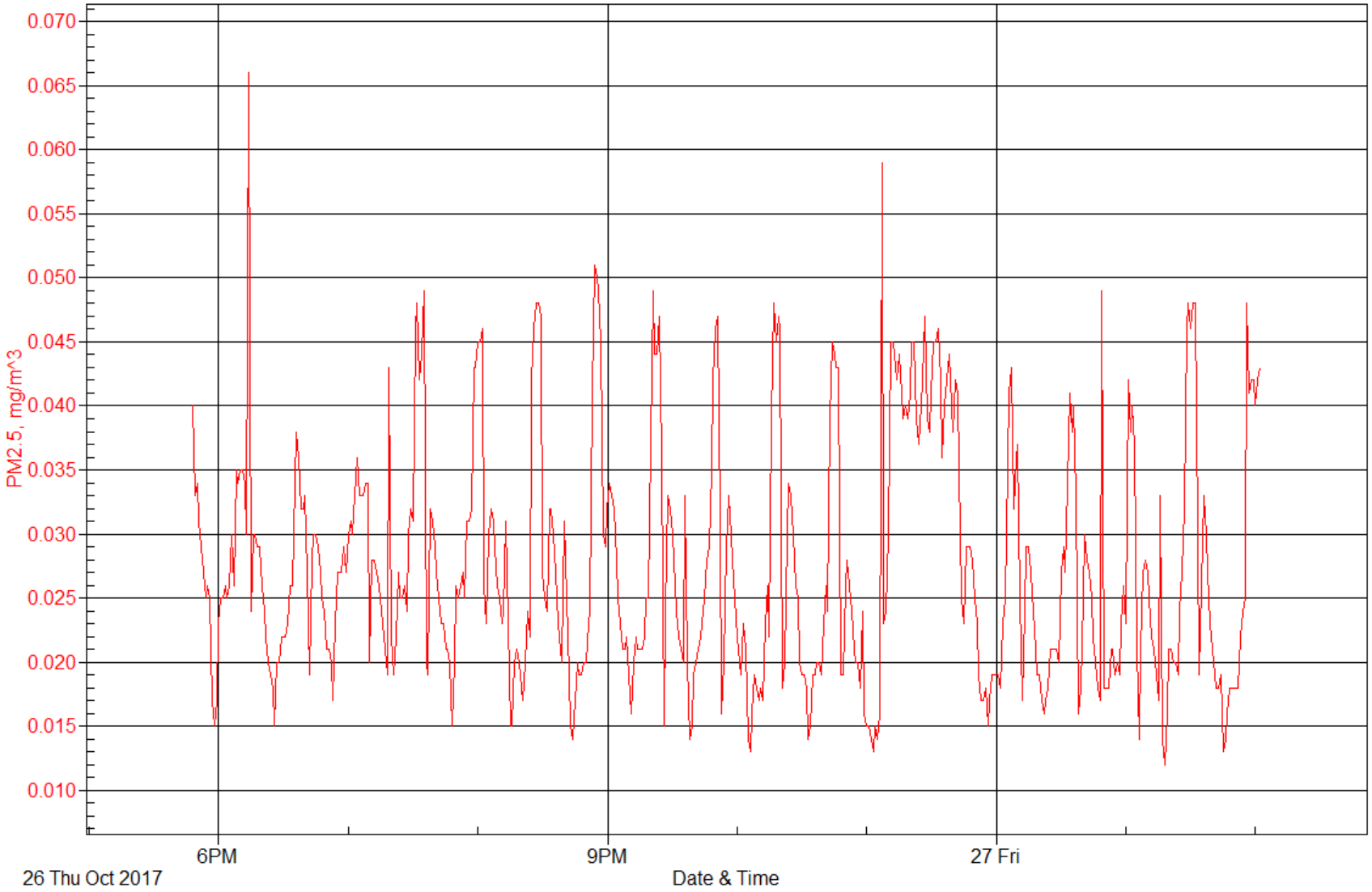
$PM_{2.5}$ Graph

Subway Operators – Sheppard Line – October 24, 2017 – 5:00 AM – 11:30 AM & 1:30 PM – 5:00 PM



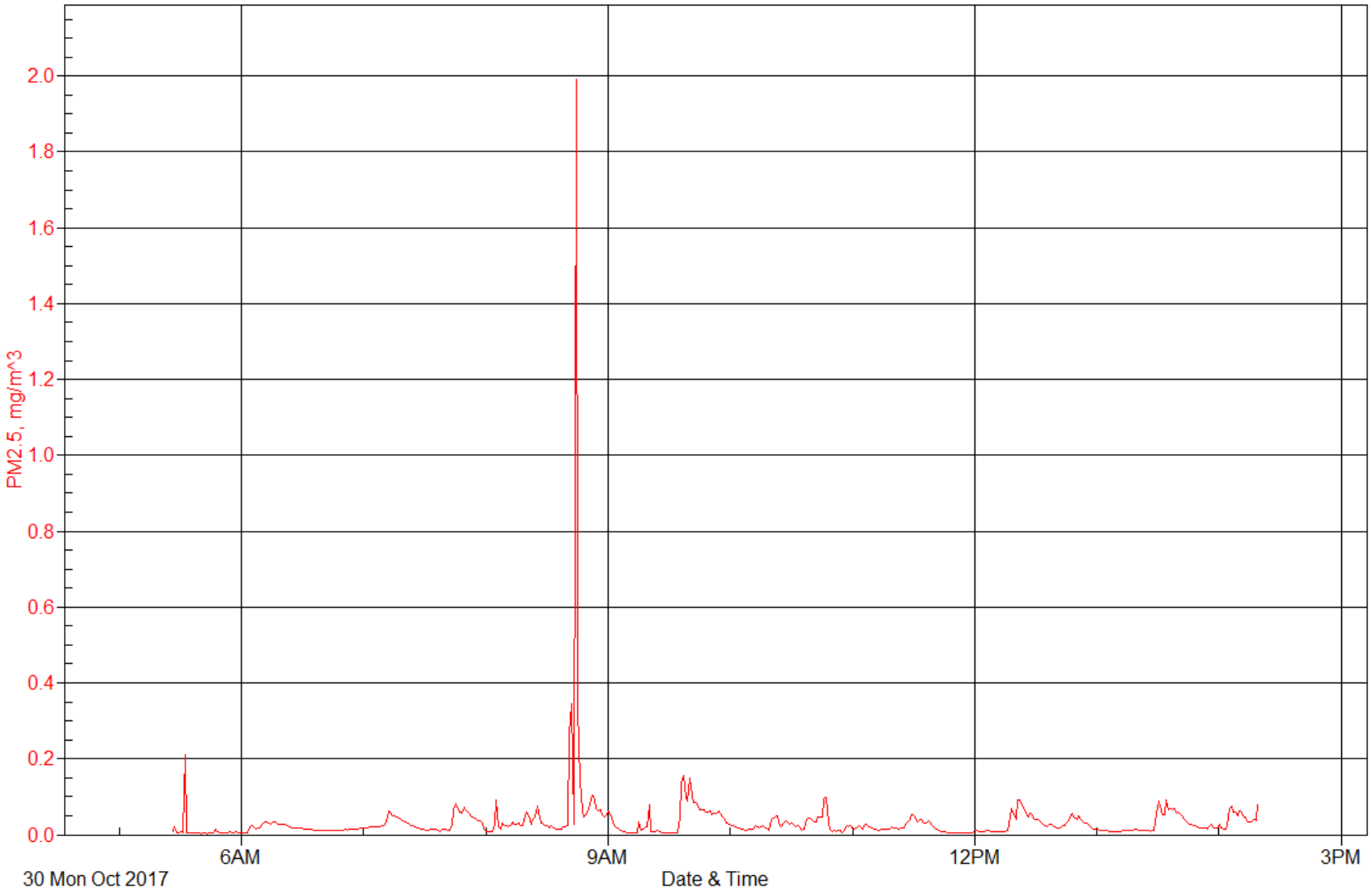
$PM_{2.5}$ Graph

Subway Operators – Sheppard Line – October 26, 2017 – 5:30 PM to 2:00 AM



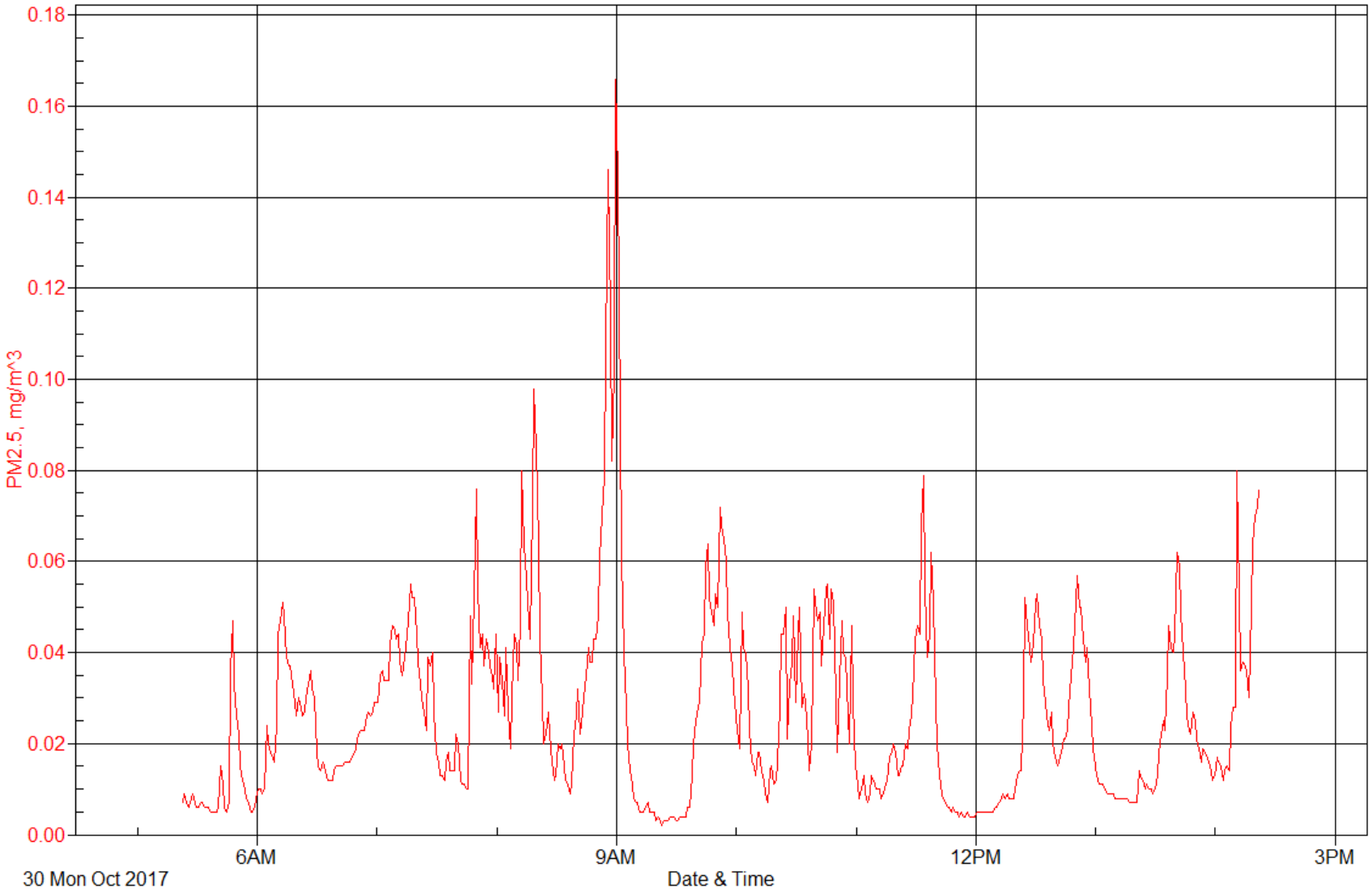
$PM_{2.5}$ Graph

Subway Operators / Guards – YUS Line (following closure) – October 30, 2017 – 5:00 AM – 3:00 PM (Operator 1)



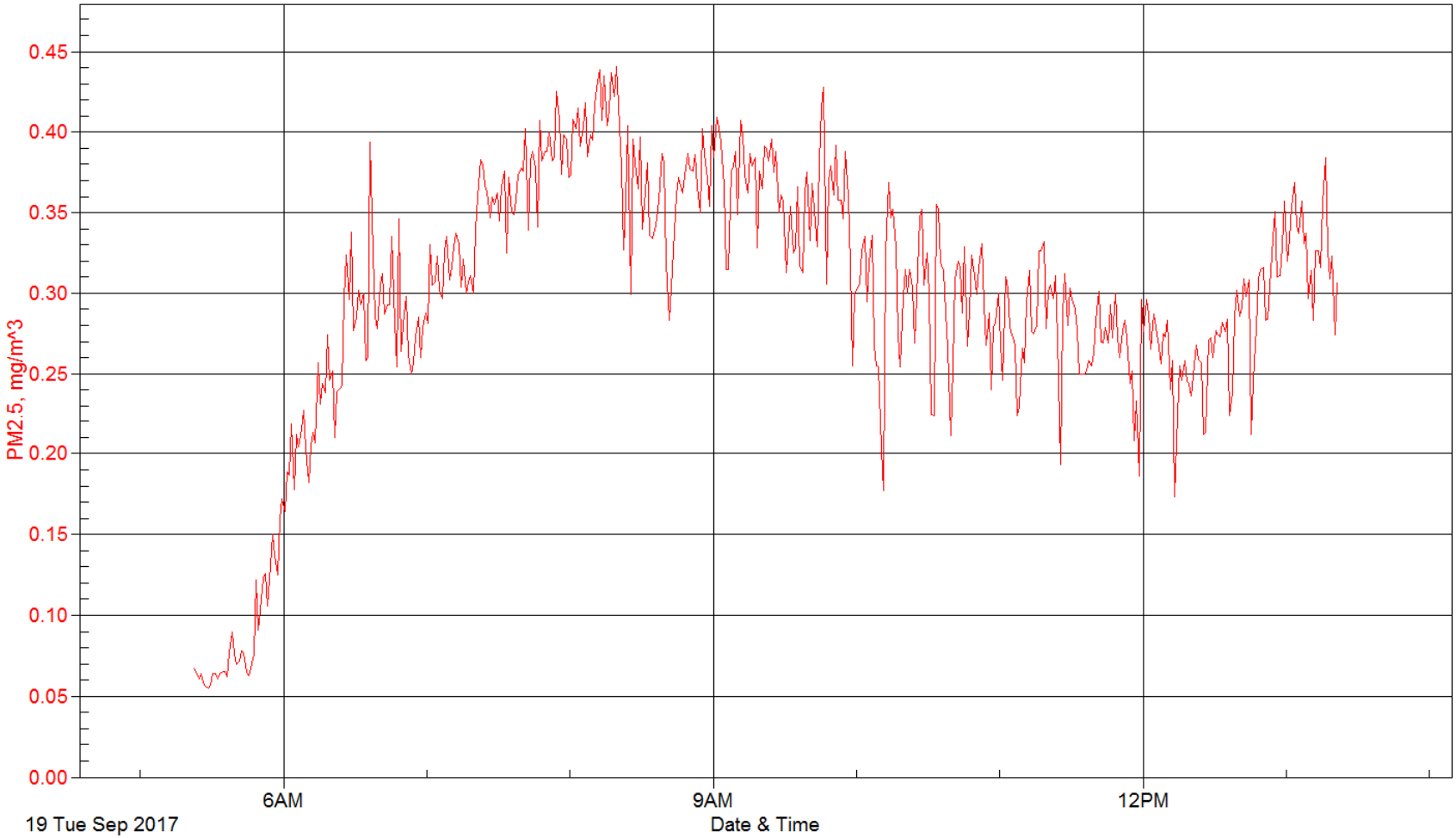
$PM_{2.5}$ Graph

Subway Operators / Guards – YUS Line (following closure) – October 30, 2017 – 5:00 AM – 3:00 PM (Operator 2)



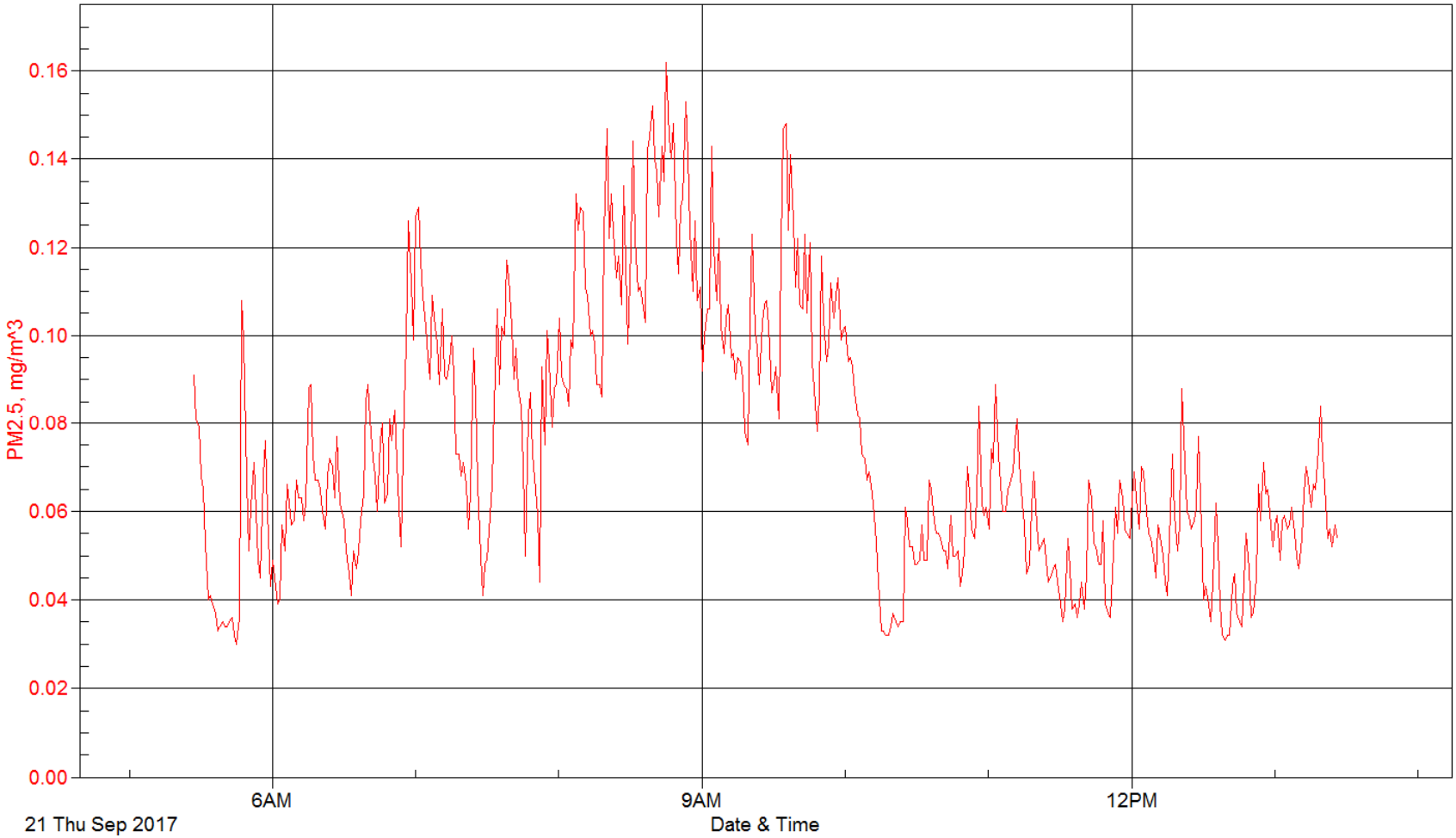
$PM_{2.5}$ Graph

Coxwell Platform – September 19, 2017 – 5:30 AM – 1:30 PM



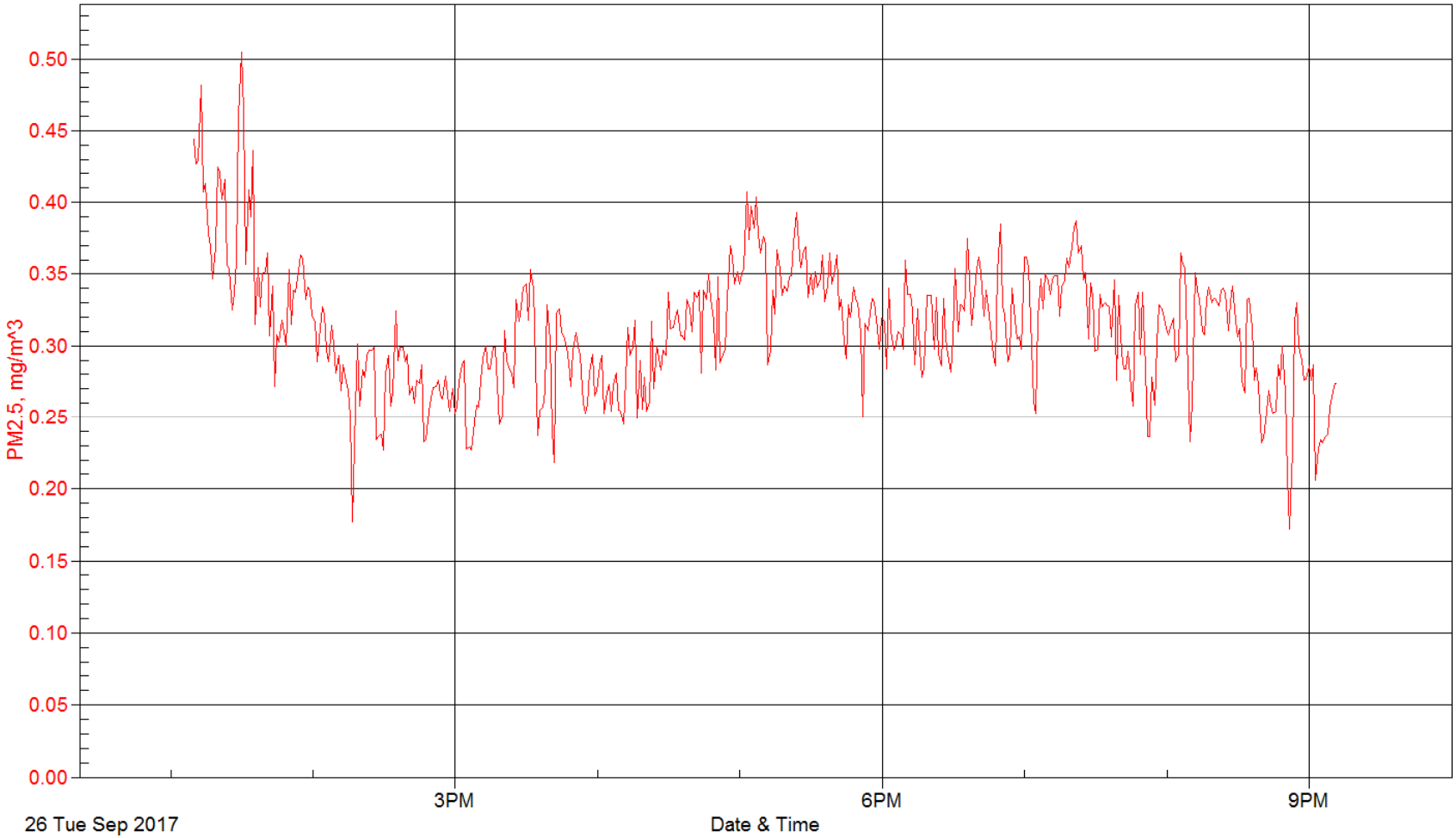
$PM_{2.5}$ Graph

Eglinton Platform – September 21, 2017 – 5:30 AM – 1:30 PM



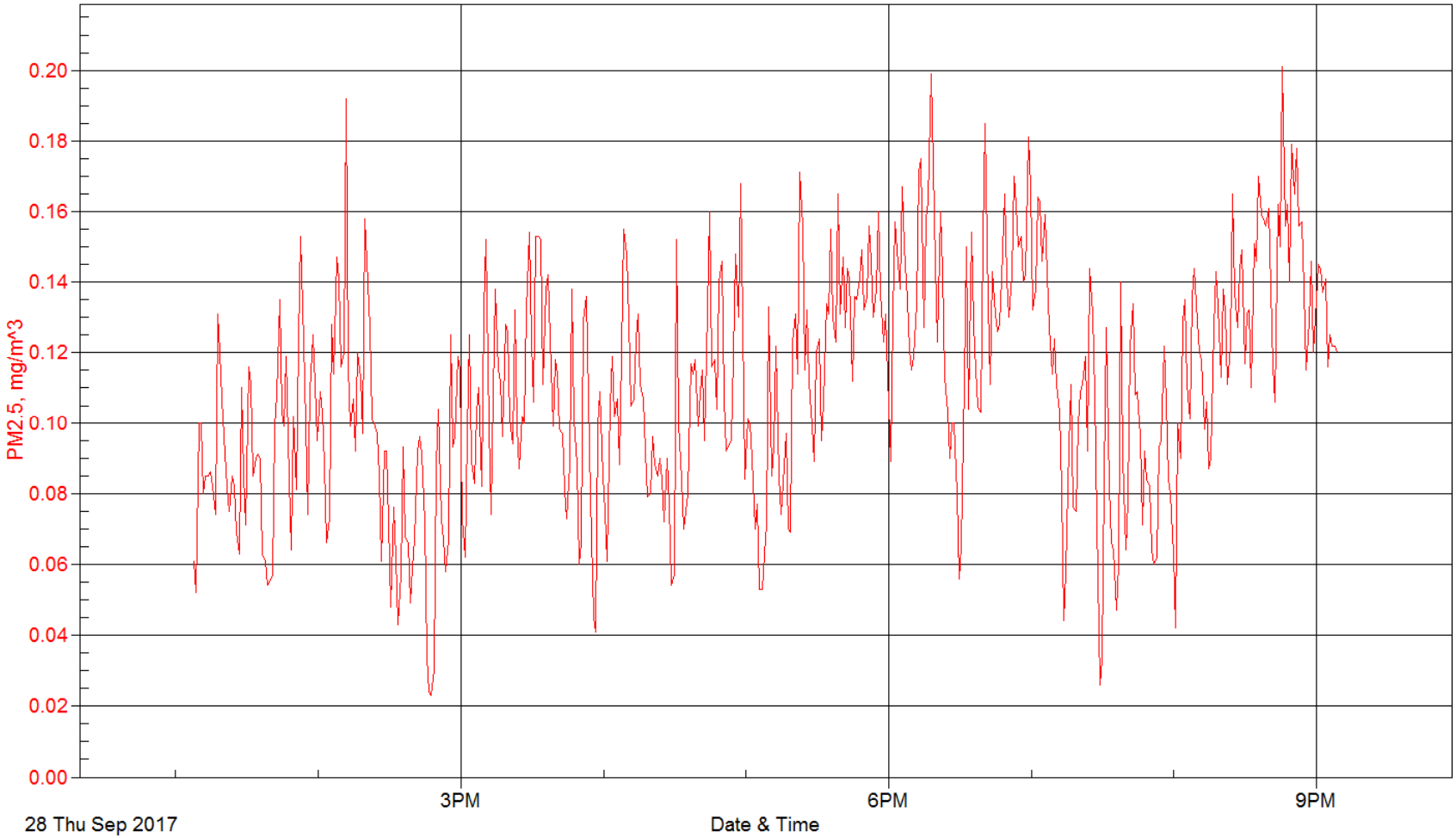
$PM_{2.5}$ Graph

Coxwell Platform – September 26, 2017 – 1:00 PM – 9:00 PM



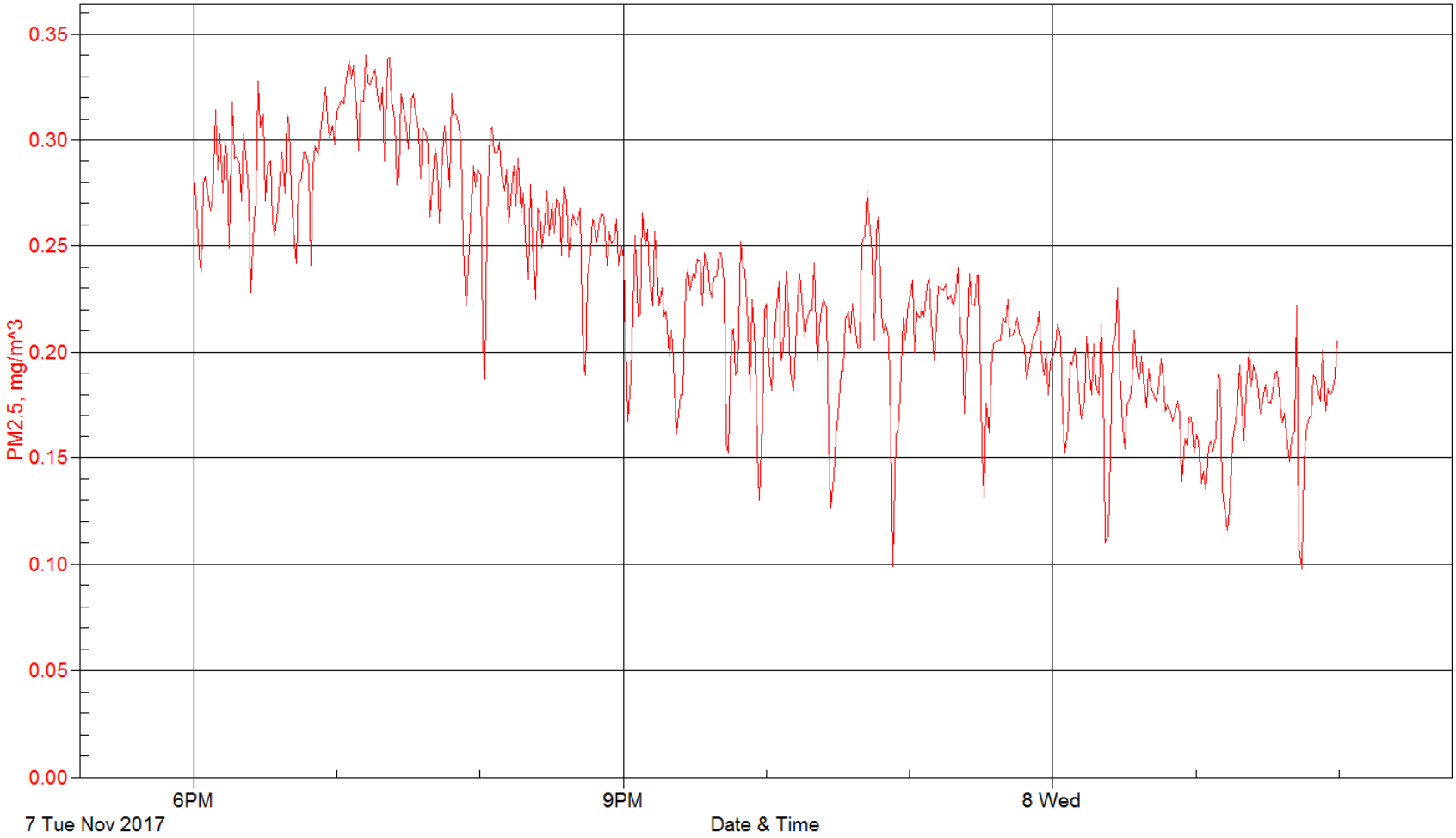
$PM_{2.5}$ Graph

Eglinton Platform – September 28, 2017 – 1:00 PM – 9:00 PM



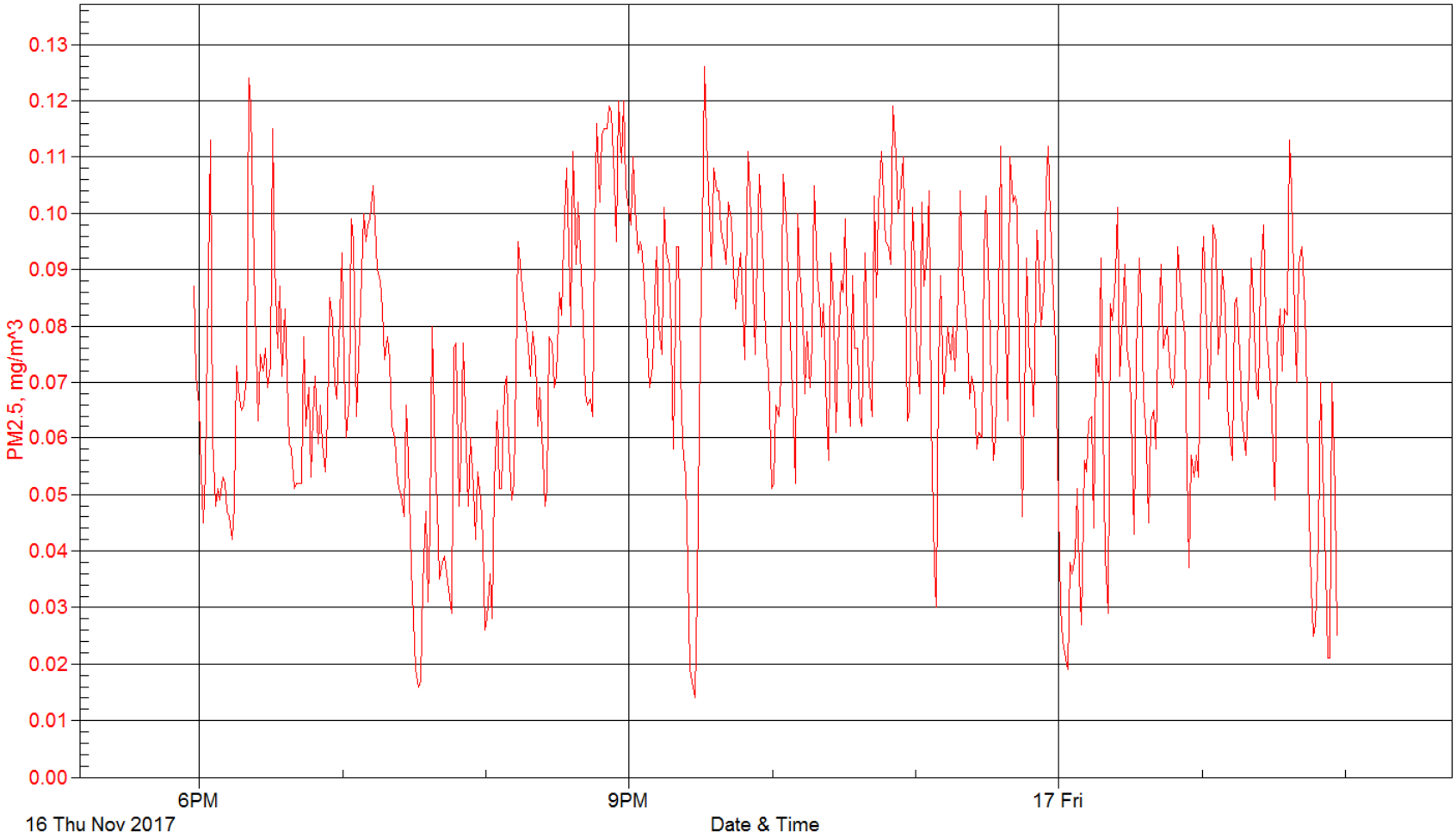
$PM_{2.5}$ Graph

Coxwell Platform – November 7, 2017 – 6:00 PM – 2:00 AM



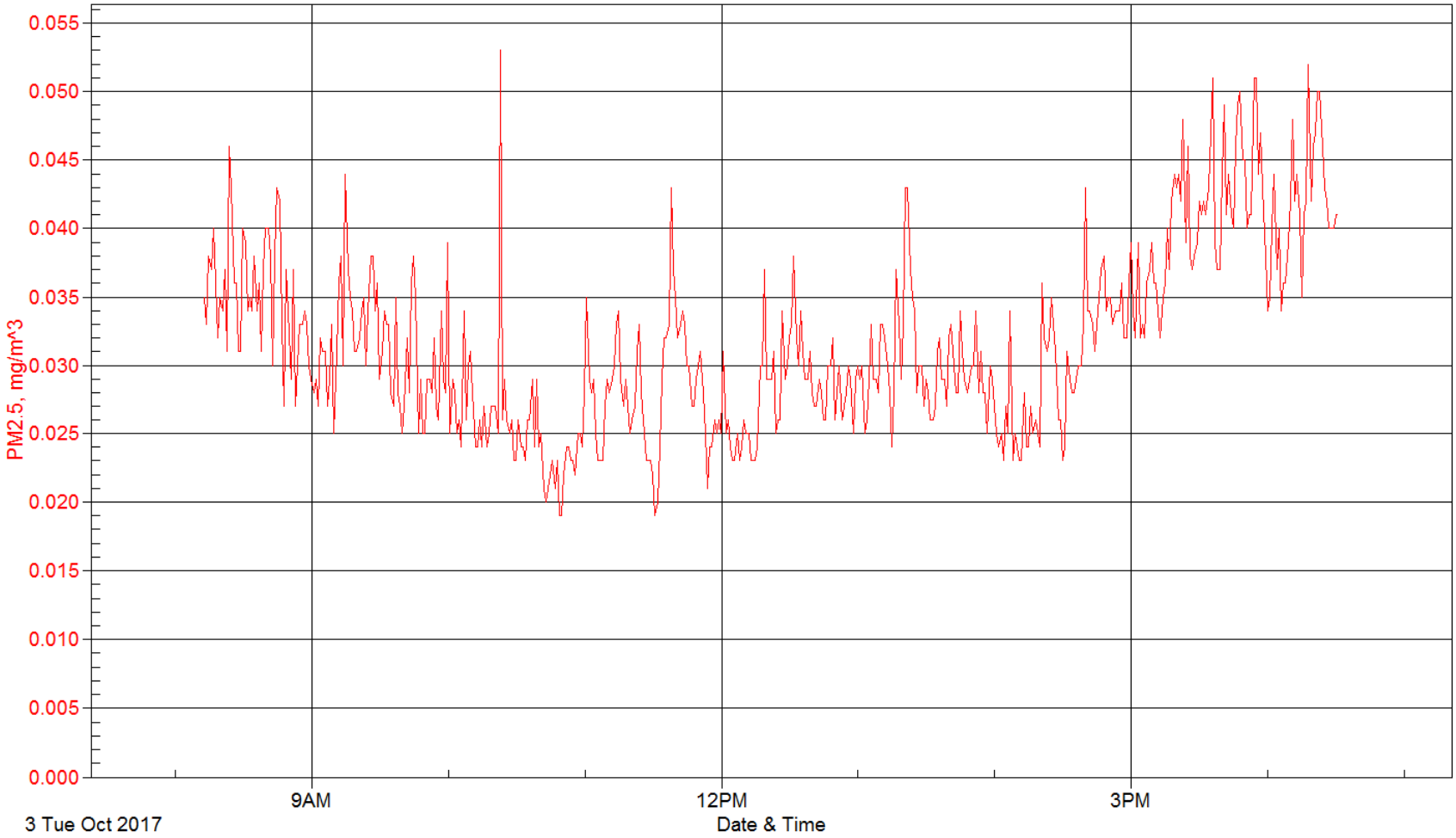
$PM_{2.5}$ Graph

Eglinton Platform – November 16, 2017 – 6:00 PM – 2:00 AM



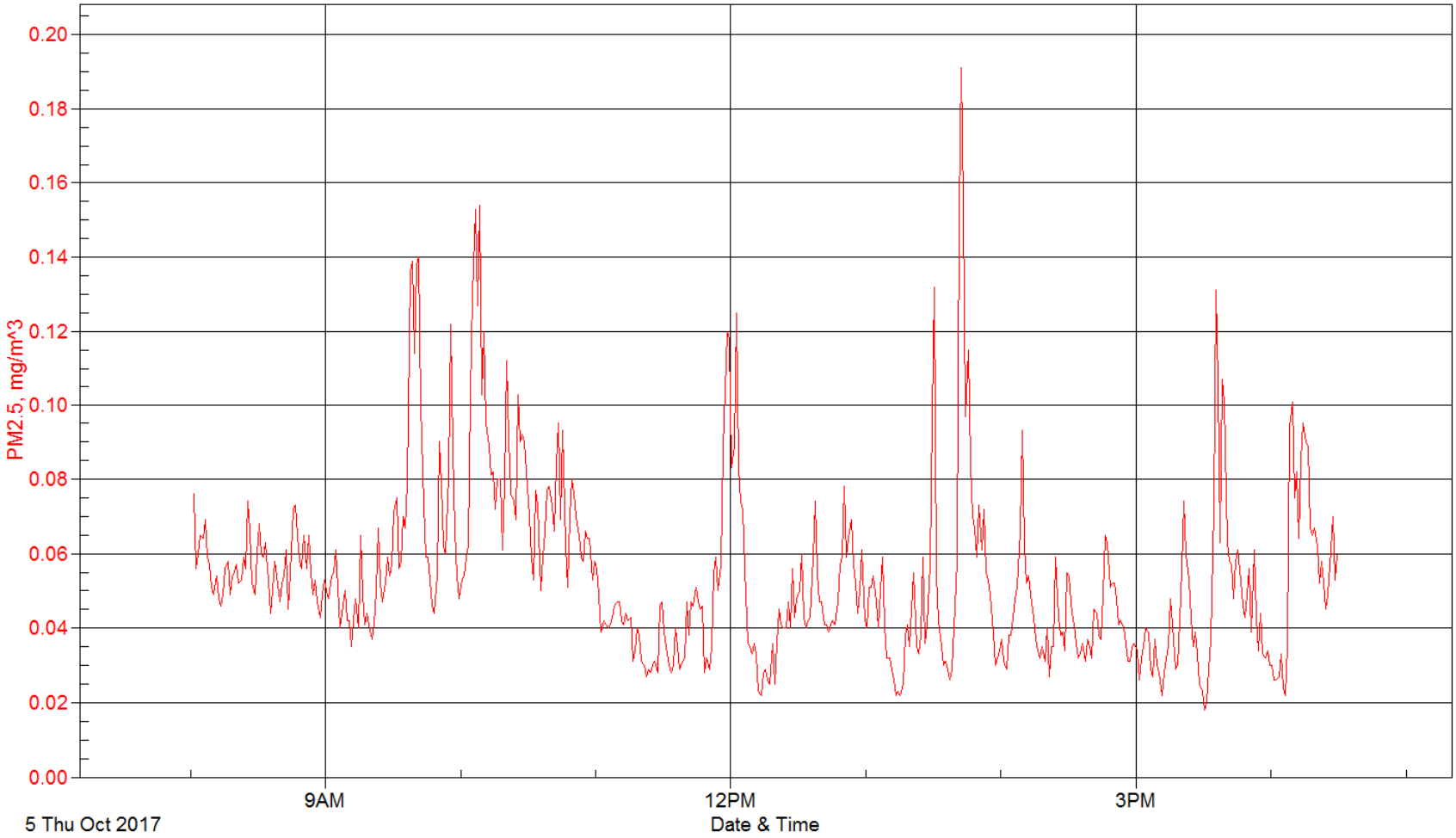
$PM_{2.5}$ Graph

End Terminal Cleaners – Finch Station – October 3, 2017 – 8:00 AM – 4:30 PM



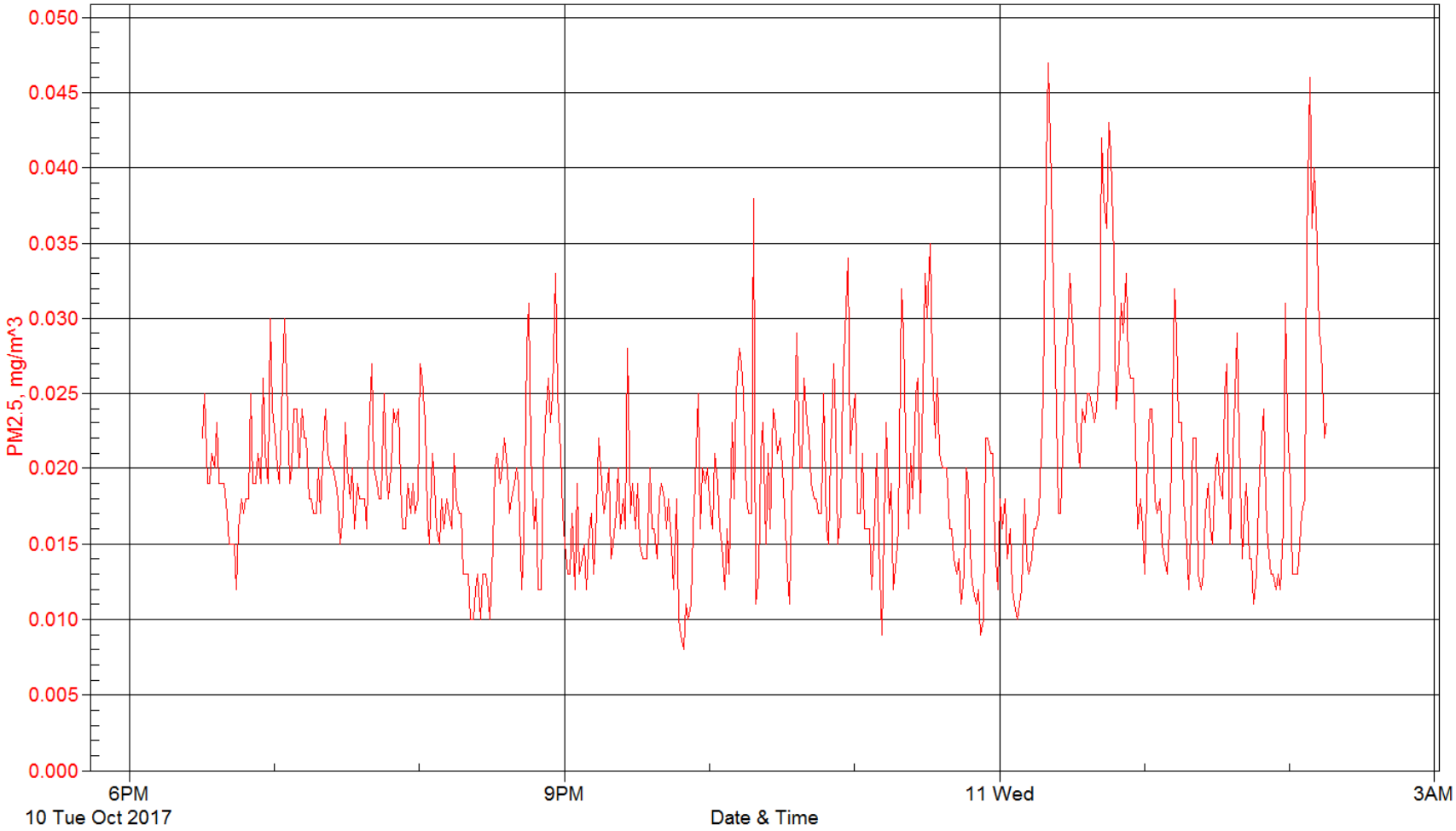
$PM_{2.5}$ Graph

End Terminal Cleaners – Kennedy Station – October 5, 2017 – 8:00 AM – 4:30 PM



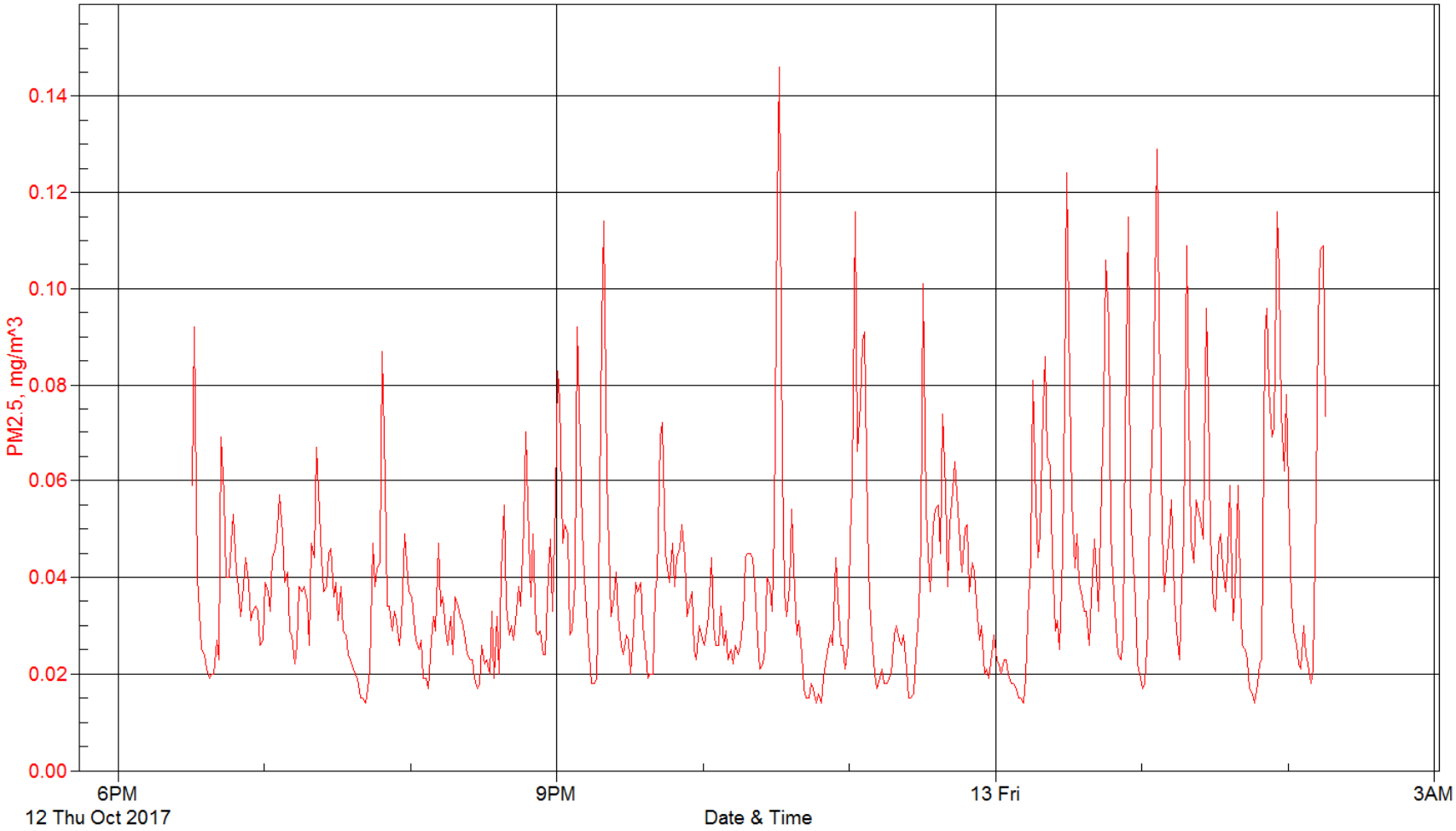
$PM_{2.5}$ Graph

End Terminal Cleaners – Finch Station – October 10, 2017 – 6:30 PM – 2:30 AM



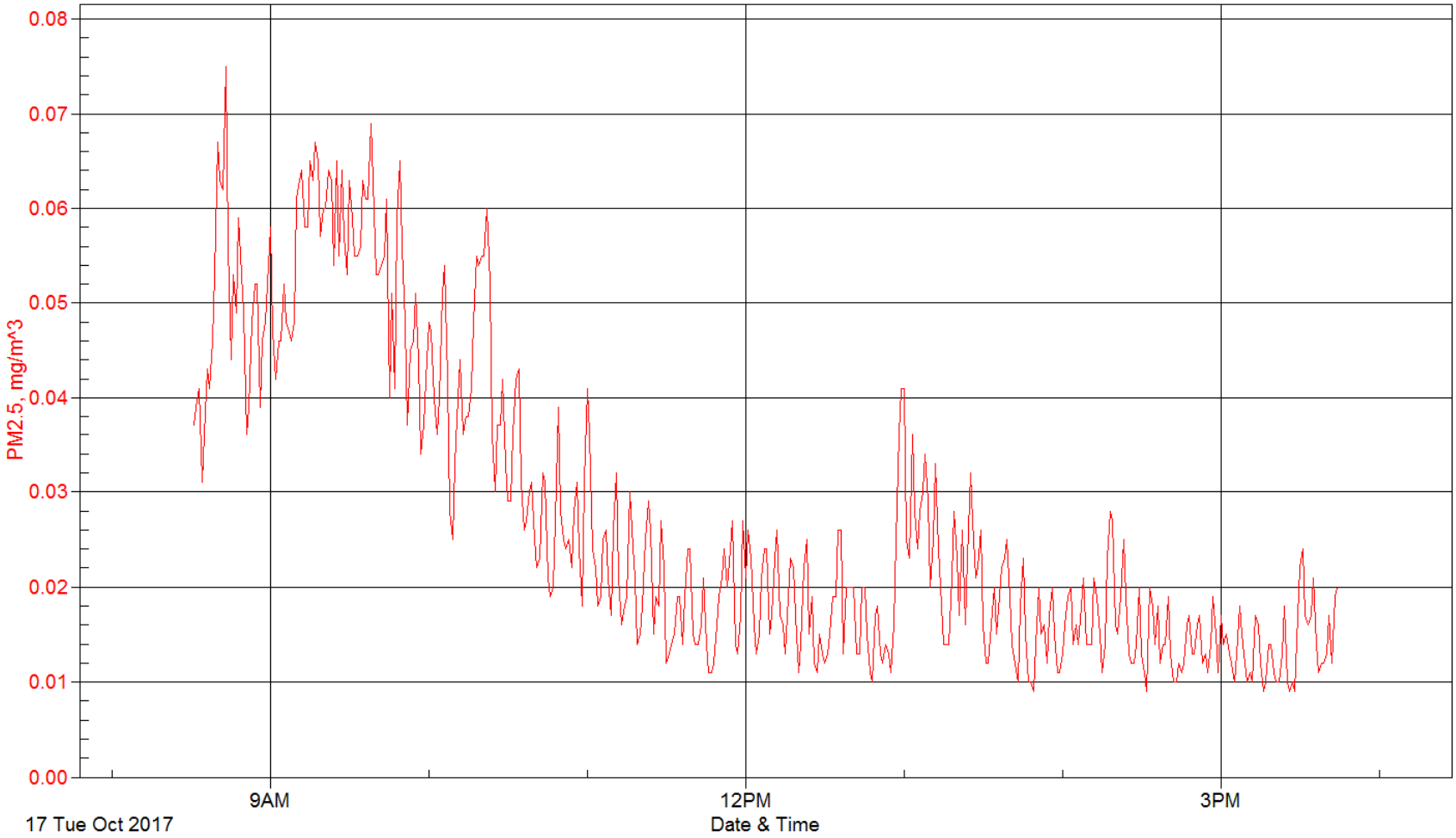
$PM_{2.5}$ Graph

End Terminal Cleaners – Kennedy Station – October 12, 2017 – 6:30 PM – 2:30 AM



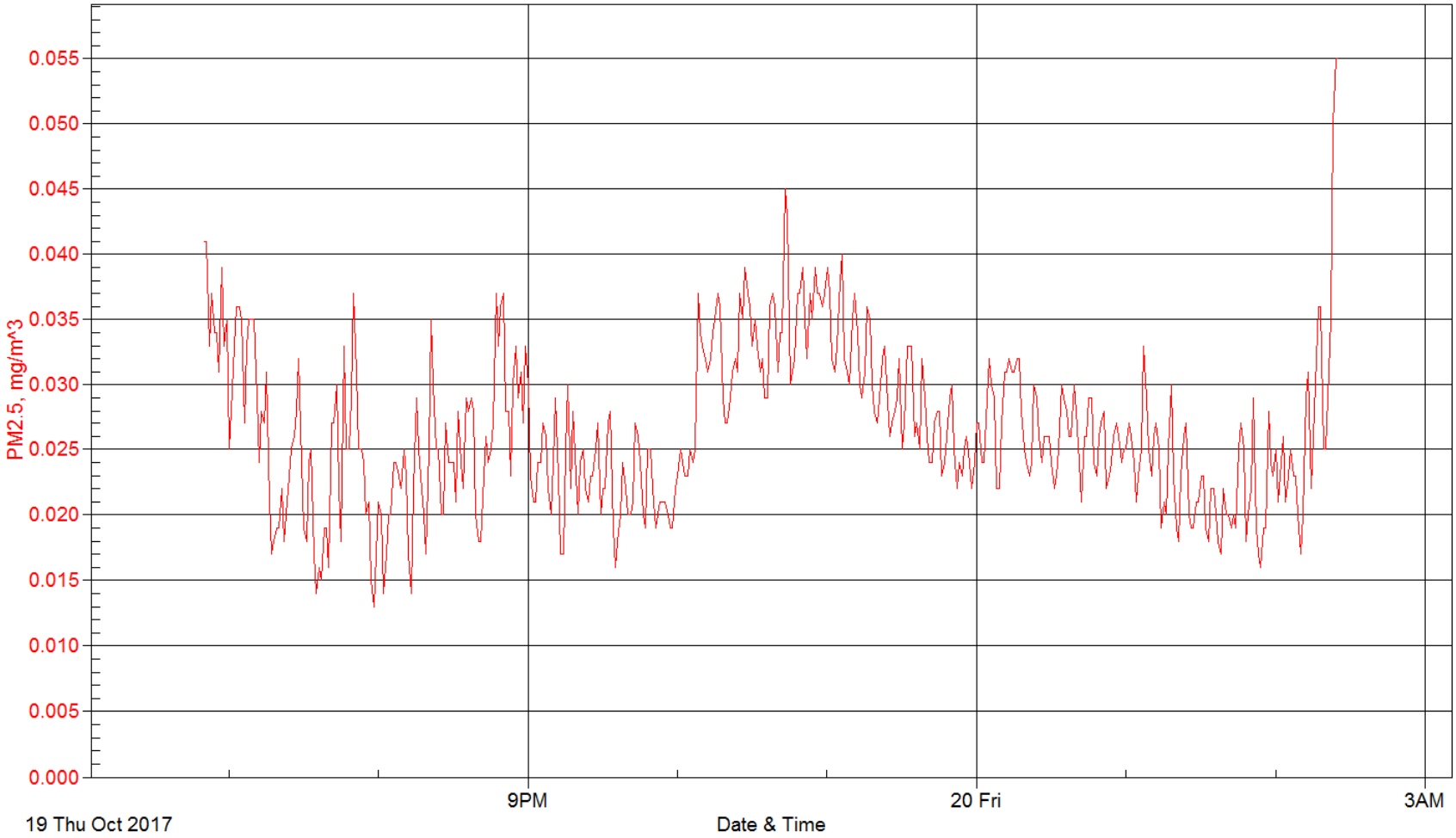
$PM_{2.5}$ Graph

End Terminal Cleaners – Sheppard Station – October 17, 2017 – 8:30AM – 3:30 PM



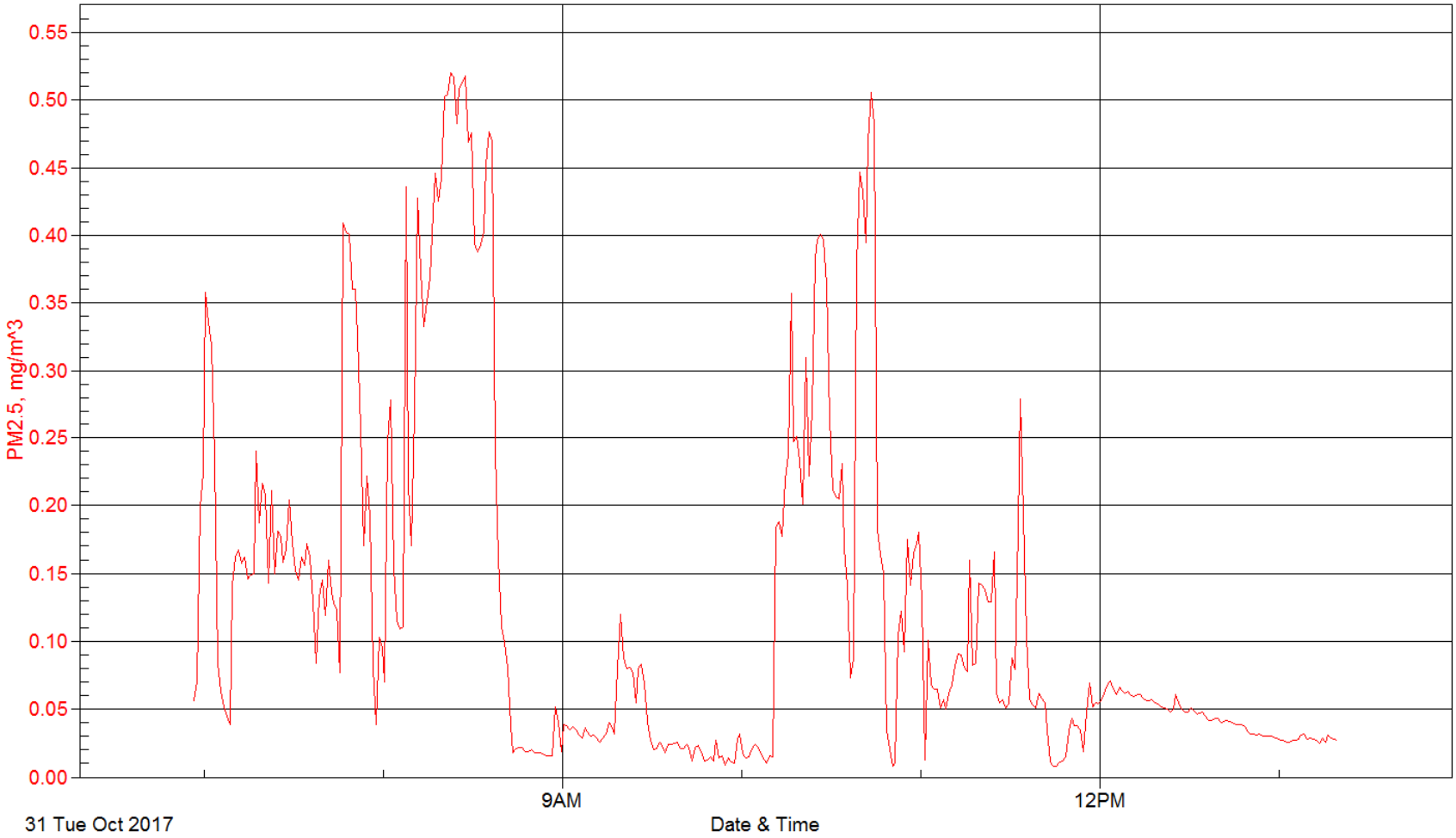
$PM_{2.5}$ Graph

End Terminal Cleaners – Sheppard Station – October 19, 2017 – 6:30 PM – 3:00 AM



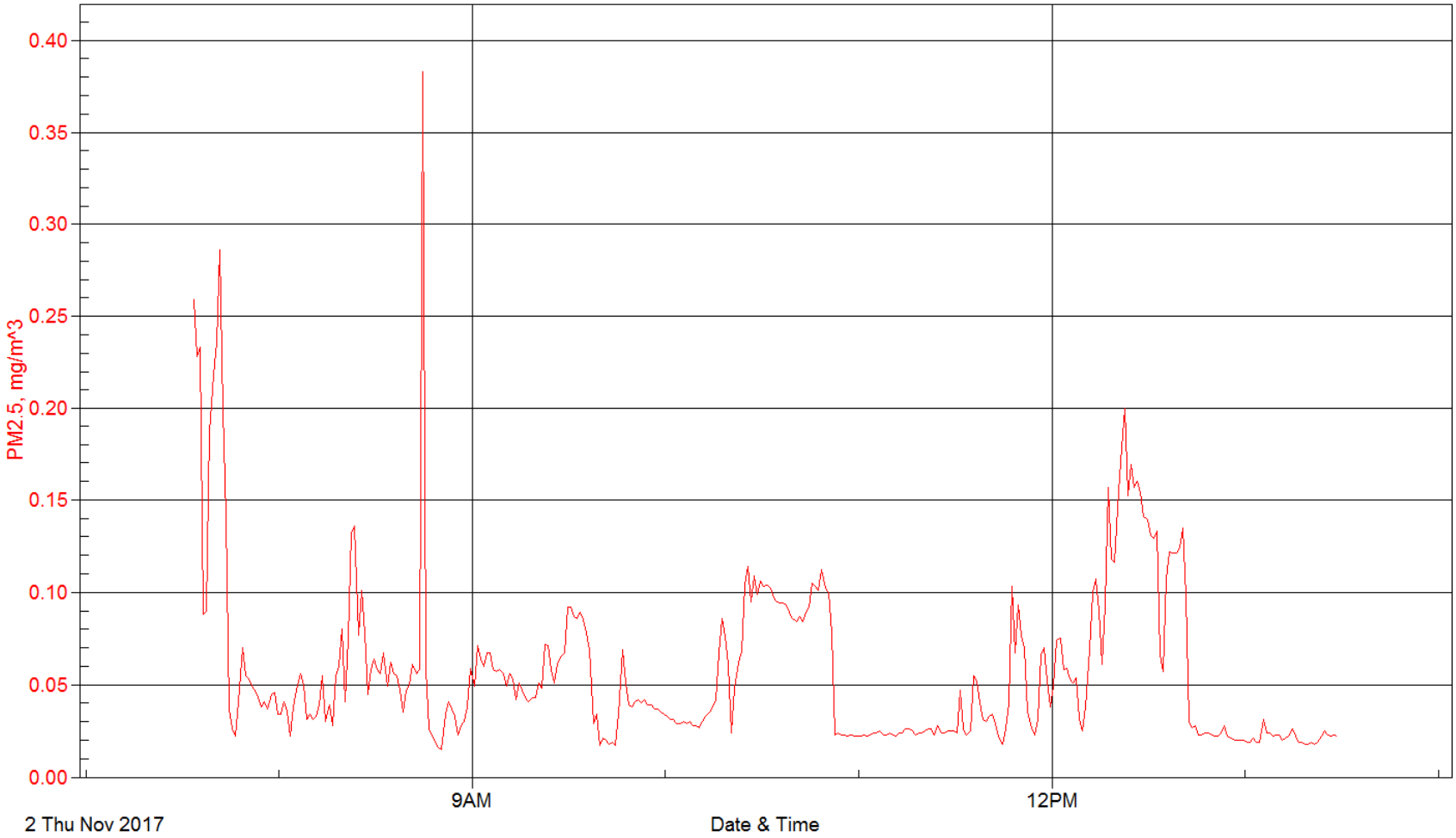
$PM_{2.5}$ Graph

Janitors (Dundas West, Jane, Old Mill, Royal York & Kipling) – October 31, 2017 – 6:30 AM – 3:00 PM



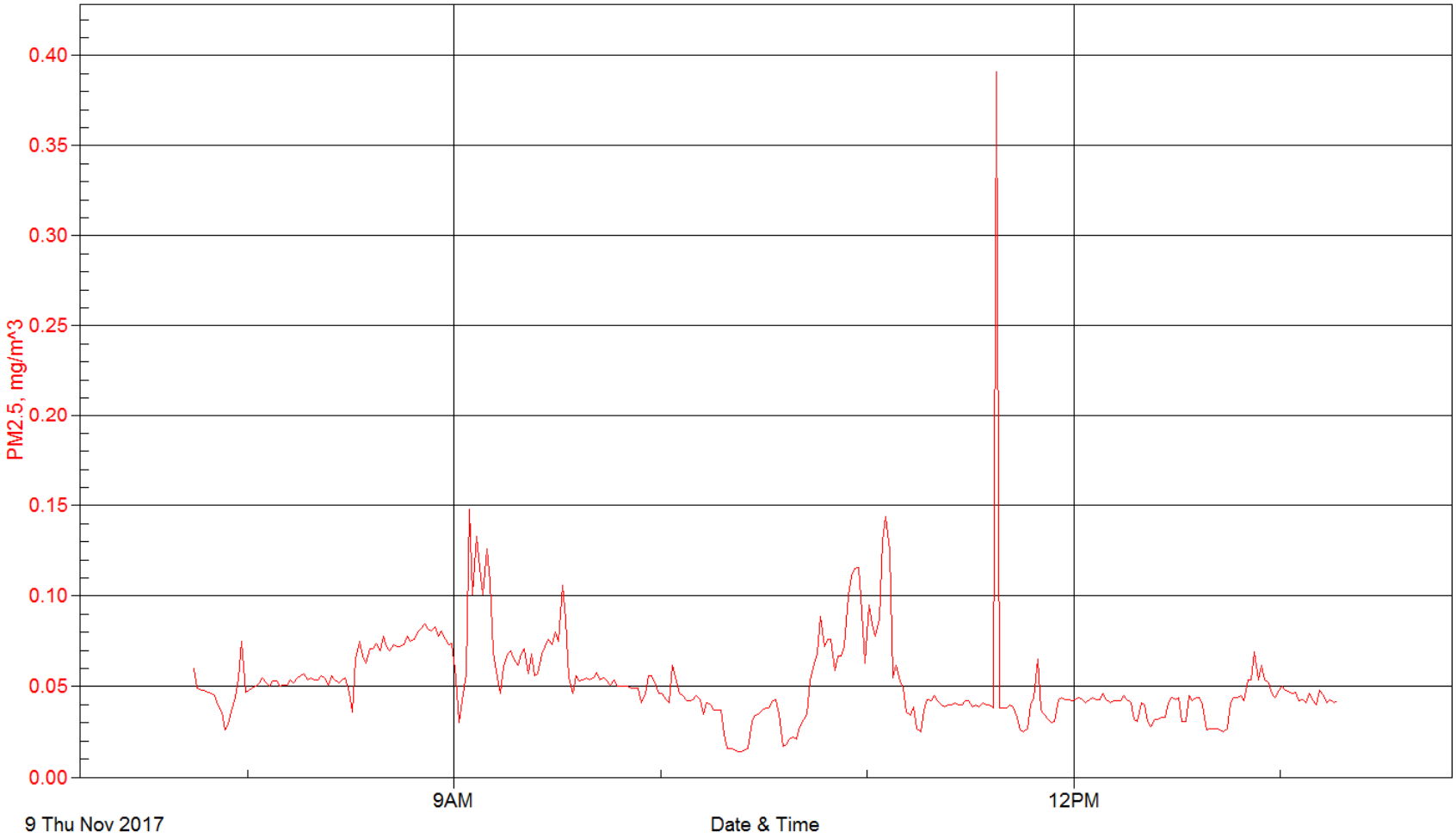
$PM_{2.5}$ Graph

Janitors (Summerhill, St Clair, Eglinton & Lawrence) – November 2, 2017 – 6:30 AM – 3:00 PM



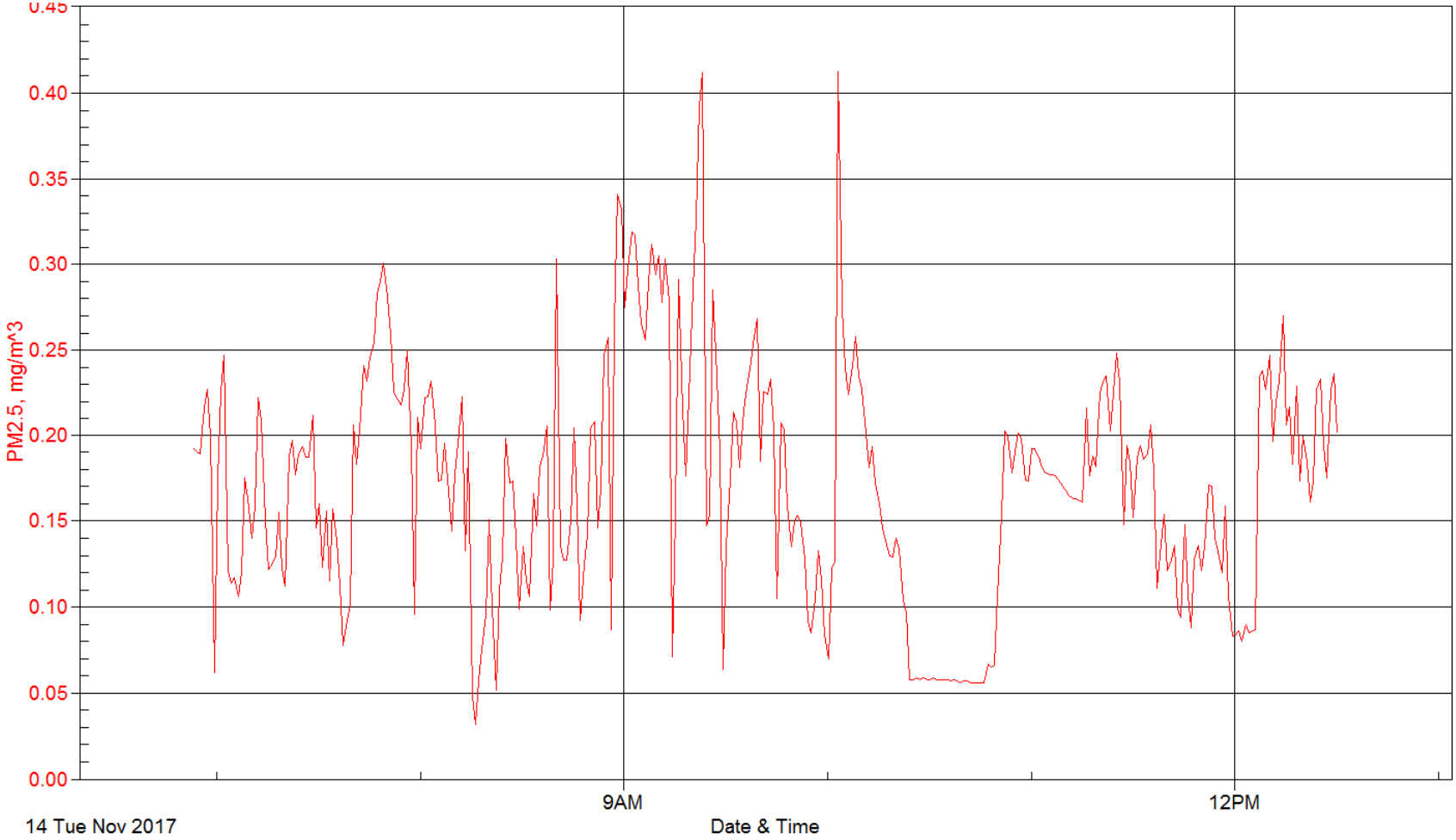
$PM_{2.5}$ Graph

Janitors (Dundas, Queen & King) – November 9, 2017 – 6:30 AM – 3:00 PM



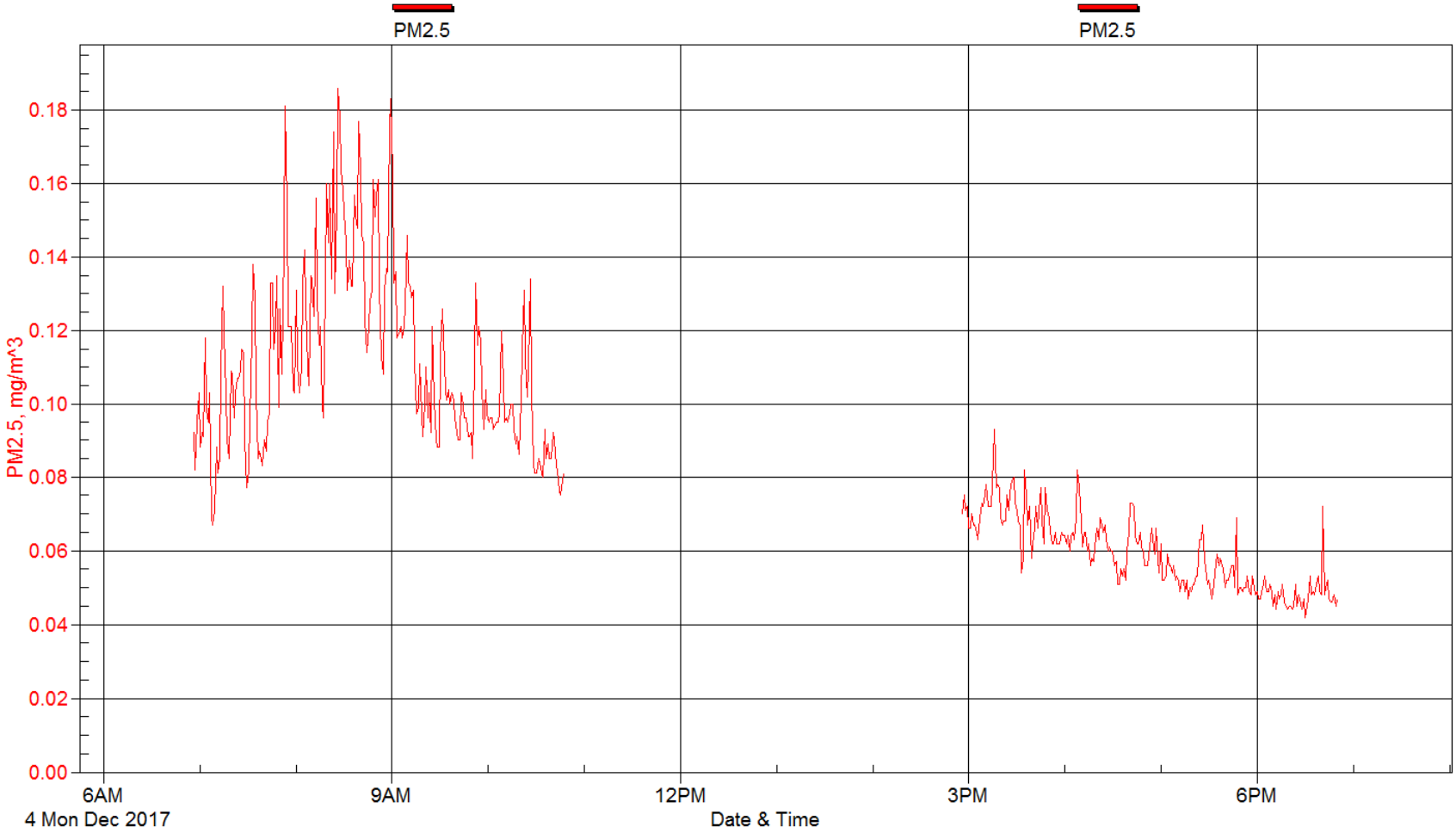
$PM_{2.5}$ Graph

Janitors (Pape, Donlands, Greenwood & Coxwell) – November 14, 2017 – 6:30 AM – 3:00 PM



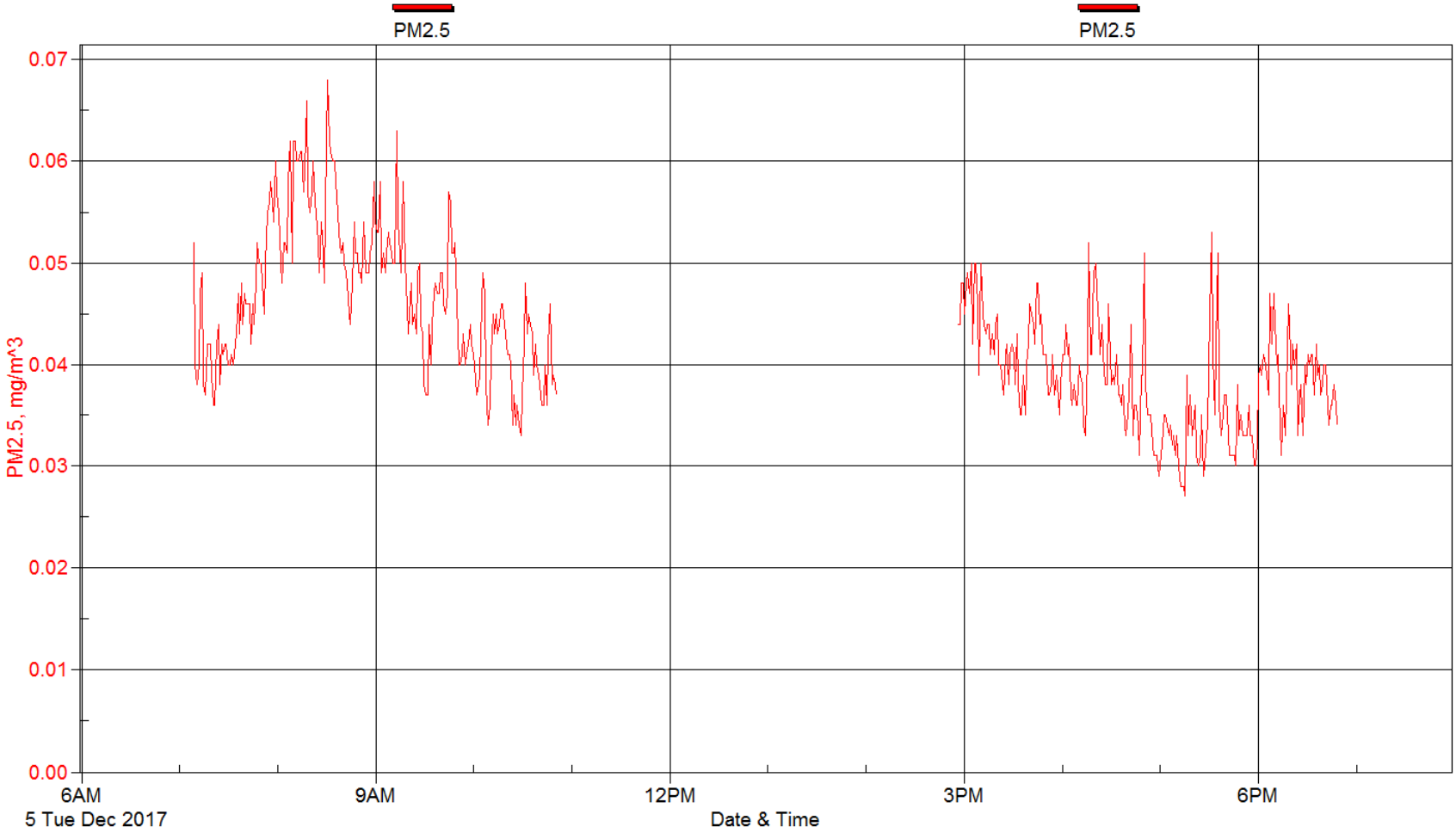
$PM_{2.5}$ Graph

Traffic Checkers – Bloor Station – December 4, 2017 – 7:00 AM – 11:00 PM & 3:00 PM – 7:00 PM



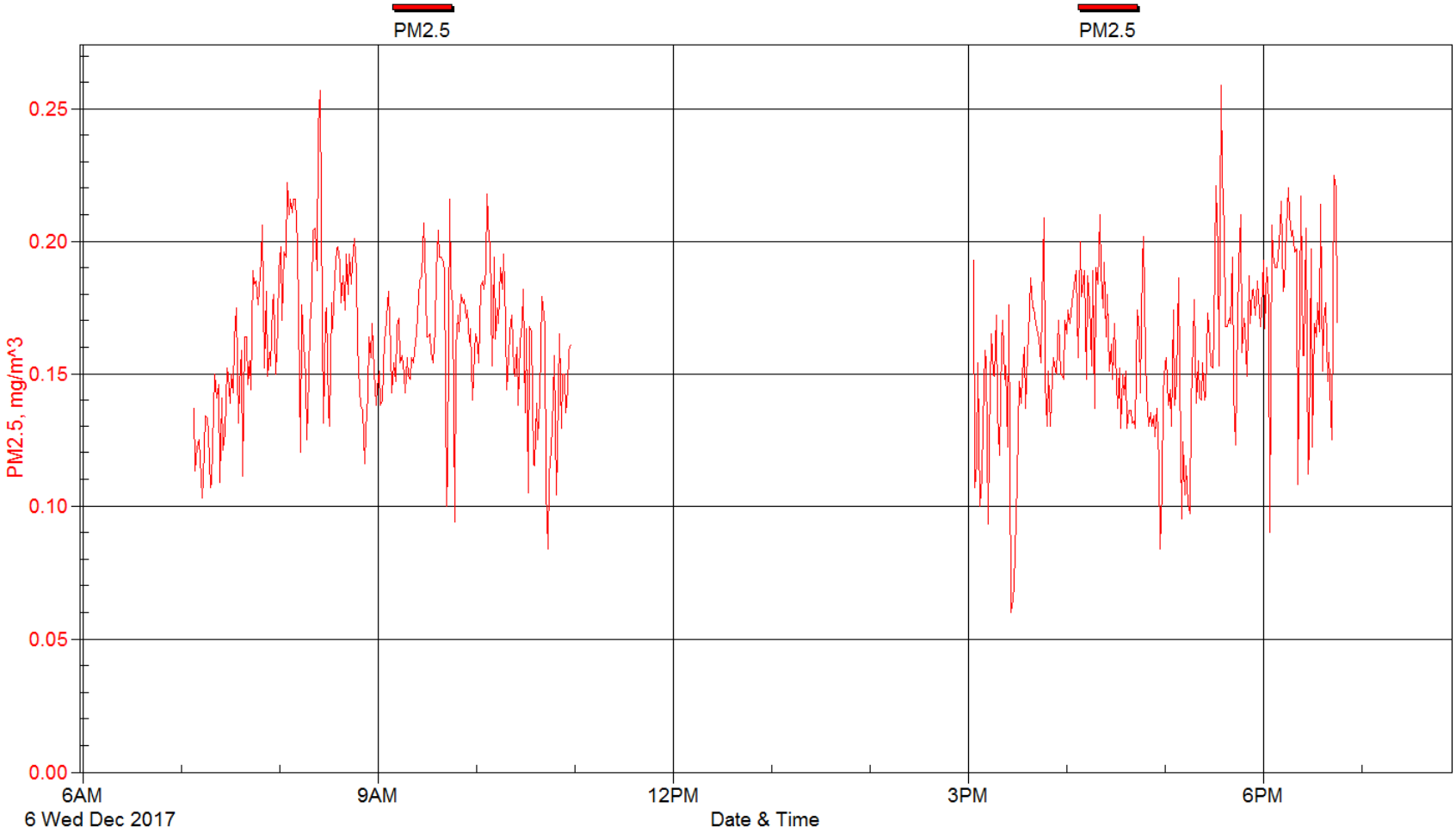
$PM_{2.5}$ Graph

Traffic Checkers – Wellesley Station – December 5, 2017 – 7:00 AM – 11:00 PM & 3:00 PM – 7:00 PM



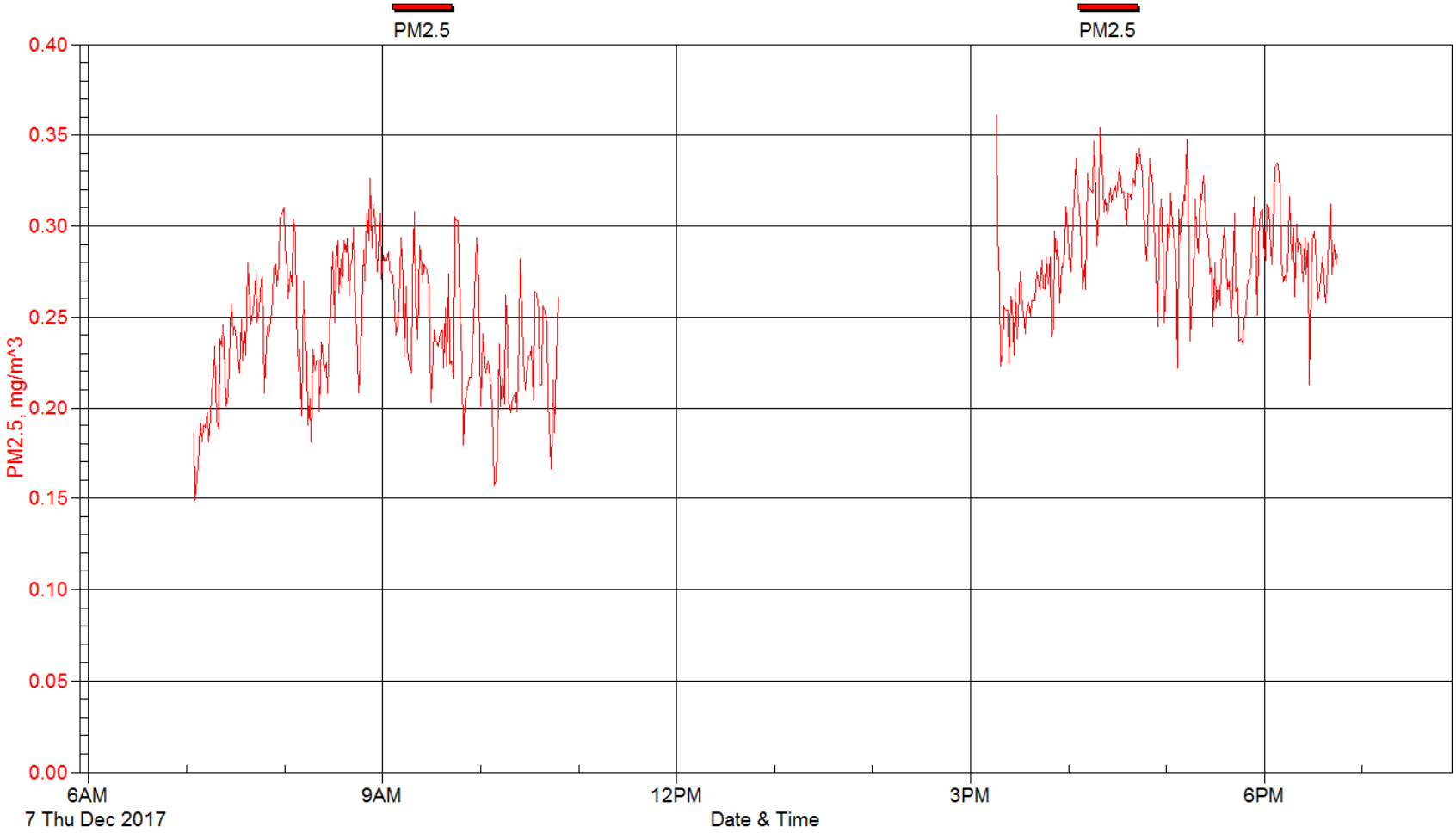
$PM_{2.5}$ Graph

Traffic Checkers – St. George Station – December 6, 2017 – 7:00 AM – 11:00 PM & 3:00 PM – 7:00 PM



$PM_{2.5}$ Graph

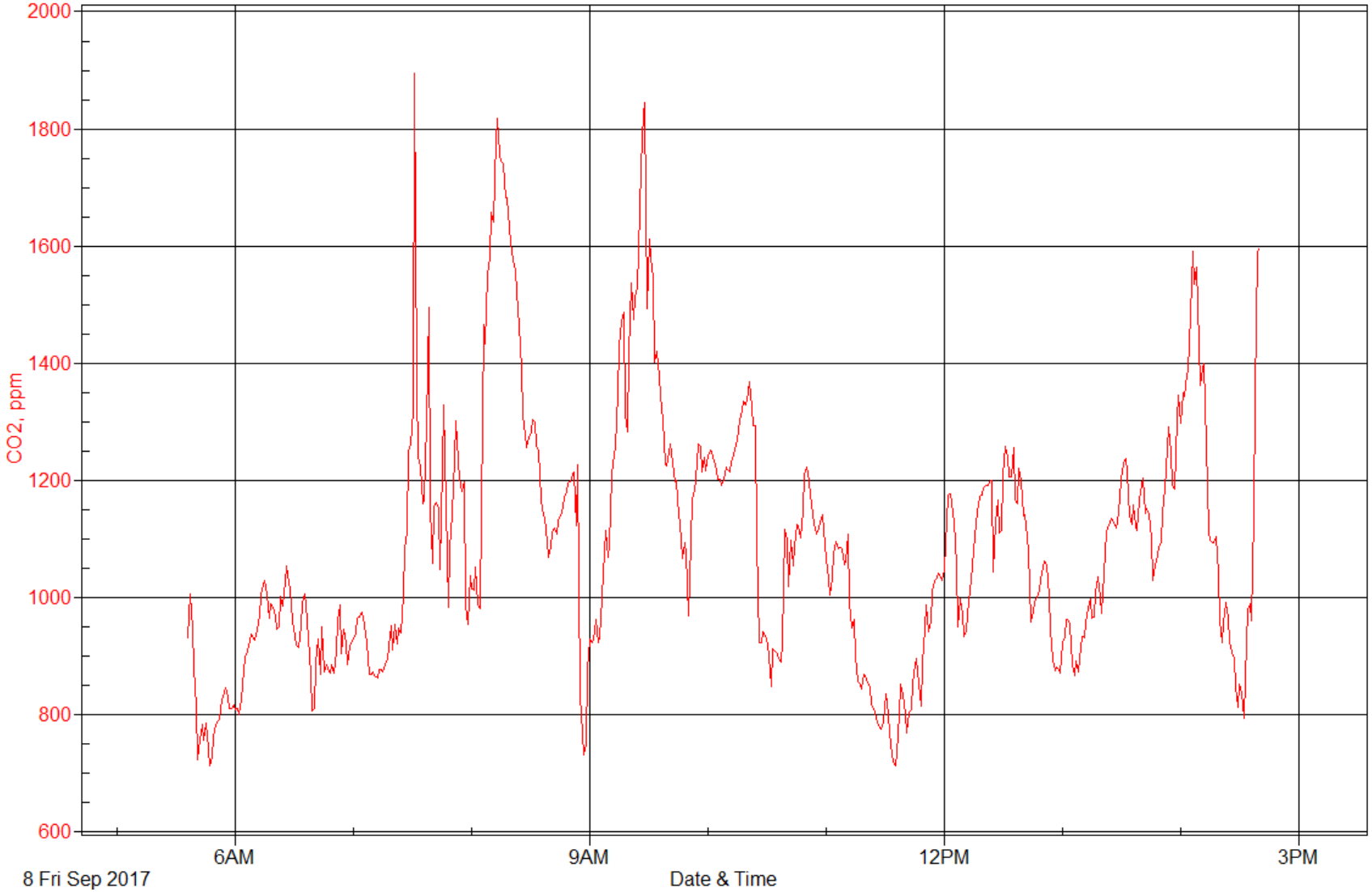
Traffic Checkers – Spadina & Sherbourne Stations – December 7, 2017 – 7:00 AM – 11:00 PM & 3:00 PM – 7:00 PM



CO_2 Graphs

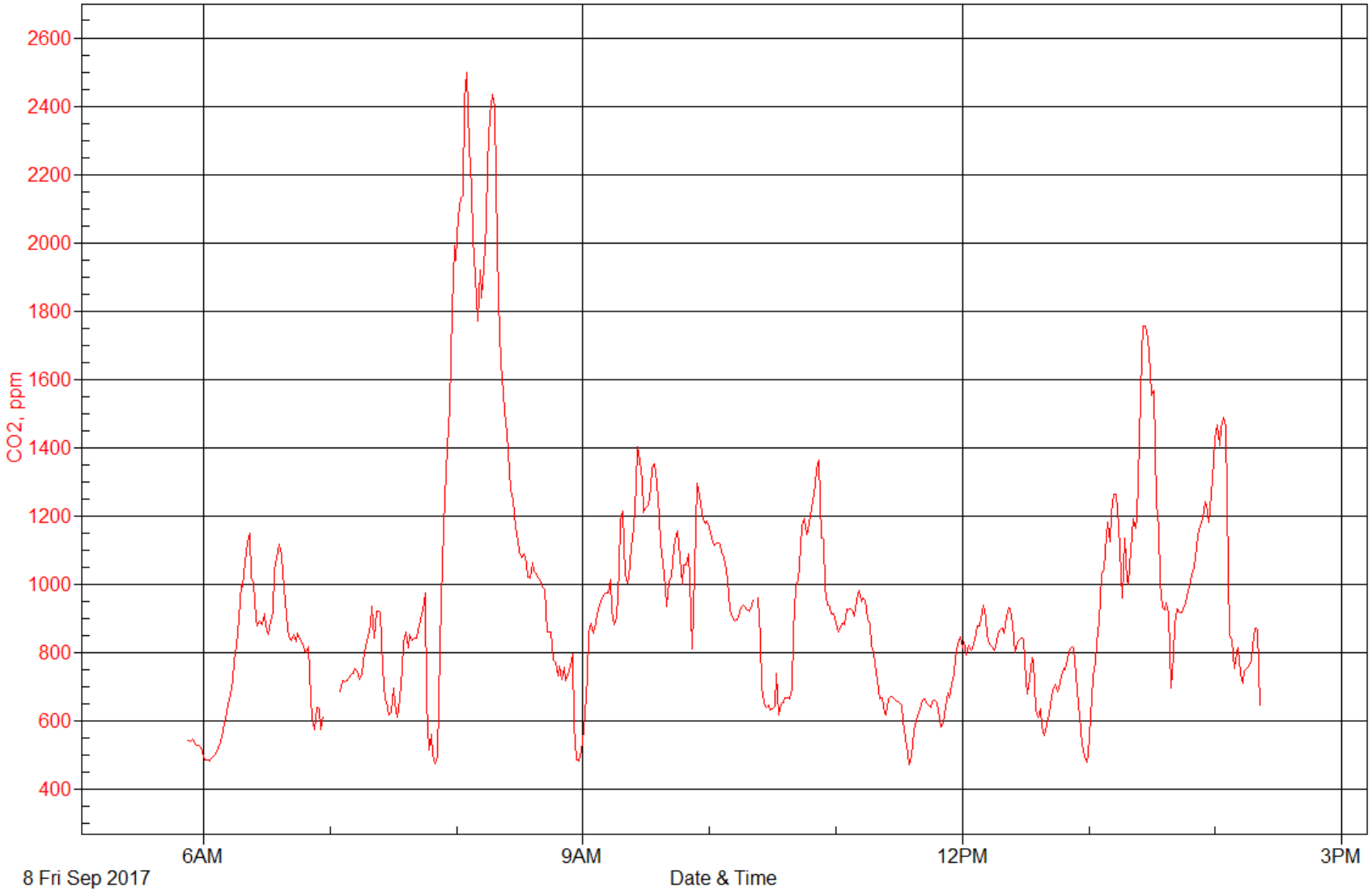
CO_2 Graph

Subway Operators / Guards – YUS Line – September 8, 2017 – 5:00 AM – 2:30 PM (Operator 1)



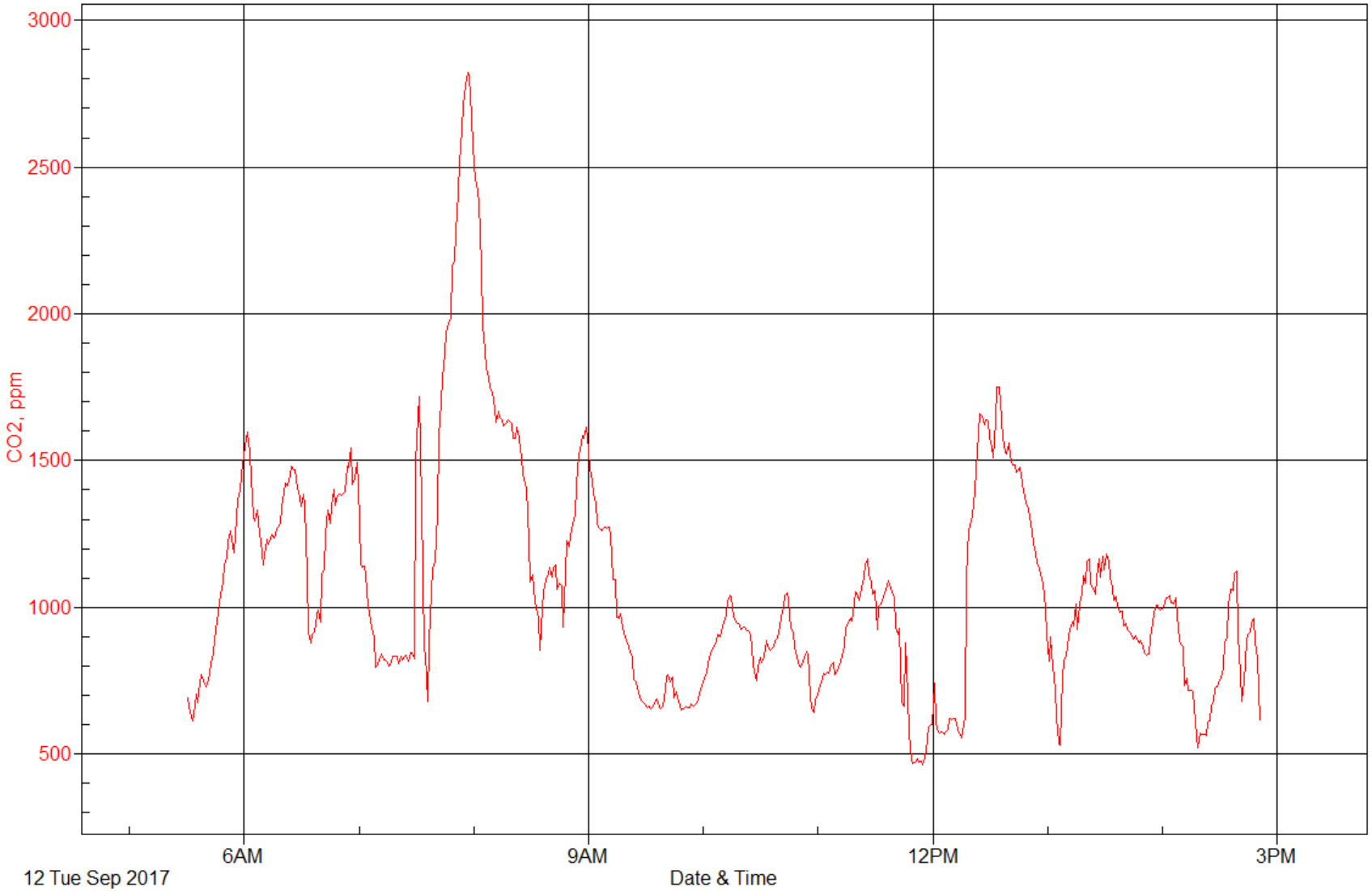
CO_2 Graph

Subway Operators / Guards – YUS Line – September 8, 2017 – 5:00 AM – 2:30 PM (Operator 2)



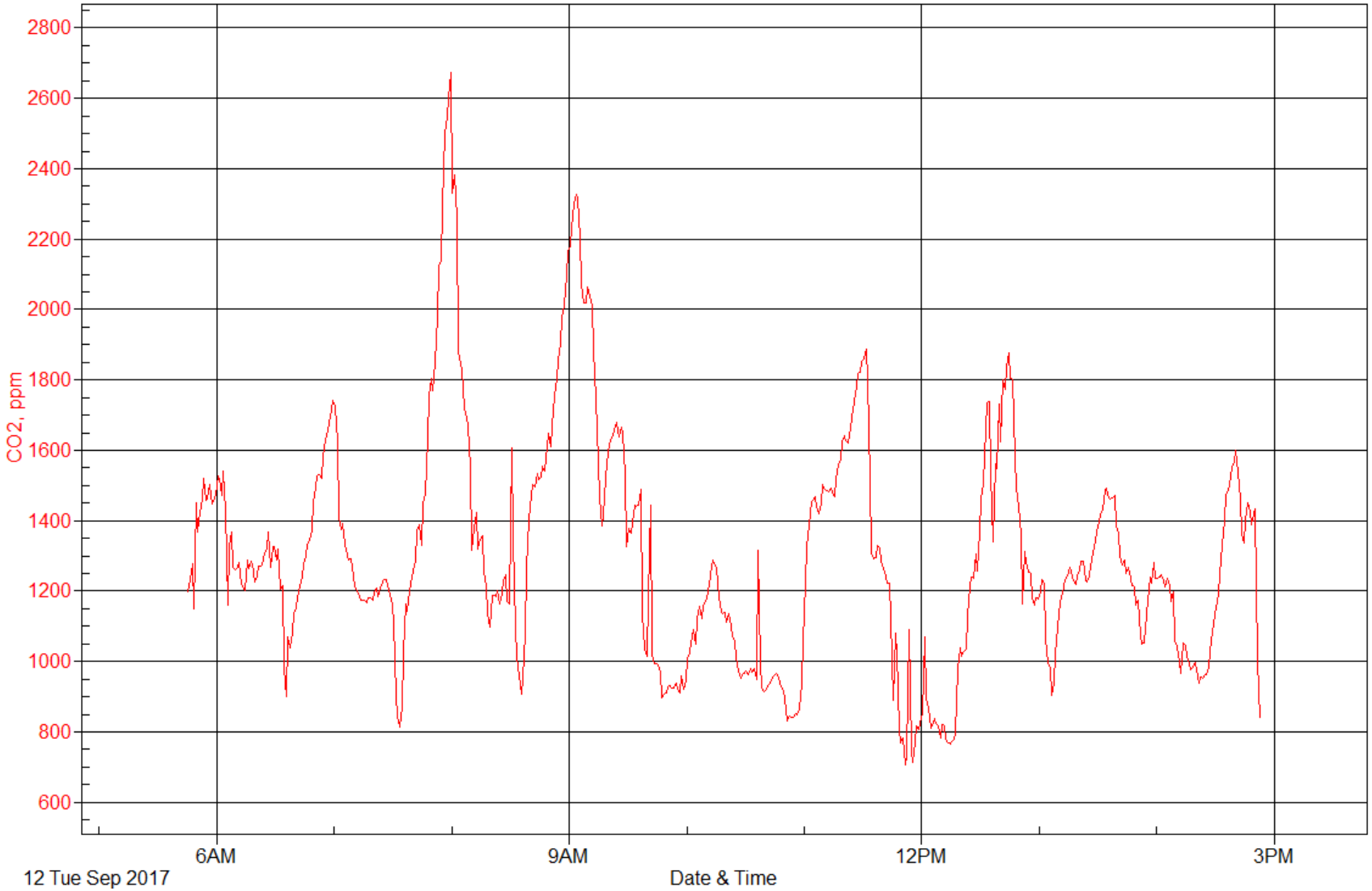
CO_2 Graph

Subway Operators / Guards – BD Line – September 12, 2017 – 5:00 AM to 3:00 PM (Operator 1)



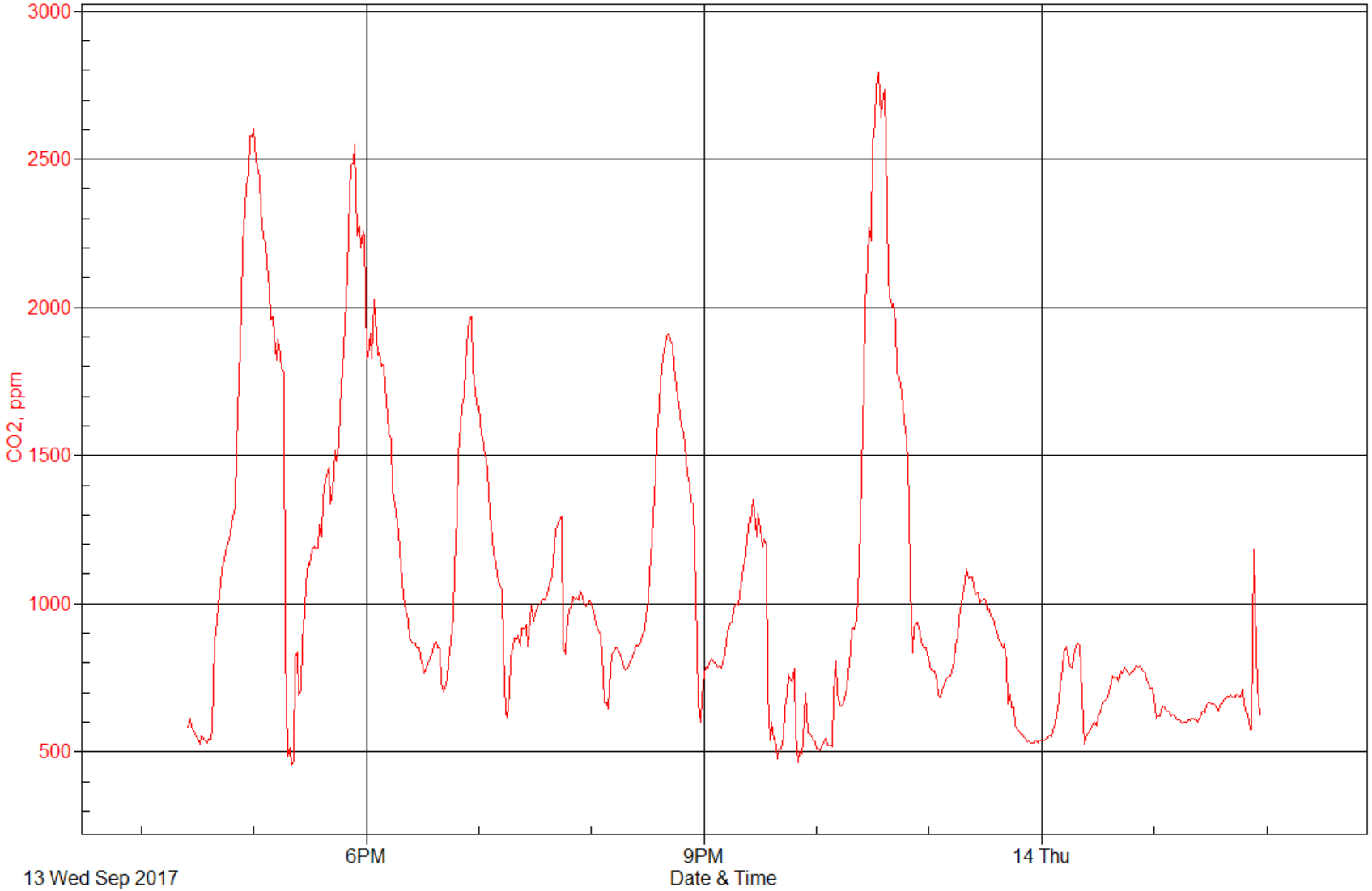
CO_2 Graph

Subway Operators / Guards – BD Line – September 12, 2017 – 5:00 AM to 3:00 PM (Operator 2)



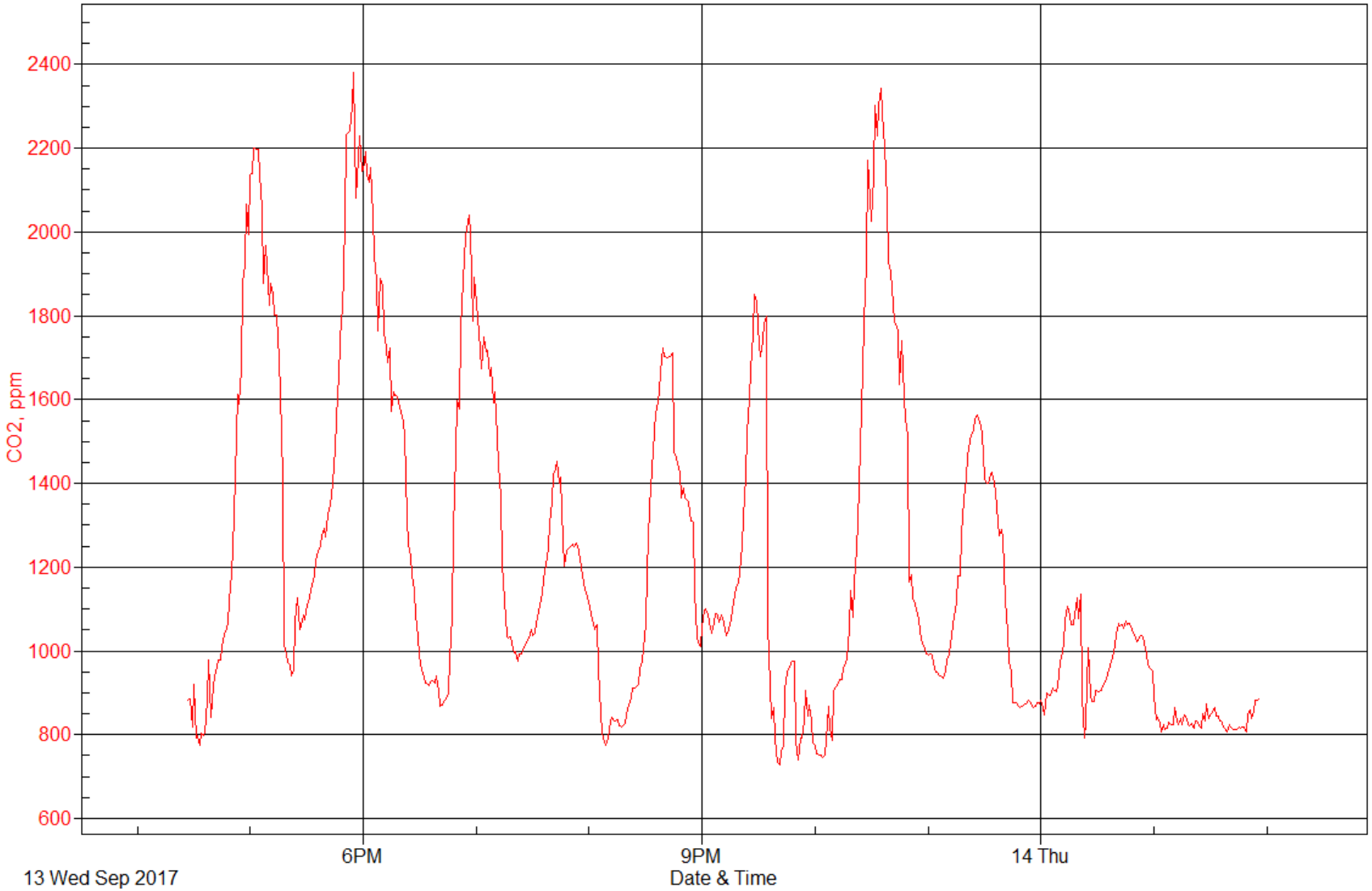
CO_2 Graph

Subway Operators / Guards – BD Line – September 13, 2017 – 4:00 PM – 2:00 AM (Operator 1)



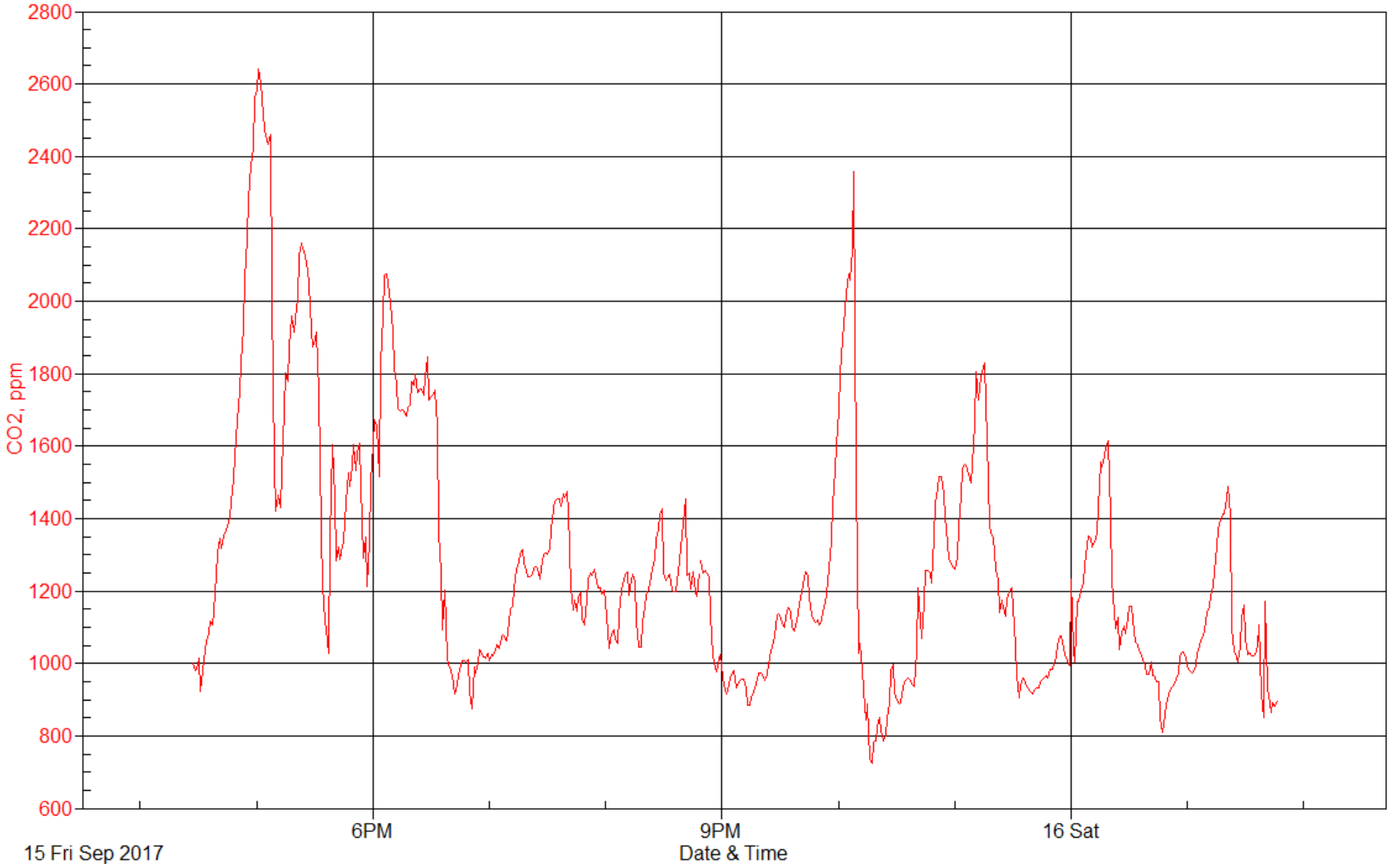
CO_2 Graph

Subway Operators / Guards – BD Line – September 13, 2017 – 4:00 PM – 2:00 AM (Operator 2)



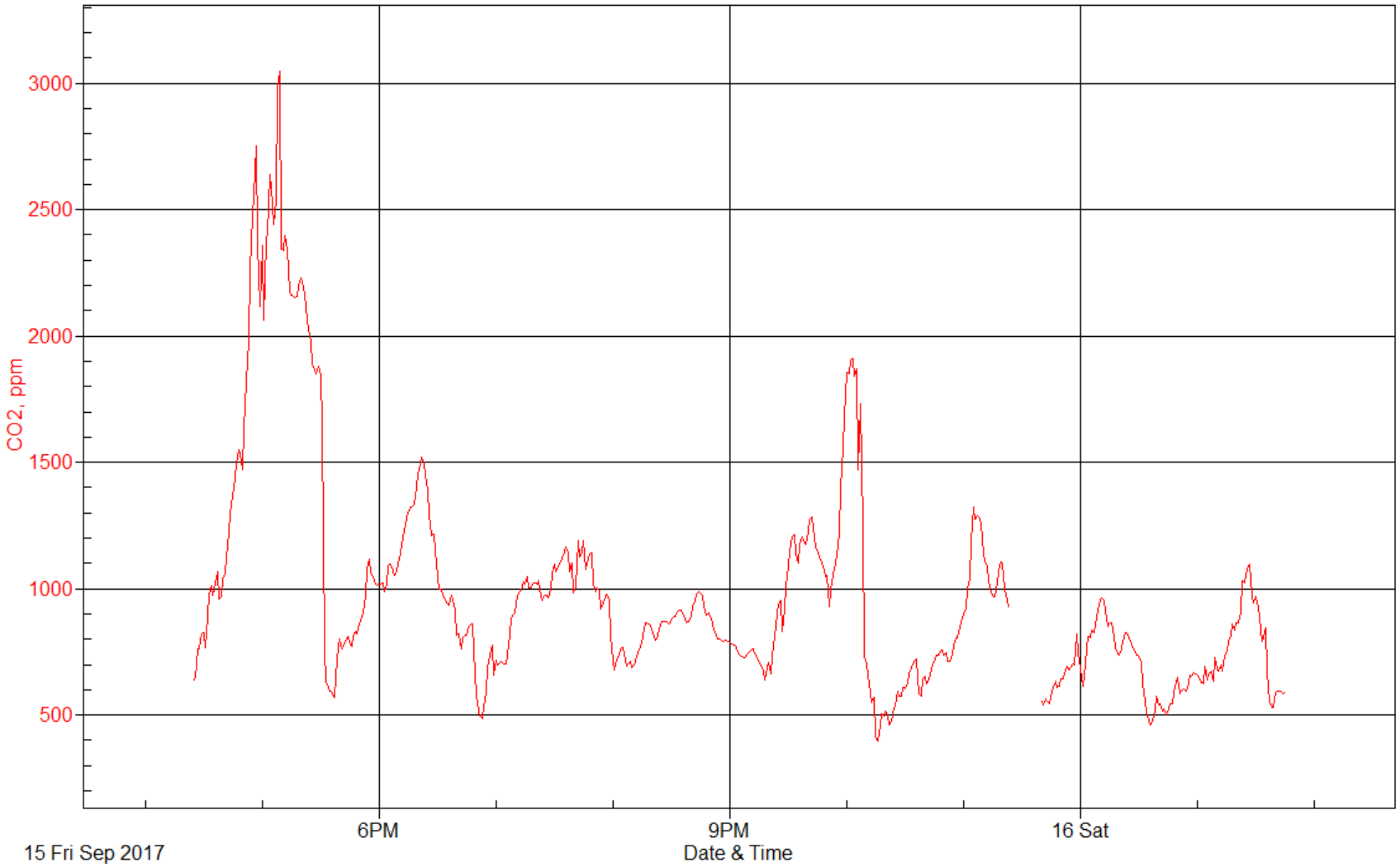
CO_2 Graph

Subway Operators / Guards – YUS Line – September 15, 2017 – 4:00 PM to 2:00 AM (Operator 1)



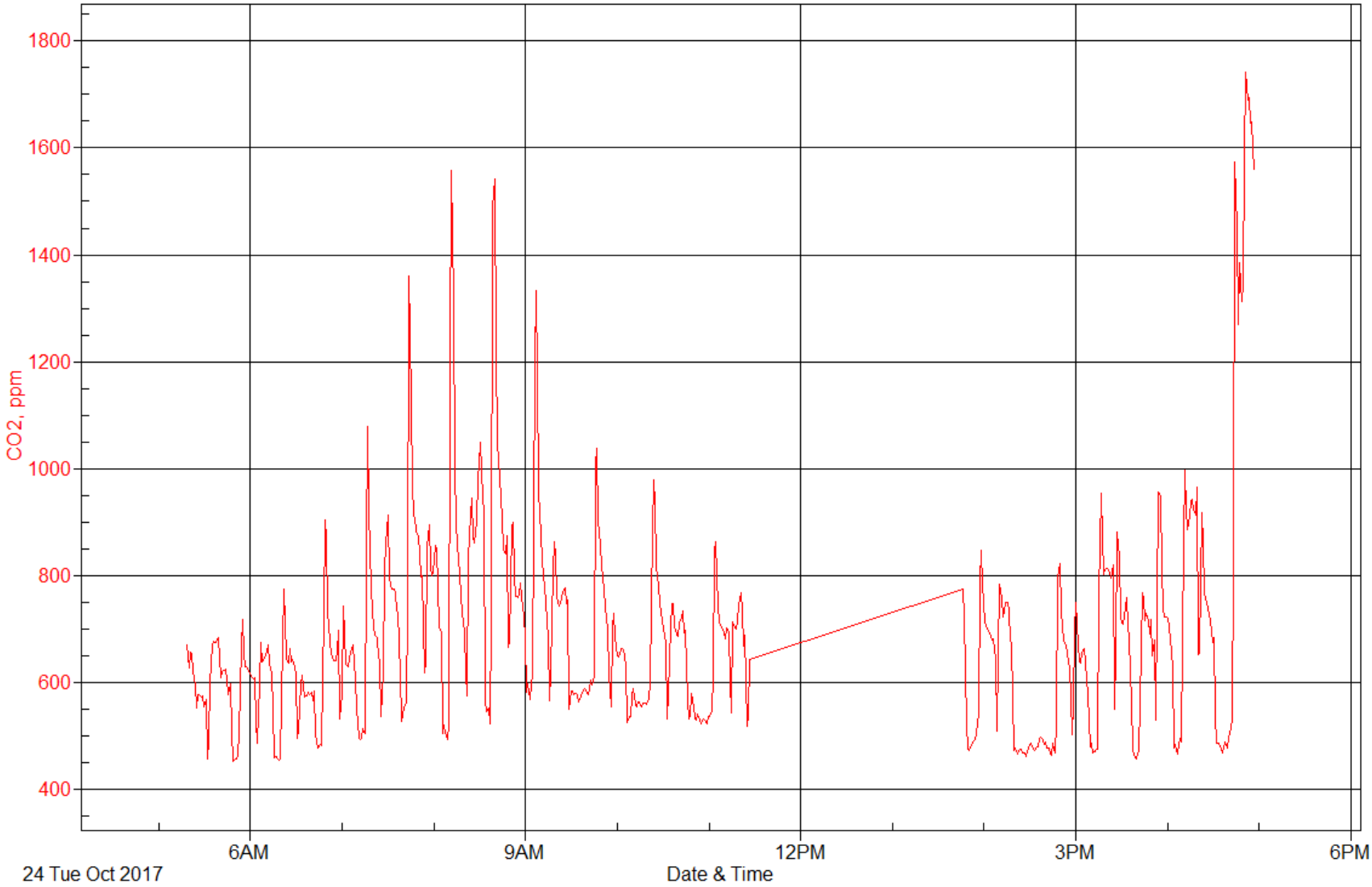
CO_2 Graph

Subway Operators / Guards – YUS Line – September 15, 2017 – 4:00 PM to 2:00 AM (Operator 2)



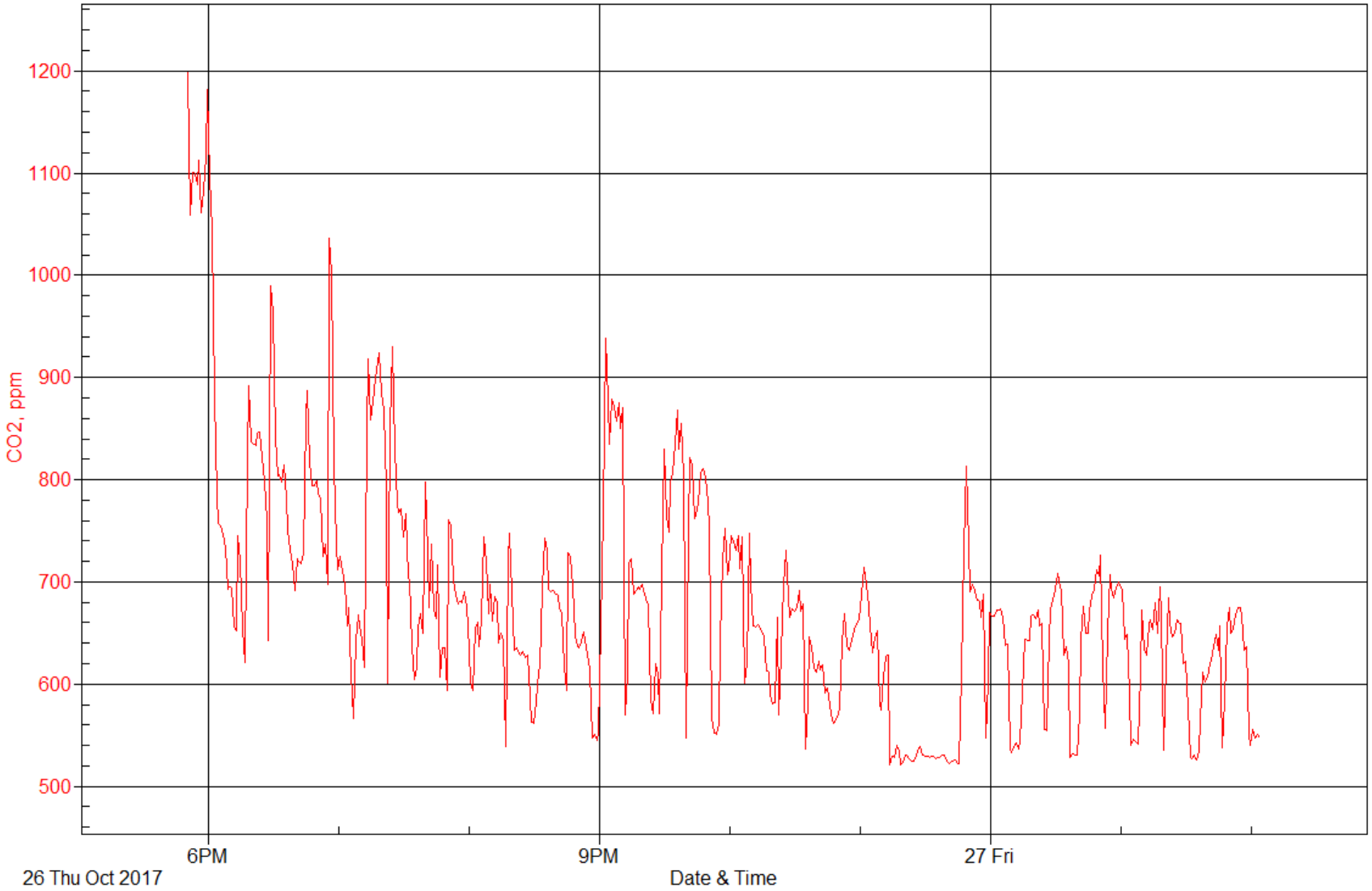
CO_2 Graph

Subway Operators – Sheppard Line – October 24, 2017 – 5:00 AM – 11:30 AM & 1:30 PM – 5:00 PM



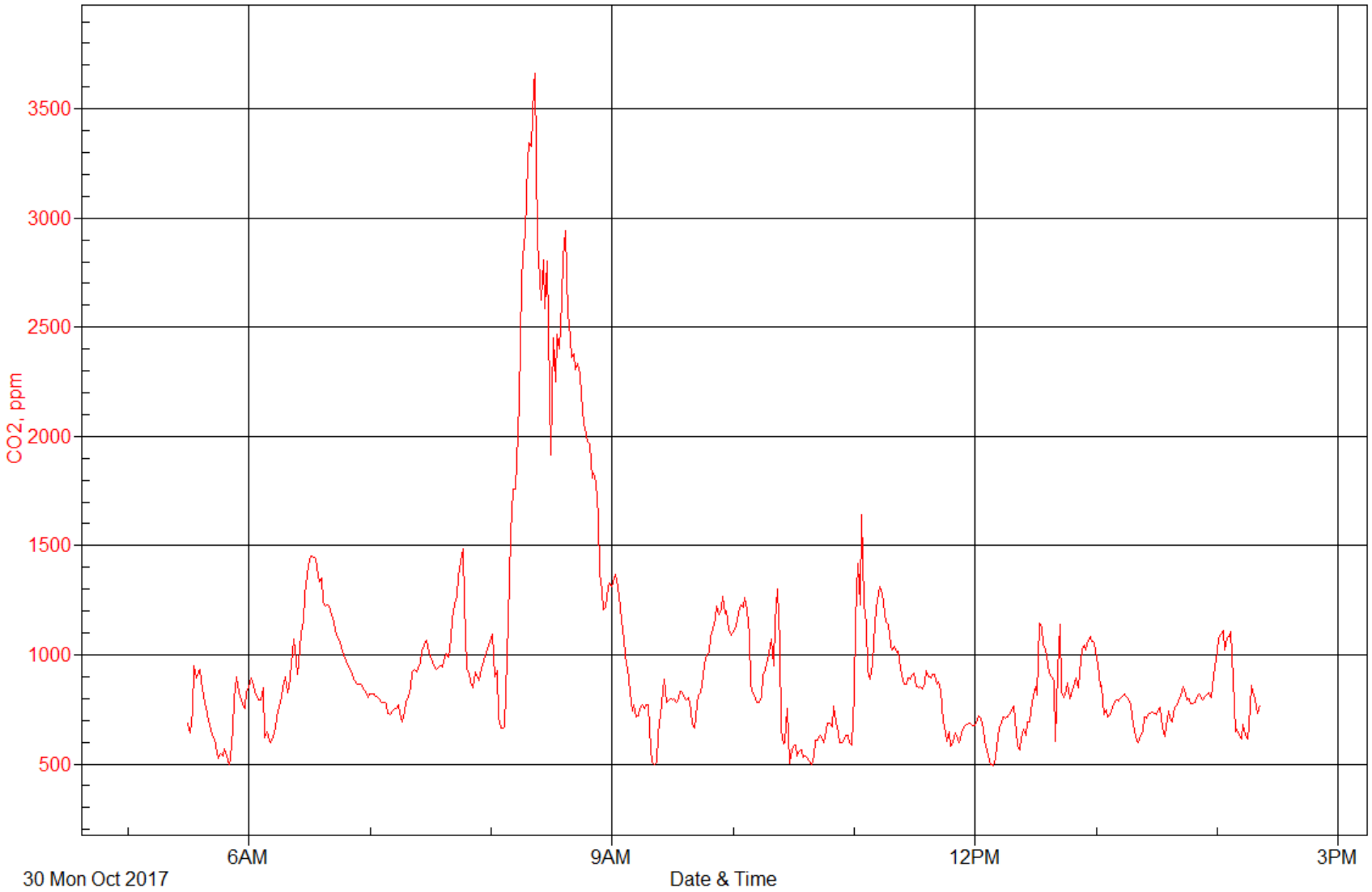
CO_2 Graph

Subway Operators – Sheppard Line – October 26, 2017 – 5:30 PM to 2:00 AM



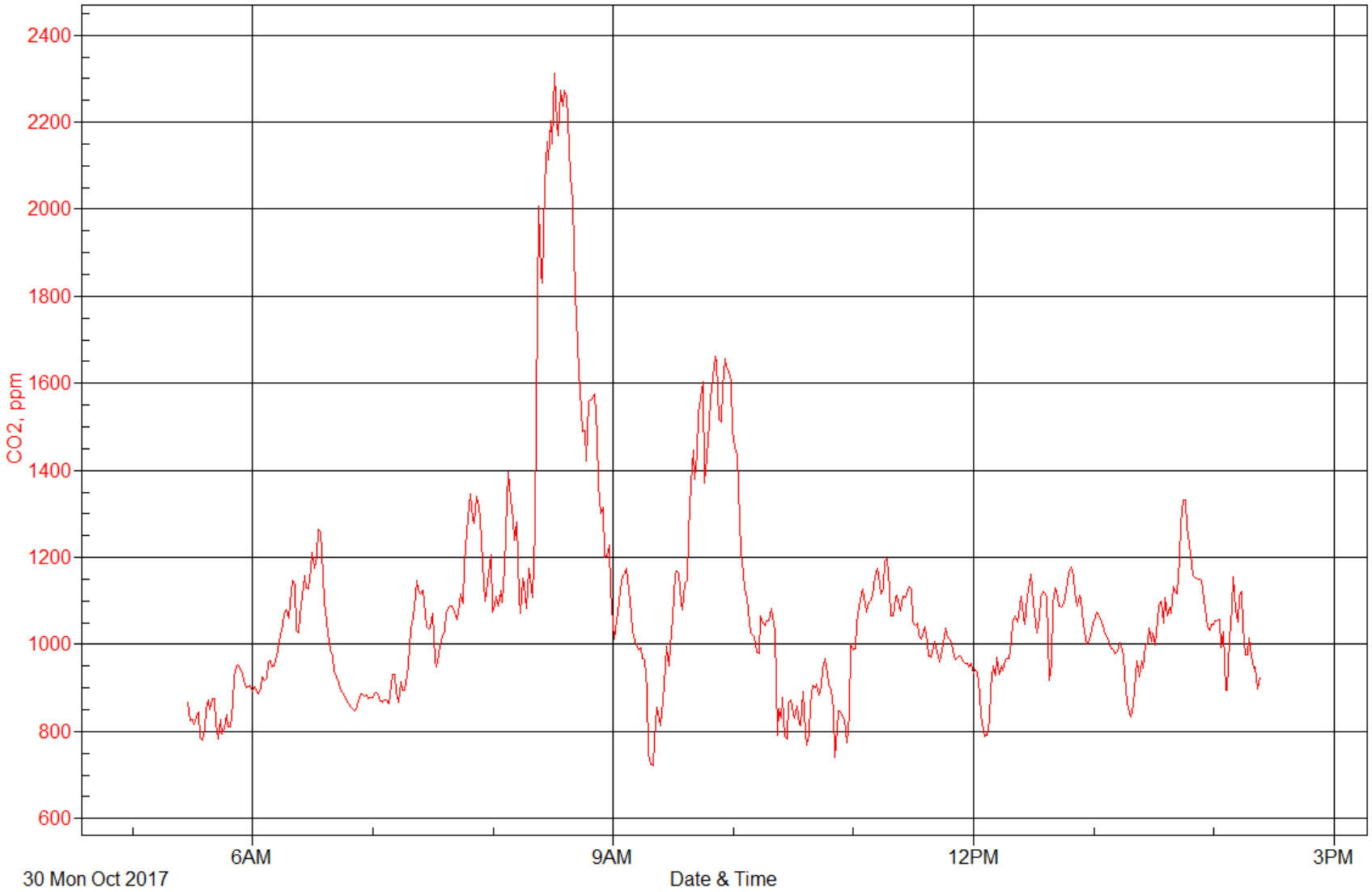
CO_2 Graph

Subway Operators / Guards – YUS Line (following closure) – October 30, 2017 – 5:00 AM – 3:00 PM (Operator 1)



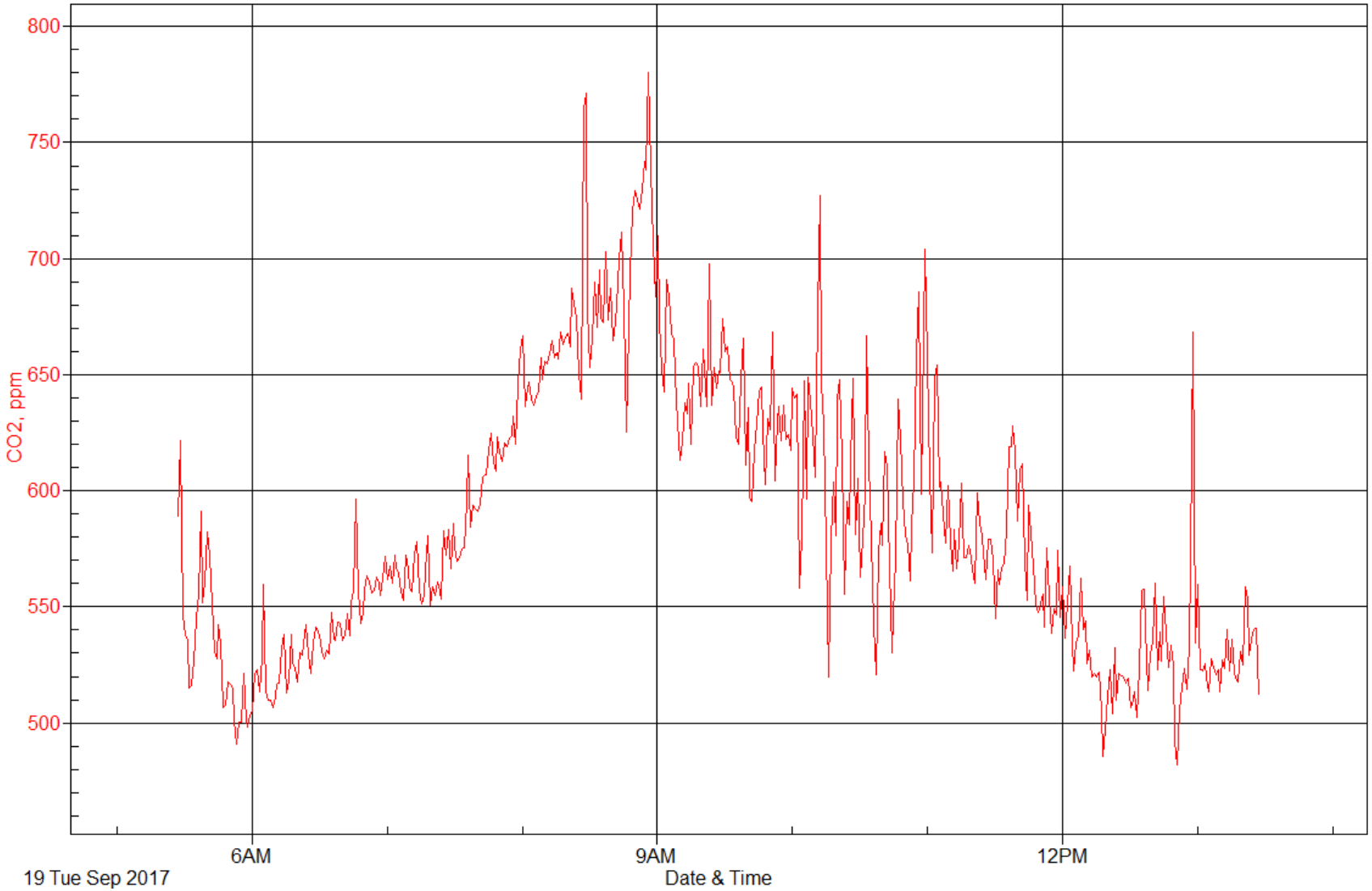
CO_2 Graph

Subway Operators / Guards – YUS Line (following closure) – October 30, 2017 – 5:00 AM – 3:00 PM (Operator 2)



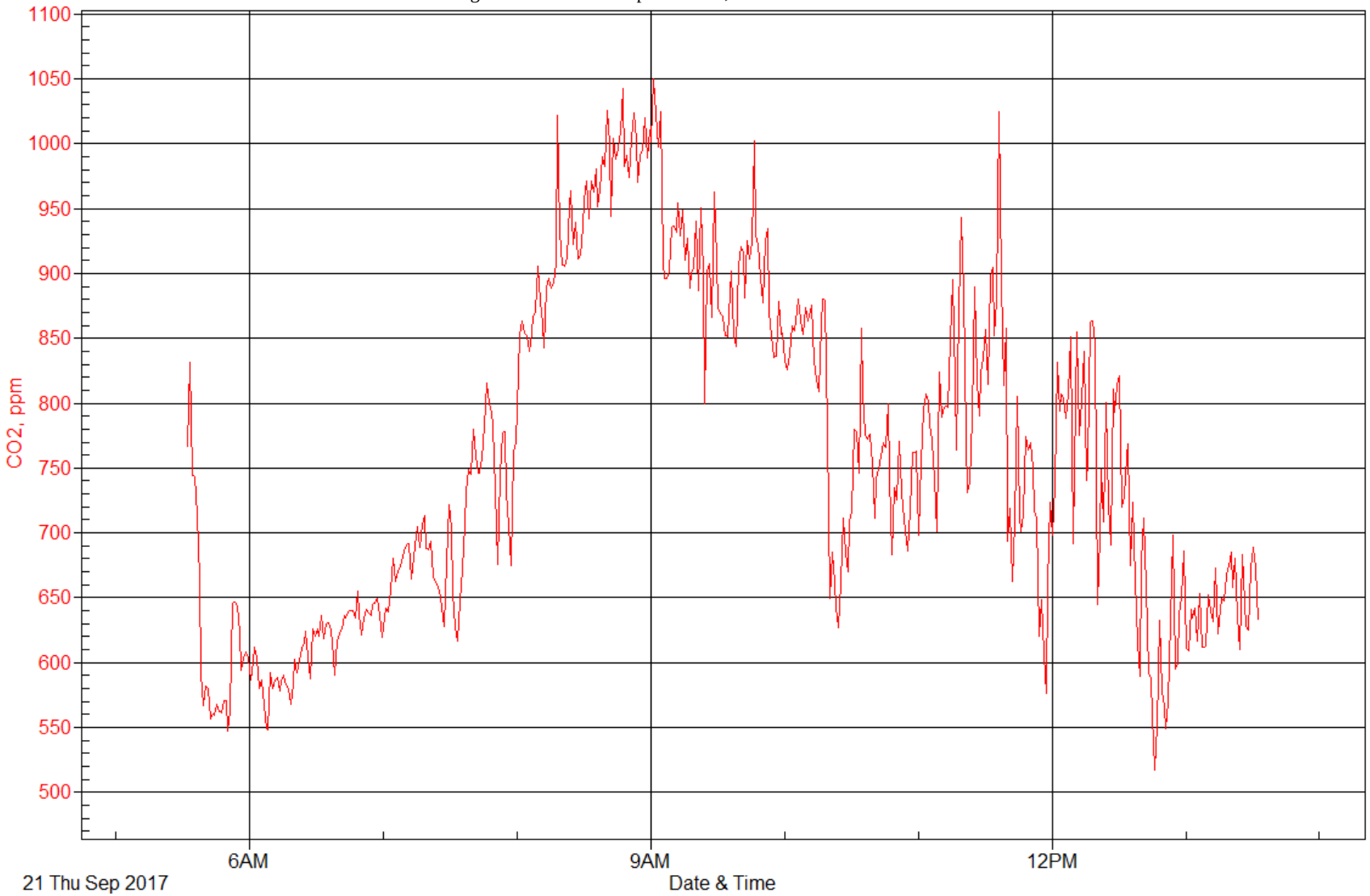
CO_2 Graph

Coxwell Platform – September 19, 2017 – 5:30 AM – 1:30 PM



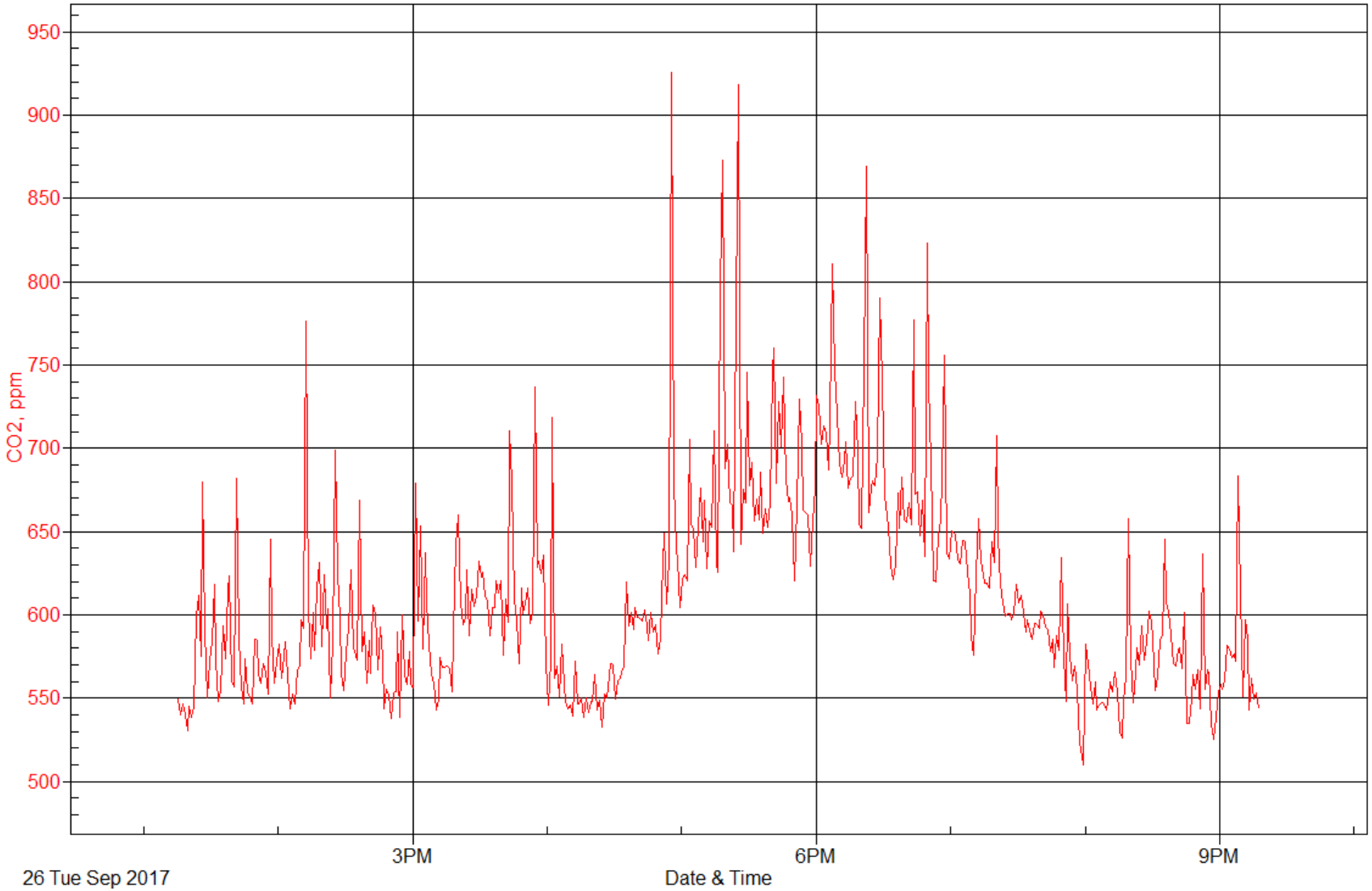
CO_2 Graph

Eglinton Platform – September 21, 2017 – 5:30 AM – 1:30 PM



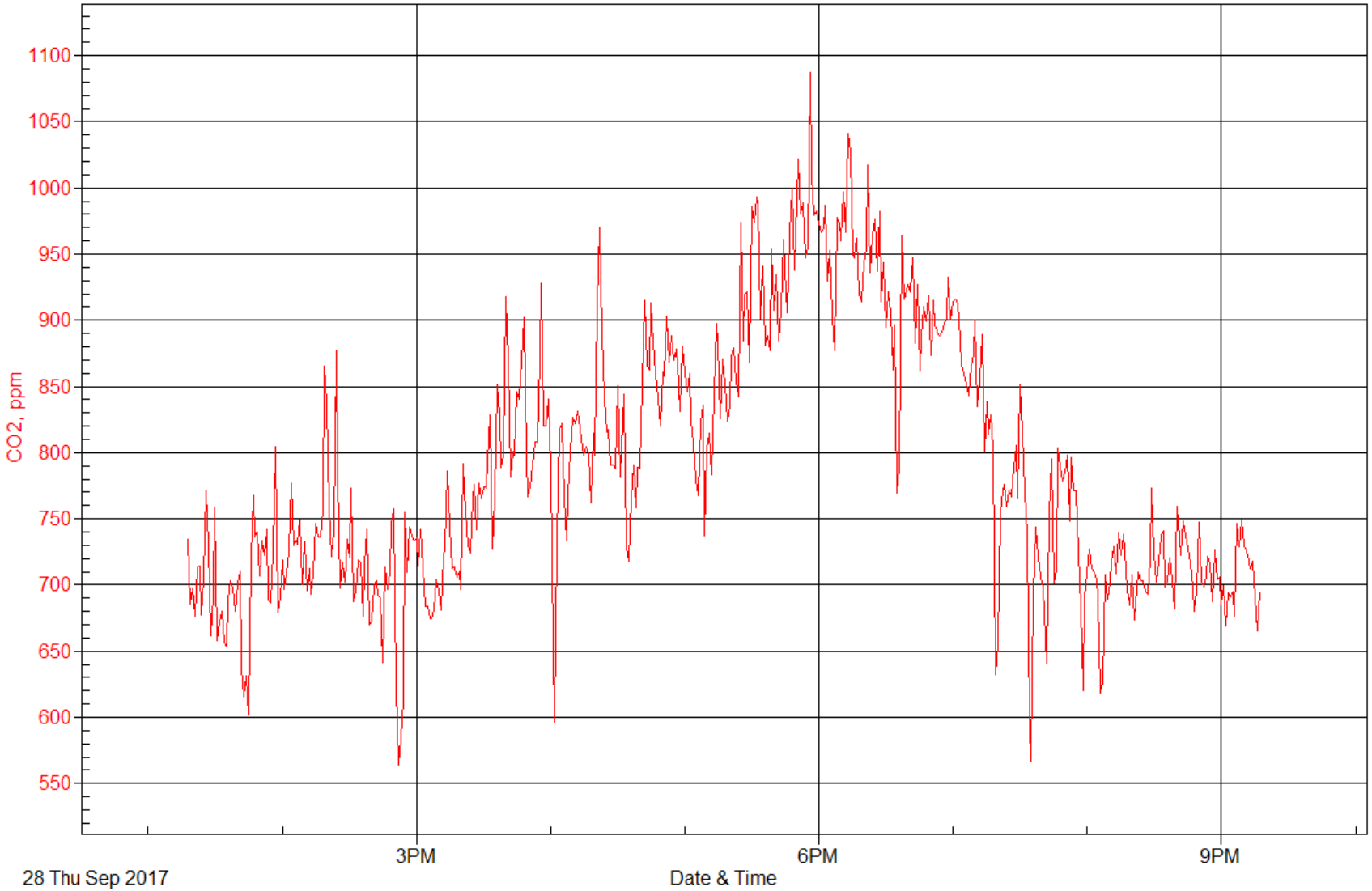
CO_2 Graph

Coxwell Platform – September 26, 2017 – 1:00 PM – 9:00 PM



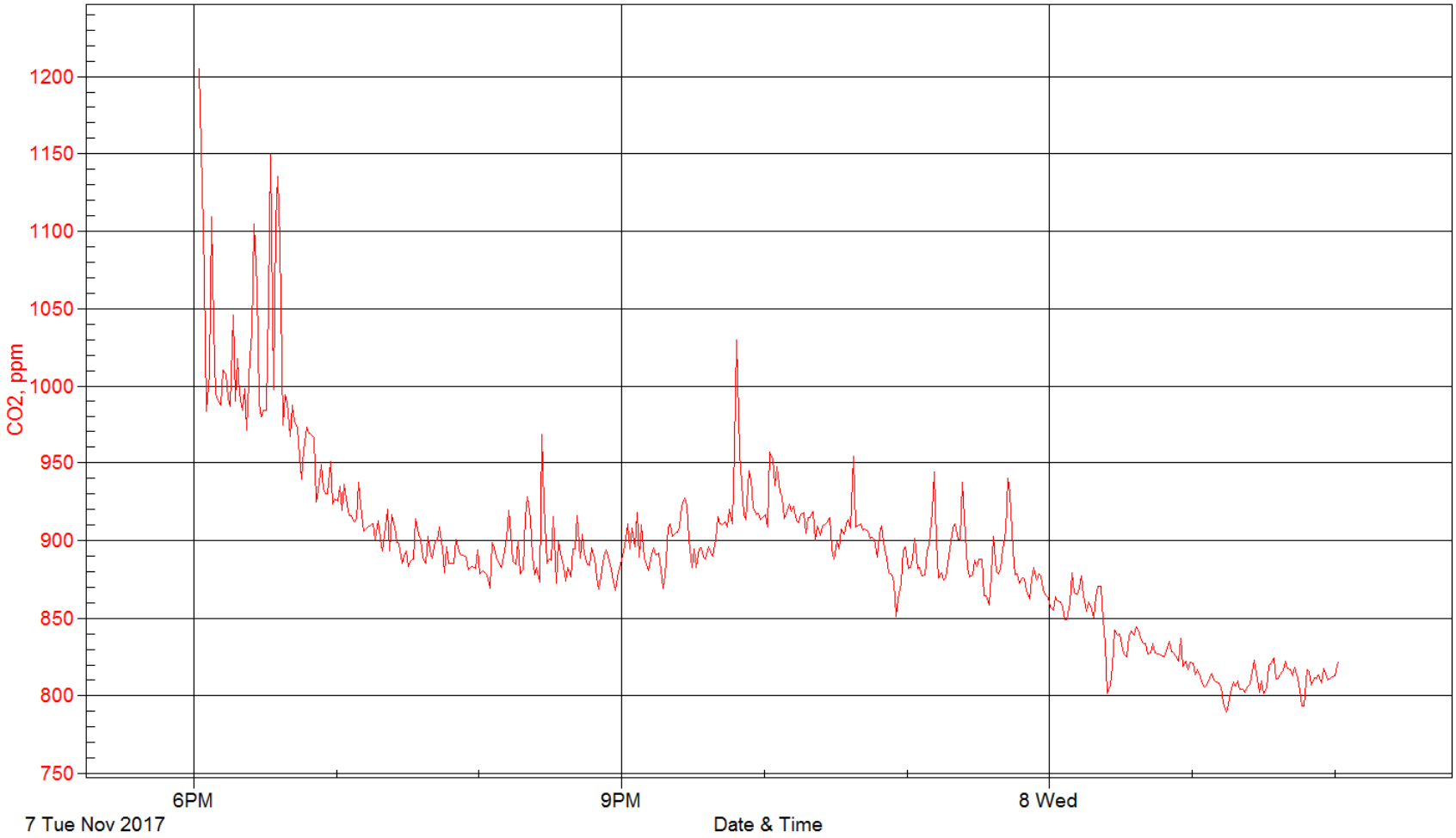
CO_2 Graph

Eglinton Platform – September 28, 2017 – 1:00 PM – 9:00 PM



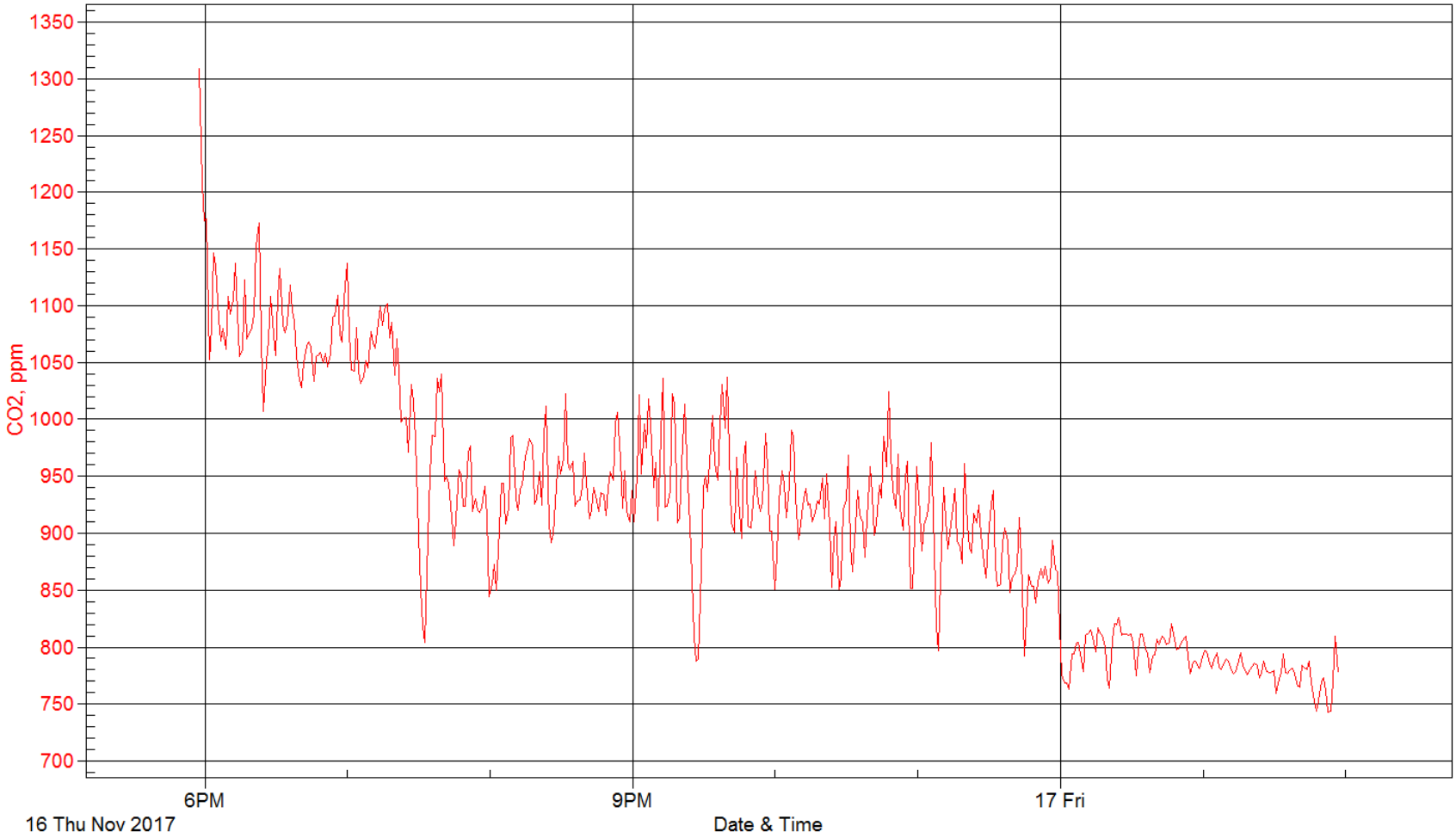
CO_2 Graph

Coxwell Platform – November 7, 2017 – 6:00 PM – 2:00 AM



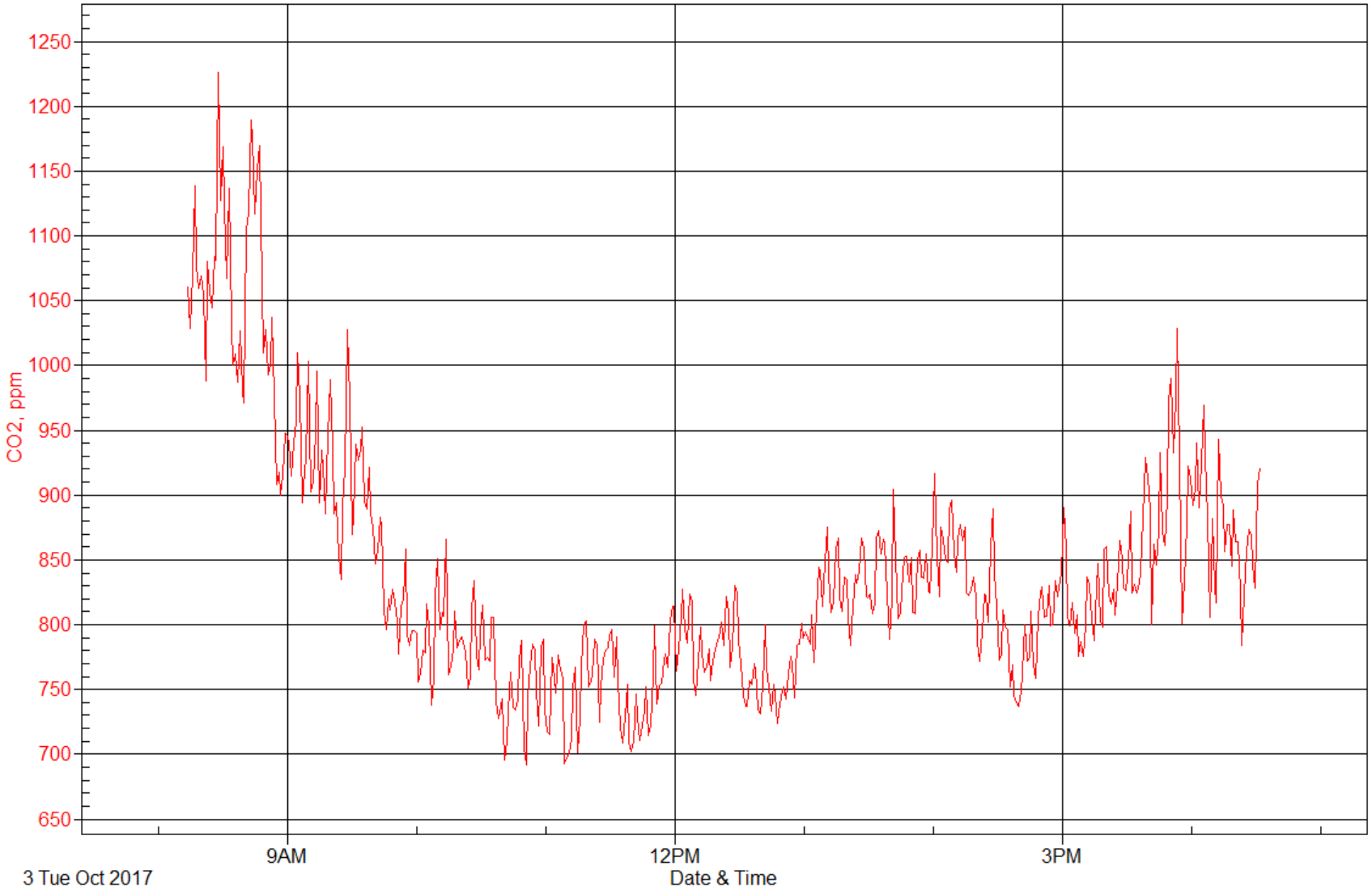
CO_2 Graph

Eglinton Platform – November 16, 2017 – 6:00 PM – 2:00 AM



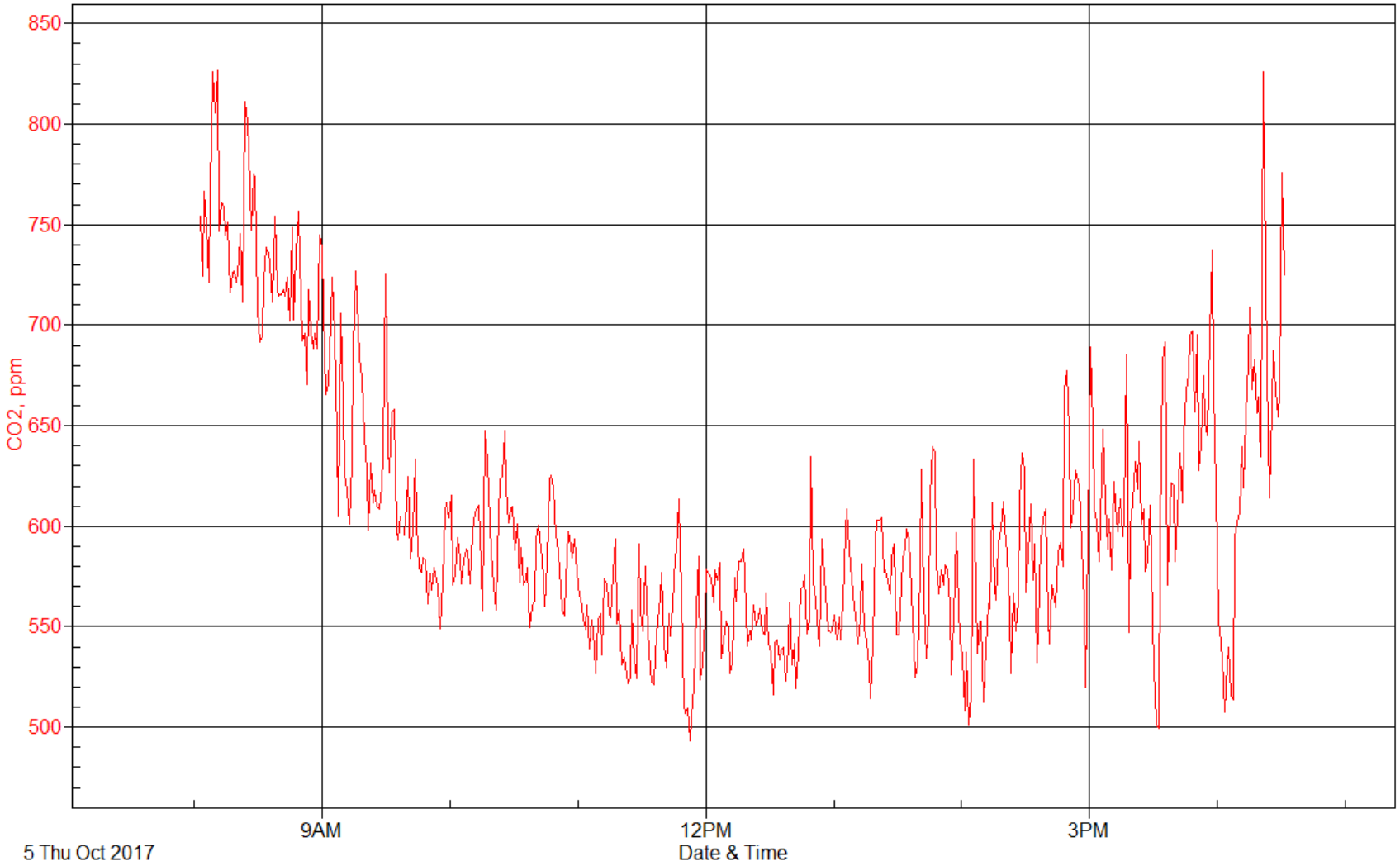
CO_2 Graph

End Terminal Cleaners – Finch Station – October 3, 2017 – 8:00 AM – 4:30 PM



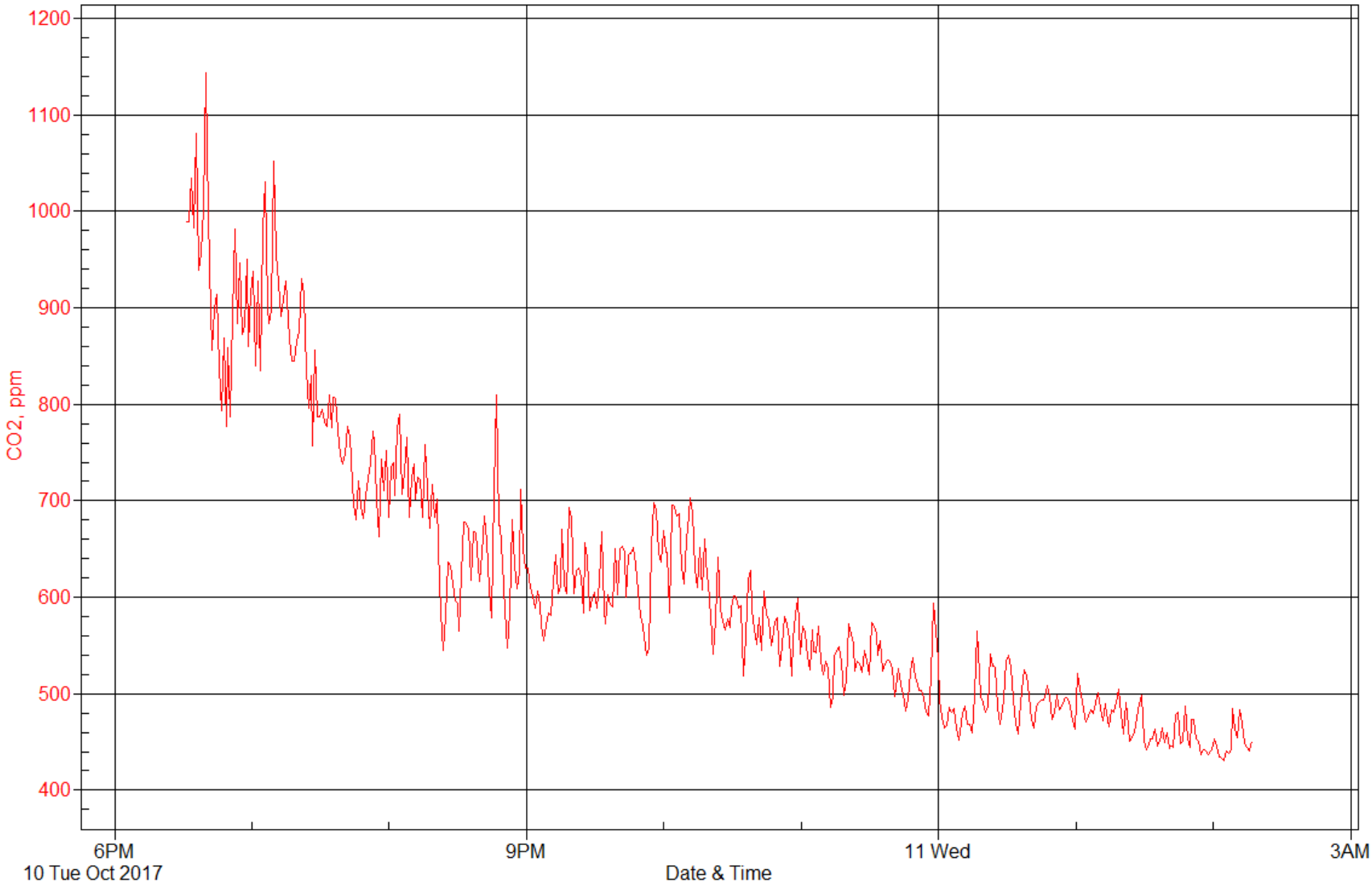
CO_2 Graph

End Terminal Cleaners – Kennedy Station – October 5, 2017 – 8:00 AM – 4:30 PM



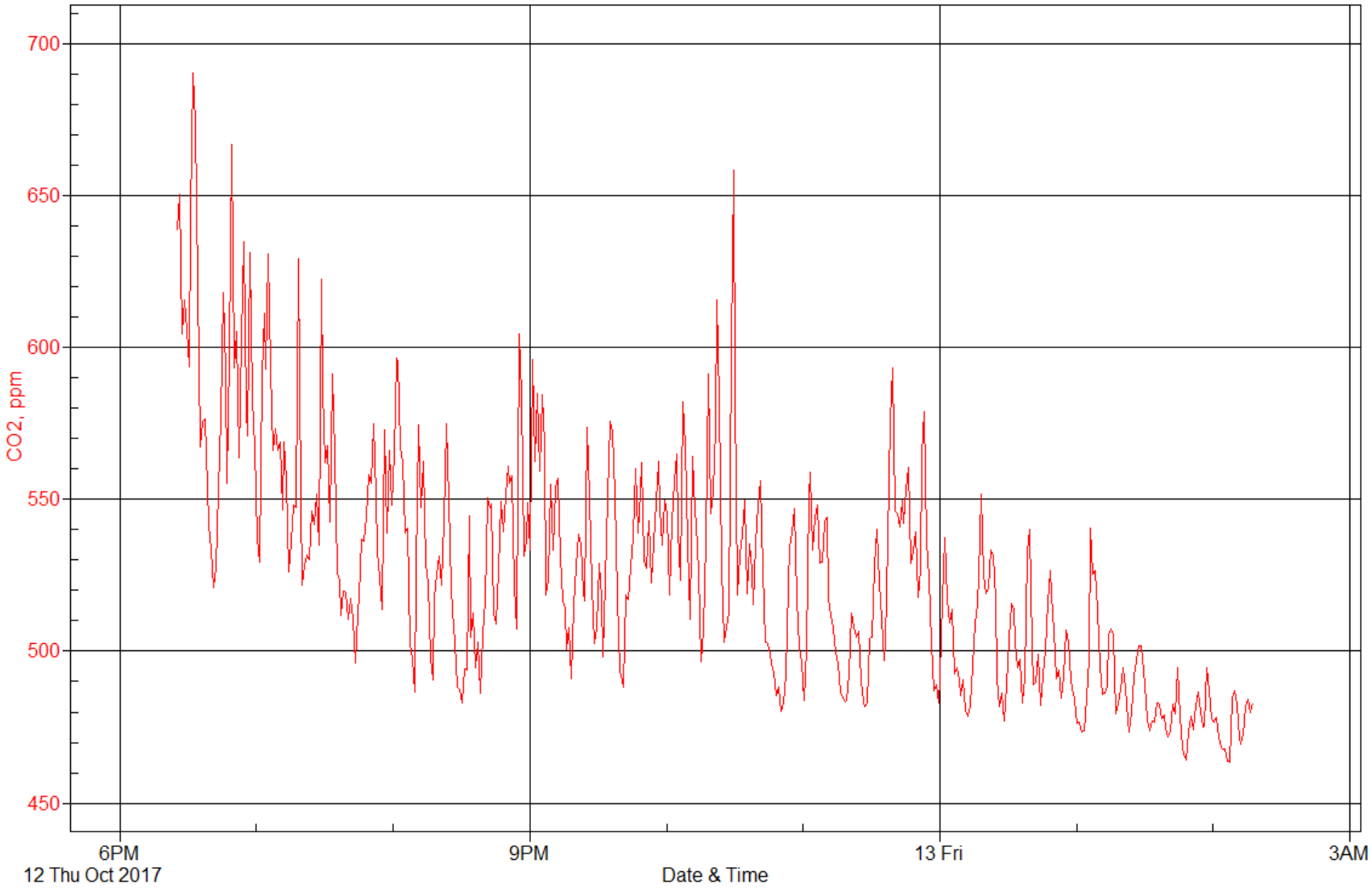
CO_2 Graph

End Terminal Cleaners – Finch Station – October 10, 2017 – 6:30 PM – 2:30 AM



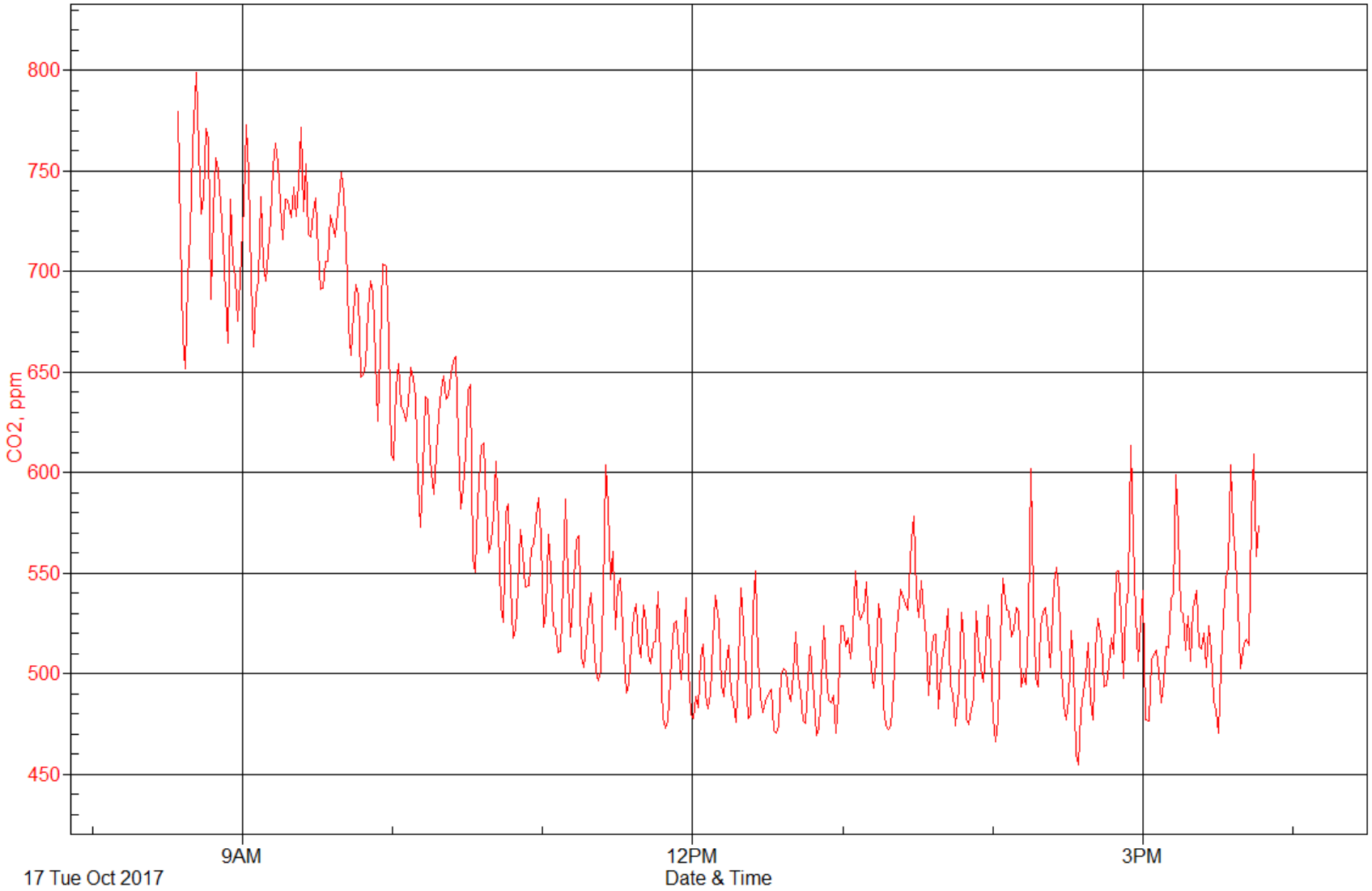
CO_2 Graph

End Terminal Cleaners – Kennedy Station – October 12, 2017 – 6:30 PM – 2:30 AM



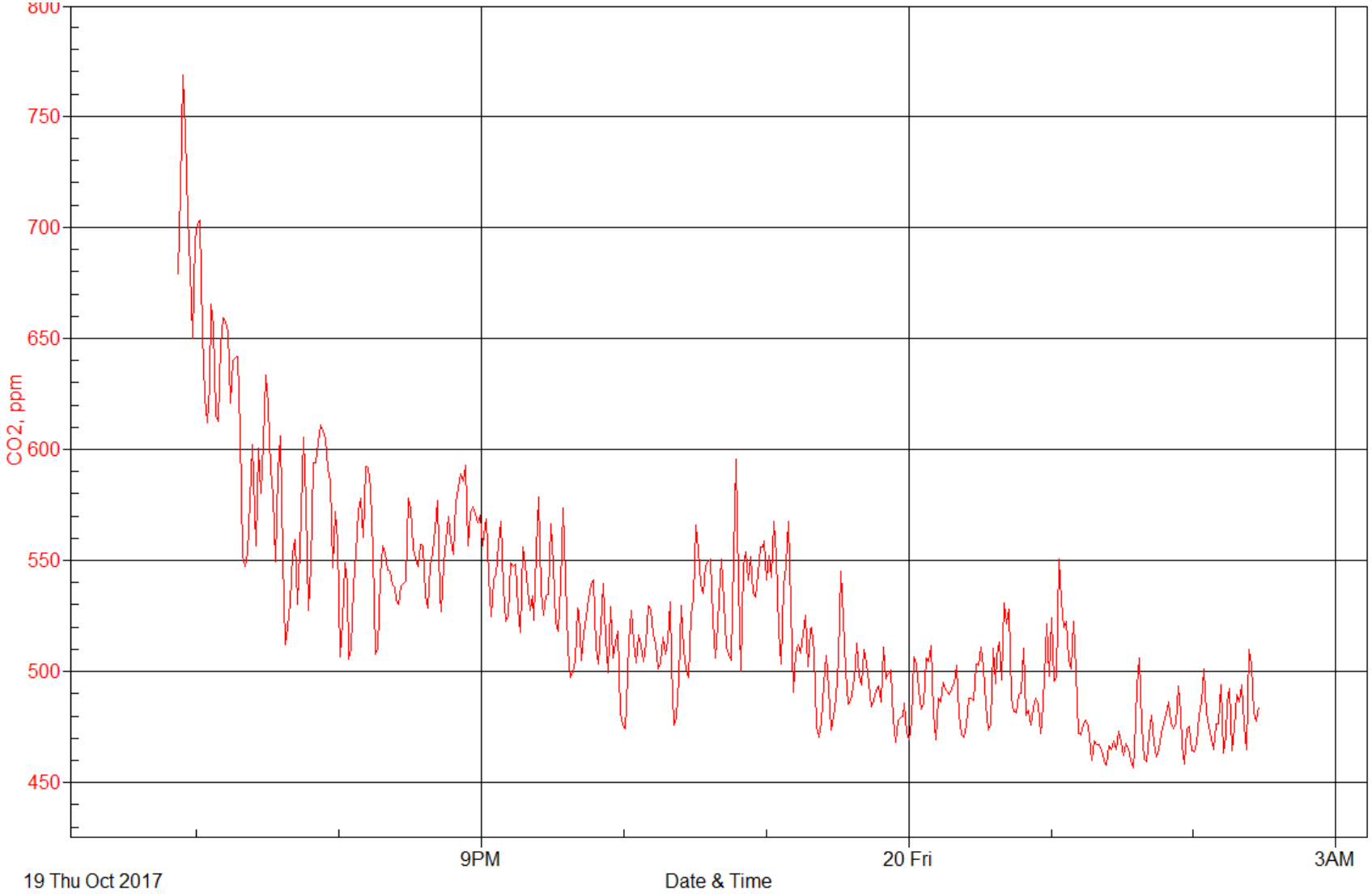
CO_2 Graph

End Terminal Cleaners – Sheppard Station – October 17, 2017 – 8:30 AM – 3:30 PM



CO_2 Graph

End Terminal Cleaners – Sheppard Station – October 17, 2017 – 6:30 PM – 3:00 AM



Laboratory Analysis Reports

Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Canada

September 19, 2017

AIHA-LAP #100324 Account# 90734 Login# L414980

Dear Mr. Umali:

Enclosed are the revised analytical results for the samples received by our laboratory on August 09, 2017. Samples 22152-A1 and 22152-A2 were subcontracted to AMA Analytical Services, Inc for TEM analysis. Their report is enclosed in its entirety. Please note that this revision cancels and supersedes L414980 (report reference:1) dated August 15, 2017 issued by SGS Galson Laboratories. All test results meet the quality control requirements of AIHA-LAP and NELAC unless otherwise stated in this report. All samples on the chain of custody were received in good condition unless otherwise noted.

Please note, sample 22152-S1 was received without a filter in the PPI. The sample along with the Blank were rejected.

Results in this report are based on the sampling data provided by the client and refer only to the samples as they were received at the laboratory.

To ensure the safety of laboratory receiving personnel, always seal bulk samples securely to prevent possible escape of material. Also, please double-bag bulk samples individually prior to shipping. Samples not received in this manner will be noted on the chain of custody form.

Current Scopes of Accreditation can be viewed at www.galsonlabs.com in the accreditations section under the "about Galson" tab.

Please contact Katrina Ahchong at (888) 432-5227, if you would like any additional information regarding this report. Thank you for using SGS Galson Laboratories.

Sincerely,

SGS Galson Laboratories

Lisa Swab
Laboratory Director

Enclosure(s)

Galson Laboratories, Inc. is now a part of SGS, the world's leading inspection, verification, testing, and certification company. As part of our transition to SGS, you will begin to see some formatting changes with reports that will improve the presentation of data and allow for the transition to the new logo.

SGS GALSON

6601 Kirkville Road
East Syracuse, NY 13057
(315) 432-5227
FAX: (315) 437-0571
www.galsonlabs.com

LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 03-AUG-17
Date Received : 09-AUG-17

Account No.: 90734
Login No. : L414980

Date Analyzed : 14-AUG-17 - 15-AUG-17
Report ID : 1012859

Client ID : 22152-M1 **Lab ID : L414980-7** **Air Volume : 1261.7 L**
Date Sampled : 08/03/17 **Date Analyzed : 08/15/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.0059	mg/m3
Cadmium	0.15	<0.15	<0.00012	mg/m3
Iron Oxide	11.	52	0.041	mg/m3
Molybdenum	0.15	<0.15	<0.00012	mg/m3
Zinc Oxide	2.8	<2.8	<0.0022	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 15-AUG-17

Submitted by: JMR/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: MLN

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

SGS GALSON

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East Syracuse, NY 13057
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FAX: (315) 437-0571
www.galsonlabs.com

LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 03-AUG-17
Date Received : 09-AUG-17

Account No.: 90734
Login No. : L414980

Date Analyzed : 14-AUG-17 - 15-AUG-17
Report ID : 1012859

Client ID : 22152-M2 **Lab ID : L414980-8** **Air Volume : NA**
Date Sampled : 08/03/17 **Date Analyzed : 08/15/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 15-AUG-17

Submitted by: JMR/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: MLN

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

SGS GALSON

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East Syracuse, NY 13057
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FAX: (315) 437-0571
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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 03-AUG-17
Date Received : 09-AUG-17

Account No.: 90734
Login No. : L414980

Date Analyzed : 14-AUG-17 - 15-AUG-17
Report ID : 1012859

Client ID : 22152-T1 **Lab ID : L414980-9** **Air Volume : 1262.5 L**
Date Sampled : 08/03/17 **Date Analyzed : 08/15/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.00071	mg/m3
Arsenic	0.30	<0.30	<0.00024	mg/m3
Barium	0.15	2.3	0.0018	mg/m3
Beryllium	0.15	<0.15	<0.00012	mg/m3
Cadmium	0.15	<0.15	<0.00012	mg/m3
Calcium Oxide	100.	<100	<0.083	mg/m3
Chromium	7.5	<7.5	<0.0059	mg/m3
Cobalt	0.45	<0.45	<0.00036	mg/m3
Copper	0.30	<0.30	<0.00024	mg/m3
Lead	0.38	<0.38	<0.00030	mg/m3
Manganese	0.15	0.50	0.00040	mg/m3
Selenium	2.3	<2.3	<0.0018	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 15-AUG-17

Submitted by: JMR/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: MLN

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 03-AUG-17
Date Received : 09-AUG-17

Account No.: 90734
Login No. : L414980

Date Analyzed : 14-AUG-17 - 15-AUG-17
Report ID : 1012859

Client ID : 22152-T2 **Lab ID : L414980-10** **Air Volume : NA**
Date Sampled : 08/03/17 **Date Analyzed : 08/15/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.30	<0.30	NA	mg/m3
Barium	0.15	<0.15	NA	mg/m3
Beryllium	0.15	<0.15	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.45	<0.45	NA	mg/m3
Copper	0.30	<0.30	NA	mg/m3
Lead	0.38	<0.38	NA	mg/m3
Manganese	0.15	<0.15	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 15-AUG-17

Submitted by: JMR/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: MLN

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 03-AUG-17
Date Received : 09-AUG-17

Account No.: 90734
Login No. : L414980

Date Analyzed : 14-AUG-17 - 15-AUG-17
Report ID : 1012858

Client ID : 22152-I1 **Lab ID : L414980-5** **Air Volume : 1270.9 L**
Date Sampled : 08/03/17 **Date Analyzed : 08/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Magnesium Oxide	12.	<12	<0.0098	mg/m3
Molybdenum	0.15	<0.15	<0.00012	mg/m3
Nickel	0.30	<0.30	<0.00024	mg/m3
Thallium	1.5	<1.5	<0.0012	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.00063	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PVC
Date : 15-AUG-17

Submitted by: JMR/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: MLN

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 03-AUG-17
Date Received : 09-AUG-17

Account No.: 90734
Login No. : L414980

Date Analyzed : 14-AUG-17 - 15-AUG-17
Report ID : 1012858

Client ID : 22152-I2 **Lab ID : L414980-6** **Air Volume : NA**
Date Sampled : 08/03/17 **Date Analyzed : 08/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Magnesium Oxide	12.	<12	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Nickel	0.30	<0.30	NA	mg/m3
Thallium	1.5	<1.5	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PVC
Date : 15-AUG-17

Submitted by: JMR/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: MLN

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 03-AUG-17
Date Received : 09-AUG-17

Account No.: 90734
Login No. : L414980

Date Analyzed : 14-AUG-17
Report ID : 1012639

Asbestos Fiber Count (A Rules)

	Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
+	22152-A1	L414980-1	21.5/100	27.4	10,549	636,500	0.017
	22152-A2	L414980-2	2.5/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : BTM
Approved by : BDB
Date : 14-AUG-17
QC by: MLN
Supervisor: BDB

< -Less Than
> -Greater Than
ND -Not Detected
NA -Not Applicable
cc -Cubic Centimeters
NS -Not Specified
mm2 -Square millimeters

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 03-AUG-17
Date Received : 09-AUG-17

Account No.: 90734
Login No. : L414980
Date Analyzed : 11-AUG-17
Report ID : 1012940

Inhalable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-I1	L414980-5	1270.9	0.14	0.11
22152-I2	L414980-6	NA	<0.10	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.10 mg
Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV
OSHA PEL : NA
Collection Media : IOM 25mm PVC

Submitted by: GMG
Approved by : KRK
Date : 15-AUG-17
Supervisor: KRK

NYS DOH # : 11626
QC by: MLN

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 03-AUG-17 Account No.: 90734
Date Received: 09-AUG-17 Login No. : L414980
Date Analyzed: 10-AUG-17 - 15-AUG-17

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L414980 (Report ID: 1012858):
TLV for Vanadium pentoxide: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for Magnesium Oxide: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: im-mwvfilt(28), MT-SOP-21(9)
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3; as Fume, Ceiling = 0.1 mg/m3.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 03-AUG-17 Account No.: 90734
Date Received: 09-AUG-17 Login No. : L414980
Date Analyzed: 10-AUG-17 - 15-AUG-17

L414980 (Report ID: 1012858):

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Magnesium Oxide	+/-9.1%	102%
Molybdenum	+/-10.3%	99.4%
Nickel	+/-10%	103%
Thallium	+/-6.6%	99.5%
Vanadium Pentoxide	+/-9.1%	102%

Parameter	Method	PEL
Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	See footnote

L414980 (Report ID: 1012859):

TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for COBALT: 0.02 mg/m3
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for Calcium Oxide: 2 mg/m3
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3
TLV for SELENIUM: 0.2 mg/m3
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for CHROMIUM: 0.5 mg/m3

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 03-AUG-17 Account No.: 90734
Date Received: 09-AUG-17 Login No. : L414980
Date Analyzed: 10-AUG-17 - 15-AUG-17

L414980 (Report ID: 1012859):
TLV for IRON OXIDE: 5 mg/m3
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: im-mwvfilt(28), MT-SOP-21(9)
PEL listed refers to Aluminum as total dust.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.

L414980 (Report ID: 1012859):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-10.6%	104%
Antimony	+/-8.2%	104%
Arsenic	+/-8.1%	107%
Barium	+/-8.1%	103%
Beryllium	+/-12.6%	103%
Cadmium	+/-9%	105%
Calcium	+/-11.3%	100%
Chromium	+/-9.1%	102%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
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Date Sampled : 03-AUG-17 Account No.: 90734
Date Received: 09-AUG-17 Login No. : L414980
Date Analyzed: 10-AUG-17 - 15-AUG-17

Cobalt	+/-10.2%	103%
Copper	+/-9.3%	104%
Iron Oxide	+/-10%	102%
Lead	+/-8.1%	103%
Manganese	+/-8.9%	103%
Molybdenum	+/-10.3%	99.4%
Selenium	+/-11.4%	105%
Zinc Oxide	+/-9.9%	106%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)
Chromium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Selenium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

+L414980-1 (Report ID: 1012639):
The sample results may have a negative bias; the filter surface was covered by fine particulate that may have obscured fibers.

L414980 (Report ID: 1012639):
SOPs: ia-pcm(26)

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 03-AUG-17 Account No.: 90734
Date Received: 09-AUG-17 Login No. : L414980
Date Analyzed: 10-AUG-17 - 15-AUG-17

L414980 (Report ID: 1012639):
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a greater than optimal variability and are probably biased.
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as follows:
0.154 (5-20 fibers/100 fields)
0.100 (>20-50 fibers/100 fields)
0.069 (>50-100 fibers/100 fields)
0.090 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take into account any uncertainty associated with the sampling process.

L414980 (Report ID: 1012940):
SOPs: GRAV-SOP-8(17)
Gravimetric analytical accuracy of the sampling media is -0.001 +/- 0.021 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.

< -Less Than	mg -Milligrams	m3 -Cubic Meters	kg -Kilograms	ppm -Parts per Million		
> -Greater Than	ug -Micrograms	l -Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable	

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CERTIFICATE OF ANALYSIS

NVLAP®
Lab Code 101143-0
NY ELAP
Lab ID 10920

Chain of Custody: 284173
Client: Galson Laboratories
Address: 6601 Kirkville Road
East Syracuse, NY 13057-9672
Attention: Pam Weaver

Job Name: Not Provided
Job Location: Not Provided
Job Number: L414980
P.O. Number: 90734

Date Submitted: 09/11/2017
Date Analyzed: 09/18/2017
Report Date: 09/18/2017
Date Sampled: 08/03/2017
Person Submitting: Zach King

Summary of Transmission Electron Microscopy

Filter Type: MCE **Pore Size:** 0.8 um **Filter Size:** 25 mm (385 mm²)

AMA Sample Number	Client Sample Number	Volume (L)	Area Analyzed (mm²)	Analytical Sensitivity f/cc	Asbestos Type Amount	# Non Asbestos Structures	Concentration f/mm²	Concentration f/cc	Fraction	Sample Type	Comments
284173-1	22152-A1	636.5	0.532	0.0011	0	0	<8	<0.0045		N/P	
284173-2	22152-A2	0.0	0.532		0	0	<8			BLK	

Analytical procedures used meet or exceed NIOSH 7402 protocols.

** - To calculate the asbestos concentration of the PCM result multiply the original PCM result by the fraction.

All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

Analyst(s): Michael Greenberg

Technical Director Andreas Saldivar

4475 Forbes Blvd. · Lanham, MD, 20706 · (301) 459-2640 · Toll Free (800) 346-0961 · Fax (301) 459-2643

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CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 284173

Mailing/Billing Information:
1. Client Name: Galson
2. Address 1:
3. Address 2:
4. Address 3:
5. Phone #: Fax #:

Submittal Information:
1. Job Name:
2. Job Location:
3. Job #: L414980 P.O. #: 90734
4. Contact Person: Pam Weaver Cell:
5. Collected by: Cell:

Reporting Info (Results provided as soon as technically feasible). If no TAT/Reporting Info is provided, AMA will assign defaults of 5-Day and email/fax to contacts on file.

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
❑ 4 Hours ❑ Immediate Date Due: ❑ 24 Hours Time Due: Comments:	❑ 4 Hours ❑ 3 Day ❑ Same Day ☒ 5 Day + Date Due: 9/18/17 ❑ Next Day ❑ 2 Day ❑ Results Required By Noon	❑ Email: ❑ Email 2: ❑ Verbals:

Asbestos Analysis
*PCM Air – Please Indicate Filter Type:
- ❑ NIOSH 7400 (QTY)
- ❑ Fiberglass (QTY)

TEM Air* – Please Indicate Filter Type:
- ❑ AHERA (QTY)
- ☒ NIOSH 7402 2 (QTY)
- ❑ Other (specify) (QTY)

PLM Bulk
- ❑ EPA 600 – Visual Estimate (QTY) ❑ Pos Stop
- ❑ EPA Point Count (QTY)
- ❑ NY State Friable 198.1 (QTY)
- ❑ Grav. Reduction ELAP 198.6 (QTY)
- ❑ Other (specify) (QTY)

MISC
- ❑ Vermiculite
- ❑ Asbestos Soil PLM (Qual) PLM (Quan) PLM/TEM (Qual) PLM/TEM (Quan)

*It is recommended that blank samples be submitted with all air and surface samples

TEM Bulk
- ❑ ELAP 198.4/Chatfield (QTY)
- ❑ NY State PLM/TEM (QTY)
- ❑ Residual Ash (QTY)

TEM Dust*
- ❑ Qual. (pres/abs) Vacuum/Dust (QTY)
- ❑ Quan. (s/area) Vacuum D5755-95 (QTY)
- ❑ Quan. (s/area)Dust D6480-99 (QTY)

TEM Water
- ❑ Qual. (pres/abs) (QTY)
- ❑ ELAP 198.2/EPA 100.2 (QTY)
- ❑ EPA 100.1 (QTY)

☒ All samples received in good condition unless otherwise noted.
(TEM Water samples °C)

If field data sheets are submitted, there is no need to complete bottom section.

Metals Analysis
- ❑ Pb Paint Chip (QTY)
- ❑ *Pb Dust Wipe (wipe type) (QTY)
- ❑ *Pb Air (QTY)
- ❑ Pb Soil/Solid (QTY)
- ❑ Pb TCLP (QTY)
- ❑ Drinking Water ❑ Pb (QTY) ❑ Cu (QTY) ❑ As (QTY)
- ❑ Waste Water ❑ Pb (QTY) ❑ Cu (QTY) ❑ As (QTY)
- ❑ Pb Furnace (Media) (QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples:
Collection Media
- ❑ *Spore-Trap (QTY) ❑ Surface Vacuum Dust (QTY)
- ❑ *Surface Swab (QTY) ❑ Culturable ID Genus (Media) (QTY)
- ❑ *Surface Tape (QTY) ❑ Culturable ID Species (Media) (QTY)
- ❑ Other (Specify) (QTY

CLIENT ID #	SAMPLE INFORMATION: SAMPLE LOCATION/ ID	DATE/ TIME	VOL (L)/ Wipe Area	ANALYSIS: TEM	PCM	PLM	LEAD	MOLD	MATRIX: AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB	CLIENT CONTACT (LABORATORY STAFF ONLY)
																Date/Time: Contact:By:
																Date/Time: Contact:By:
																Date/Time: Contact:By:

	Print Name	Signature	Date	Time
Relinquished by:	Zach King			
Received by:				
Relinquished by:				
Received for Lab by:	UMAX	KMD	9/11/17	1000

Shipping Information
☒ UPS ☐ In-Person ☐ Other
☐ FedEx ☐ Drop Box
☐ USPS ☐ Courrier
Airbill/Tracking No:

AMA

GALSON LABORATORIES
6601 Kirkville Rd
East Syracuse, NY 13057-9672
Tel: 315-437-5227
888-432-LABS(5227)
Fax: 315-437-0571
www.galsonlabs.com

Check if change of address ☐
New Client ? yes ☐ no ☐

Report To :	**Shelly Krause**	Invoice To :	**Jeanne Glisson**
	SGS Galson Laboratory		SGS Galson Laboratory
	6601 Kirkville Road		6601 Kirkville Road
	East Syracuse, NY 13057		East Syracuse, NY 13057
Phone No. :	888-432-5227	Phone No. :	888-432-5227
		Fax No.	315-437-0571

Site Name : **Project :** L414980 **Sampled By :** Client

Turnaround Time	Due Date
☑ Standard	09/18/17
☐ 4 Business Days	
☐ 3 Business Days	
☐ 2 Business Days	
☐ Next Day by 6pm	
☐ Next Day by Noon	
☐ Same day	

Verbal Authorization : 90734

Credit Card No. : Card Holder Name : Exp. :

Fax Results To : Email Only Please Fax No. : Email Only Please

Email Results To : Syracuse.Subcontracting@sgs.com

Sample Identification	Date Sampled	Collection Medium	*Air Volume (liters)/ Passive Monitors (Min)	Analysis Requested	Method Reference	Specific DL Needed
22152-A1	8/3/2017	25mm MCE PCM	636.5	Transmission Electron Microscopy	NIOSH 7402; TEM	
22152-A2	8/3/2017	25mm MCE PCM	Blank	Transmission Electron Microscopy	NIOSH 7402; TEM	

Comments:

State/Province of sampling event: Toronto

If the method being reported is not on your laboratory's current AIHA scope of accreditation, please state that in your report.
Please provide an uncertainty statement in accordance with AIHA LQAP policy document Section 2A.5.4.3.

Chain of Custody	Print Name	Signature	Date/Time
Relinquished by :	Zach King		9/8/2017 13:45
Received by LAB :			

SGS GALSON

1Z5X626A1546503699
Date:08/09/17
Shipper:UPS
Initials:MAK
Prep:UNKNOWN
L414980

☐ New Client?

Report To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2
Phone No.*: 416-393-6668
Cell No.:
Email Results To: Virgil.Umali@ttc.ca & oheresults@oheconsultants.com
Email Address:

Invoice To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2
Phone No.:
Email:
Purchase Order No.: PU240835
Credit Card: ☐ Credit Card on File ☐ Call for Credit Card Info

R98

Client Account No.*:

☐ Samples submitted using the FreePumpLoan™ Program.
☐ Samples submitted using the FreeSamplingBadges™ Program.

Need Results By*:	(surcharge)
☒ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%
☐ Next Day by Noon	150%
☐ Same Day	200%

Site Name:
Project: 22152
Sampled By: OHE Consultants

Comments:
For Metal analysis, please see attached document regarding metals to be analyzed for each fraction.

List description of industry or process/interferences present in sampling area:

State samples were collected in (ex. NY):

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify):

Sample Identification* (Maximum of 20 characters, ID's longer than 20 characters will be abbreviated.)	Date Sampled* (mm/dd/yy)	Collection Medium	Sample Volume, (Sample Time), or Sample Area*	Sample Units*: (L), ml, min., in2, cm2, ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (ex. welding, plating, painting, etc.)*
Example	01/01/11	2pc UW PVC	960 (Min)	L	Hexavalent Chromium (Cr6)	mod. OSHA ID-215	Welding
22152-A1	08/03/17	25mm PCM	637	636.5	Asbestos	NIOSH 7400 + 7402 per client	
22152-A2	↓	25mm PCM	Ø	Ø	Asbestos	NIOSH 7400	↓ EK 9/8/17
22152-S1		PW PVC in PPI	639	1281.5	Crystalline Silica (all forms)	NIOSH 7500 +	Respirable Dust NIOSH 0600
22152-S2		PW PVC in PPI	Ø	Ø	Crystalline Silica (all forms)	NIOSH 7500 +	Respirable Dust NIOSH 0600
22152-I1		PW PVC in IOM	~~633~~ 640	1270.9	Metals (Inhalable)	NIOSH 7300 +	Inhalable Dust NIOSH 0500
22152-I2		PW PVC in IOM	Ø	Ø	Metals (Inhalable)	NIOSH 7300 +	Inhalable Dust NIOSH 0500
22152-M1		UW MCE in PPI	~~648~~ 633	1261.7	Metals (Respirable)	NIOSH 7300	
22152-M2		UW MCE in PPI	Ø	Ø	Metals (Respirable)	NIOSH 7300	
22152-T1		UW MCE	639	1262.5	Metals (Total)	NIOSH 7300	
22152-T2	↓	UW MCE	Ø	Ø	Metals (Total)	NIOSH 7300	

^Galson Laboratories will substitute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ please indicate if the lower LOQ is required (only available for certain analytes see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date/Time		Print Name/Signature	Date/Time
Relinquished by:	Yunny Desiana Lee	Aug 8/17 9:00 AM	Received by:		8/8/17 4:00pm
Relinquished by:		8/8/17 6:00pm	Received by:		8/9/17 0950

Samples received after 3pm will be considered as next day's business.
*Required fields, failure to complete these fields may result in a delay in your samples being processed.

Page 1 of 1

LAB ORIGINAL

* Inhalable - MgO, Mo, Ni, Th, V_2O_5

Resp - Al, Cd, Fe_2O_3, Mo, ZnO

Total - Sb, As, Ba, Be, Cd, CaO, Cr, Co, Cu, Pb, Mn, Se

Per client JB

SGS GALSON

Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Canada

August 25, 2017

DOH ELAP #11626
AIHA-LAP #100324

Account# 90734

Login# L416116

Dear Mr. Umali:

Enclosed are the analytical results for the samples received by our laboratory on August 19, 2017. All test results meet the quality control requirements of AIHA-LAP and NELAC unless otherwise stated in this report. All samples on the chain of custody were received in good condition unless otherwise noted.

Results in this report are based on the sampling data provided by the client and refer only to the samples as they were received at the laboratory. When possible, non-IOM samples will be retained for 14 days following the date of this report (unless an extension is specifically requested). IOM samples are retained for 7 days.

Current Scopes of Accreditation can be viewed at www.galsonlabs.com in the accreditations section under the "about Galson" tab.

Please contact Katrina Ahchong at (888) 432-5227, if you would like any additional information regarding this report. Thank you for using SGS Galson Laboratories.

Sincerely,

SGS Galson Laboratories

Lisa Swab
Laboratory Director

Enclosure(s)

Galson Laboratories, Inc. is now a part of SGS, the world's leading inspection, verification, testing, and certification company. As part of our transition to SGS, you will begin to see some formatting changes with reports that will improve the presentation of data and allow for the transition to the new logo.

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 11-AUG-17
Date Received : 19-AUG-17

Account No.: 90734
Login No. : L416116
Date Analyzed : 24-AUG-17
Report ID : 1014950

Client ID : 22152-M3 **Lab ID : L416116-7** **Air Volume : 1225.4 L**
Date Sampled : 08/11/17 **Date Analyzed : 08/24/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.0061	mg/m3
Cadmium	0.15	<0.15	<0.00012	mg/m3
Iron Oxide	11.	91	0.074	mg/m3
Molybdenum	0.15	<0.15	<0.00012	mg/m3
Zinc Oxide	2.8	<2.8	<0.0023	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 25-AUG-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 11-AUG-17
Date Received : 19-AUG-17

Account No.: 90734
Login No. : L416116

Date Analyzed : 24-AUG-17
Report ID : 1014950

Client ID : 22152-M4 **Lab ID : L416116-8** **Air Volume : NA**
Date Sampled : 08/11/17 **Date Analyzed : 08/24/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 25-AUG-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 11-AUG-17
Date Received : 19-AUG-17

Account No.: 90734
Login No. : L416116

Date Analyzed : 24-AUG-17
Report ID : 1014950

Client ID : 22152-T3 **Lab ID : L416116-9** **Air Volume : 1224.6 L**
Date Sampled : 08/11/17 **Date Analyzed : 08/24/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.00073	mg/m3
Arsenic	0.30	<0.30	<0.00024	mg/m3
Barium	0.15	5.0	0.0041	mg/m3
Beryllium	0.15	<0.15	<0.00012	mg/m3
Cadmium	0.15	<0.15	<0.00012	mg/m3
Calcium Oxide	100.	<100	<0.086	mg/m3
Chromium	7.5	<7.5	<0.0061	mg/m3
Cobalt	0.45	<0.45	<0.00037	mg/m3
Copper	0.30	0.43	0.00035	mg/m3
Lead	0.38	<0.38	<0.00031	mg/m3
Manganese	0.15	0.85	0.00070	mg/m3
Selenium	2.3	<2.3	<0.0018	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 25-AUG-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 11-AUG-17
Date Received : 19-AUG-17

Account No.: 90734
Login No. : L416116

Date Analyzed : 24-AUG-17
Report ID : 1014950

Client ID : 22152-T4 **Lab ID : L416116-10** **Air Volume : NA**
Date Sampled : 08/11/17 **Date Analyzed : 08/24/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.30	<0.30	NA	mg/m3
Barium	0.15	<0.15	NA	mg/m3
Beryllium	0.15	<0.15	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.45	<0.45	NA	mg/m3
Copper	0.30	<0.30	NA	mg/m3
Lead	0.38	<0.38	NA	mg/m3
Manganese	0.15	<0.15	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 25-AUG-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 11-AUG-17
Date Received : 19-AUG-17

Account No.: 90734
Login No. : L416116

Date Analyzed : 24-AUG-17
Report ID : 1014949

Client ID : 22152-I3 **Lab ID : L416116-5** **Air Volume : 1231.4 L**
Date Sampled : 08/11/17 **Date Analyzed : 08/24/17**

Parameter	LOQ ug	Total ug	Conc	Units
Magnesium Oxide	12.	<12	<0.010	mg/m3
Molybdenum	0.15	<0.15	<0.00012	mg/m3
Nickel	0.30	<0.30	<0.00024	mg/m3
Thallium	1.5	<1.5	<0.0012	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.00065	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PVC
Date : 25-AUG-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 11-AUG-17
Date Received : 19-AUG-17

Account No.: 90734
Login No. : L416116

Date Analyzed : 24-AUG-17
Report ID : 1014949

Client ID : 22152-I4 **Lab ID : L416116-6** **Air Volume : NA**
Date Sampled : 08/11/17 **Date Analyzed : 08/24/17**

Parameter	LOQ ug	Total ug	Conc	Units
Magnesium Oxide	12.	<12	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Nickel	0.30	<0.30	NA	mg/m3
Thallium	1.5	<1.5	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PVC
Date : 25-AUG-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 11-AUG-17
Date Received : 19-AUG-17

Account No.: 90734
Login No. : L416116

Date Analyzed : 23-AUG-17
Report ID : 1014432

Asbestos Fiber Count (A Rules)

	Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
+	22152-A3	L416116-1	11/100	14	5390	621,200	0.009
	22152-A4	L416116-2	0/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : BTM
Approved by : BDB
Date : 25-AUG-17
QC by: NDC
Supervisor: BDB

< -Less Than
> -Greater Than
ND -Not Detected
NA -Not Applicable
cc -Cubic Centimeters
NS -Not Specified
mm2 -Square millimeters

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 11-AUG-17
Date Received : 19-AUG-17

Account No.: 90734
Login No. : L416116
Date Analyzed : 22-AUG-17
Report ID : 1013988

Inhalable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-I3	L416116-5	1231.4	0.22	0.18
22152-I4	L416116-6	NA	<0.10	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.10 mg
Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV
OSHA PEL : NA
Collection Media : IOM 25mm PVC

Submitted by: NRH
Approved by : KRK
Date : 22-AUG-17
Supervisor: KRK

NYS DOH # : 11626
QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 11-AUG-17
Date Received : 19-AUG-17

Account No.: 90734
Login No. : L416116
Date Analyzed : 22-AUG-17
Report ID : 1013989

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-S3	L416116-3	1217.9	0.13	0.11
22152-S4	L416116-4	NA	<0.050	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg
Analytical Method : mod. NIOSH 0600; Gravimetric
OSHA PEL : PNOR 5 mg/m3 (TWA)
Collection Media : PVC PW 37mm

Submitted by: HVN
Approved by : KRK
Date : 23-AUG-17
Supervisor: KRK

NYS DOH # : 11626
QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 11-AUG-17
Date Received : 19-AUG-17

Account No.: 90734
Login No. : L416116
Date Analyzed : 22-AUG-17 - 24-AUG-17
Report ID : 1014742

Respirable Crystalline Silica (RCS): Quartz, Cristobalite, Tridymite

Sample ID	Lab ID	Analyte	Air Vol l	ug	ug/m3
22152-S3	L416116-3	Quartz	1217.9	<5.0	<4.1
		Cristobalite	1217.9	<5.0	<4.1
		Tridymite	1217.9	<20	<16
		RCS	1217.9	<5.0	<4.1
22152-S4	L416116-4	Quartz	NA	<5.0	NA
		Cristobalite	NA	<5.0	NA
		Tridymite	NA	<20	NA
		RCS	NA	<5.0	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: Q:5.0ug C:5.0ug T:20.ug
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD
OSHA PEL : 50 ug/m3 RCS
Collection Media : PVC PW 37mm

Submitted: CMR
Approved: KRK
Date : 25-AUG-17 NYS DOH # : 11626
Supervisor: KRK QC by: NDC

< -Less Than	mg -Milligrams	kg -Kilograms	ppm -Parts per Million
> -Greater Than	ug -Micrograms	m3 -Cubic Meters	NS -Not Specified
NA -Not Applicable	ND -Not Detected	l -Liters	mppcf -Million Particles per Cubic Foot

LABORATORY FOOTNOTE REPORT

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 11-AUG-17 Account No.: 90734
Date Received: 19-AUG-17 Login No. : L416116
Date Analyzed: 22-AUG-17 - 24-AUG-17

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L416116 (Report ID: 1014949):
TLV for Vanadium pentoxide: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for Magnesium Oxide: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(32), im-mwvfilt(28), MT-SOP-21(9)
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3; as Fume, Ceiling = 0.1 mg/m3.

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 11-AUG-17 Account No.: 90734
Date Received: 19-AUG-17 Login No. : L416116
Date Analyzed: 22-AUG-17 - 24-AUG-17

L416116 (Report ID: 1014949):
0.17ug of Molybdenum was found to be in one of the two associated mblks.

L416116 (Report ID: 1014949):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Magnesium Oxide	+/-9.2%	99.2%
Molybdenum	+/-7.6%	100%
Nickel	+/-8%	101%
Thallium	+/-7.9%	101%
Vanadium Pentoxide	+/-6.5%	100%

Parameter	Method	PEL
Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	See footnote

L416116 (Report ID: 1014950):
TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for COBALT: 0.02 mg/m3
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for Calcium Oxide: 2 mg/m3
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 11-AUG-17 Account No.: 90734
Date Received: 19-AUG-17 Login No. : L416116
Date Analyzed: 22-AUG-17 - 24-AUG-17

L416116 (Report ID: 1014950):
TLV for SELENIUM: 0.2 mg/m3
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for CHROMIUM: 0.5 mg/m3
TLV for IRON OXIDE: 5 mg/m3
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(32), im-mwvfilt(28)
PEL listed refers to Aluminum as total dust.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.

L416116-9-10 (Report ID: 1014950):
The digested LOQ spike for Lead only at 0.375 ug recovered at 122% (control limits 80 to 120%).

L416116 (Report ID: 1014950):
0.17ug of Molybdenum and 0.16 ug of Manganese were found to be in one of the two associated mblks.

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 11-AUG-17 Account No.: 90734
Date Received: 19-AUG-17 Login No. : L416116
Date Analyzed: 22-AUG-17 - 24-AUG-17

L416116 (Report ID: 1014950):

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-7.7%	96.9%
Antimony	+/-9.8%	97.3%
Arsenic	+/-7.6%	103%
Barium	+/-6.5%	101%
Beryllium	+/-10.8%	103%
Cadmium	+/-8.6%	102%
Calcium Oxide	+/-10.6%	105%
Chromium	+/-11.2%	103%
Cobalt	+/-8.5%	103%
Copper	+/-10.3%	103%
Iron Oxide	+/-9.6%	106%
Lead	+/-9.1%	100%
Manganese	+/-8.3%	99.8%
Molybdenum	+/-7.6%	100%
Selenium	+/-11.6%	105%
Zinc Oxide	+/-8.9%	102%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 11-AUG-17 Account No.: 90734
Date Received: 19-AUG-17 Login No. : L416116
Date Analyzed: 22-AUG-17 - 24-AUG-17

L416116 (Report ID: 1014950):

Parameter	Method	PEL
Chromium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Selenium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

+L416116-1 (Report ID: 1014432):
The sample results may have a negative bias; the filter surface was covered by fine particulate that may have obscured fibers.

L416116 (Report ID: 1014432):
SOPs: ia-pcm(26)
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a greater than optimal variability and are probably biased.
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as follows:
0.154 (5-20 fibers/100 fields)
0.100 (>20-50 fibers/100 fields)
0.069 (>50-100 fibers/100 fields)
0.090 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take into account any uncertainty associated with the sampling process.

L416116 (Report ID: 1013988):
SOPs: GRAV-SOP-8(17)
Gravimetric analytical accuracy of the sampling media is -0.001 +/- 0.021 mg (average blank

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 11-AUG-17 Account No.: 90734
Date Received: 19-AUG-17 Login No. : L416116
Date Analyzed: 22-AUG-17 - 24-AUG-17

L416116 (Report ID: 1013988):
weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.

L416116 (Report ID: 1013989):
TLV for RESPIRABLE DUST: NA
SOPs: GRAV-SOP-5(17), GRAV-SOP-6(16)
Gravimetric analytical accuracy of the sampling media is -0.001 +/- 0.006 mg (average blank
weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.
PNOR = Particulates Not Otherwise Regulated.

L416116 (Report ID: 1014742):
TLV for QUARTZ: 0.025 mg/m3 Respirable
TLV for TRIDYMITE: NA
TLV for CRISTOBALITE: 0.025 mg/m3 Respirable
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26)

L416116 (Report ID: 1014742):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-10.3%	102%
Quartz	+/-10.9%	93.4%
Tridymite	+/-13%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

SGS GALSON

1Z5X626A6948184439
Date:08/19/17
Shipper:UPS
Initials:CEM
Prep:UNKNOWN

☐ New Client?

Report To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2
Phone No.*: 416-393-6668
Cell No.:
Email Results To: Virgil.Umali@ttc.ca & ohe results@oheconsultants.com
Email Address:

Client Account No.*:

R52

Invoice To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2
Phone No.:
Email:
Purchase Order No.: PU 240835
Credit Card: ☐ Credit Card on File ☐ Call for Credit Card Info

☐ Samples submitted using the FreePumpLoan™ Program. ☐ Samples submitted using the FreeSamplingBadges™ Program.

Need Results By*:	(surcharge)
☒ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%
☐ Next Day by Noon	150%
☐ Same Day	200%

Site Name: Project: 22152 Sampled By: OHE Consultants

Comments:

List description of industry or process/interferences present in sampling area:

State samples were collected in (ex. NY):

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify):

Sample Identification* (Maximum of 20 characters, ID's longer than 20 characters will be abbreviated.)	Date Sampled* (mm/dd/yy)	Collection Medium	Sample Volume, (Sample Time), or Sample Area*	Sample Units*: (L), ml, min., in2, cm2, ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (ex. welding, plating, painting, etc.)*
Example	01/01/11	2pc UW PVC	960	L	Hexavalent Chromium (Cr6)	mod. OSHA ID-215	Welding
22152-A3	08/11/17	25mm PCM	615	621.2	Asbestos	NIOSH 7400	
22152-A4		25mm PCM	Ø	Ø	Asbestos	NIOSH 7400	
22152-S3		PW PVC in PPI	615	1217.9	Crystalline Silica (all forms)	NIOSH 7500 + Resp. Dust NIOSH 0600	
22152-S4		PW PVC in PPI	Ø	Ø	Crystalline Silica (all forms)	NIOSH 7500 + Resp. Dust NIOSH 0600	
22152-I3		PW PVC in IOM	617	1231.4	Metals (Inhalable)	NIOSH 7300 + Inhalable Dust NIOSH 0500	
22152-I4		PW PVC in IOM	Ø	Ø	Metals (Inhalable)	NIOSH 7300 + Inhalable Dust NIOSH 0500	
22152-M3		UW MCE in PPI	615	1225.4	Metals (Respirable)	NIOSH 7300	
22152-M4		UW MCE in PPI	Ø	Ø	Metals (Respirable)		
22152-T3		UW MCE	615	1224.6	Metals (Total)		
22152-T4		UW MCE	Ø	Ø	Metals (Total)		

^Galson Laboratories will substitute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ please indicate if the lower LOQ is required (only available for certain analytes see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date/Time		Print Name/Signature	Date/Time
Relinquished by:	Yunny Deiana Lee	Aug 15/17 4:00 PM	Received by:		
Relinquished by:			Received by:	Candace Massurin	08-19-17 11:46

CA

Samples received after 3pm will be considered as next days business.

*Required fields, failure to complete these fields may result in a delay in your samples being processed.

LAB ORIGINAL

Respirable – Aluminum, Cadmium, Iron Oxide, Molybdenum (total), Zinc Oxide

Inhalable – Magnesium Oxide, Molybdenum (total), Nickel – metal, Thallium, Vanadium Pentoxide

Total – Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium Oxide, Chromium III, Cobalt, Copper, Lead, Manganese, Selenium

Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Canada

August 25, 2017

AIHA-LAP #100324 Account# 90734 Login# L416114

Dear Mr. Umali:

Enclosed are the analytical results for the samples received by our laboratory on August 19, 2017. All test results meet the quality control requirements of AIHA-LAP and NELAC unless otherwise stated in this report. All samples on the chain of custody were received in good condition unless otherwise noted.

Results in this report are based on the sampling data provided by the client and refer only to the samples as they were received at the laboratory. Unless otherwise requested, samples for asbestos analysis will be discarded 60 days from the date of this report and all other non-IOM samples will be retained for 14 days following the date of this report (when possible). IOMs will be cleaned & disposed of after seven calendar days.

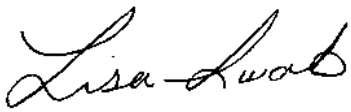
To ensure the safety of laboratory receiving personnel, always seal bulk samples securely to prevent possible escape of material. Also, please double-bag bulk samples individually prior to shipping. Samples not received in this manner will be noted on the chain of custody form.

Current Scopes of Accreditation can be viewed at www.galsonlabs.com in the accreditations section under the "about Galson" tab.

Please contact Katrina Ahchong at (888) 432-5227, if you would like any additional information regarding this report. Thank you for using SGS Galson Laboratories.

Sincerely,

SGS Galson Laboratories



Lisa Swab
Laboratory Director

Enclosure(s)

Galson Laboratories, Inc. is now a part of SGS, the world's leading inspection, verification, testing, and certification company. As part of our transition to SGS, you will begin to see some formatting changes with reportsthat will improve the presentation of data and allow for the transition to the new logo.

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 14-AUG-17
Date Received : 19-AUG-17

Account No.: 90734
Login No. : L416114
Date Analyzed : 24-AUG-17
Report ID : 1014948

Client ID : 22152-M5 **Lab ID : L416114-7** **Air Volume : 1090.8 L**
Date Sampled : 08/14/17 **Date Analyzed : 08/24/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.0069	mg/m3
Cadmium	0.15	<0.15	<0.00014	mg/m3
Iron Oxide	11.	120	0.11	mg/m3
Molybdenum	0.15	<0.15	<0.00014	mg/m3
Zinc Oxide	2.8	<2.8	<0.0026	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 25-AUG-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 14-AUG-17
Date Received : 19-AUG-17

Account No.: 90734
Login No. : L416114

Date Analyzed : 24-AUG-17
Report ID : 1014948

Client ID : 22152-M6 **Lab ID : L416114-8** **Air Volume : NA**
Date Sampled : 08/14/17 **Date Analyzed : 08/24/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 25-AUG-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 14-AUG-17
Date Received : 19-AUG-17

Account No.: 90734
Login No. : L416114

Date Analyzed : 24-AUG-17
Report ID : 1014948

Client ID : 22152-T5 **Lab ID : L416114-9** **Air Volume : 1100.0 L**
Date Sampled : 08/14/17 **Date Analyzed : 08/24/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.00082	mg/m3
Arsenic	0.30	<0.30	<0.00027	mg/m3
Barium	0.15	6.3	0.0057	mg/m3
Beryllium	0.15	<0.15	<0.00014	mg/m3
Cadmium	0.15	<0.15	<0.00014	mg/m3
Calcium Oxide	100.	<100	<0.095	mg/m3
Chromium	7.5	<7.5	<0.0068	mg/m3
Cobalt	0.45	<0.45	<0.00041	mg/m3
Copper	0.30	0.57	0.00052	mg/m3
Lead	0.38	<0.38	<0.00034	mg/m3
Manganese	0.15	0.96	0.00088	mg/m3
Selenium	2.3	<2.3	<0.0020	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 25-AUG-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 14-AUG-17
Date Received : 19-AUG-17

Account No.: 90734
Login No. : L416114

Date Analyzed : 24-AUG-17
Report ID : 1014948

Client ID : 22152-T6 **Lab ID : L416114-10** **Air Volume : NA**
Date Sampled : 08/14/17 **Date Analyzed : 08/24/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.30	<0.30	NA	mg/m3
Barium	0.15	<0.15	NA	mg/m3
Beryllium	0.15	<0.15	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.45	<0.45	NA	mg/m3
Copper	0.30	<0.30	NA	mg/m3
Lead	0.38	<0.38	NA	mg/m3
Manganese	0.15	<0.15	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 25-AUG-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 14-AUG-17
Date Received : 19-AUG-17

Account No.: 90734
Login No. : L416114

Date Analyzed : 24-AUG-17
Report ID : 1014942

Client ID : 22152-I5 **Lab ID : L416114-5** **Air Volume : 1095.4 L**
Date Sampled : 08/14/17 **Date Analyzed : 08/24/17**

Parameter	LOQ ug	Total ug	Conc	Units
Magnesium Oxide	12.	<12	<0.011	mg/m3
Molybdenum	0.15	<0.15	<0.00014	mg/m3
Nickel	0.30	<0.30	<0.00027	mg/m3
Thallium	1.5	<1.5	<0.0014	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.00073	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PVC
Date : 25-AUG-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 14-AUG-17
Date Received : 19-AUG-17

Account No.: 90734
Login No. : L416114
Date Analyzed : 24-AUG-17
Report ID : 1014942

Client ID : 22152-I6 **Lab ID : L416114-6** **Air Volume : NA**
Date Sampled : 08/14/17 **Date Analyzed : 08/24/17**

Parameter	LOQ ug	Total ug	Conc	Units
Magnesium Oxide	12.	<12	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Nickel	0.30	<0.30	NA	mg/m3
Thallium	1.5	<1.5	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PVC
Date : 25-AUG-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 14-AUG-17
Date Received : 19-AUG-17

Account No.: 90734
Login No. : L416114
Date Analyzed : 23-AUG-17
Report ID : 1014431

Asbestos Fiber Count (A Rules)

	Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
+	22152-A5	L416114-1	12/100	15.3	5891	562,700	0.010
	22152-A6	L416114-2	1.5/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : BTM
Approved by : BDB
Date : 25-AUG-17
QC by: NDC
Supervisor: BDB

< -Less Than
> -Greater Than
ND -Not Detected
NA -Not Applicable
cc -Cubic Centimeters
NS -Not Specified
mm2 -Square millimeters

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 14-AUG-17
Date Received : 19-AUG-17

Account No.: 90734
Login No. : L416114
Date Analyzed : 22-AUG-17
Report ID : 1013986

Inhalable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-I5	L416114-5	1095.4	0.42	0.38
22152-I6	L416114-6	NA	<0.10	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.10 mg
Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV
OSHA PEL : NA
Collection Media : IOM 25mm PVC

Submitted by: NRH
Approved by : KRK
Date : 22-AUG-17
Supervisor: KRK

NYS DOH # : 11626
QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 14-AUG-17
Date Received : 19-AUG-17

Account No.: 90734
Login No. : L416114
Date Analyzed : 22-AUG-17
Report ID : 1013987

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-S5	L416114-3	1094.2	0.20	0.18
22152-S6	L416114-4	NA	<0.050	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg
Analytical Method : mod. NIOSH 0600; Gravimetric
OSHA PEL : PNOR 5 mg/m3 (TWA)
Collection Media : PVC PW 37mm

Submitted by: PAH/HVN
Approved by : KRK
Date : 23-AUG-17
Supervisor: KRK

NYS DOH # : 11626
QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 14-AUG-17
Date Received : 19-AUG-17

Account No.: 90734
Login No. : L416114
Date Analyzed : 22-AUG-17 - 25-AUG-17
Report ID : 1015012

Respirable Crystalline Silica (RCS): Quartz, Cristobalite, Tridymite

Sample ID	Lab ID	Analyte	Air Vol l	ug	ug/m3
22152-S5	L416114-3	Quartz	1094.2	<5.0	<4.6
		Cristobalite	1094.2	<5.0	<4.6
		Tridymite	1094.2	<20	<18
		RCS	1094.2	<5.0	<4.6
22152-S6	L416114-4	Quartz	NA	<5.0	NA
		Cristobalite	NA	<5.0	NA
		Tridymite	NA	<20	NA
		RCS	NA	<5.0	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: Q:5.0ug C:5.0ug T:20.ug
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD
OSHA PEL : 50 ug/m3 RCS
Collection Media : PVC PW 37mm

Submitted: AJD
Approved: KRK
Date : 25-AUG-17 NYS DOH # : 11626
Supervisor: KRK QC by: NDC

< -Less Than
> -Greater Than
NA -Not Applicable
mg -Milligrams
ug -Micrograms
ND -Not Detected
kg -Kilograms
m3 -Cubic Meters
l -Liters
ppm -Parts per Million
NS -Not Specified
mppcf -Million Particles per Cubic Foot

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 14-AUG-17 Account No.: 90734
Date Received: 19-AUG-17 Login No. : L416114
Date Analyzed: 22-AUG-17 - 25-AUG-17

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L416114 (Report ID: 1014942):
TLV for Vanadium pentoxide: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for Magnesium Oxide: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(32), im-mwvfilt(28), MT-SOP-21(9)
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3; as Fume, Ceiling = 0.1 mg/m3.

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 14-AUG-17 Account No.: 90734
Date Received: 19-AUG-17 Login No. : L416114
Date Analyzed: 22-AUG-17 - 25-AUG-17

L416114 (Report ID: 1014942):
0.17ug of Molybdenum was found to be in one of the two associated media blanks.

L416114 (Report ID: 1014942):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Magnesium Oxide	+/-9.2%	99.2%
Molybdenum	+/-7.6%	100%
Nickel	+/-8%	101%
Thallium	+/-7.9%	101%
Vanadium Pentoxide	+/-6.5%	100%

Parameter	Method	PEL
Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	See footnote

L416114 (Report ID: 1014948):
TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for COBALT: 0.02 mg/m3
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for Calcium Oxide: 2 mg/m3
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 14-AUG-17 Account No.: 90734
Date Received: 19-AUG-17 Login No. : L416114
Date Analyzed: 22-AUG-17 - 25-AUG-17

L416114 (Report ID: 1014948):
TLV for SELENIUM: 0.2 mg/m3
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for CHROMIUM: 0.5 mg/m3
TLV for IRON OXIDE: 5 mg/m3
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(32), im-mwvfilt(28)
PEL listed refers to Aluminum as total dust.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.

L416114-9-10 (Report ID: 1014948):
The digested LOQ spike for Lead only at 0.375 ug recovered at 122% (control limits 80 to 120%).

L416114 (Report ID: 1014948):
0.17ug of Molybdenum and 0.16 ug of Manganese were found to be in one of the two associated media blanks.

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 14-AUG-17 Account No.: 90734
Date Received: 19-AUG-17 Login No. : L416114
Date Analyzed: 22-AUG-17 - 25-AUG-17

L416114 (Report ID: 1014948):

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-7.7%	96.9%
Antimony	+/-9.8%	97.3%
Arsenic	+/-7.6%	103%
Barium	+/-6.5%	101%
Beryllium	+/-10.8%	103%
Cadmium	+/-8.6%	102%
Calcium Oxide	+/-10.6%	105%
Chromium	+/-11.2%	103%
Cobalt	+/-8.5%	103%
Copper	+/-10.3%	103%
Iron Oxide	+/-9.6%	106%
Lead	+/-9.1%	100%
Manganese	+/-8.3%	99.8%
Molybdenum	+/-7.6%	100%
Selenium	+/-11.6%	105%
Zinc Oxide	+/-8.9%	102%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 14-AUG-17 Account No.: 90734
Date Received: 19-AUG-17 Login No. : L416114
Date Analyzed: 22-AUG-17 - 25-AUG-17

L416114 (Report ID: 1014948):

Parameter	Method	PEL
Chromium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Selenium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

+L416114-1 (Report ID: 1014431):
The sample results may have a negative bias; the filter surface was covered by fine particulate that may have obscured fibers.

L416114 (Report ID: 1014431):
SOPs: ia-pcm(26)
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a greater than optimal variability and are probably biased.
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as follows:
0.154 (5-20 fibers/100 fields)
0.100 (>20-50 fibers/100 fields)
0.069 (>50-100 fibers/100 fields)
0.090 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take into account any uncertainty associated with the sampling process.

L416114 (Report ID: 1013986):
SOPs: GRAV-SOP-8(17)
Gravimetric analytical accuracy of the sampling media is -0.001 +/- 0.021 mg (average blank

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 14-AUG-17 Account No.: 90734
Date Received: 19-AUG-17 Login No. : L416114
Date Analyzed: 22-AUG-17 - 25-AUG-17

L416114 (Report ID: 1013986):
weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.

L416114 (Report ID: 1013987):
TLV for RESPIRABLE DUST: NA
SOPs: GRAV-SOP-5(17), GRAV-SOP-6(16)
Gravimetric analytical accuracy of the sampling media is -0.001 +/- 0.006 mg (average blank
weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.
PNOR = Particulates Not Otherwise Regulated.

L416114 (Report ID: 1015012):
TLV for QUARTZ: 0.025 mg/m3 Respirable
TLV for TRIDYMITE: NA
TLV for CRISTOBALITE: 0.025 mg/m3 Respirable
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26)

L416114 (Report ID: 1015012):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-10.3%	102%
Quartz	+/-10.9%	93.4%
Tridymite	+/-13%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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1Z5X626A6948184439
Date:08/19/17
Shipper:UPS
Initials:CEM
Prep:UNKNOWN

☐ New Client?

Report To*: Toronto Transit Commission
1920 Yonge street
Suite 600
Toronto, ON M4S 3E2
Phone No.*: 416-393-6668
Cell No.:
Email Results To: Virgil.Umali@ttc.ca & oheresults@oheconsultants.com
Email Address:

R51

Invoice To*: Toronto Transit Commission
1920 Yonge street
Suite 600
Toronto, ON M4S 3E2
Phone No.:
Email:
Purchase Order No.: PU 240835
Credit Card: ☐ Credit Card on File ☐ Call for Credit Card Info

Client Account No.*:

☐ Samples submitted using the FreePumpLoan™ Program.
☐ Samples submitted using the FreeSamplingBadges™ Program.

Need Results By*:	(surcharge)
☒ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%
☐ Next Day by Noon	150%
☐ Same Day	200%

Site Name:
Project: 22152
Sampled By: OHE Consultants

Comments:
Please see attached document for the list of metals to be analyzed.

List description of industry or process/interferences present in sampling area:

State samples were collected in (ex. NY):

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify):

Sample Identification* (Maximum of 20 characters, ID's longer than 20 characters will be abbreviated.)	Date Sampled* (mm/dd/yy)	Collection Medium	Sample Volume, (Sample Time,) or Sample Area*	Sample Units*: (L) ml, min., in2, cm2, ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (ex. welding, plating, painting, etc.)*
Example	01/01/11	2pc UW PVC	960	L	Hexavalent Chromium (Cr6)	mod. OSHA ID-215	Welding
22152 - A5	08/14/17	25mm PCM	551	562.7	Asbestos	NIOSH 7400	
22152 - A6		25mm PCM	Ø	Ø	Asbestos	NIOSH 7400	
22152 - S5		PW PVC in PPI	551	1094.2	Crystalline Silica (all forms)	NIOSH 7500 + Resp.	Dust NIOSH 0600
22152 - S6		PW PVC in PPI	Ø	Ø	Crystalline Silica (all forms)	NIOSH 7500 + Resp.	Dust NIOSH 0600
22152 - I5		PW PVC in IOM	551	1095.4	Metals (Inhalable)	NIOSH 7300 + Inh.	Dust NIOSH 0500
22152 - I6		PW PVC in IOM	Ø	Ø	Metals (Inhalable)	NIOSH 7300 + Inh.	Dust NIOSH 0500
22152 - M5		UW MCE in PPI	551	1090.8	Metals (Respirable)	NIOSH 7300	
22152 - M6		UW MCE in PPI	Ø	Ø	Metals (Respirable)		
22152 - T5		UW MCE	551	1100.0	Metals (Total)		
22152 - T6		UW MCE	Ø	Ø	Metals (Total)		

^Galson Laboratories will substitute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ please indicate if the lower LOQ is required (only available for certain analytes see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date/Time		Print Name/Signature	Date/Time
Relinquished by:	Yunny Desiana Lee	Aug 15/17 4:00 PM	Received by:		
Relinquished by:			Received by:	Candace Massurin	08/19/17 11:35

CA

Samples received after 3pm will be considered as next day's business.
*Required fields, failure to complete these fields may result in a delay in your samples being processed.

Page 1 of 1

LAB ORIGINAL

Respirable – Aluminum, Cadmium, Iron Oxide, Molybdenum (total), Zinc Oxide

Inhalable – Magnesium Oxide, Molybdenum (total), Nickel – metal, Thallium, Vanadium Pentoxide

Total – Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium Oxide, Chromium III, Cobalt, Copper, Lead, Manganese, Selenium

Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Canada

August 25, 2017

AIHA-LAP #100324 Account# 90734 Login# L416110

Dear Mr. Umali:

Enclosed are the revised analytical results for the samples received by our laboratory on August 19, 2017. Please note that this revision cancels and supersedes L416110 (report reference: 1) dated August 25, 2017 issued by SGS Galson Laboratories. Per your request, samples requiring TEM analysis were subcontracted to AMA Analytical Services, Inc. Their report is enclosed in its entirety.

All test results meet the quality control requirements of AIHA-LAP and NELAC unless otherwise stated in this report. All samples on the chain of custody were received in good condition unless otherwise noted.

Results in this report are based on the sampling data provided by the client and refer only to the samples as they were received at the laboratory.

To ensure the safety of laboratory receiving personnel, always seal bulk samples securely to prevent possible escape of material. Also, please double-bag bulk samples individually prior to shipping. Samples not received in this manner will be noted on the chain of custody form.

Current Scopes of Accreditation can be viewed at www.galsonlabs.com in the accreditations section under the "about Galson" tab.

Please contact Katrina Ahchong at (888) 432-5227, if you would like any additional information regarding this report. Thank you for using SGS Galson Laboratories.

Sincerely,

SGS Galson Laboratories

Lisa Swab
Laboratory Director

Enclosure(s)

Galson Laboratories, Inc. is now a part of SGS, the world's leading inspection, verification, testing, and certification company. As part of our transition to SGS, you will begin to see some formatting changes with reports that will improve the presentation of data and allow for the transition to the new logo.

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 17-AUG-17
Date Received : 19-AUG-17

Account No.: 90734
Login No. : L416110
Date Analyzed : 24-AUG-17
Report ID : 1014940

Client ID : 22152-M7 **Lab ID : L416110-7** **Air Volume : 1120.1 L**
Date Sampled : 08/17/17 **Date Analyzed : 08/24/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.0067	mg/m3
Cadmium	0.15	<0.15	<0.00013	mg/m3
Iron Oxide	11.	76	0.068	mg/m3
Molybdenum	0.15	<0.15	<0.00013	mg/m3
Zinc Oxide	2.8	<2.8	<0.0025	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 25-AUG-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 17-AUG-17
Date Received : 19-AUG-17

Account No.: 90734
Login No. : L416110

Date Analyzed : 24-AUG-17
Report ID : 1014940

Client ID : 22152-M8 **Lab ID : L416110-8** **Air Volume : NA**
Date Sampled : 08/17/17 **Date Analyzed : 08/24/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 25-AUG-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 17-AUG-17
Date Received : 19-AUG-17

Account No.: 90734
Login No. : L416110

Date Analyzed : 24-AUG-17
Report ID : 1014940

Client ID : 22152-T7 **Lab ID : L416110-9** **Air Volume : 1124.1 L**
Date Sampled : 08/17/17 **Date Analyzed : 08/24/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.00080	mg/m3
Arsenic	0.30	<0.30	<0.00027	mg/m3
Barium	0.15	3.8	0.0034	mg/m3
Beryllium	0.15	<0.15	<0.00013	mg/m3
Cadmium	0.15	<0.15	<0.00013	mg/m3
Calcium Oxide	100.	<100	<0.093	mg/m3
Chromium	7.5	<7.5	<0.0067	mg/m3
Cobalt	0.45	<0.45	<0.00040	mg/m3
Copper	0.30	0.41	0.00036	mg/m3
Lead	0.38	<0.38	<0.00033	mg/m3
Manganese	0.15	0.66	0.00059	mg/m3
Selenium	2.3	<2.3	<0.0020	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 25-AUG-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 17-AUG-17
Date Received : 19-AUG-17

Account No.: 90734
Login No. : L416110
Date Analyzed : 24-AUG-17
Report ID : 1014940

Client ID : 22152-T8 **Lab ID : L416110-10** **Air Volume : NA**
Date Sampled : 08/17/17 **Date Analyzed : 08/24/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.30	<0.30	NA	mg/m3
Barium	0.15	<0.15	NA	mg/m3
Beryllium	0.15	<0.15	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.45	<0.45	NA	mg/m3
Copper	0.30	<0.30	NA	mg/m3
Lead	0.38	<0.38	NA	mg/m3
Manganese	0.15	<0.15	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 25-AUG-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 17-AUG-17
Date Received : 19-AUG-17

Account No.: 90734
Login No. : L416110

Date Analyzed : 24-AUG-17
Report ID : 1014939

Client ID : 22152-I7 **Lab ID : L416110-5** **Air Volume : 1114.7 L**
Date Sampled : 08/17/17 **Date Analyzed : 08/24/17**

Parameter	LOQ ug	Total ug	Conc	Units
Magnesium Oxide	12.	<12	<0.011	mg/m3
Molybdenum	0.15	<0.15	<0.00013	mg/m3
Nickel	0.30	<0.30	<0.00027	mg/m3
Thallium	1.5	<1.5	<0.0013	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.00072	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PVC
Date : 25-AUG-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 17-AUG-17
Date Received : 19-AUG-17

Account No.: 90734
Login No. : L416110
Date Analyzed : 24-AUG-17
Report ID : 1014939

Client ID : 22152-I8 **Lab ID : L416110-6** **Air Volume : NA**
Date Sampled : 08/17/17 **Date Analyzed : 08/24/17**

Parameter	LOQ ug	Total ug	Conc	Units
Magnesium Oxide	12.	<12	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Nickel	0.30	<0.30	NA	mg/m3
Thallium	1.5	<1.5	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PVC
Date : 25-AUG-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 17-AUG-17
Date Received : 19-AUG-17

Account No.: 90734
Login No. : L416110

Date Analyzed : 23-AUG-17
Report ID : 1014430

Asbestos Fiber Count (A Rules)

	Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
+	22152-A7	L416110-1	14/100	17.8	6853	569,900	0.012
	22152-A8	L416110-2	4/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : BTM
Approved by : BDB
Date : 25-AUG-17
QC by: NDC
Supervisor: BDB

< -Less Than
> -Greater Than
ND -Not Detected
NA -Not Applicable
cc -Cubic Centimeters
NS -Not Specified
mm2 -Square millimeters

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 17-AUG-17
Date Received : 19-AUG-17

Account No.: 90734
Login No. : L416110
Date Analyzed : 22-AUG-17
Report ID : 1013984

Inhalable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-I7	L416110-5	1114.7	0.35	0.31
22152-I8	L416110-6	NA	<0.10	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.10 mg
Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV
OSHA PEL : NA
Collection Media : IOM 25mm PVC

Submitted by: NRH
Approved by : KRK
Date : 22-AUG-17
Supervisor: KRK

NYS DOH # : 11626
QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 17-AUG-17
Date Received : 19-AUG-17

Account No.: 90734
Login No. : L416110
Date Analyzed : 22-AUG-17
Report ID : 1013985

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-S7	L416110-3	1113.5	0.12	0.11
22152-S8	L416110-4	NA	<0.050	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg
Analytical Method : mod. NIOSH 0600; Gravimetric
OSHA PEL : PNOR 5 mg/m3 (TWA)
Collection Media : PVC PW 37mm

Submitted by: HVN
Approved by : KRK
Date : 23-AUG-17
Supervisor: KRK

NYS DOH # : 11626
QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 17-AUG-17
Date Received : 19-AUG-17

Account No.: 90734
Login No. : L416110
Date Analyzed : 22-AUG-17 - 24-AUG-17
Report ID : 1015020

Respirable Crystalline Silica (RCS): Quartz, Cristobalite, Tridymite

Sample ID	Lab ID	Analyte	Air Vol l	ug	ug/m3
22152-S7	L416110-3	Quartz	1113.5	<5.0	<4.5
		Cristobalite	1113.5	<5.0	<4.5
		Tridymite	1113.5	<20	<18
		RCS	1113.5	<5.0	<4.5
22152-S8	L416110-4	Quartz	NA	<5.0	NA
		Cristobalite	NA	<5.0	NA
		Tridymite	NA	<20	NA
		RCS	NA	<5.0	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: Q:5.0ug C:5.0ug T:20.ug
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD
OSHA PEL : 50 ug/m3 RCS
Collection Media : PVC PW 37mm

Submitted: AJD
Approved: KRK
Date : 25-AUG-17 NYS DOH # : 11626
Supervisor: KRK QC by: NDC

< -Less Than
> -Greater Than
NA -Not Applicable
mg -Milligrams
ug -Micrograms
ND -Not Detected
kg -Kilograms
m3 -Cubic Meters
l -Liters
ppm -Parts per Million
NS -Not Specified
mppcf -Million Particles per Cubic Foot

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 17-AUG-17 Account No.: 90734
Date Received: 19-AUG-17 Login No. : L416110
Date Analyzed: 22-AUG-17 - 24-AUG-17

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L416110 (Report ID: 1014939):
TLV for Vanadium pentoxide: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for Magnesium Oxide: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(32), im-mwvfilt(28), MT-SOP-21(9)
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3; as Fume, Ceiling = 0.1 mg/m3.

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 17-AUG-17 Account No.: 90734
Date Received: 19-AUG-17 Login No. : L416110
Date Analyzed: 22-AUG-17 - 24-AUG-17

L416110 (Report ID: 1014939):
0.17ug of Molybdenum was found to be in one of the two associated media blanks.

L416110 (Report ID: 1014939):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Magnesium Oxide	+/-9.2%	99.2%
Molybdenum	+/-7.6%	100%
Nickel	+/-8%	101%
Thallium	+/-7.9%	101%
Vanadium Pentoxide	+/-6.5%	100%

Parameter	Method	PEL
Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	See footnote

L416110 (Report ID: 1014940):
TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for COBALT: 0.02 mg/m3
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for Calcium Oxide: 2 mg/m3
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 17-AUG-17 Account No.: 90734
Date Received: 19-AUG-17 Login No. : L416110
Date Analyzed: 22-AUG-17 - 24-AUG-17

L416110 (Report ID: 1014940):
TLV for SELENIUM: 0.2 mg/m3
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for CHROMIUM: 0.5 mg/m3
TLV for IRON OXIDE: 5 mg/m3
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(32), im-mwvfilt(28)
PEL listed refers to Aluminum as total dust.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.

L416110-9-10 (Report ID: 1014940):
The digested LOQ spike for Lead only at 0.375 ug recovered at 122% (control limits 80 to 120%).

L416110 (Report ID: 1014940):
0.17ug of Molybdenum and 0.16 ug of Manganese were found to be in one of the two associated media blanks.

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA -Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 17-AUG-17 Account No.: 90734
Date Received: 19-AUG-17 Login No. : L416110
Date Analyzed: 22-AUG-17 - 24-AUG-17

L416110 (Report ID: 1014940):

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-7.7%	96.9%
Antimony	+/-9.8%	97.3%
Arsenic	+/-7.6%	103%
Barium	+/-6.5%	101%
Beryllium	+/-10.8%	103%
Cadmium	+/-8.6%	102%
Calcium Oxide	+/-10.6%	105%
Chromium	+/-11.2%	103%
Cobalt	+/-8.5%	103%
Copper	+/-10.3%	103%
Iron Oxide	+/-9.6%	106%
Lead	+/-9.1%	100%
Manganese	+/-8.3%	99.8%
Molybdenum	+/-7.6%	100%
Selenium	+/-11.6%	105%
Zinc Oxide	+/-8.9%	102%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 17-AUG-17 Account No.: 90734
Date Received: 19-AUG-17 Login No. : L416110
Date Analyzed: 22-AUG-17 - 24-AUG-17

L416110 (Report ID: 1014940):

Parameter	Method	PEL
Chromium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Selenium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

+L416110-1 (Report ID: 1014430):
The sample results may have a negative bias; the filter surface was covered by fine particulate that may have obscured fibers.

L416110 (Report ID: 1014430):
SOPs: ia-pcm(26)
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a greater than optimal variability and are probably biased.
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as follows:
0.154 (5-20 fibers/100 fields)
0.100 (>20-50 fibers/100 fields)
0.069 (>50-100 fibers/100 fields)
0.090 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take into account any uncertainty associated with the sampling process.

L416110 (Report ID: 1013984):
SOPs: GRAV-SOP-8(17)
Gravimetric analytical accuracy of the sampling media is -0.001 +/- 0.021 mg (average blank

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 17-AUG-17 Account No.: 90734
Date Received: 19-AUG-17 Login No. : L416110
Date Analyzed: 22-AUG-17 - 24-AUG-17

L416110 (Report ID: 1013984):
weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.

L416110 (Report ID: 1013985):
TLV for RESPIRABLE DUST: NA
SOPs: GRAV-SOP-5(17), GRAV-SOP-6(16)
Gravimetric analytical accuracy of the sampling media is -0.001 +/- 0.006 mg (average blank
weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.
PNOR = Particulates Not Otherwise Regulated.

L416110 (Report ID: 1015020):
TLV for QUARTZ: 0.025 mg/m3 Respirable
TLV for TRIDYMITE: NA
TLV for CRISTOBALITE: 0.025 mg/m3 Respirable
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26)

L416110 (Report ID: 1015020):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-10.3%	102%
Quartz	+/-10.9%	93.4%
Tridymite	+/-13%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

NVLAP®
Lab Code 101143-0
NY ELAP
Lab ID 10920

Chain of Custody: 284174
Client: Galson Laboratories
Address: 6601 Kirkville Road
East Syracuse, NY 13057-9672
Attention: Pam Weaver

Job Name: Not Provided
Job Location: Not Provided
Job Number: L416110
P.O. Number: 90734

Date Submitted: 09/11/2017
Date Analyzed: 09/18/2017
Report Date: 09/18/2017
Date Sampled: 08/17/2017
Person Submitting: Zach King

Summary of Transmission Electron Microscopy

Filter Type: MCE **Pore Size:** 0.8 um **Filter Size:** 25 mm (385 mm²)

AMA Sample Number	Client Sample Number	Volume (L)	Area Analyzed (mm²)	Analytical Sensitivity f/cc	Asbestos Type Amount	# Non Asbestos Structures	Concentration f/mm²	Concentration f/cc	Fraction	Sample Type	Comments
284174-1	22152-A7	569.9	0.532	0.0013	0	3	<8	<0.0051	0.0	N/P	
284174-2	22152-A8	0.0	0.532		0	0	<8			N/P	

Analytical procedures used meet or exceed NIOSH 7402 protocols.

** - To calculate the asbestos concentration of the PCM result multiply the original PCM result by the fraction.

All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

Analyst(s): Michael Greenberg

Technical Director Andreas Saldivar

4475 Forbes Blvd. · Lanham, MD, 20706 · (301) 459-2640 · Toll Free (800) 346-0961 · Fax (301) 459-2643

AMA Analytical Services, Inc.
Focused on Results www.amalab.com
AIHA-LAP (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 284174

Mailing/Billing Information:
1. Client Name: Galson
2. Address 1:
3. Address 2:
4. Address 3:
5. Phone #: Fax #:

Submittal Information:
1. Job Name:
2. Job Location:
3. Job #: L416110 P.O. #: 90734
4. Contact Person: Pam Weaver Cell:
5. Collected by: Cell:

Reporting Info (Results provided as soon as technically feasible). If no TAT/Reporting Info is provided, AMA will assign defaults of 5-Day and email/fax to contacts on file.

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
❑ 4 Hours ❑ Immediate Date Due: ❑ 24 Hours Time Due: Comments:	❑ 4 Hours ❑ 3 Day ❑ Same Day ☒ 5 Day ❑ Next Day Date Due: 9/18/17 ❑ 2 Day ❑ Results Required By Noon	❑ Email: ❑ Email 2: ❑ Verbals:

Asbestos Analysis
*PCM Air – Please Indicate Filter Type:
- ❑ NIOSH 7400 (QTY)
- ❑ Fiberglass (QTY)

TEM Air* – Please Indicate Filter Type:
- ❑ AHERA (QTY)
- ☒ NIOSH 7402 2 (QTY)
- ❑ Other (specify) (QTY)

PLM Bulk
- ❑ EPA 600 – Visual Estimate (QTY) ❑ Pos Stop
- ❑ EPA Point Count (QTY)
- ❑ NY State Friable 198.1 (QTY)
- ❑ Grav. Reduction ELAP 198.6 (QTY)
- ❑ Other (specify) (QTY)

MISC
- ❑ Vermiculite
- ❑ Asbestos Soil PLM (Qual) PLM (Quan) PLM/TEM (Qual) PLM/TEM (Quan)

*It is recommended that blank samples be submitted with all air and surface samples

TEM Bulk
- ❑ ELAP 198.4/Chatfield (QTY)
- ❑ NY State PLM/TEM (QTY)
- ❑ Residual Ash (QTY)

TEM Dust*
- ❑ Qual. (pres/abs) Vacuum/Dust (QTY)
- ❑ Quan. (s/area) Vacuum D5755-95 (QTY)
- ❑ Quan. (s/area)Dust D6480-99 (QTY)

TEM Water
- ❑ Qual. (pres/abs) (QTY)
- ❑ ELAP 198.2/EPA 100.2 (QTY)
- ❑ EPA 100.1 (QTY)

☒ All samples received in good condition unless otherwise noted.
(TEM Water samples °C)

If field data sheets are submitted, there is no need to complete bottom section.

Metals Analysis
- ❑ Pb Paint Chip (QTY)
- ❑ *Pb Dust Wipe (wipe type) (QTY)
- ❑ *Pb Air (QTY)
- ❑ Pb Soil/Solid (QTY)
- ❑ Pb TCLP (QTY)
- ❑ Drinking Water ❑ Pb (QTY) ❑ Cu (QTY) ❑ As (QTY)
- ❑ Waste Water ❑ Pb (QTY) ❑ Cu (QTY) ❑ As (QTY)
- ❑ Pb Furnace (Media) (QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples:
Collection Media
- ❑ *Spore-Trap (QTY) ❑ Surface Vacuum Dust (QTY)
- ❑ *Surface Swab (QTY) ❑ Culturable ID Genus (Media) (QTY)
- ❑ *Surface Tape (QTY) ❑ Culturable ID Species (Media) (QTY)
- ❑ Other (Specify) (QTY

SAMPLE INFORMATION				ANALYSIS					MATRIX							CLIENT CONTACT
CLIENT ID #	SAMPLE LOCATION/ ID	DATE/ TIME	VOL (L)/ Wipe Area	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB	(LABORATORY STAFF ONLY)
																Date/Time: Contact:By:
																Date/Time: Contact:By:
																Date/Time: Contact:By:

	Print Name	Signature	Date	Time
Relinquished by:	Zach King			
Received by:				
Relinquished by:				
Received for Lab by:	ICMAX		9/11/17	1000

Shipping Information
☒ UPS ☐ In-Person ☐ Other
☐ FedEx ☐ Drop Box
☐ USPS ☐ Courrier
Airbill/Tracking No:

AMA

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6601 Kirkville Rd
East Syracuse, NY 13057-9672
Tel: 315-437-5227
888-432-LABS(5227)
Fax: 315-437-0571
www.galsonlabs.com

Check if change of address ☐
New Client ? yes ☐ no ☐

Report To :	**Shelly Krause**	Invoice To :	**Jeanne Glisson**
	SGS Galson Laboratory		SGS Galson Laboratory
	6601 Kirkville Road		6601 Kirkville Road
	East Syracuse, NY 13057		East Syracuse, NY 13057
Phone No. :	888-432-5227	Phone No. :	888-432-5227
		Fax No.	315-437-0571

Site Name : **Project :** L416110 **Sampled By :** Client

Turnaround Time	Due Date
☑ Standard	09/18/17
☐ 4 Business Days	
☐ 3 Business Days	
☐ 2 Business Days	
☐ Next Day by 6pm	
☐ Next Day by Noon	
☐ Same day	

Verbal Authorization : 90734

Credit Card No. : Card Holder Name : Exp. :

Fax Results To : Email Only Please Fax No. : Email Only Please

Email Results To : Syracuse.Subcontracting@sgs.com

Sample Identification	Date Sampled	Collection Medium	*Air Volume (liters)/ Passive Monitors (Min)	Analysis Requested	Method Reference	Specific DL Needed
22152-A7	8/17/2017	25mm MCE PCM	569.9	Transmission Electron Microscopy	NIOSH 7402; TEM	
22152-A8	8/17/2017	25mm MCE PCM	Blank	Transmission Electron Microscopy	NIOSH 7402; TEM	

Comments:

State/Province of sampling event: Toronto

If the method being reported is not on your laboratory's current AIHA scope of accreditation, please state that in your report.
Please provide an uncertainty statement in accordance with AIHA LQAP policy document Section 2A.5.4.3.

Chain of Custody	Print Name	Signature	Date/Time
Relinquished by :	Zach King		9/8/2017 13:46
Received by LAB :			

SGS GALSON

1Z5X626A6948184439
Date:08/19/17
Shipper:UPS
Initials:CEM
Prep:UNKNOWN

☐ New Client?

Report To*: Toronto Transit Commission
1920 Yonge street
Suite 600
Toronto, ON M4S 3E2
Phone No.*: 416-393-6668
Cell No.:

Invoice To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2
Phone No.:
Email:

R50

Client Account No.*:

Email Results To: Virgil.Umali@ttc.ca & oheresults@oheconsultants.com
Email Address:

Purchase Order No.: PU 240835
Credit Card: ☐ Credit Card on File ☐ Call for Credit Card Info

☐ Samples submitted using the FreePumpLoan™ Program.
☐ Samples submitted using the FreeSamplingBadges™ Program.

Need Results By*:	(surcharge)
☒ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%
☐ Next Day by Noon	150%
☐ Same Day	200%

Site Name: Project: 22152 Sampled By: OHE Consultants

Comments:
Please see the attached document for the list of metals to be analyzed.

List description of industry or process/interferences present in sampling area:

State samples were collected in (ex. NY):

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify):

Sample Identification* (Maximum of 20 characters, ID's longer than 20 characters will be abbreviated.)	Date Sampled* (mm/dd/yy)	Collection Medium	Sample Volume, Sample Time, or Sample Area*	Sample Units*: (L, ml, min., in2, cm2, ft2)	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (ex. welding, plating, painting, etc.)*
Example	01/01/11	2pc UW PVC	960 min.	L	Hexavalent Chromium (Cr6)	mod. OSHA ID-215	Welding
22152-A7	08/17/17	25mm PCM	554	569.9	Asbestos	NIOSH 7400 + N7402	per client ZK 9/8/17
22152-A8		25mm PCM	Ø	Ø	Asbestos	NIOSH 7400	
22152-S7		PW PVC in PPI	554	1113.5	Crystalline Silica (all forms)	NIOSH 7500 + Resp.	Dust NIOSH 0600
22152-S8		PW PVC in PPI	Ø	Ø	Crystalline Silica (all forms)	NIOSH 7500 + Resp.	Dust NIOSH 0600
22152-I7		PW PVC in IOM	554	1114.7	Metals (Inhalable)	NIOSH 7300 + Inh.	Dust NIOSH 0500
22152-I8		PW PVC in IOM	Ø	Ø	Metals (Inhalable)	NIOSH 7300 + Inh.	Dust NIOSH 0500
22152-M7		UW MCE in PPI	554	1120.1	Metals (Respirable)	NIOSH 7300	
22152-M8		UW MCE in PPI	Ø	Ø	Metals (Respirable)		
22152-T7		UW MCE	554	1124.1	Metals (Total)		
22152-T8		UW MCE	Ø	Ø	Metals (Total)		

^Galson Laboratories will substitute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ please indicate if the lower LOQ is required (only available for certain analytes see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date/Time		Print Name/Signature	Date/Time
Relinquished by:	Yunny Desiana Lee	Aug 18/17 1:00 PM	Received by:		
Relinquished by:			Received by:	Candace Massurin	08-19-17 11:35

CA

Samples received after 3pm will be considered as next day's business.
*Required fields, failure to complete these fields may result in delay in your samples being processed.

Page 1 of 1

LAB ORIGINAL

Respirable – Aluminum, Cadmium, Iron Oxide, Molybdenum (total), Zinc Oxide

Inhalable – Magnesium Oxide, Molybdenum (total), Nickel – metal, Thallium, Vanadium Pentoxide

Total – Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium Oxide, Chromium III, Cobalt, Copper, Lead, Manganese, Selenium

Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Canada

September 22, 2017

AIHA-LAP #100324 Account# 90734 Login# L417486

Dear Mr. Umali:

Enclosed are the revised analytical results for the samples received by our laboratory on September 02, 2017. Per your request, samples 22152-A9 and 22152-A10 were subcontracted to AMA Analytical Services, Inc. for TEM analysis. Their report is enclosed in its entirety. Please note that this revision cancels and supersedes L417486 (report reference:1) dated September 11, 2017 issued by SGS Galson Laboratories. All test results meet the quality control requirements of AIHA-LAP and NELAC unless otherwise stated in this report. All samples on the chain of custody were received in good condition unless otherwise noted.

Results in this report are based on the sampling data provided by the client and refer only to the samples as they were received at the laboratory.

To ensure the safety of laboratory receiving personnel, always seal bulk samples securely to prevent possible escape of material.
Current Scopes of Accreditation can be viewed at www.galsonlabs.com in the accreditations section under the "about Galson" tab.

Please contact Katrina Ahchong at (888) 432-5227, if you would like any additional information regarding this report. Thank you for using SGS Galson Laboratories.

Sincerely,

SGS Galson Laboratories

Lisa Swab
Laboratory Director

Enclosure(s)

Galson Laboratories, Inc. is now a part of SGS, the world's leading inspection, verification, testing, and certification company. As part of our transition to SGS, you will begin to see some formatting changes with reports that will improve the presentation of data and allow for the transition to the new logo.

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 29-AUG-17
Date Received : 02-SEP-17

Account No.: 90734
Login No. : L417486
Date Analyzed : 07-SEP-17
Report ID : 1017257

Client ID : 22152-M9 **Lab ID : L417486-7** **Air Volume : 800.8 L**
Date Sampled : 08/29/17 **Date Analyzed : 09/07/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.0094	mg/m3
Cadmium	0.15	<0.15	<0.00019	mg/m3
Iron Oxide	11.	66	0.083	mg/m3
Molybdenum	0.15	<0.15	<0.00019	mg/m3
Zinc Oxide	2.8	<2.8	<0.0035	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 08-SEP-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: SJW
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 29-AUG-17
Date Received : 02-SEP-17

Account No.: 90734
Login No. : L417486

Date Analyzed : 07-SEP-17
Report ID : 1017257

Client ID : 22152-M10 **Lab ID : L417486-8** **Air Volume : NA**
Date Sampled : 08/29/17 **Date Analyzed : 09/07/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 08-SEP-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: SJW
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 29-AUG-17
Date Received : 02-SEP-17

Account No.: 90734
Login No. : L417486

Date Analyzed : 07-SEP-17
Report ID : 1017257

Client ID : 22152-T9 **Lab ID : L417486-9** **Air Volume : 808.1 L**
Date Sampled : 08/29/17 **Date Analyzed : 09/07/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.0011	mg/m3
Arsenic	0.30	<0.30	<0.00037	mg/m3
Barium	0.15	3.3	0.0041	mg/m3
Beryllium	0.15	<0.15	<0.00019	mg/m3
Cadmium	0.15	<0.15	<0.00019	mg/m3
Calcium Oxide	100.	<100	<0.13	mg/m3
Chromium	7.5	<7.5	<0.0093	mg/m3
Cobalt	0.45	<0.45	<0.00056	mg/m3
Copper	0.30	0.51	0.00063	mg/m3
Lead	0.38	<0.38	<0.00046	mg/m3
Manganese	0.15	0.80	0.00099	mg/m3
Selenium	2.3	<2.3	<0.0028	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 08-SEP-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: SJW
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 29-AUG-17
Date Received : 02-SEP-17

Account No.: 90734
Login No. : L417486
Date Analyzed : 07-SEP-17
Report ID : 1017257

Client ID : 22152-T10 **Lab ID : L417486-10** **Air Volume : NA**
Date Sampled : 08/29/17 **Date Analyzed : 09/07/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.30	<0.30	NA	mg/m3
Barium	0.15	<0.15	NA	mg/m3
Beryllium	0.15	<0.15	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.45	<0.45	NA	mg/m3
Copper	0.30	<0.30	NA	mg/m3
Lead	0.38	<0.38	NA	mg/m3
Manganese	0.15	<0.15	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 08-SEP-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: SJW
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 29-AUG-17
Date Received : 02-SEP-17

Account No.: 90734
Login No. : L417486

Date Analyzed : 07-SEP-17
Report ID : 1017203

Client ID : 22152-I9 **Lab ID : L417486-5** **Air Volume : 805.7 L**
Date Sampled : 08/29/17 **Date Analyzed : 09/07/17**

Parameter	LOQ ug	Total ug	Conc	Units
Magnesium Oxide	12.	<12	<0.015	mg/m3
Molybdenum	0.15	0.33	0.00041	mg/m3
Nickel	0.30	<0.30	<0.00037	mg/m3
Thallium	1.5	<1.5	<0.0019	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.0010	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 08-SEP-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: KEG
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 29-AUG-17
Date Received : 02-SEP-17

Account No.: 90734
Login No. : L417486

Date Analyzed : 07-SEP-17
Report ID : 1017203

Client ID : 22152-I10 **Lab ID : L417486-6** **Air Volume : NA**
Date Sampled : 08/29/17 **Date Analyzed : 09/07/17**

Parameter	LOQ ug	Total ug	Conc	Units
Magnesium Oxide	12.	<12	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Nickel	0.30	<0.30	NA	mg/m3
Thallium	1.5	<1.5	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 08-SEP-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: KEG
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 29-AUG-17
Date Received : 02-SEP-17

Account No.: 90734
Login No. : L417486
Date Analyzed : 08-SEP-17
Report ID : 1017304

Asbestos Fiber Count (A Rules)

	Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
+	22152-A9	L417486-1	13.5/100	17.2	6622	403,600	0.016
	22152-A10	L417486-2	0/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : BTM
Approved by : BDB
Date : 11-SEP-17
QC by: CRD
Supervisor: BDB

< -Less Than
> -Greater Than
ND -Not Detected
NA -Not Applicable
cc -Cubic Centimeters
NS -Not Specified
mm2 -Square millimeters

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 29-AUG-17
Date Received : 02-SEP-17

Account No.: 90734
Login No. : L417486
Date Analyzed : 06-SEP-17
Report ID : 1016675

Inhalable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-I9	L417486-5	805.7	0.21	0.25
22152-I10	L417486-6	NA	<0.10	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.10 mg
Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV
OSHA PEL : NA
Collection Media : IOM 25mm PW PVC

Submitted by: NRH
Approved by : SPR
Date : 06-SEP-17
Supervisor: KRK

NYS DOH # : 11626
QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 29-AUG-17
Date Received : 02-SEP-17

Account No.: 90734
Login No. : L417486
Date Analyzed : 06-SEP-17
Report ID : 1016676

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-S9	L417486-3	808.7	0.11	0.14
22152-S10	L417486-4	NA	<0.050	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg
Analytical Method : mod. NIOSH 0600; Gravimetric
OSHA PEL : PNOR 5 mg/m3 (TWA)
Collection Media : PVC PW 37mm

Submitted by: PAH/HVN
Approved by : SPR
Date : 06-SEP-17
Supervisor: KRK

NYS DOH # : 11626
QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 29-AUG-17
Date Received : 02-SEP-17

Account No.: 90734
Login No. : L417486
Date Analyzed : 06-SEP-17 - 09-SEP-17
Report ID : 1017333

Respirable Crystalline Silica (RCS): Quartz, Cristobalite, Tridymite

Sample ID	Lab ID	Analyte	Air Vol l	ug	ug/m3
22152-S9	L417486-3	Quartz	808.7	<5.0	<6.2
		Cristobalite	808.7	<5.0	<6.2
		Tridymite	808.7	<20	<25
		RCS	808.7	<5.0	<6.2
22152-S10	L417486-4	Quartz	NA	<5.0	NA
		Cristobalite	NA	<5.0	NA
		Tridymite	NA	<20	NA
		RCS	NA	<5.0	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: Q:5.0ug C:5.0ug T:20.ug
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD
OSHA PEL : 50 ug/m3 RCS
Collection Media : PVC PW 37mm

Submitted: CMR
Approved: KRK
Date : 11-SEP-17 NYS DOH # : 11626
Supervisor: KRK QC by: CRD

< -Less Than	mg -Milligrams	kg -Kilograms	ppm -Parts per Million
> -Greater Than	ug -Micrograms	m3 -Cubic Meters	NS -Not Specified
NA -Not Applicable	ND -Not Detected	l -Liters	mppcf -Million Particles per Cubic Foot

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 29-AUG-17 Account No.: 90734
Date Received: 02-SEP-17 Login No. : L417486
Date Analyzed: 06-SEP-17 - 09-SEP-17

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L417486 (Report ID: 1017203):
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: im-mwvfilt(28), MT-SOP-21(9)
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3; as Fume, Ceiling = 0.1 mg/m3.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
TLV for Vanadium pentoxide: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for Magnesium Oxide: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 29-AUG-17 Account No.: 90734
Date Received: 02-SEP-17 Login No. : L417486
Date Analyzed: 06-SEP-17 - 09-SEP-17

L417486 (Report ID: 1017203):

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Magnesium Oxide	+/-9.1%	102%
Molybdenum	+/-10.3%	99.4%
Nickel	+/-10%	103%
Thallium	+/-6.6%	99.5%
Vanadium Pentoxide	+/-9.1%	102%

Parameter	Method	PEL
Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	See footnote

L417486 (Report ID: 1017257):

TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for COBALT: 0.02 mg/m3
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for Calcium Oxide: 2 mg/m3
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3
TLV for SELENIUM: 0.2 mg/m3
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for CHROMIUM: 0.5 mg/m3

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 29-AUG-17 Account No.: 90734
Date Received: 02-SEP-17 Login No. : L417486
Date Analyzed: 06-SEP-17 - 09-SEP-17

L417486 (Report ID: 1017257):
TLV for IRON OXIDE: 5 mg/m3
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(32), im-mwvfilt(28)
PEL listed refers to Aluminum as total dust.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.

L417486 (Report ID: 1017257):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-7.7%	96.9%
Antimony	+/-9.8%	97.3%
Arsenic	+/-7.6%	103%
Barium	+/-6.5%	101%
Beryllium	+/-10.8%	103%
Cadmium	+/-8.6%	102%
Calcium Oxide	+/-10.6%	105%
Chromium	+/-11.2%	103%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 29-AUG-17 Account No.: 90734
Date Received: 02-SEP-17 Login No. : L417486
Date Analyzed: 06-SEP-17 - 09-SEP-17

Cobalt	+/-8.5%	103%
Copper	+/-10.3%	103%
Iron Oxide	+/-9.6%	106%
Lead	+/-9.1%	100%
Manganese	+/-8.3%	99.8%
Molybdenum	+/-7.6%	100%
Selenium	+/-11.6%	105%
Zinc Oxide	+/-8.9%	102%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)
Chromium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Selenium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

+L417486-1 (Report ID: 1017304):
The sample results may have a negative bias; the filter surface was covered by fine particulate that may have obscured fibers.

L417486 (Report ID: 1017304):
SOPs: ia-pcm(26)

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 29-AUG-17 Account No.: 90734
Date Received: 02-SEP-17 Login No. : L417486
Date Analyzed: 06-SEP-17 - 09-SEP-17

L417486 (Report ID: 1017304):
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a greater than optimal variability and are probably biased.
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as follows:
0.154 (5-20 fibers/100 fields)
0.100 (>20-50 fibers/100 fields)
0.069 (>50-100 fibers/100 fields)
0.090 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take into account any uncertainty associated with the sampling process.

L417486 (Report ID: 1016675):
SOPs: GRAV-SOP-8(17)
Gravimetric analytical accuracy of the sampling media is -0.001 +/- 0.030 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.

L417486 (Report ID: 1016676):
TLV for RESPIRABLE DUST: NA
SOPs: GRAV-SOP-5(18), GRAV-SOP-6(17)
Gravimetric analytical accuracy of the sampling media is 0.002 +/- 0.018 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.
PNOR = Particulates Not Otherwise Regulated.

L417486 (Report ID: 1017333):
TLV for QUARTZ: 0.025 mg/m3 Respirable
TLV for TRIDYMITE: NA
TLV for CRISTOBALITE: 0.025 mg/m3 Respirable
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26)

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 29-AUG-17 Account No.: 90734
Date Received: 02-SEP-17 Login No. : L417486
Date Analyzed: 06-SEP-17 - 09-SEP-17

L417486 (Report ID: 1017333):

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-10.3%	102%
Quartz	+/-10.9%	93.4%
Tridymite	+/-13.6%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

NVLAP®
Lab Code 101143-0
NY ELAP
Lab ID 10920

Chain of Custody: 602243
Client: Galson Laboratories
Address: 6601 Kirkville Road
East Syracuse, NY 13057-9672
Attention: Pam Weaver

Job Name: Not Provided
Job Location: Not Provided
Job Number: L417486
P.O. Number: 90734

Date Submitted: 09/14/2017
Date Analyzed: 09/21/2017
Report Date: 09/21/2017
Date Sampled: Not Provided
Person Submitting: Cameron Kennedy

Summary of Transmission Electron Microscopy

Filter Type: MCE **Pore Size:** 0.8 um **Filter Size:** 25 mm (385 mm²)

AMA Sample Number	Client Sample Number	Volume (L)	Area Analyzed (mm²)	Analytical Sensitivity f/cc	Asbestos Type Amount	# Non Asbestos Structures	Concentration f/mm²	Concentration f/cc	Fraction	Sample Type	Comments
602243-1	22152-A9	403.6	0.532	0.0018	0	0	<8	<0.0072		N/P	
602243-2	22152-A10		0.532		0	0	<8			BLK	

Analytical procedures used meet or exceed NIOSH 7402 protocols.

** - To calculate the asbestos concentration of the PCM result multiply the original PCM result by the fraction.

All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

Analyst(s): Izabelle Mendez

Technical Director Andreas Saldivar

4475 Forbes Blvd. · Lanham, MD, 20706 · (301) 459-2640 · Toll Free (800) 346-0961 · Fax (301) 459-2643

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CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 602243

Mailing/Billing Information:
1. Client Name: GALSON
2. Address 1:
3. Address 2:
4. Address 3:
5. Phone #: Fax #:

Submittal Information:
1. Job Name:
2. Job Location:
3. Job #: L417486 P.O. #: 90734
4. Contact Person: PAM WEAVER Cell:
5. Collected by: Cell:

Reporting Info (Results provided as soon as technically feasible). If no TAT/Reporting Info is provided, AMA will assign defaults of 5-Day and email/fax to contacts on file.

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
☐ 4 Hours ☐ Immediate Date Due: ☐ 24 Hours Time Due: Comments:	☐ 4 Hours ☐ Same Day ☐ Next Day ☐ 2 Day ☐ 3 Day ☒ 5 Day + Date Due: 9/21/17 ☐ Results Required By Noon	☐ Email: ☐ Email 2: ☐ Verbals:

Asbestos Analysis
*PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 (QTY)
☐ Fiberglass (QTY)
TEM Air* – Please Indicate Filter Type:
☐ AHERA (QTY)
☒ NIOSH 7402 2 (QTY)
☐ Other (specify) (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate (QTY) ☐ Pos Stop
☐ EPA Point Count (QTY)
☐ NY State Friable 198.1 (QTY)
☐ Grav. Reduction ELAP 198.6 (QTY)
☐ Other (specify) (QTY)
MISC
☐ Vermiculite
☐ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)
*It is recommended that blank samples be submitted with all air and surface samples

TEM Bulk
☐ ELAP 198.4/Chatfield (QTY)
☐ NY State PLM/TEM (QTY)
☐ Residual Ash (QTY)
TEM Dust*
☐ Qual. (pres/abs) Vacuum/Dust (QTY)
☐ Quan. (s/area) Vacuum D5755-95 (QTY)
☐ Quan. (s/area)Dust D6480-99 (QTY)
TEM Water
☐ Qual. (pres/abs) (QTY)
☐ ELAP 198.2/EPA 100.2 (QTY)
☐ EPA 100.1 (QTY)

☐ All samples received in good condition unless otherwise noted. (TEM Water samples ___ °C)

If field data sheets are submitted, there is no need to complete bottom section.

Metals Analysis
☐ Pb Paint Chip (QTY)
☐ *Pb Dust Wipe (wipe type) (QTY)
☐ *Pb Air (QTY)
☐ Pb Soil/Solid (QTY)
☐ Pb TCLP (QTY)
☐ Drinking Water ☐ Pb (QTY) ☐ Cu (QTY) ☐ As (QTY)
☐ Waste Water ☐ Pb (QTY) ☐ Cu (QTY) ☐ As (QTY)
☐ Pb Furnace (Media) (QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples:
Collection Media
☐ *Spore-Trap (QTY) ☐ Surface Vacuum Dust (QTY)
☐ *Surface Swab (QTY) ☐ Culturable ID Genus (Media) (QTY)
☐ *Surface Tape (QTY) ☐ Culturable ID Species (Media) (QTY)
☐ Other (Specify) (QTY)

SAMPLE INFORMATION / ANALYSIS / MATRIX

CLIENT ID #	SAMPLE LOCATION/ ID	DATE/ TIME	VOL (L)/ Wipe Area	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB
				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

CLIENT CONTACT (LABORATORY STAFF ONLY)
Date/Time: Contact:By:
Date/Time: Contact:By:
Date/Time: Contact:By:

	Print Name	Signature	Date	Time
Relinquished by:	CAMERMON KENNEDY			
Received by:				
Relinquished by:				
Received for Lab by:	KMAX	[signature]	9/14/17	1030

Shipping Information
☒ UPS ☐ In-Person ☐ Other
☐ FedEx ☐ Drop Box
☐ USPS ☐ Courrier
Airbill/Tracking No:

AMA

GALSON LABORATORIES
6601 Kirkville Rd
East Syracuse, NY 13057-9672
Tel: 315-437-5227
888-432-LABS(5227)
Fax: 315-437-0571
www.galsonlabs.com

Check if change of address ☐
New Client ? yes ☐ no ☐

Report To :	Shelly Krause	Invoice To :	Jeanne Glisson
	SGS Galson Laboratory		SGS Galson Laboratory
	6601 Kirkville Road		6601 Kirkville Road
	East Syracuse, NY 13057		East Syracuse, NY 13057
Phone No. :	888-432-5227	Phone No. :	888-432-5227
		Fax No.	315-437-0571

Site Name : Project : L417486 Sampled By : Client

Turnaround Time	Due Date
☑ Standard	09/21/17
☐ 4 Business Days	
☐ 3 Business Days	
☐ 2 Business Days	
☐ Next Day by 6pm	
☐ Next Day by Noon	
☐ Same day	

Verbal Authorization : 90734

Credit Card No. : Card Holder Name : Exp. :

Fax Results To : Email Only Please Fax No. : Email Only Please

Email Results To : Syracuse.Subcontracting@sgs.com

Sample Identification	Date Sampled	Collection Medium	*Air Volume (liters)/ Passive Monitors (Min)	Analysis Requested	Method Reference	Fibers/Fields
22152-A9	8/29/2017	25mm MCE PCM	403.6	Transmission Electron Microscopy	NIOSH 7402; TEM	13.5/100
22152-A10	8/29/2017	25mm MCE PCM	BLANK	Transmission Electron Microscopy	NIOSH 7402; TEM	0/100

Comments:

State/Province of sampling event:

If the method being reported is not on your laboratory's current AIHA scope of accreditation, please state that in your report.
Please provide an uncertainty statement in accordance with AIHA LQAP policy document Section 2A.5.4.3.

Chain of Custody	Print Name	Signature	Date/Time
Relinquished by :	Cameron Kennedy		09/13/17 1038
Received by LAB :			

SGS GALSON

1Z5X626A6947465093
Date:09/02/17
Shipper:UPS
Initials:GMB
Prep:UNKNOWN
L417486

☐ New Client?

Report To*: Toronto Transit Commission
1920 Yonge Street
Client Account No.*: Suite 600 R65
Toronto, ON M4S 3E2
Phone No.*: 416-393-6668
Cell No.:
Email Results To: Virgil.Umali@ttc.ca & theresults@ohecnsultants.com
Email Address:

Invoice To*: Toronto Transit Commission
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Phone No.:
Email:
Purchase Order No.: PU 240835
Credit Card: ☐ Credit Card on File ☐ Call for Credit Card Info

☐ Samples submitted using the FreePumpLoan™ Program.
☐ Samples submitted using the FreeSamplingBadges™ Program.

Need Results By*:	(surcharge)
☒ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%
☐ Next Day by Noon	150%
☐ Same Day	200%

Site Name: Project: 22152 Sampled By: OHE Consultants

Comments:

List description of industry or process/interferences present in sampling area:

State samples were collected in (ex. NY):

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify):

Sample Identification* (Maximum of 20 characters, ID's longer than 20 characters will be abbreviated.)	Date Sampled* (mm/dd/yy)	Collection Medium	Sample Volume / Sample Time, or Sample Area*	Sample Units*: (L) ml, min., in2, cm2, ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (ex. welding, plating, painting, etc.)*
Example	01/01/11	2pc UW PVC	960	L	Hexavalent Chromium (Cr6)	mod. OSHA ID-215	Welding
22152-A9	08/29/17	25mm PCM	403.6	L	Asbestos + TEM	NIOSH 7400	for chest
22152-A10		25mm PCM	Ø		Asbestos ↓	NIOSH 7400	TK 9/17/17
22152-S9		PW PVC in PPI	808.7		Crystalline Silica (All forms)	NIOSH 7500 + NIOSH 0600 (Resp. Dust)	
22152-S10		PW PVC in PPI	Ø		Crystalline Silica (All forms)	NIOSH 7500 + NIOSH 0600 (Resp. Dust)	
22152-I9		PW PVC in Jam	805.7		Metals (Inhalable)	NIOSH 7300 + NIOSH 0500 (Inh. Dust)	
22152-I10		PW PVC in Jam	Ø		Metals (Inhalable)	NIOSH 7300 + NIOSH 0500 (Inh. Dust)	
22152-M9		MCE in PPI	800.8		Metals (Respirable)	NIOSH 7300	
22152-M10		MCE in PPI	Ø		Metals (Respirable)	NIOSH 7300	
22152-T9		MCE	808.1		Metals (total)	NIOSH 7300	
22152-T10	↓	MCE	Ø	↓	Metals (total)	NIOSH 7300	

^Galson Laboratories will substitute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ please indicate if the lower LOQ is required (only available for certain analytes see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date/Time		Print Name/Signature	Date/Time
Relinquished by:	ROMAN MATHEVET		Received by:		9/1/17 1:32
Relinquished by:		9/1/17 6:00	Received by:	Gretchen Blanding	9/2/17 1130

Samples received after 3pm will be considered as next day's business.
*Required fields, failure to complete these fields may result in a delay in your samples being processed.

Respirable – Aluminum, Cadmium, Iron Oxide, Molybdenum (total), Zinc Oxide

Inhalable – Magnesium Oxide, Molybdenum (total), Nickel – metal, Thallium, Vanadium Pentoxide

Total – Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium Oxide, Chromium III, Cobalt, Copper, Lead, Manganese, Selenium

Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Canada

September 22, 2017

AIHA-LAP #100324 Account# 90734 Login# L417478

Dear Mr. Umali:

Enclosed are the revised analytical results for the samples received by our laboratory on September 02, 2017. Per your request, samples 22152-A11 and 22152-A12 were subcontracted to AMA Analytical Services, Inc. Please note that this revision cancels and supersedes L417478 (report reference:1) dated September 11, 2017 issued by SGS Galson Laboratories. All test results meet the quality control requirements of AIHA-LAP and NELAC unless otherwise stated in this report. All samples on the chain of custody were received in good condition unless otherwise noted.

Results in this report are based on the sampling data provided by the client and refer only to the samples as they were received at the laboratory.

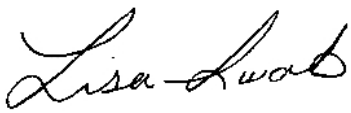
To ensure the safety of laboratory receiving personnel, always seal bulk samples securely to prevent possible escape of material. Also, please double-bag bulk samples individually prior to shipping. Samples not received in this manner will be noted on the chain of custody form.

Current Scopes of Accreditation can be viewed at www.galsonlabs.com in the accreditations section under the "about Galson" tab.

Please contact Katrina Ahchong at (888) 432-5227, if you would like any additional information regarding this report. Thank you for using SGS Galson Laboratories.

Sincerely,

SGS Galson Laboratories



Lisa Swab
Laboratory Director

Enclosure(s)

Galson Laboratories, Inc. is now a part of SGS, the world's leading inspection, verification, testing, and certification company. As part of our transition to SGS, you will begin to see some formatting changes with reports that will improve the presentation of data and allow for the transition to the new logo.

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6601 Kirkville Road
East Syracuse, NY 13057
(315) 432-5227
FAX: (315) 437-0571
www.galsonlabs.com

LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 31-AUG-17
Date Received : 02-SEP-17

Account No.: 90734
Login No. : L417478

Date Analyzed : 07-SEP-17 - 08-SEP-17
Report ID : 1017255

Client ID : 22152-M11 **Lab ID : L417478-7** **Air Volume : 758.5 L**
Date Sampled : 08/31/17 **Date Analyzed : 09/07/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.0099	mg/m3
Cadmium	0.15	<0.15	<0.00020	mg/m3
Iron Oxide	11.	140	0.19	mg/m3
Molybdenum	0.15	<0.15	<0.00020	mg/m3
Zinc Oxide	2.8	<2.8	<0.0037	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 08-SEP-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: SJW
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 31-AUG-17
Date Received : 02-SEP-17

Account No.: 90734
Login No. : L417478

Date Analyzed : 07-SEP-17 - 08-SEP-17
Report ID : 1017255

Client ID : 22152-M12 **Lab ID : L417478-8** **Air Volume : NA**
Date Sampled : 08/31/17 **Date Analyzed : 09/07/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 08-SEP-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: SJW
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 31-AUG-17
Date Received : 02-SEP-17

Account No.: 90734
Login No. : L417478

Date Analyzed : 07-SEP-17 - 08-SEP-17
Report ID : 1017255

Client ID : 22152-T11 **Lab ID : L417478-9** **Air Volume : 757.5 L**
Date Sampled : 08/31/17 **Date Analyzed : 09/07/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.0012	mg/m3
Arsenic	0.30	<0.30	<0.00040	mg/m3
Barium	0.15	11	0.015	mg/m3
Beryllium	0.15	<0.15	<0.00020	mg/m3
Cadmium	0.15	<0.15	<0.00020	mg/m3
Calcium Oxide	100.	<100	<0.14	mg/m3
Chromium	7.5	<7.5	<0.0099	mg/m3
Cobalt	0.45	<0.45	<0.00059	mg/m3
Copper	0.30	0.96	0.0013	mg/m3
Lead	0.38	<0.38	<0.00050	mg/m3
Manganese	0.15	1.6	0.0021	mg/m3
Selenium	2.3	<2.3	<0.0030	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 08-SEP-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: SJW
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 31-AUG-17
Date Received : 02-SEP-17

Account No.: 90734
Login No. : L417478

Date Analyzed : 07-SEP-17 - 08-SEP-17
Report ID : 1017255

Client ID : 22152-T12 **Lab ID : L417478-10** **Air Volume : NA**
Date Sampled : 08/31/17 **Date Analyzed : 09/07/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.30	<0.30	NA	mg/m3
Barium	0.15	<0.15	NA	mg/m3
Beryllium	0.15	<0.15	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.45	<0.45	NA	mg/m3
Copper	0.30	<0.30	NA	mg/m3
Lead	0.38	<0.38	NA	mg/m3
Manganese	0.15	<0.15	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 08-SEP-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: SJW
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 31-AUG-17
Date Received : 02-SEP-17

Account No.: 90734
Login No. : L417478
Date Analyzed : 07-SEP-17 - 08-SEP-17
Report ID : 1017199

Client ID : 22152-I11 **Lab ID : L417478-5** **Air Volume : 754.7 L**
Date Sampled : 08/31/17 **Date Analyzed : 09/08/17**

Parameter	LOQ ug	Total ug	Conc	Units
Magnesium Oxide	12.	<12	<0.016	mg/m3
Molybdenum	0.15	<0.15	<0.00020	mg/m3
Nickel	0.30	<0.30	<0.00040	mg/m3
Thallium	1.5	<1.5	<0.0020	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.0011	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 08-SEP-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: KEG
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 31-AUG-17
Date Received : 02-SEP-17

Account No.: 90734
Login No. : L417478
Date Analyzed : 07-SEP-17 - 08-SEP-17
Report ID : 1017199

Client ID : 22152-I12 **Lab ID : L417478-6** **Air Volume : NA**
Date Sampled : 08/31/17 **Date Analyzed : 09/08/17**

Parameter	LOQ ug	Total ug	Conc	Units
Magnesium Oxide	12.	<12	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Nickel	0.30	<0.30	NA	mg/m3
Thallium	1.5	<1.5	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 08-SEP-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: KEG
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

LABORATORY ANALYSIS REPORT

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East Syracuse, NY 13057
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Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 31-AUG-17
Date Received : 02-SEP-17

Account No.: 90734
Login No. : L417478
Date Analyzed : 08-SEP-17
Report ID : 1017303

Asbestos Fiber Count (A Rules)

	Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
+	22152-A11	L417478-1	18/100	22.9	8817	380,040	0.023
	22152-A12	L417478-2	1.5/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : BTM
Approved by : BDB
Date : 11-SEP-17
QC by: CRD
Supervisor: BDB

< -Less Than > -Greater Than ND -Not Detected
NA -Not Applicable cc -Cubic Centimeters NS -Not Specified
mm2 -Square millimeters

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East Syracuse, NY 13057
(315) 432-5227
FAX: (315) 437-0571
www.galsonlabs.com

LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 31-AUG-17
Date Received : 02-SEP-17

Account No.: 90734
Login No. : L417478
Date Analyzed : 06-SEP-17
Report ID : 1016672

Inhalable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-I11	L417478-5	754.7	0.48	0.63
22152-I12	L417478-6	NA	<0.10	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.10 mg
Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV
OSHA PEL : NA
Collection Media : IOM 25mm PW PVC

Submitted by: NRH
Approved by : SPR
Date : 06-SEP-17
Supervisor: KRK

NYS DOH # : 11626
QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

SGS GALSON

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East Syracuse, NY 13057
(315) 432-5227
FAX: (315) 437-0571
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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 31-AUG-17
Date Received : 02-SEP-17

Account No.: 90734
Login No. : L417478
Date Analyzed : 06-SEP-17
Report ID : 1016673

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-S11	L417478-3	758.6	0.067	0.088
22152-S12	L417478-4	NA	<0.050	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg
Analytical Method : mod. NIOSH 0600; Gravimetric
OSHA PEL : PNOR 5 mg/m3 (TWA)
Collection Media : PVC PW 37mm

Submitted by: HVN
Approved by : SPR
Date : 06-SEP-17
Supervisor: KRK

NYS DOH # : 11626
QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 31-AUG-17
Date Received : 02-SEP-17

Account No.: 90734
Login No. : L417478
Date Analyzed : 06-SEP-17 - 10-SEP-17
Report ID : 1017526

Respirable Crystalline Silica (RCS): Quartz, Cristobalite, Tridymite

Sample ID	Lab ID	Analyte	Air Vol l	ug	ug/m3
22152-S11	L417478-3	Quartz	758.6	<5.0	<6.6
		Cristobalite	758.6	<5.0	<6.6
		Tridymite	758.6	<20	<26
		RCS	758.6	<5.0	<6.6
22152-S12	L417478-4	Quartz	NA	<5.0	NA
		Cristobalite	NA	<5.0	NA
		Tridymite	NA	<20	NA
		RCS	NA	<5.0	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: Q:5.0ug C:5.0ug T:20.ug
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD
OSHA PEL : 50 ug/m3 RCS
Collection Media : PVC PW 37mm

Submitted: AJD
Approved: KRK
Date : 11-SEP-17 NYS DOH # : 11626
Supervisor: KRK QC by: CRD

< -Less Than
> -Greater Than
NA -Not Applicable
mg -Milligrams
ug -Micrograms
ND -Not Detected
kg -Kilograms
m3 -Cubic Meters
l -Liters
ppm -Parts per Million
NS -Not Specified
mppcf -Million Particles per Cubic Foot

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 31-AUG-17 Account No.: 90734
Date Received: 02-SEP-17 Login No. : L417478
Date Analyzed: 06-SEP-17 - 10-SEP-17

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L417478 (Report ID: 1017199):
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: im-mwvfilt(28), MT-SOP-21(9)
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3; as Fume, Ceiling = 0.1 mg/m3.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
TLV for Vanadium pentoxide: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for Magnesium Oxide: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 31-AUG-17 Account No.: 90734
Date Received: 02-SEP-17 Login No. : L417478
Date Analyzed: 06-SEP-17 - 10-SEP-17

L417478 (Report ID: 1017199):

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Magnesium Oxide	+/-9.1%	102%
Molybdenum	+/-10.3%	99.4%
Nickel	+/-10%	103%
Thallium	+/-6.6%	99.5%
Vanadium Pentoxide	+/-9.1%	102%

Parameter	Method	PEL
Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	See footnote

L417478 (Report ID: 1017255):

TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for COBALT: 0.02 mg/m3
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for Calcium Oxide: 2 mg/m3
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3
TLV for SELENIUM: 0.2 mg/m3
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for CHROMIUM: 0.5 mg/m3

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 31-AUG-17 Account No.: 90734
Date Received: 02-SEP-17 Login No. : L417478
Date Analyzed: 06-SEP-17 - 10-SEP-17

L417478 (Report ID: 1017255):
TLV for IRON OXIDE: 5 mg/m3
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(32), im-mwvfilt(28)
PEL listed refers to Aluminum as total dust.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.

L417478 (Report ID: 1017255):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-7.7%	96.9%
Antimony	+/-9.8%	97.3%
Arsenic	+/-7.6%	103%
Barium	+/-6.5%	101%
Beryllium	+/-10.8%	103%
Cadmium	+/-8.6%	102%
Calcium Oxide	+/-10.6%	105%
Chromium	+/-11.2%	103%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
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Date Received: 02-SEP-17 Login No. : L417478
Date Analyzed: 06-SEP-17 - 10-SEP-17

Cobalt	+/-8.5%	103%
Copper	+/-10.3%	103%
Iron Oxide	+/-9.6%	106%
Lead	+/-9.1%	100%
Manganese	+/-8.3%	99.8%
Molybdenum	+/-7.6%	100%
Selenium	+/-11.6%	105%
Zinc Oxide	+/-8.9%	102%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)
Chromium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Selenium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

+L417478-1 (Report ID: 1017303):
The sample results may have a negative bias; the filter surface was covered by fine particulate that may have obscured fibers.

L417478 (Report ID: 1017303):
SOPs: ia-pcm(26)

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
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Date Sampled : 31-AUG-17 Account No.: 90734
Date Received: 02-SEP-17 Login No. : L417478
Date Analyzed: 06-SEP-17 - 10-SEP-17

L417478 (Report ID: 1017303):
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a greater than optimal variability and are probably biased.
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as follows:
0.154 (5-20 fibers/100 fields)
0.100 (>20-50 fibers/100 fields)
0.069 (>50-100 fibers/100 fields)
0.090 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take into account any uncertainty associated with the sampling process.

L417478 (Report ID: 1016672):
SOPs: GRAV-SOP-8(17)
Gravimetric analytical accuracy of the sampling media is -0.001 +/- 0.030 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.

L417478 (Report ID: 1016673):
TLV for RESPIRABLE DUST: NA
SOPs: GRAV-SOP-5(18), GRAV-SOP-6(17)
Gravimetric analytical accuracy of the sampling media is 0.002 +/- 0.018 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.
PNOR = Particulates Not Otherwise Regulated.

L417478-4 (Report ID: 1016673):
Filter received torn at the laboratory.

L417478 (Report ID: 1017526):
TLV for QUARTZ: 0.025 mg/m3 Respirable
TLV for TRIDYMITE: NA
TLV for CRISTOBALITE: 0.025 mg/m3 Respirable
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26)

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 31-AUG-17 Account No.: 90734
Date Received: 02-SEP-17 Login No. : L417478
Date Analyzed: 06-SEP-17 - 10-SEP-17

L417478-4 (Report ID: 1017526):
Filter received torn at the laboratory.

L417478 (Report ID: 1017526):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-10.3%	102%
Quartz	+/-10.9%	93.4%
Tridymite	+/-13.6%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

NVLAP®
Lab Code 101143-0
NY ELAP
Lab ID 10920

Chain of Custody: 602242
Client: Galson Laboratories
Address: 6601 Kirkville Road
East Syracuse, NY 13057-9672
Attention: Pam Weaver

Job Name: Not Provided
Job Location: Not Provided
Job Number: L417478
P.O. Number: 90734

Date Submitted: 09/14/2017
Date Analyzed: 09/21/2017
Report Date: 09/21/2017
Date Sampled: 08/31/2017
Person Submitting: N/A

Summary of Transmission Electron Microscopy

Filter Type: MCE **Pore Size:** 0.8 um **Filter Size:** 25 mm (385 mm²)

AMA Sample Number	Client Sample Number	Volume (L)	Area Analyzed (mm²)	Analytical Sensitivity f/cc	Asbestos Type Amount	# Non Asbestos Structures	Concentration f/mm²	Concentration f/cc	Fraction	Sample Type	Comments
602242-1	22152-A11	380.04	0.532	0.0019	0	0	<8	<0.0076		N/P	
602242-2	22152-A12		0.532		0	0	<8			BLK	

Analytical procedures used meet or exceed NIOSH 7402 protocols.

** - To calculate the asbestos concentration of the PCM result multiply the original PCM result by the fraction.

All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

Analyst(s): Izabelle Mendez

Technical Director Andreas Saldivar

4475 Forbes Blvd. · Lanham, MD, 20706 · (301) 459-2640 · Toll Free (800) 346-0961 · Fax (301) 459-2643

AMA Analytical Services, Inc.
Focused on Results www.amalab.com
AIHA-LAP (#100470) NVLAP (#101143-0) NY ELAP (10920)
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(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 602242

Mailing/Billing Information:

1. Client Name: GALSON
2. Address 1:
3. Address 2:
4. Address 3:
5. Phone #: Fax #:

Submittal Information:

1. Job Name:
2. Job Location:
3. Job #: L417478 P.O. #: 90734
4. Contact Person: PAM WEAVER Cell:
5. Collected by: Cell:

Reporting Info (Results provided as soon as technically feasible). If no TAT/Reporting Info is provided, AMA will assign defaults of 5-Day and email/fax to contacts on file.

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
☐ 4 Hours ☐ Immediate Date Due: ☐ 24 Hours Time Due: Comments:	☐ 4 Hours ☐ Same Day ☐ Next Day ☐ 2 Day ☐ 3 Day ☒ 5 Day + Date Due: 9/21/17 ☐ Results Required By Noon	☐ Email: ☐ Email 2: ☐ Verbals:

Asbestos Analysis

*PCM Air – Please Indicate Filter Type:
- ☐ NIOSH 7400 (QTY)
- ☐ Fiberglass (QTY)

TEM Air* – Please Indicate Filter Type:
- ☐ AHERA (QTY)
- ☒ NIOSH 7402 2 (QTY)
- ☐ Other (specify) (QTY)

PLM Bulk
- ☐ EPA 600 – Visual Estimate (QTY) ☐ Pos Stop
- ☐ EPA Point Count (QTY)
- ☐ NY State Friable 198.1 (QTY)
- ☐ Grav. Reduction ELAP 198.6 (QTY)
- ☐ Other (specify) (QTY)

MISC
- ☐ Vermiculite
- ☐ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

*It is recommended that blank samples be submitted with all air and surface samples

TEM Bulk
- ☐ ELAP 198.4/Chatfield (QTY)
- ☐ NY State PLM/TEM (QTY)
- ☐ Residual Ash (QTY)

TEM Dust*
- ☐ Qual. (pres/abs) Vacuum/Dust (QTY)
- ☐ Quan. (s/area) Vacuum D5755-95 (QTY)
- ☐ Quan. (s/area)Dust D6480-99 (QTY)

TEM Water
- ☐ Qual. (pres/abs) (QTY)
- ☐ ELAP 198.2/EPA 100.2 (QTY)
- ☐ EPA 100.1 (QTY)

☑ All samples received in good condition unless otherwise noted. (TEM Water samples ___ °C)

If field data sheets are submitted, there is no need to complete bottom section.

Metals Analysis
- ☐ Pb Paint Chip (QTY)
- ☐ *Pb Dust Wipe (wipe type) (QTY)
- ☐ *Pb Air (QTY)
- ☐ Pb Soil/Solid (QTY)
- ☐ Pb TCLP (QTY)
- ☐ Drinking Water ☐ Pb (QTY) ☐ Cu (QTY) ☐ As (QTY)
- ☐ Waste Water ☐ Pb (QTY) ☐ Cu (QTY) ☐ As (QTY)
- ☐ Pb Furnace (Media) (QTY)

Fungal Analysis

Collection Apparatus for Spore Traps/Air Samples:
Collection Media
- ☐ *Spore-Trap (QTY) ☐ Surface Vacuum Dust (QTY)
- ☐ *Surface Swab (QTY) ☐ Culturable ID Genus (Media) (QTY)
- ☐ *Surface Tape (QTY) ☐ Culturable ID Species (Media) (QTY)
- ☐ Other (Specify) (QTY)

SAMPLE INFORMATION

CLIENT ID #	SAMPLE LOCATION/ ID	DATE/ TIME	VOL (L)/ Wipe Area	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB	CLIENT CONTACT (LABORATORY STAFF ONLY)
				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Date/Time: Contact:By:
				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Date/Time: Contact:By:
				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Date/Time: Contact:By:
				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

	Print Name	Signature	Date	Time
Relinquished by:	CAMERMON KENNEDY			
Received by:				
Relinquished by:				
Received for Lab by:	KMtx	[signature]	9/14/17	1030

Shipping Information
- ☑ UPS ☐ In-Person ☐ Other
- ☐ FedEx ☐ Drop Box
- ☐ USPS ☐ Courrier

Airbill/Tracking No:

AMA

GALSON LABORATORIES
6601 Kirkville Rd
East Syracuse, NY 13057-9672
Tel: 315-437-5227
888-432-LABS(5227)
Fax: 315-437-0571
www.galsonlabs.com

Check if change of address ☐
New Client ? yes ☐ no ☐

Report To :	**Shelly Krause**	Invoice To :	**Jeanne Glisson**
	SGS Galson Laboratory		SGS Galson Laboratory
	6601 Kirkville Road		6601 Kirkville Road
	East Syracuse, NY 13057		East Syracuse, NY 13057
Phone No. :	888-432-5227	Phone No. :	888-432-5227
		Fax No.	315-437-0571

Site Name : **Project :** L417478 **Sampled By :** Client

Turnaround Time	Due Date
☑ Standard	09/21/17
☐ 4 Business Days	
☐ 3 Business Days	
☐ 2 Business Days	
☐ Next Day by 6pm	
☐ Next Day by Noon	
☐ Same day	

Verbal Authorization : 90734

Credit Card No. : Card Holder Name : Exp. :

Fax Results To : Email Only Please Fax No. : Email Only Please

Email Results To : Syracuse.Subcontracting@sgs.com

Sample Identification	Date Sampled	Collection Medium	*Air Volume (liters)/ Passive Monitors (Min)	Analysis Requested	Method Reference	Fibers/Fields
22152-A11	8/31/2017	25mm MCE PCM	380.04	Transmission Electron Microscopy	NIOSH 7402; TEM	18/100
22152-A12	8/31/2017	25mm MCE PCM	BLANK	Transmission Electron Microscopy	NIOSH 7402; TEM	1.5/100

Comments:

State/Province of sampling event:

If the method being reported is not on your laboratory's current AIHA scope of accreditation, please state that in your report.
Please provide an uncertainty statement in accordance with AIHA LQAP policy document Section 2A.5.4.3.

Chain of Custody	Print Name	Signature	Date/Time
Relinquished by :	Cameron Kennedy		09/13/17 1054
Received by LAB :			

SGS GALSON

1Z5X626A6947465093
Date:09/02/17
Shipper:UPS
Initials:GMB
Prep:UNKNOWN
L417478

☐ New Client?

Report To*: Toronto Transit Comission
1920 Yonge St
Suite 601
Toronto, On M4S3E2

Invoice To*:

R50

Client Account No.*:

Phone No.*: 416-393-6668
Phone No.:
Cell No.:
Email:
Email Results To: Virgil.Unali@ttc.ca & OHERefulH@OHE
Purchase Order No.: PW240835
Email Address: consultemy.com
Credit Card: ☐ Credit Card on File ☐ Call for Credit Card Info
☐ Samples submitted using the FreePumpLoan™ Program.
☐ Samples submitted using the FreeSamplingBadges™ Program.

Need Results By*:	(surcharge)
☒ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%
☐ Next Day by Noon	150%
☐ Same Day	200%

Site Name:
Project: 22152
Sampled By: OHE Consultemy
Comments:

List description of industry or process/interferences present in sampling area:

State samples were collected in (ex. NY):

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify):

Sample Identification* (Maximum of 20 characters. ID's longer than 20 characters will be abbreviated.)	Date Sampled* (mm/dd/yy)	Collection Medium	Sample Volume, (Sample Time), or Sample Area*	Sample Units*: L, ml, min., in2, cm2, ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (ex. welding, plating, painting, etc.)*
Example	01/01/11	2pc UW PVC	960	L	Hexavalent Chromium (Cr6)	mod. OSHA ID-215	Welding
22152-A11	08/31/17	25mm PCM	378	380.04	Asbestos +TEM	NIOSH 7400	Paint
22152-A12	↓	25mm PCM	Ø	Ø	Asbestos	↓	TK 9/19/17
22152-S11		PW PVC in PPE	378	758.6	Crystalline silica (all forms)	NIOSH 7500 + NIOSH 0600	Resp Dust
22152-S12		PW PVC in PPE	Ø	Ø	Crystalline silica (all forms)		
22152-T11		PW PVC in IOM	378	754.7	Metals (inhalable)	NIOSH 7300 + Tubul. Dust NIOSH 0500	
22152-T12		PW PVC in IOM	Ø	Ø	Metals (inhalable)	↓	
22152-M11		MW MCE in PPE	378	758.5	Metals (Respirable)	NIOSH 7300	
22152-M12		MW MCE in PPE	Ø	Ø	Metals (Respirable)		
22152-T11		MW MCE	378	757.5	Metals (total)		
22152-T12	↓	MW MCE	Ø	Ø	Metals (total)	↓	

^Galson Laboratories will substitute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ please indicate if the lower LOQ is required (only available for certain analytes see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date/Time		Print Name/Signature	Date/Time
Relinquished by:	LARYSA KOVAROUTSEVA	~~09/01/17~~ 09/01/17	Received by:		9/1/17 5:38 pm
Relinquished by:		9/1/17 9:42	Received by:	Gretchen Blanding	9/2/17 1130

Samples received after 3pm will be considered as next day's business.
*Required fields, failure to complete these fields may result in a delay in your samples being processed.

Respirable – Aluminum, Cadmium, Iron Oxide, Molybdenum (total), Zinc Oxide

Inhalable – Magnesium Oxide, Molybdenum (total), Nickel – metal, Thallium, Vanadium Pentoxide

Total – Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium Oxide, Chromium III, Cobalt, Copper, Lead, Manganese, Selenium

Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St., Suite 600
Toronto, ON M4S 3E2
Canada

September 18, 2017

AIHA-LAP #100324 Account# 90734 Login# L418175

Dear Mr. Umali:

Enclosed are the analytical results for the samples received by our laboratory on September 12, 2017. All test results meet the quality control requirements of AIHA-LAP and NELAC unless otherwise stated in this report. All samples on the chain of custody were received in good condition unless otherwise noted.

Results in this report are based on the sampling data provided by the client and refer only to the samples as they were received at the laboratory. Unless otherwise requested, samples for asbestos analysis will be discarded 60 days from the date of this report and all other non-IOM samples will be retained for 14 days following the date of this report (when possible). IOMs will be cleaned & disposed of after seven calendar days.

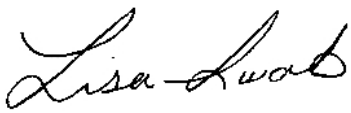
To ensure the safety of laboratory receiving personnel, always seal bulk samples securely to prevent possible escape of material. Also, please double-bag bulk samples individually prior to shipping. Samples not received in this manner will be noted on the chain of custody form.

Current Scopes of Accreditation can be viewed at www.galsonlabs.com in the accreditations section under the "about Galson" tab.

Please contact Katrina Ahchong at (888) 432-5227, if you would like any additional information regarding this report. Thank you for using SGS Galson Laboratories.

Sincerely,

SGS Galson Laboratories



Lisa Swab
Laboratory Director

Enclosure(s)

Galson Laboratories, Inc. is now a part of SGS, the world's leading inspection, verification, testing, and certification company. As part of our transition to SGS, you will begin to see some formattingchanges withreports that will improve the presentation of data and allow for the transition to the new logo.

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East Syracuse, NY 13057
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FAX: (315) 437-0571
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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : NS
Date Received : 12-SEP-17

Account No.: 90734
Login No. : L418175

Date Analyzed : 14-SEP-17
Report ID : 1018454

Client ID : 22152-M13 **Lab ID : L418175-7** **Air Volume : 772.6 L**
Date Sampled : **Date Analyzed : 09/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.0097	mg/m3
Cadmium	0.15	<0.15	<0.00019	mg/m3
Iron Oxide	11.	29	0.037	mg/m3
Molybdenum	0.15	<0.15	<0.00019	mg/m3
Zinc Oxide	2.8	<2.8	<0.0036	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 15-SEP-17

Submitted by: SJW/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : NS
Date Received : 12-SEP-17

Account No.: 90734
Login No. : L418175

Date Analyzed : 14-SEP-17
Report ID : 1018454

Client ID : 22152-M14 **Lab ID : L418175-8** **Air Volume : NA**
Date Sampled : **Date Analyzed : 09/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 15-SEP-17

Submitted by: SJW/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : NS
Date Received : 12-SEP-17

Account No.: 90734
Login No. : L418175

Date Analyzed : 14-SEP-17
Report ID : 1018454

Client ID : 22152-T13 **Lab ID : L418175-9** **Air Volume : 774.0 L**
Date Sampled : **Date Analyzed : 09/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.0012	mg/m3
Arsenic	0.30	<0.30	<0.00039	mg/m3
Barium	0.15	1.2	0.0016	mg/m3
Beryllium	0.15	<0.15	<0.00019	mg/m3
Cadmium	0.15	<0.15	<0.00019	mg/m3
Calcium Oxide	100.	<100	<0.14	mg/m3
Chromium	7.5	<7.5	<0.0097	mg/m3
Cobalt	0.45	<0.45	<0.00058	mg/m3
Copper	0.30	<0.30	<0.00039	mg/m3
Lead	0.38	<0.38	<0.00048	mg/m3
Manganese	0.15	0.27	0.00035	mg/m3
Selenium	2.3	<2.3	<0.0029	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 15-SEP-17

Submitted by: SJW/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : NS
Date Received : 12-SEP-17

Account No.: 90734
Login No. : L418175

Date Analyzed : 14-SEP-17
Report ID : 1018454

Client ID : 22152-T14 **Lab ID : L418175-10** **Air Volume : NA**
Date Sampled : **Date Analyzed : 09/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.30	<0.30	NA	mg/m3
Barium	0.15	<0.15	NA	mg/m3
Beryllium	0.15	<0.15	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.45	<0.45	NA	mg/m3
Copper	0.30	<0.30	NA	mg/m3
Lead	0.38	<0.38	NA	mg/m3
Manganese	0.15	<0.15	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 15-SEP-17

Submitted by: SJW/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : NS
Date Received : 12-SEP-17

Account No.: 90734
Login No. : L418175

Date Analyzed : 14-SEP-17
Report ID : 1018451

Client ID : 22152-I13 **Lab ID : L418175-5** **Air Volume : 776.02 L**
Date Sampled : **Date Analyzed : 09/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Magnesium Oxide	12.	<12	<0.016	mg/m3
Molybdenum	0.15	0.17	0.00021	mg/m3
Nickel	0.30	<0.30	<0.00039	mg/m3
Thallium	1.5	<1.5	<0.0019	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.0010	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PVC
Date : 15-SEP-17

Submitted by: SJW/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : NS
Date Received : 12-SEP-17

Account No.: 90734
Login No. : L418175

Date Analyzed : 14-SEP-17
Report ID : 1018451

Client ID : 22152-I14 **Lab ID : L418175-6** **Air Volume : NA**
Date Sampled : **Date Analyzed : 09/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Magnesium Oxide	12.	<12	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Nickel	0.30	<0.30	NA	mg/m3
Thallium	1.5	<1.5	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PVC
Date : 15-SEP-17

Submitted by: SJW/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : NS
Date Received : 12-SEP-17

Account No.: 90734
Login No. : L418175

Date Analyzed : 14-SEP-17
Report ID : 1018274

Asbestos Fiber Count (A Rules)

Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
22152-A13	L418175-1	7/100	8.9	3427	392,600	0.009
22152-A14	L418175-2	.5/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : BTM
Approved by : BDB
Date : 18-SEP-17
QC by: AMD
Supervisor: BDB

< -Less Than
> -Greater Than
ND -Not Detected
NA -Not Applicable
cc -Cubic Centimeters
NS -Not Specified
mm2 -Square millimeters

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LABORATORY ANALYSIS REPORT

Client	: Toronto Transit Commission Ltd	Account No.:	90734
Site	: NS	Login No. :	L418175
Project No.	: 22152		
Date Sampled	: NS	Date Analyzed :	13-SEP-17
Date Received	: 12-SEP-17	Report ID :	1017840

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-S13	L418175-3	769.2	<0.050	<0.065
22152-S14	L418175-4	NA	<0.050	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg		Submitted by: PAH	
Analytical Method : mod. NIOSH 0600; Gravimetric		Approved by : SPR	
OSHA PEL : PNOR 5 mg/m3 (TWA)		Date : 13-SEP-17	NYS DOH # : 11626
Collection Media : PVC PW 37mm		Supervisor: KRK	QC by: AMD

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable
>	-Greater Than	ug	-Micrograms	l	-Liters	NS -Not Specified	ppm -Parts per Million

ND -Not Detected

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : NS
Date Received : 12-SEP-17

Account No.: 90734
Login No. : L418175

Date Analyzed : 13-SEP-17 - 17-SEP-17
Report ID : 1018863

Respirable Crystalline Silica (RCS): Quartz, Cristobalite, Tridymite

Sample ID	Lab ID	Analyte	Air Vol l	ug	ug/m3
22152-S13	L418175-3	Quartz	769.2	<5.0	<6.5
		Cristobalite	769.2	<5.0	<6.5
		Tridymite	769.2	<20	<26
		RCS	769.2	<5.0	<6.5
22152-S14	L418175-4	Quartz	NA	<5.0	NA
		Cristobalite	NA	<5.0	NA
		Tridymite	NA	<20	NA
		RCS	NA	<5.0	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: Q:5.0ug C:5.0ug T:20.ug
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD
OSHA PEL : 50 ug/m3 RCS
Collection Media : PVC PW 37mm

Submitted: SPR
Approved: KRK
Date : 18-SEP-17 NYS DOH # : 11626
Supervisor: KRK QC by: AMD

< -Less Than
> -Greater Than
NA -Not Applicable
mg -Milligrams
ug -Micrograms
ND -Not Detected
kg -Kilograms
m3 -Cubic Meters
l -Liters
ppm -Parts per Million
NS -Not Specified
mppcf -Million Particles per Cubic Foot

LABORATORY FOOTNOTE REPORT

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled :
Date Received: 12-SEP-17
Date Analyzed: 13-SEP-17 - 17-SEP-17

Account No.: 90734
Login No. : L418175

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L418175 (Report ID: 1018451):
TLV for Vanadium pentoxide: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for Magnesium Oxide: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(32), im-mwvfilt(28)
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3; as Fume, Ceiling = 0.1 mg/m3.

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled :
Date Received: 12-SEP-17
Date Analyzed: 13-SEP-17 - 17-SEP-17

Account No.: 90734
Login No. : L418175

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Magnesium Oxide	+/-9.2%	99.2%
Molybdenum	+/-7.6%	100%
Nickel	+/-8%	101%
Thallium	+/-7.9%	101%
Vanadium Pentoxide	+/-6.5%	100%

Parameter	Method	PEL
Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	See footnote

L418175 (Report ID: 1018454):
TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for COBALT: 0.02 mg/m3
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for Calcium Oxide: 2 mg/m3
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3
TLV for SELENIUM: 0.2 mg/m3
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for CHROMIUM: 0.5 mg/m3
TLV for IRON OXIDE: 5 mg/m3

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled :
Date Received: 12-SEP-17
Date Analyzed: 13-SEP-17 - 17-SEP-17

Account No.: 90734
Login No. : L418175

L418175 (Report ID: 1018454):
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(32), im-mwvfilt(28)
PEL listed refers to Aluminum as total dust.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.

L418175 (Report ID: 1018454):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-7.7%	96.9%
Antimony	+/-9.8%	97.3%
Arsenic	+/-7.6%	103%
Barium	+/-6.5%	101%
Beryllium	+/-10.8%	103%
Cadmium	+/-8.6%	102%
Calcium Oxide	+/-10.6%	105%
Chromium	+/-11.2%	103%
Cobalt	+/-8.5%	103%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled :
Date Received: 12-SEP-17
Date Analyzed: 13-SEP-17 - 17-SEP-17

Account No.: 90734
Login No. : L418175

Copper	+/-10.3%	103%
Iron Oxide	+/-9.6%	106%
Lead	+/-9.1%	100%
Manganese	+/-8.3%	99.8%
Molybdenum	+/-7.6%	100%
Selenium	+/-11.6%	105%
Zinc Oxide	+/-8.9%	102%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)
Chromium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Selenium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

L418175 (Report ID: 1018274):
SOPs: ia-pcm(26)
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a greater than optimal variability and are probably biased.
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as follows:
0.154 (5-20 fibers/100 fields)

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Date Sampled :
Date Received: 12-SEP-17
Date Analyzed: 13-SEP-17 - 17-SEP-17

Account No.: 90734
Login No. : L418175

L418175 (Report ID: 1018274):
0.100 (>20-50 fibers/100 fields)
0.069 (>50-100 fibers/100 fields)
0.090 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take into account any uncertainty associated with the sampling process.

L418175 (Report ID: 1017840):
TLV for RESPIRABLE DUST: NA
SOPs: GRAV-SOP-5(18), GRAV-SOP-6(17)
Gravimetric analytical accuracy of the sampling media is 0.002 +/- 0.018 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.
PNOR = Particulates Not Otherwise Regulated.

L418175 (Report ID: 1018863):
TLV for QUARTZ: 0.025 mg/m3 Respirable
TLV for TRIDYMITE: NA
TLV for CRISTOBALITE: 0.025 mg/m3 Respirable
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26)

L418175 (Report ID: 1018863):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-10.3%	102%
Quartz	+/-10.9%	93.4%
Tridymite	+/-13.6%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

L418175

SGS GALSON

1Z5X626A6646673473
Date:09/12/17
Shipper:UPS
Initials:ZRK
Prep:UNKNOWN

☐ New Client?

Report To*: Toronto Transit Commission
1920 Yonge St
Client Account No.*: Suite 600
Toronto, ON M4S 3E2
Phone No.*: 416-393-6668

Invoice To*: KTh

Phone No.:
Cell No.:
Email:
Email Results To: Virgil.Unali@ttc.ca OHEresults@OHEconsultants.com
Email Address:
Purchase Order No.:
Credit Card: ☐ Credit Card on File ☐ Call for Credit Card Info

☐ Samples submitted using the FreePumpLoan™ Program.
☐ Samples submitted using the FreeSamplingBadges™ Program.

Need Results By*:	(surcharge)
☒ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%
☐ Next Day by Noon	150%
☐ Same Day	200%

Site Name:
Project: 22152
Sampled By: OHE consultants
Comments:

List description of industry or process/interferences present in sampling area:

State samples were collected in (ex. NY):

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify):

Sample Identification* (Maximum of 20 characters, ID's longer than 20 characters will be abbreviated.)	Date Sampled* (mm/dd/yy)	Collection Medium	Sample Volume, (Sample Time), or Sample Area*	Sample Units*: L, ml, min., in2, cm2, ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (ex. welding, plating, painting, etc.)*
Example	01/01/11	2pc UW PVC	960	L	Hexavalent Chromium (Cr6)	mod. OSHA ID-215	Welding
22152 - A13		25mm PCM	380	392.6	Asbestos	NIOSH 7400	
22152 - A14		↓	Ø		↓	↓	
22152-S13		PWPVC in PPI	380	769.2	Crystalline Silica (all forms)	NIOSH 7500, 0600 (Resp. Dust)	
22152-S14		↓	Ø		↓	↓	
22152-I13		PWPVC in JOM	380	776.02	Metals (Inhalable)	NIOSH 7300 + Inhalable Particulate (NIOSH 0500)	
22152-I14		↓	Ø		↓	↓	
22152-M13		UW MCE in PDI	380	772.6	Metals (Respirable)	NIOSH 7300	
22152-M14		↓	Ø		↓	↓	
22152-T13		UW MCE	380	774.8	Metals (Total)	↓	
22152-T14		↓	Ø		↓		

^Galson Laboratories will substitute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ please indicate if the lower LOQ is required (only available for certain analytes see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date/Time		Print Name/Signature	Date/Time
Relinquished by:	LARYSA KOKOROUTSEVA	09/06/17	Received by:	Herman Sani	9/11/17 9:50a
Relinquished by:	Herman Sani	9/11/17 6:00p	Received by:	Kris Stone	9/12/17 1007

Samples received after 3pm will be considered as next day's business.
*Required fields, failure to complete these fields may result in a delay in your samples being processed.

LAB ORIGINAL

TTC 22152

Respirable – Aluminum, Cadmium, Iron Oxide, Molybdenum (total), Zinc Oxide

Inhalable – Magnesium Oxide, Molybdenum (total), Nickel – metal, Thallium, Vanadium Pentoxide

Total – Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium Oxide, Chromium III, Cobalt, Copper, Lead, Manganese, Selenium

Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Canada

October 04, 2017

AIHA-LAP #100324 Account# 90734 Login# L418161

Dear Mr. Umali:

Enclosed are the revised analytical results for the samples received by our laboratory on September 12, 2017. Please note that this revision cancels and supersedes L418161 (report reference: 1) dated September 18, 2017 issued by SGS Galson Laboratories. Samples requiring TEM analysis were subcontracted to AMA Analytical Services, Inc. Their report is enclosed in its entirety. All samples on the chain of custody were received in good condition unless otherwise noted.

Results in this report are based on the sampling data provided by the client and refer only to the samples as they were received at the laboratory.

To ensure the safety of laboratory receiving personnel, always seal bulk samples securely to prevent possible escape of material. Also, please double-bag bulk samples individually prior to shipping. Samples not received in this manner will be noted on the chain of custody form.

Current scopes of accreditation can be viewed at www.galsonlabs.com in the accreditations section under the "about Galson" tab. Please contact Katrina Ahchong, at (888) 432-5227, if you require additional information regarding this report. Thank you for using SGS Galson Laboratories.

Sincerely,

SGS Galson Laboratories

Pamela Weaver
Asbestos Technical Manager

Enclosure(s)

Galson Laboratories, Inc. is now a part of SGS, the world's leading inspection, verification, testing, and certification company. As part of our transition to SGS, you will begin to see some formatting changes with reports that will improve the presentation of data and allow for the transition to the new logo.

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 07-SEP-17
Date Received : 12-SEP-17

Account No.: 90734
Login No. : L418161
Date Analyzed : 14-SEP-17
Report ID : 1018444

Client ID : 22152-M15 **Lab ID : L418161-5** **Air Volume : 741.6 L**
Date Sampled : 09/07/17 **Date Analyzed : 09/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.010	mg/m3
Cadmium	0.15	<0.15	<0.00020	mg/m3
Iron Oxide	11.	79	0.11	mg/m3
Molybdenum	0.15	0.17	0.00022	mg/m3
Zinc Oxide	2.8	<2.8	<0.0038	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 15-SEP-17

Submitted by: SJW/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 07-SEP-17
Date Received : 12-SEP-17

Account No.: 90734
Login No. : L418161

Date Analyzed : 14-SEP-17
Report ID : 1018444

Client ID : 22152-M16 **Lab ID : L418161-6** **Air Volume : NA**
Date Sampled : 09/07/17 **Date Analyzed : 09/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 15-SEP-17

Submitted by: SJW/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 07-SEP-17
Date Received : 12-SEP-17

Account No.: 90734
Login No. : L418161
Date Analyzed : 14-SEP-17
Report ID : 1018444

Client ID : 22152-T15 **Lab ID : L418161-7** **Air Volume : 745.7 L**
Date Sampled : 09/07/17 **Date Analyzed : 09/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.0012	mg/m3
Arsenic	0.30	<0.30	<0.00040	mg/m3
Barium	0.15	2.6	0.0035	mg/m3
Beryllium	0.15	<0.15	<0.00020	mg/m3
Cadmium	0.15	<0.15	<0.00020	mg/m3
Calcium Oxide	100.	<100	<0.14	mg/m3
Chromium	7.5	<7.5	<0.010	mg/m3
Cobalt	0.45	<0.45	<0.00060	mg/m3
Copper	0.30	<0.30	<0.00040	mg/m3
Lead	0.38	<0.38	<0.00050	mg/m3
Magnesium Oxide	12.	<12	<0.017	mg/m3
Manganese	0.15	0.68	0.00092	mg/m3
Molybdenum	0.15	0.30	0.00041	mg/m3
Nickel	0.30	<0.30	<0.00040	mg/m3
Selenium	2.3	<2.3	<0.0030	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 15-SEP-17
Submitted by: SJW/JJL
NYS DOH # : 11626
Approved by: JJL
Supervisor: KEG
QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client	: Toronto Transit Commission Ltd	Account No.:	90734
Site	: NS	Login No. :	L418161
Project No.	: 22152		
Date Sampled	: 07-SEP-17	Date Analyzed :	14-SEP-17
Date Received	: 12-SEP-17	Report ID :	1018444

Client ID : 22152-T15 **Lab ID : L418161-7** **Air Volume : 745.7 L**
Date Sampled : 09/07/17 **Date Analyzed : 09/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Thallium	1.5	<1.5	<0.0020	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.0011	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm Submitted by: SJW/JJL Approved by: JJL
Date : 15-SEP-17 NYS DOH # : 11626 Supervisor: KEG QC by: NDC

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
>	-Greater Than	ug	-Micrograms	l	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 07-SEP-17
Date Received : 12-SEP-17

Account No.: 90734
Login No. : L418161
Date Analyzed : 14-SEP-17
Report ID : 1018444

Client ID : 22152-T16 **Lab ID : L418161-8** **Air Volume : NA**
Date Sampled : **Date Analyzed : 09/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.30	<0.30	NA	mg/m3
Barium	0.15	<0.15	NA	mg/m3
Beryllium	0.15	<0.15	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.45	<0.45	NA	mg/m3
Copper	0.30	<0.30	NA	mg/m3
Lead	0.38	<0.38	NA	mg/m3
Magnesium Oxide	12.	<12	NA	mg/m3
Manganese	0.15	<0.15	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Nickel	0.30	<0.30	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 15-SEP-17

Submitted by: SJW/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
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Date Sampled : 07-SEP-17
Date Received : 12-SEP-17

Account No.: 90734
Login No. : L418161

Date Analyzed : 14-SEP-17
Report ID : 1018444

Client ID : 22152-T16 **Lab ID : L418161-8** **Air Volume : NA**
Date Sampled : **Date Analyzed : 09/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Thallium	1.5	<1.5	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 15-SEP-17

Submitted by: SJW/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 07-SEP-17
Date Received : 12-SEP-17

Account No.: 90734
Login No. : L418161
Date Analyzed : 14-SEP-17
Report ID : 1018272

Asbestos Fiber Count (A Rules)

	Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
+	22152-A15	L418161-1	14/100	17.8	6853	379,400	0.018
	22152-A16	L418161-2	3/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : BTM
Approved by : BDB
Date : 18-SEP-17
QC by: NDC
Supervisor: BDB

< -Less Than
> -Greater Than
ND -Not Detected
NA -Not Applicable
cc -Cubic Centimeters
NS -Not Specified
mm2 -Square millimeters

SGS GALSON

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 07-SEP-17
Date Received : 12-SEP-17

Account No.: 90734
Login No. : L418161
Date Analyzed : 13-SEP-17
Report ID : 1017838

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-S15	L418161-3	745.2	<0.050	<0.067
22152-S16	L418161-4	NA	<0.050	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg
Analytical Method : mod. NIOSH 0600; Gravimetric
OSHA PEL : PNOR 5 mg/m3 (TWA)
Collection Media : PVC PW 37mm

Submitted by: HVN
Approved by : SPR
Date : 13-SEP-17
Supervisor: KRK

NYS DOH # : 11626
QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

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Site : NS
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Date Sampled : 07-SEP-17
Date Received : 12-SEP-17

Account No.: 90734
Login No. : L418161

Date Analyzed : 13-SEP-17 - 17-SEP-17
Report ID : 1018859

Respirable Crystalline Silica (RCS): Quartz, Cristobalite, Tridymite

Sample ID	Lab ID	Analyte	Air Vol l	ug	ug/m3
22152-S15	L418161-3	Quartz	745.2	<5.0	<6.7
		Cristobalite	745.2	<5.0	<6.7
		Tridymite	745.2	<20	<27
		RCS	745.2	<5.0	<6.7
22152-S16	L418161-4	Quartz	NA	<5.0	NA
		Cristobalite	NA	<5.0	NA
		Tridymite	NA	<20	NA
		RCS	NA	<5.0	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: Q:5.0ug C:5.0ug T:20.ug
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD
OSHA PEL : 50 ug/m3 RCS
Collection Media : PVC PW 37mm

Submitted: NLO
Approved: CMR
Date : 18-SEP-17 NYS DOH # : 11626
Supervisor: KRK QC by: NDC

< -Less Than
> -Greater Than
NA -Not Applicable
mg -Milligrams
ug -Micrograms
ND -Not Detected
kg -Kilograms
m3 -Cubic Meters
l -Liters
ppm -Parts per Million
NS -Not Specified
mppcf -Million Particles per Cubic Foot

LABORATORY FOOTNOTE REPORT

6601 Kirkville Road
East Syracuse, NY 13057
(315) 432-5227
FAX: (315) 437-0571
www.galsonlabs.com

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 07-SEP-17 Account No.: 90734
Date Received: 12-SEP-17 Login No. : L418161
Date Analyzed: 13-SEP-17 - 17-SEP-17

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L418161 (Report ID: 1018444):
TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for Vanadium pentoxide: 0.05 mg/m3 (Inhalable)
TLV for COBALT: 0.02 mg/m3
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for Calcium Oxide: 2 mg/m3
TLV for Magnesium Oxide: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3
TLV for SELENIUM: 0.2 mg/m3
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for CHROMIUM: 0.5 mg/m3
TLV for IRON OXIDE: 5 mg/m3

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 07-SEP-17 Account No.: 90734
Date Received: 12-SEP-17 Login No. : L418161
Date Analyzed: 13-SEP-17 - 17-SEP-17

L418161 (Report ID: 1018444):
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(32), im-mwvfilt(28)
PEL listed refers to Aluminum as total dust.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3; as Fume, Ceiling = 0.1 mg/m3.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.

L418161 (Report ID: 1018444):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-7.7%	96.9%
Antimony	+/-9.8%	97.3%
Arsenic	+/-7.6%	103%
Barium	+/-6.5%	101%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 07-SEP-17 Account No.: 90734
Date Received: 12-SEP-17 Login No. : L418161
Date Analyzed: 13-SEP-17 - 17-SEP-17

Beryllium	+/-10.8%	103%
Cadmium	+/-8.6%	102%
Calcium Oxide	+/-10.6%	105%
Chromium	+/-11.2%	103%
Cobalt	+/-8.5%	103%
Copper	+/-10.3%	103%
Iron Oxide	+/-9.6%	106%
Lead	+/-9.1%	100%
Magnesium Oxide	+/-9.2%	99.2%
Manganese	+/-8.3%	99.8%
Molybdenum	+/-7.6%	100%
Nickel	+/-8%	101%
Selenium	+/-11.6%	105%
Thallium	+/-7.9%	101%
Vanadium Pentoxide	+/-6.5%	100%
Zinc Oxide	+/-8.9%	102%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)
Chromium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Manganese	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 07-SEP-17 Account No.: 90734
Date Received: 12-SEP-17 Login No. : L418161
Date Analyzed: 13-SEP-17 - 17-SEP-17

L418161 (Report ID: 1018444):

Parameter	Method	PEL
Nickel	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Selenium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Thallium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	See footnote
Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

+L418161-1 (Report ID: 1018272):
The sample results may have a negative bias; the filter surface was covered by fine particulate that may have obscured fibers.

L418161 (Report ID: 1018272):
SOPs: ia-pcm(26)
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a greater than optimal variability and are probably biased.
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as follows:
0.154 (5-20 fibers/100 fields)
0.100 (>20-50 fibers/100 fields)
0.069 (>50-100 fibers/100 fields)
0.090 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take into account any uncertainty associated with the sampling process.

L418161 (Report ID: 1017838):
TLV for RESPIRABLE DUST: NA
SOPs: GRAV-SOP-5(18), GRAV-SOP-6(17)
Gravimetric analytical accuracy of the sampling media is 0.002 +/- 0.018 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.
PNOR = Particulates Not Otherwise Regulated.

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 07-SEP-17 Account No.: 90734
Date Received: 12-SEP-17 Login No. : L418161
Date Analyzed: 13-SEP-17 - 17-SEP-17

L418161 (Report ID: 1018859):
TLV for QUARTZ: 0.025 mg/m3 Respirable
TLV for TRIDYMITE: NA
TLV for CRISTOBALITE: 0.025 mg/m3 Respirable
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26)

L418161 (Report ID: 1018859):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-10.3%	102%
Quartz	+/-10.9%	93.4%
Tridymite	+/-13.6%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

NVLAP®
Lab Code 101143-0
NY ELAP
Lab ID 10920

Chain of Custody: 285414
Client: Galson Laboratories
Address: 6601 Kirkville Road
East Syracuse, NY 13057-9672
Attention: Pam Weaver

Job Name: Not Provided
Job Location: Not Provided
Job Number: L418161
P.O. Number: 90734

Date Submitted: 09/28/2017
Date Analyzed: 10/04/2017
Report Date: 10/04/2017
Date Sampled: 09/07/2017
Person Submitting: Cameron Kennedy

Summary of Transmission Electron Microscopy

Filter Type: MCE **Pore Size:** 0.8 um **Filter Size:** 25 mm (385 mm²)

AMA Sample Number	Client Sample Number	Volume (L)	Area Analyzed (mm²)	Analytical Sensitivity f/cc	Asbestos Type Amount	# Non Asbestos Structures	Concentration f/mm²	Concentration f/cc	Fraction	Sample Type	Comments
285414-1	22152-A15	379.4	0.532	0.0019	0	6.5	<8	<0.0076	0.0	N/P	
285414-2	22152-A16	0.0	0.532		0	0	<8			BLK	

Analytical procedures used meet or exceed NIOSH 7402 protocols.

** - To calculate the asbestos concentration of the PCM result multiply the original PCM result by the fraction.

All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

Analyst(s): Michael Greenberg

Technical Director Andreas Saldivar

4475 Forbes Blvd. · Lanham, MD, 20706 · (301) 459-2640 · Toll Free (800) 346-0961 · Fax (301) 459-2643

AMA Analytical Services, Inc.
Focused on Results www.amalab.com
AIHA-LAP (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 285414

Mailing/Billing Information:
1. Client Name: Galson
2. Address 1:
3. Address 2:
4. Address 3:
5. Phone #: Fax #:

Submittal Information:
1. Job Name:
2. Job Location:
3. Job #: C418161 P.O. #: 90734
4. Contact Person: Pam Weaver Cell:
5. Collected by: Cell:

Reporting Info (Results provided as soon as technically feasible). If no TAT/Reporting Info is provided, AMA will assign defaults of 5-Day and email/fax to contacts on file.

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
☐ 4 Hours ☐ Immediate Date Due: ☐ 24 Hours Time Due: Comments:	☐ 4 Hours ☐ Same Day ☐ Next Day ☐ 2 Day ☐ 3 Day ☒ 5 Day + Date Due: 10/5/17 ☐ Results Required By Noon	☐ Email: ☐ Email 2: ☐ Verbals:

Asbestos Analysis
*PCM Air – Please Indicate Filter Type:
☐ NIOSH 7400 (QTY)
☐ Fiberglass (QTY)
TEM Air* – Please Indicate Filter Type:
☐ AHERA (QTY)
☒ NIOSH 7402 2 (QTY)
☐ Other (specify) (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate (QTY) ☐ Pos Stop
☐ EPA Point Count (QTY)
☐ NY State Friable 198.1 (QTY)
☐ Grav. Reduction ELAP 198.6 (QTY)
☐ Other (specify) (QTY)
MISC
☐ Vermiculite
☐ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)
*It is recommended that blank samples be submitted with all air and surface samples

TEM Bulk
☐ ELAP 198.4/Chatfield (QTY)
☐ NY State PLM/TEM (QTY)
☒ ~~Residual Ash (QTY)~~ KMAX
TEM Dust*
☐ Qual. (pres/abs) Vacuum/Dust (QTY)
☐ Quan. (s/area) Vacuum D5755-95 (QTY)
☐ Quan. (s/area)Dust D6480-99 (QTY)
TEM Water
☐ Qual. (pres/abs) (QTY)
☐ ELAP 198.2/EPA 100.2 (QTY)
☐ EPA 100.1 (QTY)
☒ All samples received in good condition unless otherwise noted. (TEM Water samples °C)
If field data sheets are submitted, there is no need to complete bottom section.

Metals Analysis
☐ Pb Paint Chip (QTY)
☐ *Pb Dust Wipe (wipe type) (QTY)
☐ *Pb Air (QTY)
☐ Pb Soil/Solid (QTY)
☐ Pb TCLP (QTY)
☐ Drinking Water ☐ Pb (QTY) ☐ Cu (QTY) ☐ As (QTY)
☐ Waste Water ☐ Pb (QTY) ☐ Cu (QTY) ☐ As (QTY)
☐ Pb Furnace (Media) (QTY)
Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples:
Collection Media
☐ *Spore-Trap (QTY) ☐ Surface Vacuum Dust (QTY)
☐ *Surface Swab (QTY) ☐ Culturable ID Genus (Media) (QTY)
☐ *Surface Tape (QTY) ☐ Culturable ID Species (Media) (QTY)
☐ Other (Specify) (QTY)

CLIENT ID #	SAMPLE INFORMATION SAMPLE LOCATION/ ID	DATE/ TIME	VOL (L)/ Wipe Area	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB	CLIENT CONTACT (LABORATORY STAFF ONLY)
																Date/Time: Contact:By:
																Date/Time: Contact:By:
																Date/Time: Contact:By:

	Print Name	Signature	Date	Time
Relinquished by:				
Received by:				
Relinquished by:	KMAX	[signature]	9/28/17	1017
Received for Lab by:				

Shipping Information
☒ UPS ☐ In-Person ☐ Other
☐ FedEx ☐ Drop Box
☐ USPS ☐ Courier
Airbill/Tracking No:

GALSON LABORATORIES
6601 Kirkville Rd
East Syracuse, NY 13057-9672
Tel: 315-437-5227
888-432-LABS(5227)
Fax: 315-437-0571
www.galsonlabs.com

AMA

Check if change of address ☐
New Client ? yes ☐ no ☐

Report To :	Shelly Krause	Invoice To :	Jeanne Glisson
	SGS Galson Laboratory		SGS Galson Laboratory
	6601 Kirkville Road		6601 Kirkville Road
	East Syracuse, NY 13057		East Syracuse, NY 13057
Phone No. :	888-432-5227	Phone No. :	888-432-5227
		Fax No.	315-437-0571

Site Name : Project : L418161 Sampled By : Client

Turnaround Time	Due Date
☑ Standard	10/06/17
☐ 4 Business Days	
☐ 3 Business Days	
☐ 2 Business Days	
☐ Next Day by 6pm	
☐ Next Day by Noon	
☐ Same day	

Verbal Authorization : 90734
Credit Card No. : Card Holder Name : Exp. :
Fax Results To : Email Only Please Fax No. : Email Only Please
Email Results To : Syracuse.Subcontracting@sgs.com

Sample Identification	Date Sampled	Collection Medium	*Air Volume (liters)/ Passive Monitors (Min)	Analysis Requested	Method Reference	Fibers/Fields
22152-A15	9/7/2017	25mm MCE PCM	379.4	Transmission Electron Microscopy	NIOSH 7402; TEM	14/100
22152-A16	9/7/2017	25mm MCE PCM	BLANK	Transmission Electron Microscopy	NIOSH 7402; TEM	3/100

Comments:

State/Province of sampling event:

If the method being reported is not on your laboratory's current AIHA scope of accreditation, please state that in your report.
Please provide an uncertainty statement in accordance with AIHA LQAP policy document Section 2A.5.4.3.

Chain of Custody	Print Name	Signature	Date/Time
Relinquished by :	Cameron Kennedy		09/27/17 1630
Received by LAB :			

4r L418161

SGS GALSON L4186

125X626A6646673473
Date:09/12/17
Shipper:UPS
Initials:ZRK
Prep:UNKNOWN

☐ New Client?

Report To*: Toronto Transit Commission, 1920 Yonge St., Suite 600, TORONTO, ON M4S 3E2

Client Account No.*:

Phone No.*: 416-393-6668

Cell No.:

Email Results To: virgil.umali@ttc.ca & oheresults@

Email Address: oheconsultants.com

Invoice To*: Toronto Transit Commission, 1920 Yonge St, Suite 600, TORONTO, ON M4S 3E2 KTD

Phone No.:

Email:

Purchase Order No.: PU 240835

Credit Card: ☐ Credit Card on File ☐ Call for Credit Card Info

☐ Samples submitted using the FreePumpLoan™ Program.

☐ Samples submitted using the FreeSamplingBadges™ Program.

Need Results By*:	(surcharge)
☒ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%
☐ Next Day by Noon	150%
☐ Same Day	200%

Site Name:

Project: 22152

Sampled By: OHE Consultants

Comments:

List description of industry or process/interferences present in sampling area:

State samples were collected in (ex. NY):

Please indicate which OEL this data will be used for: ☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA ☐ MSHA ☐ Other (specify):

Sample Identification* (Maximum of 20 characters, ID's longer than 20 characters will be abbreviated.)	Date Sampled* (mm/dd/yy)	Collection Medium	Sample Volume, Sample Time, or Sample Area*	Sample Units*: L, ml, min., in2, cm2, ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (ex. welding, plating, painting, etc.)*
Example	01/01/11	2pc UW PVC	960	L	Hexavalent Chromium (Cr6)	mod. OSHA ID-215	Welding
22152-A15	09/07/17	25mm PCM	379.4	L	Asbestos PCM (per client OK 9/21/17: TEM)	NIOSH 7400	
22152-A16	↓	25mm PCM	Ø	Ø	Asbestos ↓	NIOSH 7400	
22152-S15	↓	PW PVC in PPI	745.2	L	Crystalline Silica (all forms)	NIOSH 7500 + Resp. Dust NIOSH 0600	
22152-S16	↓	PW PVC in PPI	Ø	Ø	————	" ————	
22152-M15	↓	UW MCE in PPI	741.6	L	Metals (Respirable)	NIOSH 7300	See Attached
22152-M16	↓	UW MCE in PPI	Ø	Ø	———— " ————	NIOSH 7300	List
22152-T15	↓	UW MCE	745.7	L	Metals (Total)	NIOSH 7300	See Attached
22152-T16	↓	UW MCE	Ø	Ø	———— "	————	List
	↓						

^Galson Laboratories will substitute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ please indicate if the lower LOQ is required (only available for certain analytes see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*: ALL FORMS PLEASE

Chain of Custody	Print Name/Signature	Date/Time		Print Name/Signature	Date/Time
Relinquished by:	ROMAIN MATHEVET [signature]	Sep. 11/2017 10am	Received by:	Herman Saini [signature]	9/11/17 4:57pm
Relinquished by:	Herman Saini [signature]	9/11/17 6:00pm	Received by:	Kris Stone [signature]	9/12/17 1007

Samples received after 3pm will be considered as next day's business.

*Required fields, failure to complete these fields may result in a delay in your samples being processed.

Page ____ of ____

LAB ORIGINAL

TTC 22152

Samples 22152-M15 & 22152-M16:

Analyze for: Aluminum, Cadmium, Iron Oxide, Molybdenum, Zinc Oxide

Samples 22152-T15 & 22152-T16:

Analyze for: Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium Oxide, Chromium III, Cobalt, Copper, Lead, Magnesium Oxide, Manganese, Molybdenum, Nickel – metal, Selenium, Thallium, Vanadium Pentoxide

Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St., Suite 600
Toronto, ON M4S 3E2
Canada

September 18, 2017

AIHA-LAP #100324 Account# 90734 Login# L418180

Dear Mr. Umali:

Enclosed are the analytical results for the samples received by our laboratory on September 12, 2017. All test results meet the quality control requirements of AIHA-LAP and NELAC unless otherwise stated in this report. All samples on the chain of custody were received in good condition unless otherwise noted.

Results in this report are based on the sampling data provided by the client and refer only to the samples as they were received at the laboratory. Unless otherwise requested, samples for asbestos analysis will be discarded 60 days from the date of this report and all other non-IOM samples will be retained for 14 days following the date of this report (when possible). IOMs will be cleaned & disposed of after seven calendar days.

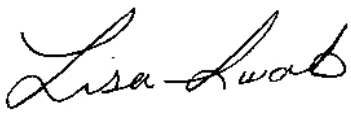
To ensure the safety of laboratory receiving personnel, always seal bulk samples securely to prevent possible escape of material. Also, please double-bag bulk samples individually prior to shipping. Samples not received in this manner will be noted on the chain of custody form.

Current Scopes of Accreditation can be viewed at www.galsonlabs.com in the accreditations section under the "about Galson" tab.

Please contact Katrina Ahchong at (888) 432-5227, if you would like any additional information regarding this report. Thank you for using SGS Galson Laboratories.

Sincerely,

SGS Galson Laboratories



Lisa Swab
Laboratory Director

Enclosure(s)

Galson Laboratories, Inc. is now a part of SGS, the world's leading inspection, verification, testing, and certification company. As part of our transition to SGS, you will begin to see some formattingchanges withreports that will improve the presentation of data and allow for the transition to the new logo.

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 08-SEP-17
Date Received : 12-SEP-17

Account No.: 90734
Login No. : L418180

Date Analyzed : 14-SEP-17
Report ID : 1018459

Client ID : 22152-M17 **Lab ID : L418180-7** **Air Volume : 1084.2 L**
Date Sampled : 09/08/17 **Date Analyzed : 09/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.0069	mg/m3
Cadmium	0.15	<0.15	<0.00014	mg/m3
Iron Oxide	11.	40	0.037	mg/m3
Molybdenum	0.15	<0.15	<0.00014	mg/m3
Zinc Oxide	2.8	<2.8	<0.0026	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 15-SEP-17

Submitted by: SJW/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 08-SEP-17
Date Received : 12-SEP-17

Account No.: 90734
Login No. : L418180

Date Analyzed : 14-SEP-17
Report ID : 1018459

Client ID : 22152-M18 **Lab ID : L418180-8** **Air Volume : NA**
Date Sampled : 09/08/17 **Date Analyzed : 09/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 15-SEP-17

Submitted by: SJW/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 08-SEP-17
Date Received : 12-SEP-17

Account No.: 90734
Login No. : L418180

Date Analyzed : 14-SEP-17
Report ID : 1018459

Client ID : 22152-T17 **Lab ID : L418180-9** **Air Volume : 1074.2 L**
Date Sampled : 09/08/17 **Date Analyzed : 09/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.00084	mg/m3
Arsenic	0.30	<0.30	<0.00028	mg/m3
Barium	0.15	0.75	0.00070	mg/m3
Beryllium	0.15	<0.15	<0.00014	mg/m3
Cadmium	0.15	<0.15	<0.00014	mg/m3
Calcium Oxide	100.	<100	<0.098	mg/m3
Chromium	7.5	<7.5	<0.0070	mg/m3
Cobalt	0.45	<0.45	<0.00042	mg/m3
Copper	0.30	<0.30	<0.00028	mg/m3
Lead	0.38	<0.38	<0.00035	mg/m3
Manganese	0.15	0.31	0.00029	mg/m3
Selenium	2.3	<2.3	<0.0021	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 15-SEP-17

Submitted by: SJW/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 08-SEP-17
Date Received : 12-SEP-17

Account No.: 90734
Login No. : L418180
Date Analyzed : 14-SEP-17
Report ID : 1018459

Client ID : 22152-T18 **Lab ID : L418180-10** **Air Volume : NA**
Date Sampled : 09/08/17 **Date Analyzed : 09/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.30	<0.30	NA	mg/m3
Barium	0.15	<0.15	NA	mg/m3
Beryllium	0.15	<0.15	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.45	<0.45	NA	mg/m3
Copper	0.30	<0.30	NA	mg/m3
Lead	0.38	<0.38	NA	mg/m3
Manganese	0.15	<0.15	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 15-SEP-17

Submitted by: SJW/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 08-SEP-17
Date Received : 12-SEP-17

Account No.: 90734
Login No. : L418180

Date Analyzed : 14-SEP-17
Report ID : 1018457

Client ID : 22152-I15 **Lab ID : L418180-5** **Air Volume : 1074.0 L**
Date Sampled : 09/08/17 **Date Analyzed : 09/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Magnesium Oxide	12.	<12	<0.012	mg/m3
Molybdenum	0.15	<0.15	<0.00014	mg/m3
Nickel	0.30	<0.30	<0.00028	mg/m3
Thallium	1.5	<1.5	<0.0014	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.00075	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PVC
Date : 15-SEP-17

Submitted by: SJW/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 08-SEP-17
Date Received : 12-SEP-17

Account No.: 90734
Login No. : L418180
Date Analyzed : 14-SEP-17
Report ID : 1018457

Client ID : 22152-I16 **Lab ID : L418180-6** **Air Volume : NA**
Date Sampled : 09/08/17 **Date Analyzed : 09/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Magnesium Oxide	12.	<12	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Nickel	0.30	<0.30	NA	mg/m3
Thallium	1.5	<1.5	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PVC
Date : 15-SEP-17

Submitted by: SJW/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 08-SEP-17
Date Received : 12-SEP-17

Account No.: 90734
Login No. : L418180
Date Analyzed : 14-SEP-17
Report ID : 1018275

Asbestos Fiber Count (A Rules)

Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
22152-A17	L418180-1	4/100	<7	<2700	533,400	<0.005
22152-A18	L418180-2	2/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : BTM
Approved by : BDB
Date : 18-SEP-17
QC by: AMD
Supervisor: BDB

< -Less Than
> -Greater Than
ND -Not Detected
NA -Not Applicable
cc -Cubic Centimeters
NS -Not Specified
mm2 -Square millimeters

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 08-SEP-17
Date Received : 12-SEP-17

Account No.: 90734
Login No. : L418180
Date Analyzed : 13-SEP-17
Report ID : 1017842

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-S17	L418180-3	1066.9	0.054	0.051
22152-S18	L418180-4	NA	<0.050	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg
Analytical Method : mod. NIOSH 0600; Gravimetric
OSHA PEL : PNOR 5 mg/m3 (TWA)
Collection Media : PVC PW 37mm

Submitted by: PAH
Approved by : SPR
Date : 13-SEP-17
Supervisor: KRK

NYS DOH # : 11626
QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 08-SEP-17
Date Received : 12-SEP-17

Account No.: 90734
Login No. : L418180
Date Analyzed : 13-SEP-17 - 17-SEP-17
Report ID : 1018861

Respirable Crystalline Silica (RCS): Quartz, Cristobalite, Tridymite

Sample ID	Lab ID	Analyte	Air Vol l	ug	ug/m3
22152-S17	L418180-3	Quartz	1066.9	<5.0	<4.7
		Cristobalite	1066.9	<5.0	<4.7
		Tridymite	1066.9	<20	<19
		RCS	1066.9	<5.0	<4.7
22152-S18	L418180-4	Quartz	NA	<5.0	NA
		Cristobalite	NA	<5.0	NA
		Tridymite	NA	<20	NA
		RCS	NA	<5.0	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: Q:5.0ug C:5.0ug T:20.ug
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD
OSHA PEL : 50 ug/m3 RCS
Collection Media : PVC PW 37mm

Submitted: SPR
Approved: KRK
Date : 18-SEP-17 NYS DOH # : 11626
Supervisor: KRK QC by: AMD

< -Less Than
> -Greater Than
NA -Not Applicable
mg -Milligrams
ug -Micrograms
ND -Not Detected
kg -Kilograms
m3 -Cubic Meters
l -Liters
ppm -Parts per Million
NS -Not Specified
mppcf -Million Particles per Cubic Foot

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 08-SEP-17 Account No.: 90734
Date Received: 12-SEP-17 Login No. : L418180
Date Analyzed: 13-SEP-17 - 17-SEP-17

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L418180 (Report ID: 1018457):
TLV for Vanadium pentoxide: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for Magnesium Oxide: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(32), im-mwvfilt(28)
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3; as Fume, Ceiling = 0.1 mg/m3.

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 08-SEP-17 Account No.: 90734
Date Received: 12-SEP-17 Login No. : L418180
Date Analyzed: 13-SEP-17 - 17-SEP-17

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Magnesium Oxide	+/-9.2%	99.2%
Molybdenum	+/-7.6%	100%
Nickel	+/-8%	101%
Thallium	+/-7.9%	101%
Vanadium Pentoxide	+/-6.5%	100%

Parameter	Method	PEL
Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	See footnote

L418180 (Report ID: 1018459):
TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for COBALT: 0.02 mg/m3
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for Calcium Oxide: 2 mg/m3
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3
TLV for SELENIUM: 0.2 mg/m3
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for CHROMIUM: 0.5 mg/m3
TLV for IRON OXIDE: 5 mg/m3

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 08-SEP-17 Account No.: 90734
Date Received: 12-SEP-17 Login No. : L418180
Date Analyzed: 13-SEP-17 - 17-SEP-17

L418180 (Report ID: 1018459):
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(32), im-mwvfilt(28)
PEL listed refers to Aluminum as total dust.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.

L418180 (Report ID: 1018459):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-7.7%	96.9%
Antimony	+/-9.8%	97.3%
Arsenic	+/-7.6%	103%
Barium	+/-6.5%	101%
Beryllium	+/-10.8%	103%
Cadmium	+/-8.6%	102%
Calcium Oxide	+/-10.6%	105%
Chromium	+/-11.2%	103%
Cobalt	+/-8.5%	103%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 08-SEP-17 Account No.: 90734
Date Received: 12-SEP-17 Login No. : L418180
Date Analyzed: 13-SEP-17 - 17-SEP-17

Copper	+/-10.3%	103%
Iron Oxide	+/-9.6%	106%
Lead	+/-9.1%	100%
Manganese	+/-8.3%	99.8%
Molybdenum	+/-7.6%	100%
Selenium	+/-11.6%	105%
Zinc Oxide	+/-8.9%	102%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)
Chromium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Selenium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

L418180 (Report ID: 1018275):
SOPs: ia-pcm(26)
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a greater than optimal variability and are probably biased.
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as follows:
0.154 (5-20 fibers/100 fields)

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 08-SEP-17 Account No.: 90734
Date Received: 12-SEP-17 Login No. : L418180
Date Analyzed: 13-SEP-17 - 17-SEP-17

L418180 (Report ID: 1018275):
0.100 (>20-50 fibers/100 fields)
0.069 (>50-100 fibers/100 fields)
0.090 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take into account any uncertainty associated with the sampling process.

L418180 (Report ID: 1017842):
TLV for RESPIRABLE DUST: NA
SOPs: GRAV-SOP-5(18), GRAV-SOP-6(17)
Gravimetric analytical accuracy of the sampling media is 0.002 +/- 0.018 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.
PNOR = Particulates Not Otherwise Regulated.

L418180 (Report ID: 1018861):
TLV for QUARTZ: 0.025 mg/m3 Respirable
TLV for TRIDYMITE: NA
TLV for CRISTOBALITE: 0.025 mg/m3 Respirable
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26)

L418180 (Report ID: 1018861):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-10.3%	102%
Quartz	+/-10.9%	93.4%
Tridymite	+/-13.6%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

SGS GALSON L418180

1Z5X626A6646673473
Date:09/12/17
Shipper:UPS
Initials:ZRK
Prep:UNKNOWN

☐ New Client?

Report To*: Toronto Transit Commission
1920 Yonge St.
Suite 600
Toronto, ON M4S 3E2
Phone No.*: 416-393-6668
Cell No.:
Email Results To: Virgil.Umali@ttc.ca & oheresults@oheconsultants.com

Invoice To*: Toronto Transit Commission
1920 Yonge St.
Suite 600
Toronto, ON M4S 3E2
Phone No.:
Email:
Purchase Order No.: PU 240835
Credit Card: ☐ Credit Card on File ☐ Call for Credit Card Info

Client Account No.*:

☐ Samples submitted using the FreePumpLoan™ Program. ☐ Samples submitted using the FreeSamplingBadges™ Program.

Need Results By*:	(surcharge)
☒ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%
☐ Next Day by Noon	150%
☐ Same Day	200%

Site Name: Project: 22152 Sampled By: OHE Consultants

Comments:

List description of industry or process/interferences present in sampling area:

State samples were collected in (ex. NY):

Please indicate which OEL this data will be used for: ☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA ☐ MSHA ☐ Other (specify):

Sample Identification* (Maximum of 20 characters, ID's longer than 20 characters will be abbreviated.)	Date Sampled* (mm/dd/yy)	Collection Medium	Sample Volume, ~~Sample Time~~ or Sample Area*	Sample Units*: L, ml, min., in2, cm2, ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (ex. welding, plating, painting, etc.)*
Example	01/01/11	2pc UW PVC	960	L	Hexavalent Chromium (Cr6)	mod. OSHA ID-215	Welding
22152-A17	09/08/17	25mm PCM	543	533.4	Asbestos	NIOSH 7400	
22152-A18		25mm PCM	Ø	Ø	Asbestos	NIOSH 7400	
22152-S17		PW PVC in PPI	543	1066.9	Crystalline Silica (all forms)	NIOSH 7500 + Resp. Dust	NIOSH 0600
22152-S18		PW PVC in PPI	Ø	Ø	"	"	"
22152-I15		PW PVC in IOM	543	1074.0	Metals (Inhalable)	NIOSH 7300 + Inh. Dust	NIOSH 0500
22152-I16		PW PVC in IOM	Ø	Ø	"	"	"
22152-M17		UW MCE in PPI	543	1084.2	Metals (Respirable)	NIOSH 7300	
22152-M18		UW MCE in PPI	Ø	Ø	"	"	
22152-T17		UW MCE	543	1074.2	Metals (Total)		
22152-T18	↓	UW MCE	Ø	Ø	"	↓	

^Galson Laboratories will substitute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ please indicate if the lower LOQ is required (only available for certain analytes see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date/Time		Print Name/Signature	Date/Time
Relinquished by:	Yunny Desiang Lee	Sep 8/2017 5PM	Received by:	Herman Sai	9/11/17 5:00
Relinquished by:	Herman Sai	9/11/17 6:00pm	Received by:	Kris Stone	9/12/17 0942

Samples received after 3pm will be considered as next days business.
*Required fields, failure to complete these fields may result in a delay in your samples being processed.

LAB ORIGINAL

Page 1 of 1

Respirable – Aluminum, Cadmium, Iron Oxide, Molybdenum (total), Zinc Oxide

Inhalable – Magnesium Oxide, Molybdenum (total), Nickel – metal, Thallium, Vanadium Pentoxide

Total – Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium Oxide, Chromium III, Cobalt, Copper, Lead, Manganese, Selenium

SGS GALSON

Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Canada

September 18, 2017

AIHA-LAP #100324 Account# 90734 Login# L418167

Dear Mr. Umali:

Enclosed are the analytical results for the samples received by our laboratory on September 12, 2017. All test results meet the quality control requirements of AIHA-LAP and NELAC unless otherwise stated in this report. All samples on the chain of custody were received in good condition unless otherwise noted.

Results in this report are based on the sampling data provided by the client and refer only to the samples as they were received at the laboratory. Unless otherwise requested, samples for asbestos analysis will be discarded 60 days from the date of this report and all other non-IOM samples will be retained for 14 days following the date of this report (when possible). IOMs will be cleaned & disposed of after seven calendar days.

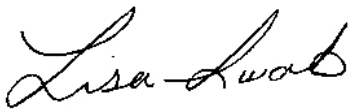
To ensure the safety of laboratory receiving personnel, always seal bulk samples securely to prevent possible escape of material. Also, please double-bag bulk samples individually prior to shipping. Samples not received in this manner will be noted on the chain of custody form.

Current Scopes of Accreditation can be viewed at www.galsonlabs.com in the accreditations section under the "about Galson" tab.

Please contact Katrina Ahchong at (888) 432-5227, if you would like any additional information regarding this report. Thank you for using SGS Galson Laboratories.

Sincerely,

SGS Galson Laboratories



Lisa Swab
Laboratory Director

Enclosure(s)

Galson Laboratories, Inc. is now a part of SGS, the world's leading inspection, verification, testing, and certification company. As part of our transition to SGS, you will begin to see some formatting changes with reports that willimprove the presentation of data and allow for the transition to the new logo.

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : NS
Date Received : 12-SEP-17

Account No.: 90734
Login No. : L418167
Date Analyzed : 14-SEP-17
Report ID : 1018450

Client ID : 22152-M19 **Lab ID : L418167-7** **Air Volume : 1040.1 L**
Date Sampled : **Date Analyzed : 09/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.0072	mg/m3
Cadmium	0.15	<0.15	<0.00014	mg/m3
Iron Oxide	11.	31	0.030	mg/m3
Molybdenum	0.15	<0.15	<0.00014	mg/m3
Zinc Oxide	2.8	<2.8	<0.0027	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 15-SEP-17

Submitted by: SJW/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client	: Toronto Transit Commission Ltd	Account No.:	90734
Site	: NS	Login No. :	L418167
Project No.	: 22152		
Date Sampled	: NS	Date Analyzed :	14-SEP-17
Date Received	: 12-SEP-17	Report ID :	1018450

Client ID : 22152-M20 **Lab ID : L418167-8** **Air Volume : NA**
Date Sampled : **Date Analyzed : 09/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm Submitted by: SJW/JJL Approved by: JJL
Date : 15-SEP-17 NYS DOH # : 11626 Supervisor: KEG QC by: NDC

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified

NA	-Not Applicable
ND	-Not Detected
ppm	-Parts per Million
LOQ	-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : NS
Date Received : 12-SEP-17

Account No.: 90734
Login No. : L418167

Date Analyzed : 14-SEP-17
Report ID : 1018450

Client ID : 22152-T19 **Lab ID : L418167-9** **Air Volume : 1034.7 L**
Date Sampled : **Date Analyzed : 09/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.00087	mg/m3
Arsenic	0.30	<0.30	<0.00029	mg/m3
Barium	0.15	0.76	0.00073	mg/m3
Beryllium	0.15	<0.15	<0.00014	mg/m3
Cadmium	0.15	<0.15	<0.00014	mg/m3
Calcium Oxide	100.	<100	<0.10	mg/m3
Chromium	7.5	<7.5	<0.0072	mg/m3
Cobalt	0.45	<0.45	<0.00043	mg/m3
Copper	0.30	<0.30	<0.00029	mg/m3
Lead	0.38	<0.38	<0.00036	mg/m3
Manganese	0.15	0.29	0.00028	mg/m3
Selenium	2.3	<2.3	<0.0022	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 15-SEP-17

Submitted by: SJW/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : NS
Date Received : 12-SEP-17

Account No.: 90734
Login No. : L418167
Date Analyzed : 14-SEP-17
Report ID : 1018450

Client ID : 22152-T20 **Lab ID : L418167-10** **Air Volume : NA**
Date Sampled : **Date Analyzed : 09/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.30	<0.30	NA	mg/m3
Barium	0.15	<0.15	NA	mg/m3
Beryllium	0.15	<0.15	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.45	<0.45	NA	mg/m3
Copper	0.30	<0.30	NA	mg/m3
Lead	0.38	<0.38	NA	mg/m3
Manganese	0.15	<0.15	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 15-SEP-17

Submitted by: SJW/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : NS
Date Received : 12-SEP-17

Account No.: 90734
Login No. : L418167
Date Analyzed : 14-SEP-17
Report ID : 1018447

Client ID : 22152-I17 **Lab ID : L418167-5** **Air Volume : 1042.2 L**
Date Sampled : **Date Analyzed : 09/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Magnesium Oxide	12.	<12	<0.012	mg/m3
Molybdenum	0.15	0.17	0.00016	mg/m3
Nickel	0.30	<0.30	<0.00029	mg/m3
Thallium	1.5	<1.5	<0.0014	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.00077	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PVC
Date : 15-SEP-17

Submitted by: SJW/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : NS
Date Received : 12-SEP-17

Account No.: 90734
Login No. : L418167

Date Analyzed : 14-SEP-17
Report ID : 1018447

Client ID : 22152-I18 **Lab ID : L418167-6** **Air Volume : NA**
Date Sampled : **Date Analyzed : 09/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Magnesium Oxide	12.	<12	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Nickel	0.30	<0.30	NA	mg/m3
Thallium	1.5	<1.5	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PVC
Date : 15-SEP-17

Submitted by: SJW/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : NS
Date Received : 12-SEP-17

Account No.: 90734
Login No. : L418167

Date Analyzed : 14-SEP-17
Report ID : 1018273

Asbestos Fiber Count (A Rules)

Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
22152-A19	L418167-1	3/100	<7	<2700	521,000	<0.005
22152-A20	L418167-2	1.5/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : BTM
Approved by : BDB
Date : 18-SEP-17
QC by: NDC
Supervisor: BDB

< -Less Than
> -Greater Than
ND -Not Detected
NA -Not Applicable
cc -Cubic Centimeters
NS -Not Specified
mm2 -Square millimeters

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : NS
Date Received : 12-SEP-17

Account No.: 90734
Login No. : L418167
Date Analyzed : 13-SEP-17
Report ID : 1017839

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-S19	L418167-3	1031.3	<0.050	<0.048
22152-S20	L418167-4	NA	<0.050	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg
Analytical Method : mod. NIOSH 0600; Gravimetric
OSHA PEL : PNOR 5 mg/m3 (TWA)
Collection Media : PVC PW 37mm

Submitted by: NRH/HVN
Approved by : SPR
Date : 13-SEP-17 NYS DOH # : 11626
Supervisor: KRK QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : NS
Date Received : 12-SEP-17

Account No.: 90734
Login No. : L418167

Date Analyzed : 13-SEP-17 - 17-SEP-17
Report ID : 1018860

Respirable Crystalline Silica (RCS): Quartz, Cristobalite, Tridymite

Sample ID	Lab ID	Analyte	Air Vol l	ug	ug/m3
22152-S19	L418167-3	Quartz	1031.3	<5.0	<4.8
		Cristobalite	1031.3	<5.0	<4.8
		Tridymite	1031.3	<20	<19
		RCS	1031.3	<5.0	<4.8
22152-S20	L418167-4	Quartz	NA	<5.0	NA
		Cristobalite	NA	<5.0	NA
		Tridymite	NA	<20	NA
		RCS	NA	<5.0	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: Q:5.0ug C:5.0ug T:20.ug
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD
OSHA PEL : 50 ug/m3 RCS
Collection Media : PVC PW 37mm

Submitted: SPR
Approved: KRK
Date : 18-SEP-17 NYS DOH # : 11626
Supervisor: KRK QC by: NDC

< -Less Than
> -Greater Than
NA -Not Applicable
mg -Milligrams
ug -Micrograms
ND -Not Detected
kg -Kilograms
m3 -Cubic Meters
l -Liters
ppm -Parts per Million
NS -Not Specified
mppcf -Million Particles per Cubic Foot

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled :
Date Received: 12-SEP-17
Date Analyzed: 13-SEP-17 - 17-SEP-17

Account No.: 90734
Login No. : L418167

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L418167 (Report ID: 1018447):
TLV for Vanadium pentoxide: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for Magnesium Oxide: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(32), im-mwvfilt(28)
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3; as Fume, Ceiling = 0.1 mg/m3.

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled :
Date Received: 12-SEP-17
Date Analyzed: 13-SEP-17 - 17-SEP-17

Account No.: 90734
Login No. : L418167

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Magnesium Oxide	+/-9.2%	99.2%
Molybdenum	+/-7.6%	100%
Nickel	+/-8%	101%
Thallium	+/-7.9%	101%
Vanadium Pentoxide	+/-6.5%	100%

Parameter	Method	PEL
Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	See footnote

L418167 (Report ID: 1018450):
TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for COBALT: 0.02 mg/m3
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for Calcium Oxide: 2 mg/m3
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3
TLV for SELENIUM: 0.2 mg/m3
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for CHROMIUM: 0.5 mg/m3
TLV for IRON OXIDE: 5 mg/m3

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled :
Date Received: 12-SEP-17
Date Analyzed: 13-SEP-17 - 17-SEP-17

Account No.: 90734
Login No. : L418167

L418167 (Report ID: 1018450):
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(32), im-mwvfilt(28)
PEL listed refers to Aluminum as total dust.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.

L418167 (Report ID: 1018450):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-7.7%	96.9%
Antimony	+/-9.8%	97.3%
Arsenic	+/-7.6%	103%
Barium	+/-6.5%	101%
Beryllium	+/-10.8%	103%
Cadmium	+/-8.6%	102%
Calcium Oxide	+/-10.6%	105%
Chromium	+/-11.2%	103%
Cobalt	+/-8.5%	103%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled :
Date Received: 12-SEP-17
Date Analyzed: 13-SEP-17 - 17-SEP-17

Account No.: 90734
Login No. : L418167

Copper	+/-10.3%	103%
Iron Oxide	+/-9.6%	106%
Lead	+/-9.1%	100%
Manganese	+/-8.3%	99.8%
Molybdenum	+/-7.6%	100%
Selenium	+/-11.6%	105%
Zinc Oxide	+/-8.9%	102%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)
Chromium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Selenium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

L418167 (Report ID: 1018273):
SOPs: ia-pcm(26)
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a greater than optimal variability and are probably biased.
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as follows:
0.154 (5-20 fibers/100 fields)

< -Less Than	mg -Milligrams	m3 -Cubic Meters	kg -Kilograms	ppm -Parts per Million		
> -Greater Than	ug -Micrograms	l -Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable	

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled :
Date Received: 12-SEP-17
Date Analyzed: 13-SEP-17 - 17-SEP-17

Account No.: 90734
Login No. : L418167

L418167 (Report ID: 1018273):
0.100 (>20-50 fibers/100 fields)
0.069 (>50-100 fibers/100 fields)
0.090 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take into account any uncertainty associated with the sampling process.

L418167 (Report ID: 1017839):
TLV for RESPIRABLE DUST: NA
SOPs: GRAV-SOP-5(18), GRAV-SOP-6(17)
Gravimetric analytical accuracy of the sampling media is 0.002 +/- 0.018 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.
PNOR = Particulates Not Otherwise Regulated.

L418167 (Report ID: 1018860):
TLV for QUARTZ: 0.025 mg/m3 Respirable
TLV for TRIDYMITE: NA
TLV for CRISTOBALITE: 0.025 mg/m3 Respirable
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26)

L418167 (Report ID: 1018860):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-10.3%	102%
Quartz	+/-10.9%	93.4%
Tridymite	+/-13.6%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

L418167

SGS GALSON

1Z5X626A6646673473
Date:09/12/17
Shipper:UPS
Initials:ZRK
Prep:UNKNOWN

☐ New Client?

Report To*: Toronto Transit Commission, 1920 Yonge St, Suite 600, Toronto, ON M4S 3E2

Client Account No.*:

Invoice To*: RTB

Phone No.*: 416-393-6668

Phone No.:

Cell No.:

Email:

Email Results To: Virgil.Uwali@ttc.ca OHEresults@

Purchase Order No.: PU 240 835

Email Address: OHEconsultants.com

Credit Card: ☐ Credit Card on File ☐ Call for Credit Card Info

☐ Samples submitted using the FreePumpLoan™ Program. ☐ Samples submitted using the FreeSamplingBadges™ Program.

Need Results By*:	(surcharge)
☒ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%
☐ Next Day by Noon	150%
☐ Same Day	200%

Site Name:

Project: 22152

Sampled By: OHE Consultants

Comments:

List description of industry or process/interferences present in sampling area:

State samples were collected in (ex. NY):

Please indicate which OEL this data will be used for: ☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA ☐ MSHA ☐ Other (specify):

Sample Identification* (Maximum of 20 characters, ID's longer than 20 characters will be abbreviated.)	Date Sampled* (mm/dd/yy)	Collection Medium	Sample Volume, Sample Time, or Sample Area*	Sample Units*: L, ml, min., in2, cm2, ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (ex. welding, plating, painting, etc.)*
Example	01/01/11	2pc UW PVC	960	L	Hexavalent Chromium (Cr6)	mod. OSHA ID-215	Welding
22152-A19		25mm PCM	515	521.0	Asbestos	NIOSH 7400	
22152-A20		25mm PCM	Ø	Ø	↓	↓	
22152-S19		PW PVC in PPI		1031.3	Crystalline Silica (all forms)	NIOSH 7500 & Resp. Dust	
22152-S20		↓	Ø	Ø	↓	NIOSH 0600	
22152-I17		PW PVC in IOM		1042.2	Metals (Inhalable)	NIOSH 7300 & Inh. Dust	
22152 I18		↓	Ø	Ø	↓	NIOSH 0500	
22152-M19		MCE in PPI		1040.1	Metals (Respirable)	NIOSH 7300	
22152-M20		↓	Ø	Ø	↓	↓	
22152-T19		MCE		1034.7	Metals (Total)		
22152-T20		↓	Ø	Ø	↓	↓	

^Galson Laboratories will substitute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ please indicate if the lower LOQ is required (only available for certain analytes see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date/Time		Print Name/Signature	Date/Time
Relinquished by:	Larysa Kokhrovtseva	09/08/17	Received by:	Hemu Sai	9/11/17 5:00
Relinquished by:	Hemu Sai	9/11/17 6:00	Received by:	Kris Stone	9/12/17 1007

Samples received after 3pm will be considered as next day's business.

***Required fields, failure to complete these fields may result in a delay in your samples being processed.** Page ____ of ____

LAB ORIGINAL

TTC 22152

Respirable – Aluminum, Cadmium, Iron Oxide, Molybdenum (total), Zinc Oxide

Inhalable – Magnesium Oxide, Molybdenum (total), Nickel – metal, Thallium, Vanadium Pentoxide

Total – Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium Oxide, Chromium III, Cobalt, Copper, Lead, Manganese, Selenium

Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Canada

September 25, 2017

AIHA-LAP #100324 Account# 90734 Login# L418917

Dear Mr. Umali:

Enclosed are the analytical results for the samples received by our laboratory on September 19, 2017. All test results meet the quality control requirements of AIHA-LAP and NELAC unless otherwise stated in this report. All samples on the chain of custody were received in good condition unless otherwise noted.

Please note the ID discrepancies recorded on the attached chain of custody. The IDs from the chain have been used for this report.

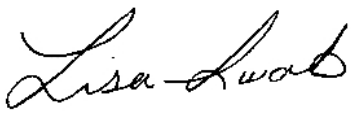
Results in this report are based on the sampling data provided by the client and refer only to the samples as they were received at the laboratory. Unless otherwise requested, samples for asbestos analysis will be discarded 60 days from the date of this report and all other non-IOM samples will be retained for 14 days following the date of this report (when possible). IOMs will be cleaned & disposed of after seven calendar days.

Current Scopes of Accreditation can be viewed at www.galsonlabs.com in the accreditations section under the "about Galson" tab.

Please contact Katrina Ahchong at (888) 432-5227, if you would like any additional information regarding this report. Thank you for using SGS Galson Laboratories.

Sincerely,

SGS Galson Laboratories



Lisa Swab
Laboratory Director

Enclosure(s)

Galson Laboratories, Inc. is now a part of SGS, the world's leading inspection, verification, testing, and certification company. As part of our transition to SGS, you will begin to see some formatting changes with reports that will improve the presentation of data and allow for the transition to the new logo.

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FAX: (315) 437-0571
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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 12-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418917
Date Analyzed : 21-SEP-17
Report ID : 1019860

Client ID : 22152-M21 **Lab ID : L418917-7** **Air Volume : 1110.3 L**
Date Sampled : 09/12/17 **Date Analyzed : 09/21/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.0068	mg/m3
Cadmium	0.15	<0.15	<0.00014	mg/m3
Iron Oxide	11.	110	0.098	mg/m3
Molybdenum	0.15	<0.15	<0.00014	mg/m3
Zinc Oxide	2.8	<2.8	<0.0025	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 25-SEP-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 12-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418917
Date Analyzed : 21-SEP-17
Report ID : 1019860

Client ID : 22152-M22 **Lab ID : L418917-8** **Air Volume : NA**
Date Sampled : 09/12/17 **Date Analyzed : 09/21/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 25-SEP-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 12-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418917

Date Analyzed : 21-SEP-17
Report ID : 1019860

Client ID : 22152-T21 **Lab ID : L418917-9** **Air Volume : 1099.4 L**
Date Sampled : 09/12/17 **Date Analyzed : 09/21/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.00082	mg/m3
Arsenic	0.30	<0.30	<0.00027	mg/m3
Barium	0.15	5.9	0.0054	mg/m3
Beryllium	0.15	<0.15	<0.00014	mg/m3
Cadmium	0.15	<0.15	<0.00014	mg/m3
Calcium Oxide	100.	<100	<0.095	mg/m3
Chromium	7.5	<7.5	<0.0068	mg/m3
Cobalt	0.45	<0.45	<0.00041	mg/m3
Copper	0.30	0.48	0.00044	mg/m3
Lead	0.38	<0.38	<0.00034	mg/m3
Manganese	0.15	0.86	0.00078	mg/m3
Selenium	2.3	<2.3	<0.0020	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 25-SEP-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 12-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418917
Date Analyzed : 21-SEP-17
Report ID : 1019860

Client ID : 22152-T22 **Lab ID : L418917-10** **Air Volume : NA**
Date Sampled : 09/12/17 **Date Analyzed : 09/21/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.30	<0.30	NA	mg/m3
Barium	0.15	<0.15	NA	mg/m3
Beryllium	0.15	<0.15	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.45	<0.45	NA	mg/m3
Copper	0.30	<0.30	NA	mg/m3
Lead	0.38	<0.38	NA	mg/m3
Manganese	0.15	<0.15	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 25-SEP-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 12-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418917

Date Analyzed : 21-SEP-17
Report ID : 1019859

Client ID : 22152-I19 **Lab ID : L418917-5** **Air Volume : 1100.7 L**
Date Sampled : 09/12/17 **Date Analyzed : 09/21/17**

Parameter	LOQ ug	Total ug	Conc	Units
Magnesium Oxide	12.	<12	<0.011	mg/m3
Molybdenum	0.15	<0.15	<0.00014	mg/m3
Nickel	0.30	<0.30	<0.00027	mg/m3
Thallium	1.5	<1.5	<0.0014	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.00073	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 22-SEP-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 12-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418917

Date Analyzed : 21-SEP-17
Report ID : 1019859

Client ID : 22152-I20 **Lab ID : L418917-6** **Air Volume : NA**
Date Sampled : 09/12/17 **Date Analyzed : 09/21/17**

Parameter	LOQ ug	Total ug	Conc	Units
Magnesium Oxide	12.	<12	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Nickel	0.30	<0.30	NA	mg/m3
Thallium	1.5	<1.5	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 22-SEP-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 12-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418917
Date Analyzed : 25-SEP-17
Report ID : 1020356

Asbestos Fiber Count (A Rules)

	Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
+	22152-A21	L418917-1	3/100	<7	<2700	556,700	<0.005
	22152-A22	L418917-2	1/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : BTM
Approved by : BDB
Date : 25-SEP-17
QC by: NDC
Supervisor: BDB

< -Less Than
> -Greater Than
ND -Not Detected
NA -Not Applicable
cc -Cubic Centimeters
NS -Not Specified
mm2 -Square millimeters

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 12-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418917
Date Analyzed : 20-SEP-17
Report ID : 1019309

Inhalable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-I19	L418917-5	1100.7	0.24	0.22
22152-I20	L418917-6	NA	<0.10	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.10 mg
Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV
OSHA PEL : NA
Collection Media : IOM 25mm PW PVC

Submitted by: NRH
Approved by : SPR
Date : 20-SEP-17
Supervisor: KRK

NYS DOH # : 11626
QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 12-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418917
Date Analyzed : 20-SEP-17
Report ID : 1019308

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-S21	L418917-3	1098.1	0.16	0.15
22152-S22	L418917-4	NA	<0.050	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg
Analytical Method : mod. NIOSH 0600; Gravimetric
OSHA PEL : PNOR 5 mg/m3 (TWA)
Collection Media : PVC PW 37mm

Submitted by: NRH/HVN
Approved by : SPR
Date : 20-SEP-17
Supervisor: KRK

NYS DOH # : 11626
QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 12-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418917
Date Analyzed : 20-SEP-17 - 22-SEP-17
Report ID : 1020012

Respirable Crystalline Silica (RCS): Quartz, Cristobalite, Tridymite

Sample ID	Lab ID	Analyte	Air Vol l	ug	ug/m3
22152-S21	L418917-3	Quartz	1098.1	<5.0	<4.6
		Cristobalite	1098.1	<5.0	<4.6
		Tridymite	1098.1	<20	<18
		RCS	1098.1	<5.0	<4.6
22152-S22	L418917-4	Quartz	NA	<5.0	NA
		Cristobalite	NA	<5.0	NA
		Tridymite	NA	<20	NA
		RCS	NA	<5.0	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: Q:5.0ug C:5.0ug T:20.ug
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD
OSHA PEL : 50 ug/m3 RCS
Collection Media : PVC PW 37mm

Submitted: SPR
Approved: CMR
Date : 25-SEP-17 NYS DOH # : 11626
Supervisor: KRK QC by: NDC

< -Less Than
> -Greater Than
NA -Not Applicable
mg -Milligrams
ug -Micrograms
ND -Not Detected
kg -Kilograms
m3 -Cubic Meters
l -Liters
ppm -Parts per Million
NS -Not Specified
mppcf -Million Particles per Cubic Foot

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 12-SEP-17 Account No.: 90734
Date Received: 19-SEP-17 Login No. : L418917
Date Analyzed: 20-SEP-17 - 25-SEP-17

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L418917 (Report ID: 1019859):
TLV for Vanadium pentoxide: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for Magnesium Oxide: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(32), im-mwvfilt(28)
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3; as Fume, Ceiling = 0.1 mg/m3.

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 12-SEP-17 Account No.: 90734
Date Received: 19-SEP-17 Login No. : L418917
Date Analyzed: 20-SEP-17 - 25-SEP-17

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Magnesium Oxide	+/-9.2%	99.2%
Molybdenum	+/-7.6%	100%
Nickel	+/-8%	101%
Thallium	+/-7.9%	101%
Vanadium Pentoxide	+/-6.5%	100%

Parameter	Method	PEL
Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	See footnote

L418917 (Report ID: 1019860):
TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for COBALT: 0.02 mg/m3
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for Calcium Oxide: 2 mg/m3
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3
TLV for SELENIUM: 0.2 mg/m3
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for CHROMIUM: 0.5 mg/m3
TLV for IRON OXIDE: 5 mg/m3

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 12-SEP-17 Account No.: 90734
Date Received: 19-SEP-17 Login No. : L418917
Date Analyzed: 20-SEP-17 - 25-SEP-17

L418917 (Report ID: 1019860):
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(32), im-mwvfilt(28)
PEL listed refers to Aluminum as total dust.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.

L418917 (Report ID: 1019860):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-7.7%	96.9%
Antimony	+/-9.8%	97.3%
Arsenic	+/-7.6%	103%
Barium	+/-6.5%	101%
Beryllium	+/-10.8%	103%
Cadmium	+/-8.6%	102%
Calcium Oxide	+/-10.6%	105%
Chromium	+/-11.2%	103%
Cobalt	+/-8.5%	103%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 12-SEP-17 Account No.: 90734
Date Received: 19-SEP-17 Login No. : L418917
Date Analyzed: 20-SEP-17 - 25-SEP-17

Copper	+/-10.3%	103%
Iron Oxide	+/-9.6%	106%
Lead	+/-9.1%	100%
Manganese	+/-8.3%	99.8%
Molybdenum	+/-7.6%	100%
Selenium	+/-11.6%	105%
Zinc Oxide	+/-8.9%	102%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)
Chromium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Selenium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

+L418917-1 (Report ID: 1020356):
The sample results may have a negative bias; the filter surface was covered by fine particulate that may have obscured fibers.

L418917 (Report ID: 1020356):
SOPs: ia-pcm(26)
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 12-SEP-17 Account No.: 90734
Date Received: 19-SEP-17 Login No. : L418917
Date Analyzed: 20-SEP-17 - 25-SEP-17

L418917 (Report ID: 1020356):
greater than optimal variability and are probably biased.
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as follows:
0.154 (5-20 fibers/100 fields)
0.100 (>20-50 fibers/100 fields)
0.069 (>50-100 fibers/100 fields)
0.090 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take into account any uncertainty associated with the sampling process.

L418917 (Report ID: 1019309):
SOPs: GRAV-SOP-8(17)
Gravimetric analytical accuracy of the sampling media is -0.001 +/- 0.030 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.

L418917 (Report ID: 1019308):
TLV for RESPIRABLE DUST: NA
SOPs: GRAV-SOP-5(18), GRAV-SOP-6(17)
Gravimetric analytical accuracy of the sampling media is 0.002 +/- 0.018 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.
PNOR = Particulates Not Otherwise Regulated.

L418917 (Report ID: 1020012):
TLV for QUARTZ: 0.025 mg/m3 Respirable
TLV for TRIDYMITE: NA
TLV for CRISTOBALITE: 0.025 mg/m3 Respirable
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26)

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 12-SEP-17 Account No.: 90734
Date Received: 19-SEP-17 Login No. : L418917
Date Analyzed: 20-SEP-17 - 25-SEP-17

L418917 (Report ID: 1020012):

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-10.3%	102%
Quartz	+/-10.9%	93.4%
Tridymite	+/-13.6%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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1Z5X626A6646025995
Date: 09/19/17
Shipper: UPS
Initials: MAK
Prep: UNKNOWN
L4891M

☐ New Client?

Report To*: Toronto Transit Commission
1320 Yonge St
Suite 600
TORONTO, ON M4S 3E2

Client Account No.*:

Phone No.*: 416 393 6668
Cell No.: virgil.unali@ttc.ca
Email Results To: $ oheresults@ohecansultants.com
Email Address:

Invoice To*: Toronto Transit Commission
1320 Yonge St
Suite 600
TORONTO, ON M4S 3E2

Phone No.:
Email:
Purchase Order No.: PU 240 835
Credit Card: ☐ Credit Card on File ☐ Call for Credit Card Info

☐ Samples submitted using the FreePumpLoan™ Program. ☐ Samples submitted using the FreeSamplingBadges™ Program.

Need Results By*:	(surcharge)
☒ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%
☐ Next Day by Noon	150%
☐ Same Day	200%

Site Name:
Project: 22152
Sampled By: OHE Consultants

Comments:
* ALL ID's are nos. 25, nos. 26 ** ID's are nos. 23, nos. 24. SE 9/19/17 R106

List description of industry or process/interferences present in sampling area:

State samples were collected in (ex. NY):

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify):

Sample Identification* (Maximum of 20 characters, ID's longer than 20 characters will be abbreviated.)	Date Sampled* (mm/dd/yy)	Collection Medium	Sample Volume, Sample Time, or Sample Area*	Sample Units*: (L), ml, min., in2, cm2, ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (ex. welding, plating, painting, etc.)*
Example	01/01/11	2pc UW PVC	960	L	Hexavalent Chromium (Cr6)	mod. OSHA ID-215	Welding
22152-A21 *	09/12/17	25mm PCM	556.7	L	Asbestos	NIOSH 7400	
22152-A22 *		25mm PCM	Ø		"	"	
22152-S21 *		PW PVC in PPI	1038.1		Crystalline Silica (all forms)	NIOSH 7500 + Resp Dust NIOSH 0600	
22152-S22 *		PW PVC in PPI	Ø		"	"	
22152-I19 **		PW MCE in IOM	1100.7		Inhalable Metals + Inhalable Dust	NIOSH 7300 & 0500	
22152-I20 **		PW MCE in IOM	Ø		"	"	
22152-M21 *		PW PVC in PPI	1110.3		Metals (Respirable)	NIOSH 7300	
22152-M22 *		PW PVC in PPI	Ø		"	"	
22152-T21 *		UW MCE	1093.4		Metals (total)	"	
22152-T22 *		UW MCE	Ø		"	"	

^Galson Laboratories will substitute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ please indicate if the lower LOQ is required (only available for certain analytes see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date/Time		Print Name/Signature	Date/Time
Relinquished by:	ROMAIN MATHIEUET	Sept. 13 1PM	Received by:		9/19 5:29
Relinquished by:		9/13	Received by:		9/19/17 0955

Samples received after 3pm will be considered as next day's business.
*Required fields, failure to complete these fields may result in a delay in your samples being processed.

Page 1 of 1

LAB ORIGINAL

Respirable – Aluminum, Cadmium, Iron Oxide, Molybdenum (total), Zinc Oxide

Inhalable – Magnesium Oxide, Molybdenum (total), Nickel – metal, Thallium, Vanadium Pentoxide

Total – Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium Oxide, Chromium III, Cobalt, Copper, Lead, Manganese, Selenium

SGS GALSON

Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Canada

September 25, 2017

AIHA-LAP #100324 Account# 90734 Login# L418946

Dear Mr. Umali:

Enclosed are the analytical results for the samples received by our laboratory on September 19, 2017. All test results meet the quality control requirements of AIHA-LAP and NELAC unless otherwise stated in this report. All samples on the chain of custody were received in good condition unless otherwise noted.

Results in this report are based on the sampling data provided by the client and refer only to the samples as they were received at the laboratory. Unless otherwise requested, samples for asbestos analysis will be discarded 60 days from the date of this report and all other non-IOM samples will be retained for 14 days following the date of this report (when possible). IOMs will be cleaned & disposed of after seven calendar days.

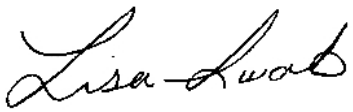
To ensure the safety of laboratory receiving personnel, always seal bulk samples securely to prevent possible escape of material. Also, please double-bag bulk samples individually prior to shipping. Samples not received in this manner will be noted on the chain of custody form.

Current Scopes of Accreditation can be viewed at www.galsonlabs.com in the accreditations section under the "about Galson" tab.

Please contact Katrina Ahchong at (888) 432-5227, if you would like any additional information regarding this report. Thank you for using SGS Galson Laboratories.

Sincerely,

SGS Galson Laboratories



Lisa Swab
Laboratory Director

Enclosure(s)

Galson Laboratories, Inc. is now a part of SGS, the world's leading inspection, verification, testing, and certification company. As part of our transition to SGS, you will begin to see some formatting changes with reports that willimprove the presentation of data and allow for the transition to the new logo.

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 12-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418946
Date Analyzed : 21-SEP-17
Report ID : 1019866

Client ID : 22152-M23 **Lab ID : L418946-7** **Air Volume : 1132.9 L**
Date Sampled : 09/12/17 **Date Analyzed : 09/21/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.0066	mg/m3
Cadmium	0.15	<0.15	<0.00013	mg/m3
Iron Oxide	11.	110	0.097	mg/m3
Molybdenum	0.15	<0.15	<0.00013	mg/m3
Zinc Oxide	2.8	<2.8	<0.0025	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 22-SEP-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 12-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418946

Date Analyzed : 21-SEP-17
Report ID : 1019866

Client ID : 22152-M24 **Lab ID : L418946-8** **Air Volume : NA**
Date Sampled : 09/12/17 **Date Analyzed : 09/21/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 22-SEP-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 12-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418946

Date Analyzed : 21-SEP-17
Report ID : 1019866

Client ID : 22152-T23 **Lab ID : L418946-9** **Air Volume : 1120.4 L**
Date Sampled : 09/12/17 **Date Analyzed : 09/21/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.00080	mg/m3
Arsenic	0.30	<0.30	<0.00027	mg/m3
Barium	0.15	6.5	0.0058	mg/m3
Beryllium	0.15	<0.15	<0.00013	mg/m3
Cadmium	0.15	<0.15	<0.00013	mg/m3
Calcium Oxide	100.	<100	<0.094	mg/m3
Chromium	7.5	<7.5	<0.0067	mg/m3
Cobalt	0.45	<0.45	<0.00040	mg/m3
Copper	0.30	0.52	0.00047	mg/m3
Lead	0.38	<0.38	<0.00033	mg/m3
Manganese	0.15	0.93	0.00083	mg/m3
Selenium	2.3	<2.3	<0.0020	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 22-SEP-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 12-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418946
Date Analyzed : 21-SEP-17
Report ID : 1019866

Client ID : 22152-T24 **Lab ID : L418946-10** **Air Volume : NA**
Date Sampled : 09/12/17 **Date Analyzed : 09/21/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.30	<0.30	NA	mg/m3
Barium	0.15	<0.15	NA	mg/m3
Beryllium	0.15	<0.15	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.45	<0.45	NA	mg/m3
Copper	0.30	<0.30	NA	mg/m3
Lead	0.38	<0.38	NA	mg/m3
Manganese	0.15	<0.15	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 22-SEP-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 12-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418946

Date Analyzed : 21-SEP-17
Report ID : 1019864

Client ID : 22152-I21 **Lab ID : L418946-5** **Air Volume : 1129.2 L**
Date Sampled : 09/12/17 **Date Analyzed : 09/21/17**

Parameter	LOQ ug	Total ug	Conc	Units
Magnesium Oxide	12.	<12	<0.011	mg/m3
Molybdenum	0.15	<0.15	<0.00013	mg/m3
Nickel	0.30	<0.30	<0.00027	mg/m3
Thallium	1.5	<1.5	<0.0013	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.00071	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 22-SEP-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 12-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418946

Date Analyzed : 21-SEP-17
Report ID : 1019864

Client ID : 22152-I22 **Lab ID : L418946-6** **Air Volume : NA**
Date Sampled : 09/12/17 **Date Analyzed : 09/21/17**

Parameter	LOQ ug	Total ug	Conc	Units
Magnesium Oxide	12.	<12	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Nickel	0.30	<0.30	NA	mg/m3
Thallium	1.5	<1.5	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 22-SEP-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 12-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418946
Date Analyzed : 25-SEP-17
Report ID : 1020360

Asbestos Fiber Count (A Rules)

	Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
+	22152-A23	L418946-1	8/100	10.2	3927	564,700	0.007
	22152-A24	L418946-2	1.5/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : BTM
Approved by : BDB
Date : 25-SEP-17
QC by: AMD
Supervisor: BDB

< -Less Than
> -Greater Than
ND -Not Detected
NA -Not Applicable
cc -Cubic Centimeters
NS -Not Specified
mm2 -Square millimeters

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 12-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418946
Date Analyzed : 20-SEP-17
Report ID : 1019325

Inhalable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-I21	L418946-5	1129.2	0.26	0.23
22152-I22	L418946-6	NA	<0.10	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.10 mg
Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV
OSHA PEL : NA
Collection Media : IOM 25mm PW PVC

Submitted by: NRH
Approved by : SPR
Date : 20-SEP-17
Supervisor: KRK

NYS DOH # : 11626
QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 12-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418946
Date Analyzed : 20-SEP-17
Report ID : 1019324

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-S23	L418946-3	1114.6	0.14	0.12
22152-S24	L418946-4	NA	<0.050	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg
Analytical Method : mod. NIOSH 0600; Gravimetric
OSHA PEL : PNOR 5 mg/m3 (TWA)
Collection Media : PVC PW 37mm

Submitted by: NRH
Approved by : SPR
Date : 20-SEP-17
Supervisor: KRK

NYS DOH # : 11626
QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 12-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418946
Date Analyzed : 20-SEP-17 - 22-SEP-17
Report ID : 1019979

Respirable Crystalline Silica (RCS): Quartz, Cristobalite, Tridymite

Sample ID	Lab ID	Analyte	Air Vol l	ug	ug/m3
22152-S23	L418946-3	Quartz	1114.6	<5.0	<4.5
		Cristobalite	1114.6	<5.0	<4.5
		Tridymite	1114.6	<20	<18
		RCS	1114.6	<5.0	<4.5
22152-S24	L418946-4	Quartz	NA	<5.0	NA
		Cristobalite	NA	<5.0	NA
		Tridymite	NA	<20	NA
		RCS	NA	<5.0	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: Q:5.0ug C:5.0ug T:20.ug
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD
OSHA PEL : 50 ug/m3 RCS
Collection Media : PVC PW 37mm

Submitted: NLO
Approved: CMR
Date : 23-SEP-17 NYS DOH # : 11626
Supervisor: KRK QC by: AMD

< -Less Than
> -Greater Than
NA -Not Applicable
mg -Milligrams
ug -Micrograms
ND -Not Detected
kg -Kilograms
m3 -Cubic Meters
l -Liters
ppm -Parts per Million
NS -Not Specified
mppcf -Million Particles per Cubic Foot

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 12-SEP-17 Account No.: 90734
Date Received: 19-SEP-17 Login No. : L418946
Date Analyzed: 20-SEP-17 - 25-SEP-17

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L418946 (Report ID: 1019864):
TLV for Vanadium pentoxide: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for Magnesium Oxide: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(32), im-mwvfilt(28)
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3; as Fume, Ceiling = 0.1 mg/m3.

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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Client Name : Toronto Transit Commission Ltd.
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Date Sampled : 12-SEP-17 Account No.: 90734
Date Received: 19-SEP-17 Login No. : L418946
Date Analyzed: 20-SEP-17 - 25-SEP-17

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Magnesium Oxide	+/-9.2%	99.2%
Molybdenum	+/-7.6%	100%
Nickel	+/-8%	101%
Thallium	+/-7.9%	101%
Vanadium Pentoxide	+/-6.5%	100%

Parameter	Method	PEL
Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	See footnote

L418946 (Report ID: 1019866):
TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for COBALT: 0.02 mg/m3
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for Calcium Oxide: 2 mg/m3
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3
TLV for SELENIUM: 0.2 mg/m3
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for CHROMIUM: 0.5 mg/m3
TLV for IRON OXIDE: 5 mg/m3

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 12-SEP-17 Account No.: 90734
Date Received: 19-SEP-17 Login No. : L418946
Date Analyzed: 20-SEP-17 - 25-SEP-17

L418946 (Report ID: 1019866):
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(32), im-mwvfilt(28)
PEL listed refers to Aluminum as total dust.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.

L418946 (Report ID: 1019866):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-7.7%	96.9%
Antimony	+/-9.8%	97.3%
Arsenic	+/-7.6%	103%
Barium	+/-6.5%	101%
Beryllium	+/-10.8%	103%
Cadmium	+/-8.6%	102%
Calcium Oxide	+/-10.6%	105%
Chromium	+/-11.2%	103%
Cobalt	+/-8.5%	103%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
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Date Sampled : 12-SEP-17 Account No.: 90734
Date Received: 19-SEP-17 Login No. : L418946
Date Analyzed: 20-SEP-17 - 25-SEP-17

Copper	+/-10.3%	103%
Iron Oxide	+/-9.6%	106%
Lead	+/-9.1%	100%
Manganese	+/-8.3%	99.8%
Molybdenum	+/-7.6%	100%
Selenium	+/-11.6%	105%
Zinc Oxide	+/-8.9%	102%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)
Chromium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Selenium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

+L418946-1 (Report ID: 1020360):
The sample results may have a negative bias; the filter surface was covered by fine particulate that may have obscured fibers.

L418946 (Report ID: 1020360):
SOPs: ia-pcm(26)
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 12-SEP-17 Account No.: 90734
Date Received: 19-SEP-17 Login No. : L418946
Date Analyzed: 20-SEP-17 - 25-SEP-17

L418946 (Report ID: 1020360):
greater than optimal variability and are probably biased.
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as follows:
0.154 (5-20 fibers/100 fields)
0.100 (>20-50 fibers/100 fields)
0.069 (>50-100 fibers/100 fields)
0.090 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take into account any uncertainty associated with the sampling process.

L418946 (Report ID: 1019325):
SOPs: GRAV-SOP-8(17)
Gravimetric analytical accuracy of the sampling media is -0.001 +/- 0.030 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.

L418946 (Report ID: 1019324):
TLV for RESPIRABLE DUST: NA
SOPs: GRAV-SOP-5(18), GRAV-SOP-6(17)
Gravimetric analytical accuracy of the sampling media is 0.002 +/- 0.018 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.
PNOR = Particulates Not Otherwise Regulated.

L418946 (Report ID: 1019979):
TLV for QUARTZ: 0.025 mg/m3 Respirable
TLV for TRIDYMITE: NA
TLV for CRISTOBALITE: 0.025 mg/m3 Respirable
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26)

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 12-SEP-17 Account No.: 90734
Date Received: 19-SEP-17 Login No. : L418946
Date Analyzed: 20-SEP-17 - 25-SEP-17

L418946 (Report ID: 1019979):

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-10.3%	102%
Quartz	+/-10.9%	93.4%
Tridymite	+/-13.6%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

SGS GALSON

1Z5X626A6646025995
Date:09/19/17
Shipper:UPS
Initials:MAK
Prep:UNKNOWN
L418946

☐ New Client?

Client Account No.* :

Report To* :	Toronto Transit Commission, 1920 Yonge St., Suite 600, Toronto, ON M4S 3E2
Phone No.* :	416-393-6668
Cell No. :	
Email Results To :	Virgil.Umali@ttc.ca & oheresults@
Email Address :	oheconsultants.com
Invoice To* :	Toronto Transit Commission, 1920 Yonge St., Suite 600, Toronto, ON M4S 3E2
Phone No. :	
Email :	
Purchase Order No. :	PU240835
Credit Card :	☐ Credit Card on File ☐ Call for Credit Card Info

☐ Samples submitted using the FreePumpLoan™ Program. ☐ Samples submitted using the FreeSamplingBadges™ Program.

Need Results By*:	(surcharge)
☒ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%
☐ Next Day by Noon	150%
☐ Same Day	200%

Site Name : Project : 22152 Sampled By : OHE Consultants

Comments: R116

List description of industry or process/interferences present in sampling area:

State samples were collected in (ex. NY):

Please indicate which OEL this data will be used for: ☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA ☐ MSHA ☐ Other (specify):

Sample Identification* (Maximum of 20 characters, ID's longer than 20 characters will be abbreviated.)	Date Sampled* (mm/dd/yy)	Collection Medium	Sample Volume, Sample Time, or Sample Area*	Sample Units*: L, ml, min., in2, cm2, ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (ex. welding, plating, painting, etc.)*
Example	01/01/11	2pc UW PVC	960	L	Hexavalent Chromium (Cr6)	mod. OSHA ID-215	Welding
22152-A23	09/12/17	25mm PCM	560	564.7	Asbestos	NIOSH 7400	
22152-A24	↓	25mm PCM	Ø	Ø	〃		
22152-S23		PW PVC in PPI	558	1114.6	Crystalline Silica (all forms)	NIOSH 7500 + Resp. Dust NIOSH 0600	
22152-S24		PW PVC in PPI	Ø	Ø	〃		
22152-I21		PW PVC in IOM	560	1129.2	Metals (Inhalable) NIOSH	7300 + Inh. Dust	NIOSH 0500
22152-I22		PW PVC in IOM	Ø	Ø	〃		
22152-M23		UW MCE in PPI	558	1132.9	Metals (Respirable)	NIOSH 7300	
22152-M24		UW MCE in PPI	Ø	Ø	〃		
22152-T23		UW MCE	560	1120.4	Metals (Total)	NIOSH 7300	
22152-T24	↓	UW MCE	Ø	Ø	〃		

^Galson Laboratories will substitute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ please indicate if the lower LOQ is required (only available for certain analytes see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date/Time		Print Name/Signature	Date/Time
Relinquished by :	Yunny Deriana Lee	Sep 13/17 11:50AM	Received by:	Herman Sain	9/18/17 5:32
Relinquished by :	Herman Sain	9/18/17 6:00pm	Received by:	Mkraus	9/19/17 0959

Samples received after 3pm will be considered as next day's business.

***Required fields, failure to complete these fields may result in a delay in your samples being processed.** Page 1 of 1

LAB ORIGINAL

Respirable – Aluminum, Cadmium, Iron Oxide, Molybdenum (total), Zinc Oxide

Inhalable – Magnesium Oxide, Molybdenum (total), Nickel – metal, Thallium, Vanadium Pentoxide

Total – Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium Oxide, Chromium III, Cobalt, Copper, Lead, Manganese, Selenium

SGS GALSON

Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Canada

September 25, 2017

AIHA-LAP #100324 Account# 90734 Login# L418951

Dear Mr. Umali:

Enclosed are the analytical results for the samples received by our laboratory on September 19, 2017. All test results meet the quality control requirements of AIHA-LAP and NELAC unless otherwise stated in this report. All samples on the chain of custody were received in good condition unless otherwise noted.

Results in this report are based on the sampling data provided by the client and refer only to the samples as they were received at the laboratory. Unless otherwise requested, samples for asbestos analysis will be discarded 60 days from the date of this report and all other non-IOM samples will be retained for 14 days following the date of this report (when possible). IOMs will be cleaned & disposed of after seven calendar days.

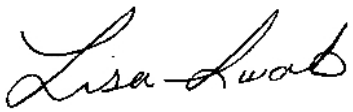
To ensure the safety of laboratory receiving personnel, always seal bulk samples securely to prevent possible escape of material. Also, please double-bag bulk samples individually prior to shipping. Samples not received in this manner will be noted on the chain of custody form.

Current Scopes of Accreditation can be viewed at www.galsonlabs.com in the accreditations section under the "about Galson" tab.

Please contact Katrina Ahchong at (888) 432-5227, if you would like any additional information regarding this report. Thank you for using SGS Galson Laboratories.

Sincerely,

SGS Galson Laboratories



Lisa Swab
Laboratory Director

Enclosure(s)

Galson Laboratories, Inc. is now a part of SGS, the world's leading inspection, verification, testing, and certification company. As part of our transition to SGS, you will begin to see some formatting changes with reports that willimprove the presentation of data and allow for the transition to the new logo.

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 13-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418951

Date Analyzed : 21-SEP-17 - 22-SEP-17
Report ID : 1019868

Client ID : 22152-M25 **Lab ID : L418951-7** **Air Volume : 1156.6 L**
Date Sampled : 09/13/17 **Date Analyzed : 09/21/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.0065	mg/m3
Cadmium	0.15	<0.15	<0.00013	mg/m3
Iron Oxide	11.	130	0.11	mg/m3
Molybdenum	0.15	<0.15	<0.00013	mg/m3
Zinc Oxide	2.8	<2.8	<0.0024	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 22-SEP-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 13-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418951

Date Analyzed : 21-SEP-17 - 22-SEP-17
Report ID : 1019868

Client ID : 22152-M26 **Lab ID : L418951-8** **Air Volume : NA**
Date Sampled : 09/13/17 **Date Analyzed : 09/21/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 22-SEP-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 13-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418951

Date Analyzed : 21-SEP-17 - 22-SEP-17
Report ID : 1019868

Client ID : 22152-T25 **Lab ID : L418951-9** **Air Volume : 1154 L**
Date Sampled : 09/13/17 **Date Analyzed : 09/21/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.00078	mg/m3
Arsenic	0.30	<0.30	<0.00026	mg/m3
Barium	0.15	7.7	0.0066	mg/m3
Beryllium	0.15	<0.15	<0.00013	mg/m3
Cadmium	0.15	<0.15	<0.00013	mg/m3
Calcium Oxide	100.	<100	<0.091	mg/m3
Chromium	7.5	<7.5	<0.0065	mg/m3
Cobalt	0.45	<0.45	<0.00039	mg/m3
Copper	0.30	0.62	0.00054	mg/m3
Lead	0.38	<0.38	<0.00032	mg/m3
Manganese	0.15	1.1	0.00095	mg/m3
Selenium	2.3	<2.3	<0.0019	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 22-SEP-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 13-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418951

Date Analyzed : 21-SEP-17 - 22-SEP-17
Report ID : 1019868

Client ID : 22152-T26 **Lab ID : L418951-10** **Air Volume : NA**
Date Sampled : 09/13/17 **Date Analyzed : 09/21/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.30	<0.30	NA	mg/m3
Barium	0.15	<0.15	NA	mg/m3
Beryllium	0.15	<0.15	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.45	<0.45	NA	mg/m3
Copper	0.30	<0.30	NA	mg/m3
Lead	0.38	<0.38	NA	mg/m3
Manganese	0.15	<0.15	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 22-SEP-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 13-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418951

Date Analyzed : 21-SEP-17 - 22-SEP-17
Report ID : 1020106

Client ID : 22152-I23 **Lab ID : L418951-5** **Air Volume : 1148.1 L**
Date Sampled : 09/13/17 **Date Analyzed : 09/22/17**

Parameter	LOQ ug	Total ug	Conc	Units
Magnesium Oxide	12.	<12	<0.011	mg/m3
Molybdenum	0.15	<0.15	<0.00013	mg/m3
Nickel	0.30	<0.30	<0.00026	mg/m3
Thallium	1.5	<1.5	<0.0013	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.00070	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 24-SEP-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 13-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418951

Date Analyzed : 21-SEP-17 - 22-SEP-17
Report ID : 1020106

Client ID : 22152-I24 **Lab ID : L418951-6** **Air Volume : NA**
Date Sampled : 09/13/17 **Date Analyzed : 09/22/17**

Parameter	LOQ ug	Total ug	Conc	Units
Magnesium Oxide	12.	<12	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Nickel	0.30	<0.30	NA	mg/m3
Thallium	1.5	<1.5	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 24-SEP-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 13-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418951
Date Analyzed : 25-SEP-17
Report ID : 1020362

Asbestos Fiber Count (A Rules)

	Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
+	22152-A25	L418951-1	9/100	11.5	4428	570,200	0.008
	22152-A26	L418951-2	2.5/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : BTM
Approved by : BDB
Date : 25-SEP-17
QC by: AMD
Supervisor: BDB

< -Less Than
> -Greater Than
ND -Not Detected
NA -Not Applicable
cc -Cubic Centimeters
NS -Not Specified
mm2 -Square millimeters

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 13-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418951
Date Analyzed : 20-SEP-17
Report ID : 1019362

Inhalable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-I23	L418951-5	1148.1	0.16	0.14
22152-I24	L418951-6	NA	<0.10	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.10 mg
Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV
OSHA PEL : NA
Collection Media : IOM 25mm PW PVC

Submitted by: HVN
Approved by : SPR
Date : 20-SEP-17
Supervisor: KRK

NYS DOH # : 11626
QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 13-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418951
Date Analyzed : 22-SEP-17
Report ID : 1019959

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-S25	L418951-3	1156	0.074	0.064
22152-S26	L418951-4	NA	<0.050	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg
Analytical Method : mod. NIOSH 0600; Gravimetric
OSHA PEL : PNOR 5 mg/m3 (TWA)
Collection Media : PVC PW 37mm

Submitted by: GMG
Approved by : SPR
Date : 22-SEP-17
Supervisor: KRK

NYS DOH # : 11626
QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 13-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418951
Date Analyzed : 22-SEP-17 - 23-SEP-17
Report ID : 1020047

Respirable Crystalline Silica (RCS): Quartz, Cristobalite, Tridymite

Sample ID	Lab ID	Analyte	Air Vol l	ug	ug/m3
22152-S25	L418951-3	Quartz	1156	<5.0	<4.3
		Cristobalite	1156	<5.0	<4.3
		Tridymite	1156	<20	<17
		RCS	1156	<5.0	<4.3
22152-S26	L418951-4	Quartz	NA	<5.0	NA
		Cristobalite	NA	<5.0	NA
		Tridymite	NA	<20	NA
		RCS	NA	<5.0	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: Q:5.0ug C:5.0ug T:20.ug
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD
OSHA PEL : 50 ug/m3 RCS
Collection Media : PVC PW 37mm

Submitted: CMR/NLO
Approved: KRK/CMR
Date : 25-SEP-17 NYS DOH # : 11626
Supervisor: KRK QC by: AMD

< -Less Than
> -Greater Than
NA -Not Applicable
mg -Milligrams
ug -Micrograms
ND -Not Detected
kg -Kilograms
m3 -Cubic Meters
l -Liters
ppm -Parts per Million
NS -Not Specified
mppcf -Million Particles per Cubic Foot

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 13-SEP-17 Account No.: 90734
Date Received: 19-SEP-17 Login No. : L418951
Date Analyzed: 20-SEP-17 - 25-SEP-17

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L418951 (Report ID: 1020106):
TLV for Vanadium pentoxide: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for Magnesium Oxide: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(32), im-mwvfilt(28)
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3; as Fume, Ceiling = 0.1 mg/m3.

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 13-SEP-17 Account No.: 90734
Date Received: 19-SEP-17 Login No. : L418951
Date Analyzed: 20-SEP-17 - 25-SEP-17

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Magnesium Oxide	+/-9.2%	99.2%
Molybdenum	+/-7.6%	100%
Nickel	+/-8%	101%
Thallium	+/-7.9%	101%
Vanadium Pentoxide	+/-6.5%	100%

Parameter	Method	PEL
Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	See footnote

L418951 (Report ID: 1019868):
TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for COBALT: 0.02 mg/m3
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for Calcium Oxide: 2 mg/m3
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3
TLV for SELENIUM: 0.2 mg/m3
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for CHROMIUM: 0.5 mg/m3
TLV for IRON OXIDE: 5 mg/m3

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 13-SEP-17 Account No.: 90734
Date Received: 19-SEP-17 Login No. : L418951
Date Analyzed: 20-SEP-17 - 25-SEP-17

L418951 (Report ID: 1019868):
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(32), im-mwvfilt(28)
PEL listed refers to Aluminum as total dust.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.

L418951 (Report ID: 1019868):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-7.7%	96.9%
Antimony	+/-9.8%	97.3%
Arsenic	+/-7.6%	103%
Barium	+/-6.5%	101%
Beryllium	+/-10.8%	103%
Cadmium	+/-8.6%	102%
Calcium Oxide	+/-10.6%	105%
Chromium	+/-11.2%	103%
Cobalt	+/-8.5%	103%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
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Date Sampled : 13-SEP-17 Account No.: 90734
Date Received: 19-SEP-17 Login No. : L418951
Date Analyzed: 20-SEP-17 - 25-SEP-17

Copper	+/-10.3%	103%
Iron Oxide	+/-9.6%	106%
Lead	+/-9.1%	100%
Manganese	+/-8.3%	99.8%
Molybdenum	+/-7.6%	100%
Selenium	+/-11.6%	105%
Zinc Oxide	+/-8.9%	102%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)
Chromium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Selenium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

+L418951-1 (Report ID: 1020362):
The sample results may have a negative bias; the filter surface was covered by fine particulate that may have obscured fibers.

L418951 (Report ID: 1020362):
SOPs: ia-pcm(26)
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 13-SEP-17 Account No.: 90734
Date Received: 19-SEP-17 Login No. : L418951
Date Analyzed: 20-SEP-17 - 25-SEP-17

L418951 (Report ID: 1020362):
greater than optimal variability and are probably biased.
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as follows:
0.154 (5-20 fibers/100 fields)
0.100 (>20-50 fibers/100 fields)
0.069 (>50-100 fibers/100 fields)
0.090 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take into account any uncertainty associated with the sampling process.

L418951 (Report ID: 1019362):
SOPs: GRAV-SOP-8(17)
Gravimetric analytical accuracy of the sampling media is -0.001 +/- 0.030 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.

L418951 (Report ID: 1019959):
TLV for RESPIRABLE DUST: NA
SOPs: GRAV-SOP-5(18), GRAV-SOP-6(17)
Gravimetric analytical accuracy of the sampling media is 0.002 +/- 0.018 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.
PNOR = Particulates Not Otherwise Regulated.

L418951 (Report ID: 1020047):
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26)
TLV for QUARTZ: 0.025 mg/m3 Respirable
TLV for TRIDYMITE: NA
TLV for CRISTOBALITE: 0.025 mg/m3 Respirable

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 13-SEP-17 Account No.: 90734
Date Received: 19-SEP-17 Login No. : L418951
Date Analyzed: 20-SEP-17 - 25-SEP-17

L418951 (Report ID: 1020047):

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-10.3%	102%
Quartz	+/-10.9%	93.4%
Tridymite	+/-13.6%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

SGS GALSON

1Z5X626A6646025995
Date:09/19/17
Shipper:UPS
Initials:MAK
Prep:UNKNOWN
L418951

☐ New Client?

Report To*: Toronto Transit Commission, 1320 Yonge St., Suite 600, TORONTO, ON M4S 3E2

Client Account No.*:

Phone No.*: 416 393 4468

Cell No.:

Email Results To: virgil.umeh@ttc.ca & dheresults@dheconsultants.com

Email Address:

Invoice To*: Toronto Transit Commission, 1320 Yonge St, Suite 600, TORONTO, ON M4S 3E2

Phone No.:

Email:

Purchase Order No.: PU 240 835

Credit Card: ☐ Credit Card on File ☐ Call for Credit Card Info

☐ Samples submitted using the FreePumpLoan™ Program.
☐ Samples submitted using the FreeSamplingBadges™ Program.

Need Results By*:	(surcharge)
☒ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%
☐ Next Day by Noon	150%
☐ Same Day	200%

Site Name: ~~** IDs = 22152~~ Project: 22152 Sampled By: DHE Consultants

Comments: ~~*** IDs: 22152: T21, T22~~ ID's ok \$\$ ~~ϕ IDs = 22152 M21, M22~~ ~~* IDs are: 22152: A21 A22~~ SG 9/19/17 ~~** IDs are 22152-S21, S22~~

R118

List description of industry or process/interferences present in sampling area:

State samples were collected in (ex. NY):

Please indicate which OEL this data will be used for: ☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA ☐ MSHA ☐ Other (specify):

Sample Identification* (Maximum of 20 characters, ID's longer than 20 characters will be abbreviated.)	Date Sampled* (mm/dd/yy)	Collection Medium	Sample Volume, Sample Time, or Sample Area*	Sample Units*: L, ml, min., in2, cm2, ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (ex. welding, plating, painting, etc.)*
Example	01/01/11	2pc UW PVC	960	L	Hexavalent Chromium (Cr6)	mod. OSHA ID-215	Welding
22152-A25 *	09/13/17	25mm PCM	570.2	L	Asbestos	NIOSH 7400	
22152-A26 *	↓	"	∅	↓	"	"	
22152-S25 **		PW PVC in PPI	1156.0		Crystalline Silica (All forms)	NIOSH 7500 + Resp. Dust NIOSH 0600	
22152-S26 **		"	∅.		"	"	
22152-I23 ***		PW MCE in IOM	1148.1		Metals (Inh.) + Inh. Dust	NIOSH 7300 + NIOSH 0500	
22152-I24 ***		"	∅		"	"	
22152-M25 ϕ		UW PVC in PPI	1156.6		Metals (Respirable)	NIOSH 7300	
22152-M26 ϕ		"	∅		"	"	
22152-T25 ϕϕ		UW MCE	1154.0		Metals (total)	NIOSH 7300	
22152-T26 ϕϕ	↓	"	∅	↓	"	"	

^Galson Laboratories will substitute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ please indicate if the lower LOQ is required (only available for certain analytes see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date/Time		Print Name/Signature	Date/Time
Relinquished by:	Roman Methevet [signature]	Sept. 14 1PM	Received by:	Herman San [signature]	9/13/17 5:30p
Relinquished by:	Herman San [signature]	9/13/17 6:00pm	Received by:	M Kims [signature]	9/19/17 0959

Samples received after 3pm will be considered as next day's business.

*Required fields, failure to complete these fields may result in a delay in your samples being processed. Page 1 of 1

LAB ORIGINAL

Respirable – Aluminum, Cadmium, Iron Oxide, Molybdenum (total), Zinc Oxide

Inhalable – Magnesium Oxide, Molybdenum (total), Nickel – metal, Thallium, Vanadium Pentoxide

Total – Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium Oxide, Chromium III, Cobalt, Copper, Lead, Manganese, Selenium

Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Canada

September 25, 2017

AIHA-LAP #100324 Account# 90734 Login# L418925

Dear Mr. Umali:

Enclosed are the analytical results for the samples received by our laboratory on September 19, 2017. All test results meet the quality control requirements of AIHA-LAP and NELAC unless otherwise stated in this report. All samples on the chain of custody were received in good condition unless otherwise noted.

Results in this report are based on the sampling data provided by the client and refer only to the samples as they were received at the laboratory. Unless otherwise requested, samples for asbestos analysis will be discarded 60 days from the date of this report and all other non-IOM samples will be retained for 14 days following the date of this report (when possible). IOMs will be cleaned & disposed of after seven calendar days.

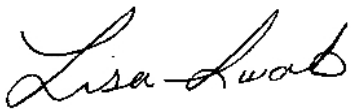
To ensure the safety of laboratory receiving personnel, always seal bulk samples securely to prevent possible escape of material. Also, please double-bag bulk samples individually prior to shipping. Samples not received in this manner will be noted on the chain of custody form.

Current Scopes of Accreditation can be viewed at www.galsonlabs.com in the accreditations section under the "about Galson" tab.

Please contact Katrina Ahchong at (888) 432-5227, if you would like any additional information regarding this report. Thank you for using SGS Galson Laboratories.

Sincerely,

SGS Galson Laboratories



Lisa Swab
Laboratory Director

Enclosure(s)

Galson Laboratories, Inc. is now a part of SGS, the world's leading inspection, verification, testing, and certification company. As part of our transition to SGS, you will begin to see some formatting changes with reports that willimprove the presentation of data and allow for the transition to the new logo.

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 14-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418925
Date Analyzed : 21-SEP-17 - 22-SEP-17
Report ID : 1019908

Client ID : 22152-M27 **Lab ID : L418925-7** **Air Volume : 1116.9 L**
Date Sampled : 09/14/17 **Date Analyzed : 09/21/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.0067	mg/m3
Cadmium	0.15	<0.15	<0.00013	mg/m3
Iron Oxide	11.	130	0.11	mg/m3
Molybdenum	0.15	<0.15	<0.00013	mg/m3
Zinc Oxide	2.8	<2.8	<0.0025	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 22-SEP-17

Submitted by: JPA/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 14-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418925

Date Analyzed : 21-SEP-17 - 22-SEP-17
Report ID : 1019908

Client ID : 22152-M28 **Lab ID : L418925-8** **Air Volume : NA**
Date Sampled : 09/14/17 **Date Analyzed : 09/21/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 22-SEP-17

Submitted by: JPA/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 14-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418925

Date Analyzed : 21-SEP-17 - 22-SEP-17
Report ID : 1019908

Client ID : 22152-T27 **Lab ID : L418925-9** **Air Volume : 1139.4 L**
Date Sampled : 09/14/17 **Date Analyzed : 09/21/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.00079	mg/m3
Arsenic	0.30	<0.30	<0.00026	mg/m3
Barium	0.15	7.7	0.0067	mg/m3
Beryllium	0.15	<0.15	<0.00013	mg/m3
Cadmium	0.15	<0.15	<0.00013	mg/m3
Calcium Oxide	100.	<100	<0.092	mg/m3
Chromium	7.5	<7.5	<0.0066	mg/m3
Cobalt	0.45	<0.45	<0.00039	mg/m3
Copper	0.30	0.59	0.00052	mg/m3
Lead	0.38	<0.38	<0.00033	mg/m3
Manganese	0.15	1.1	0.00095	mg/m3
Selenium	2.3	<2.3	<0.0020	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 22-SEP-17

Submitted by: JPA/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 14-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418925
Date Analyzed : 21-SEP-17 - 22-SEP-17
Report ID : 1019908

Client ID : 22152-T28 **Lab ID : L418925-10** **Air Volume : NA**
Date Sampled : 09/14/17 **Date Analyzed : 09/21/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.30	<0.30	NA	mg/m3
Barium	0.15	<0.15	NA	mg/m3
Beryllium	0.15	<0.15	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.45	<0.45	NA	mg/m3
Copper	0.30	<0.30	NA	mg/m3
Lead	0.38	<0.38	NA	mg/m3
Manganese	0.15	<0.15	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 22-SEP-17

Submitted by: JPA/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 14-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418925

Date Analyzed : 21-SEP-17 - 22-SEP-17
Report ID : 1020105

Client ID : 22152-I25 **Lab ID : L418925-5** **Air Volume : 1137.2 L**
Date Sampled : 09/14/17 **Date Analyzed : 09/22/17**

Parameter	LOQ ug	Total ug	Conc	Units
Magnesium Oxide	12.	<12	<0.011	mg/m3
Molybdenum	0.15	<0.15	<0.00013	mg/m3
Nickel	0.30	<0.30	<0.00026	mg/m3
Thallium	1.5	<1.5	<0.0013	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.00071	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 24-SEP-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 14-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418925

Date Analyzed : 21-SEP-17 - 22-SEP-17
Report ID : 1020105

Client ID : 22152-I26 **Lab ID : L418925-6** **Air Volume : NA**
Date Sampled : 09/14/17 **Date Analyzed : 09/22/17**

Parameter	LOQ ug	Total ug	Conc	Units
Magnesium Oxide	12.	<12	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Nickel	0.30	<0.30	NA	mg/m3
Thallium	1.5	<1.5	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 24-SEP-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 14-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418925
Date Analyzed : 25-SEP-17
Report ID : 1020357

Asbestos Fiber Count (A Rules)

	Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
+	22152-A27	L418925-1	7.5/100	9.6	3696	574,600	0.006
	22152-A28	L418925-2	2/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : BTM
Approved by : BDB
Date : 25-SEP-17
QC by: NDC
Supervisor: BDB

< -Less Than
> -Greater Than
ND -Not Detected
NA -Not Applicable
cc -Cubic Centimeters
NS -Not Specified
mm2 -Square millimeters

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 14-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418925
Date Analyzed : 20-SEP-17
Report ID : 1019363

Inhalable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-I25	L418925-5	1137.2	0.25	0.22
22152-I26	L418925-6	NA	<0.10	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.10 mg
Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV
OSHA PEL : NA
Collection Media : IOM 25mm PW PVC

Submitted by: HVN
Approved by : SPR
Date : 20-SEP-17
Supervisor: KRK

NYS DOH # : 11626
QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 14-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418925
Date Analyzed : 20-SEP-17
Report ID : 1019310

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-S27	L418925-3	1134.6	0.18	0.16
22152-S28	L418925-4	NA	<0.050	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg
Analytical Method : mod. NIOSH 0600; Gravimetric
OSHA PEL : PNOR 5 mg/m3 (TWA)
Collection Media : PVC PW 37mm

Submitted by: NRH/HVN
Approved by : SPR
Date : 20-SEP-17
Supervisor: KRK

NYS DOH # : 11626
QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 14-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418925
Date Analyzed : 20-SEP-17 - 22-SEP-17
Report ID : 1020034

Respirable Crystalline Silica (RCS): Quartz, Cristobalite, Tridymite

Sample ID	Lab ID	Analyte	Air Vol l	ug	ug/m3
22152-S27	L418925-3	Quartz	1134.6	<5.0	<4.4
		Cristobalite	1134.6	<5.0	<4.4
		Tridymite	1134.6	<20	<18
		RCS	1134.6	<5.0	<4.4
22152-S28	L418925-4	Quartz	NA	<5.0	NA
		Cristobalite	NA	<5.0	NA
		Tridymite	NA	<20	NA
		RCS	NA	<5.0	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: Q:5.0ug C:5.0ug T:20.ug
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD
OSHA PEL : 50 ug/m3 RCS
Collection Media : PVC PW 37mm

Submitted: NLO
Approved: CMR
Date : 25-SEP-17 NYS DOH # : 11626
Supervisor: KRK QC by: NDC

< -Less Than
> -Greater Than
NA -Not Applicable
mg -Milligrams
ug -Micrograms
ND -Not Detected
kg -Kilograms
m3 -Cubic Meters
l -Liters
ppm -Parts per Million
NS -Not Specified
mppcf -Million Particles per Cubic Foot

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 14-SEP-17 Account No.: 90734
Date Received: 19-SEP-17 Login No. : L418925
Date Analyzed: 20-SEP-17 - 25-SEP-17

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L418925 (Report ID: 1020105):
TLV for Vanadium pentoxide: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for Magnesium Oxide: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(32), im-mwvfilt(28)
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3; as Fume, Ceiling = 0.1 mg/m3.

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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Client Name : Toronto Transit Commission Ltd.
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Date Sampled : 14-SEP-17 Account No.: 90734
Date Received: 19-SEP-17 Login No. : L418925
Date Analyzed: 20-SEP-17 - 25-SEP-17

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Magnesium Oxide	+/-9.2%	99.2%
Molybdenum	+/-7.6%	100%
Nickel	+/-8%	101%
Thallium	+/-7.9%	101%
Vanadium Pentoxide	+/-6.5%	100%

Parameter	Method	PEL
Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	See footnote

L418925 (Report ID: 1019908):
TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for COBALT: 0.02 mg/m3
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for Calcium Oxide: 2 mg/m3
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3
TLV for SELENIUM: 0.2 mg/m3
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for CHROMIUM: 0.5 mg/m3
TLV for IRON OXIDE: 5 mg/m3

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
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Date Sampled : 14-SEP-17 Account No.: 90734
Date Received: 19-SEP-17 Login No. : L418925
Date Analyzed: 20-SEP-17 - 25-SEP-17

L418925 (Report ID: 1019908):
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(32), im-mwvfilt(28)
PEL listed refers to Aluminum as total dust.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.

L418925 (Report ID: 1019908):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-7.7%	96.9%
Antimony	+/-9.8%	97.3%
Arsenic	+/-7.6%	103%
Barium	+/-6.5%	101%
Beryllium	+/-10.8%	103%
Cadmium	+/-8.6%	102%
Calcium Oxide	+/-10.6%	105%
Chromium	+/-11.2%	103%
Cobalt	+/-8.5%	103%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Date Received: 19-SEP-17 Login No. : L418925
Date Analyzed: 20-SEP-17 - 25-SEP-17

Copper	+/-10.3%	103%
Iron Oxide	+/-9.6%	106%
Lead	+/-9.1%	100%
Manganese	+/-8.3%	99.8%
Molybdenum	+/-7.6%	100%
Selenium	+/-11.6%	105%
Zinc Oxide	+/-8.9%	102%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)
Chromium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Selenium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

+L418925-1 (Report ID: 1020357):
The sample results may have a negative bias; the filter surface was covered by fine particulate that may have obscured fibers.

L418925 (Report ID: 1020357):
SOPs: ia-pcm(26)
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
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Project No. : 22152

Date Sampled : 14-SEP-17 Account No.: 90734
Date Received: 19-SEP-17 Login No. : L418925
Date Analyzed: 20-SEP-17 - 25-SEP-17

L418925 (Report ID: 1020357):
greater than optimal variability and are probably biased.
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as follows:
0.154 (5-20 fibers/100 fields)
0.100 (>20-50 fibers/100 fields)
0.069 (>50-100 fibers/100 fields)
0.090 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take into account any uncertainty associated with the sampling process.

L418925 (Report ID: 1019363):
SOPs: GRAV-SOP-8(17)
Gravimetric analytical accuracy of the sampling media is -0.001 +/- 0.030 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.

L418925 (Report ID: 1019310):
TLV for RESPIRABLE DUST: NA
SOPs: GRAV-SOP-5(18), GRAV-SOP-6(17)
Gravimetric analytical accuracy of the sampling media is 0.002 +/- 0.018 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.
PNOR = Particulates Not Otherwise Regulated.

L418925 (Report ID: 1020034):
TLV for QUARTZ: 0.025 mg/m3 Respirable
TLV for TRIDYMITE: NA
TLV for CRISTOBALITE: 0.025 mg/m3 Respirable
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26)

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 14-SEP-17 Account No.: 90734
Date Received: 19-SEP-17 Login No. : L418925
Date Analyzed: 20-SEP-17 - 25-SEP-17

L418925 (Report ID: 1020034):

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-10.3%	102%
Quartz	+/-10.9%	93.4%
Tridymite	+/-13.6%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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1Z5X626A6646025995
Date:09/19/17
Shipper:UPS
Initials:MAK
Prep:UNKNOWN
L418925

☐ New Client?

Report To*: Toronto Transit Commission
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Phone No.*: 416-393-6668
Cell No.:
Email Results To: Virgil.Umali@ttc.ca & cheresults@oheconsultants.com

Invoice To*: Toronto Transit Commission
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2.
Phone No.:
Email:
Purchase Order No.: PU 240835
Credit Card: ☐ Credit Card on File ☐ Call for Credit Card Info

Client Account No.*:

☐ Samples submitted using the FreePumpLoan™ Program. ☐ Samples submitted using the FreeSamplingBadges™ Program.

Need Results By*:	(surcharge)
☒ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%
☐ Next Day by Noon	150%
☐ Same Day	200%

Site Name: Project: 22152 Sampled By: OHE Consultants

Comments:

List description of industry or process/interferences present in sampling area:

State samples were collected in (ex. NY):

Please indicate which OEL this data will be used for: ☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA ☐ MSHA ☐ Other (specify):

Sample Identification* (Maximum of 20 characters, ID's longer then 20 characters will be abbreviated.)	Date Sampled* (mm/dd/yy)	Collection Medium	Sample Volume, (Sample Time) or Sample Area*	Sample Units*: L, ml, min., in2, cm2, ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (ex. welding, plating, painting, etc.)*
Example	01/01/11	2pc UW PVC	960	L	Hexavalent Chromium (Cr6)	mod. OSHA ID-215	Welding
22152-A27	09/14/17	25mm PCM	562	574.6	Asbestos	NIOSH 7400	
22152-A28		25mm PCM	Ø	Ø	"	"	
22152-527		PW PVC in PPI	555	1134.6	Crystalline Silica (all forms)	NIOSH 7500 + Resp. Dust NIOSH 0600	
22152-528		PW PVC in PPI	Ø	Ø	"	"	
22152-I25		PW PVC in IOM	562	1137.2	Metals (Inhalable) NIOSH	7300 + Inh. Dust	NIOSH 0500
22152-I26		PW PVC in IOM	Ø	Ø	"	"	
22152-M27		UW MCE in PPI	555	1116.9	Metals (Respirable)	NIOSH 7300	
22152-M28		UW MCE in PPI	Ø	Ø	"	"	
22152-T27		UW MCE	562	1139.4	Metals (Total)	NIOSH 7300	
22152-T28	↓	UW MCE	Ø	Ø	"	"	

^Galson Laboratories will substitute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ please indicate if the lower LOQ is required (only available for certain analytes see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date/Time		Print Name/Signature	Date/Time
Relinquished by:	Yunny Desiree Lee	Sep 14/2017 1:30PM	Received by:		9/18/17 5:22
Relinquished by:		9/18/17 6:00PM	Received by:		9/19/17 0755

Samples received after 3pm will be considered as next day's business.

*Required fields, failure to complete these fields may result in a delay in your samples being processed.

Page 1 of 1

LAB ORIGINAL

Respirable – Aluminum, Cadmium, Iron Oxide, Molybdenum (total), Zinc Oxide

Inhalable – Magnesium Oxide, Molybdenum (total), Nickel – metal, Thallium, Vanadium Pentoxide

Total – Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium Oxide, Chromium III, Cobalt, Copper, Lead, Manganese, Selenium

SGS GALSON

Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Canada

September 25, 2017

AIHA-LAP #100324 Account# 90734 Login# L418930

Dear Mr. Umali:

Enclosed are the analytical results for the samples received by our laboratory on September 19, 2017. All test results meet the quality control requirements of AIHA-LAP and NELAC unless otherwise stated in this report. All samples on the chain of custody were received in good condition unless otherwise noted.

Results in this report are based on the sampling data provided by the client and refer only to the samples as they were received at the laboratory. Unless otherwise requested, samples for asbestos analysis will be discarded 60 days from the date of this report and all other non-IOM samples will be retained for 14 days following the date of this report (when possible). IOMs will be cleaned & disposed of after seven calendar days.

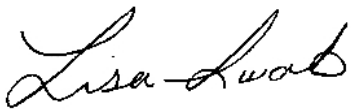
To ensure the safety of laboratory receiving personnel, always seal bulk samples securely to prevent possible escape of material. Also, please double-bag bulk samples individually prior to shipping. Samples not received in this manner will be noted on the chain of custody form.

Current Scopes of Accreditation can be viewed at www.galsonlabs.com in the accreditations section under the "about Galson" tab.

Please contact Katrina Ahchong at (888) 432-5227, if you would like any additional information regarding this report. Thank you for using SGS Galson Laboratories.

Sincerely,

SGS Galson Laboratories



Lisa Swab
Laboratory Director

Enclosure(s)

Galson Laboratories, Inc. is now a part of SGS, the world's leading inspection, verification, testing, and certification company. As part of our transition to SGS, you will begin to see some formatting changes with reports that willimprove the presentation of data and allow for the transition to the new logo.

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FAX: (315) 437-0571
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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 15-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418930
Date Analyzed : 21-SEP-17 - 24-SEP-17
Report ID : 1019873

Client ID : 22152-M29 **Lab ID : L418930-7** **Air Volume : 1132.1 L**
Date Sampled : 09/15/17 **Date Analyzed : 09/21/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.0066	mg/m3
Cadmium	0.15	<0.15	<0.00013	mg/m3
Iron Oxide	11.	28	0.024	mg/m3
Molybdenum	0.15	<0.15	<0.00013	mg/m3
Zinc Oxide	2.8	<2.8	<0.0025	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 22-SEP-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: MLN

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 15-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418930

Date Analyzed : 21-SEP-17 - 24-SEP-17
Report ID : 1019873

Client ID : 22152-M30 **Lab ID : L418930-8** **Air Volume : NA**
Date Sampled : 09/15/17 **Date Analyzed : 09/21/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 22-SEP-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: MLN

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 15-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418930

Date Analyzed : 21-SEP-17 - 24-SEP-17
Report ID : 1019873

Client ID : 22152-T29 **Lab ID : L418930-9** **Air Volume : 1140.4 L**
Date Sampled : 09/15/17 **Date Analyzed : 09/21/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.00079	mg/m3
Arsenic	0.30	<0.30	<0.00026	mg/m3
Barium	0.15	0.57	0.00050	mg/m3
Beryllium	0.15	<0.15	<0.00013	mg/m3
Cadmium	0.15	<0.15	<0.00013	mg/m3
Calcium Oxide	100.	<100	<0.092	mg/m3
Chromium	7.5	<7.5	<0.0066	mg/m3
Cobalt	0.45	<0.45	<0.00039	mg/m3
Copper	0.30	<0.30	<0.00026	mg/m3
Lead	0.38	<0.38	<0.00033	mg/m3
Manganese	0.15	0.21	0.00018	mg/m3
Selenium	2.3	<2.3	<0.0020	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 22-SEP-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: MLN

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 15-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418930

Date Analyzed : 21-SEP-17 - 24-SEP-17
Report ID : 1019873

Client ID : 22152-T30 **Lab ID : L418930-10** **Air Volume : NA**
Date Sampled : 09/15/17 **Date Analyzed : 09/21/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.30	<0.30	NA	mg/m3
Barium	0.15	<0.15	NA	mg/m3
Beryllium	0.15	<0.15	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.45	<0.45	NA	mg/m3
Copper	0.30	<0.30	NA	mg/m3
Lead	0.38	<0.38	NA	mg/m3
Manganese	0.15	<0.15	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 22-SEP-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: MLN

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 15-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418930

Date Analyzed : 21-SEP-17 - 24-SEP-17
Report ID : 1020234

Client ID : 22152-I27 **Lab ID : L418930-5** **Air Volume : 1133.5 L**
Date Sampled : 09/15/17 **Date Analyzed : 09/24/17**

Parameter	LOQ ug	Total ug	Conc	Units
Magnesium Oxide	12.	<12	<0.011	mg/m3
Molybdenum	0.15	<0.15	<0.00013	mg/m3
Nickel	0.30	<0.30	<0.00026	mg/m3
Thallium	1.5	<1.5	<0.0013	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.00071	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 25-SEP-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: MLN

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 15-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418930

Date Analyzed : 21-SEP-17 - 24-SEP-17
Report ID : 1020234

Client ID : 22152-I28 **Lab ID : L418930-6** **Air Volume : NA**
Date Sampled : 09/15/17 **Date Analyzed : 09/24/17**

Parameter	LOQ ug	Total ug	Conc	Units
Magnesium Oxide	12.	<12	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Nickel	0.30	<0.30	NA	mg/m3
Thallium	1.5	<1.5	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 25-SEP-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: MLN

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 15-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418930
Date Analyzed : 25-SEP-17
Report ID : 1020358

Asbestos Fiber Count (A Rules)

Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
22152-A29	L418930-1	7/100	8.9	3427	561,600	0.006
22152-A30	L418930-2	.5/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : BTM
Approved by : BDB
Date : 25-SEP-17
QC by: MLN
Supervisor: BDB

< -Less Than
> -Greater Than
ND -Not Detected
NA -Not Applicable
cc -Cubic Centimeters
NS -Not Specified
mm2 -Square millimeters

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 15-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418930
Date Analyzed : 22-SEP-17
Report ID : 1019971

Inhalable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-I27	L418930-5	1133.5	0.10	0.092
22152-I28	L418930-6	NA	<0.10	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.10 mg
Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV
OSHA PEL : NA
Collection Media : IOM 25mm PW PVC

Submitted by: NRH
Approved by : SPR
Date : 22-SEP-17
Supervisor: KRK

NYS DOH # : 11626
QC by: MLN

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 15-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418930
Date Analyzed : 20-SEP-17
Report ID : 1019442

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-S29	L418930-3	1130	<0.050	<0.044
22152-S30	L418930-4	NA	<0.050	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg
Analytical Method : mod. NIOSH 0600; Gravimetric
OSHA PEL : PNOR 5 mg/m3 (TWA)
Collection Media : PVC PW 37mm

Submitted by: HVN
Approved by : SPR
Date : 20-SEP-17
Supervisor: KRK

NYS DOH # : 11626
QC by: MLN

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 15-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418930
Date Analyzed : 20-SEP-17 - 22-SEP-17
Report ID : 1020045

Respirable Crystalline Silica (RCS): Quartz, Cristobalite, Tridymite

Sample ID	Lab ID	Analyte	Air Vol l	ug	ug/m3
22152-S29	L418930-3	Quartz	1130	<5.0	<4.4
		Cristobalite	1130	<5.0	<4.4
		Tridymite	1130	<20	<18
		RCS	1130	<5.0	<4.4
22152-S30	L418930-4	Quartz	NA	<5.0	NA
		Cristobalite	NA	<5.0	NA
		Tridymite	NA	<20	NA
		RCS	NA	<5.0	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: Q:5.0ug C:5.0ug T:20.ug
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD
OSHA PEL : 50 ug/m3 RCS
Collection Media : PVC PW 37mm

Submitted: CMR
Approved: KRK
Date : 25-SEP-17 NYS DOH # : 11626
Supervisor: KRK QC by: MLN

< -Less Than
> -Greater Than
NA -Not Applicable
mg -Milligrams
ug -Micrograms
ND -Not Detected
kg -Kilograms
m3 -Cubic Meters
l -Liters
ppm -Parts per Million
NS -Not Specified
mppcf -Million Particles per Cubic Foot

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 15-SEP-17 Account No.: 90734
Date Received: 19-SEP-17 Login No. : L418930
Date Analyzed: 20-SEP-17 - 25-SEP-17

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L418930 (Report ID: 1020234):
TLV for Vanadium pentoxide: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for Magnesium Oxide: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(32), im-mwvfilt(28)
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3; as Fume, Ceiling = 0.1 mg/m3.

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 15-SEP-17 Account No.: 90734
Date Received: 19-SEP-17 Login No. : L418930
Date Analyzed: 20-SEP-17 - 25-SEP-17

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Magnesium Oxide	+/-9.2%	99.2%
Molybdenum	+/-7.6%	100%
Nickel	+/-8%	101%
Thallium	+/-7.9%	101%
Vanadium Pentoxide	+/-6.5%	100%

Parameter	Method	PEL
Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	See footnote

L418930 (Report ID: 1019873):
TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for COBALT: 0.02 mg/m3
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for Calcium Oxide: 2 mg/m3
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3
TLV for SELENIUM: 0.2 mg/m3
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for CHROMIUM: 0.5 mg/m3
TLV for IRON OXIDE: 5 mg/m3

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 15-SEP-17 Account No.: 90734
Date Received: 19-SEP-17 Login No. : L418930
Date Analyzed: 20-SEP-17 - 25-SEP-17

L418930 (Report ID: 1019873):
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(32), im-mwvfilt(28)
PEL listed refers to Aluminum as total dust.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.

L418930 (Report ID: 1019873):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-7.7%	96.9%
Antimony	+/-9.8%	97.3%
Arsenic	+/-7.6%	103%
Barium	+/-6.5%	101%
Beryllium	+/-10.8%	103%
Cadmium	+/-8.6%	102%
Calcium Oxide	+/-10.6%	105%
Chromium	+/-11.2%	103%
Cobalt	+/-8.5%	103%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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FAX: (315) 437-0571
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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 15-SEP-17 Account No.: 90734
Date Received: 19-SEP-17 Login No. : L418930
Date Analyzed: 20-SEP-17 - 25-SEP-17

Copper	+/-10.3%	103%
Iron Oxide	+/-9.6%	106%
Lead	+/-9.1%	100%
Manganese	+/-8.3%	99.8%
Molybdenum	+/-7.6%	100%
Selenium	+/-11.6%	105%
Zinc Oxide	+/-8.9%	102%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)
Chromium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Selenium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

L418930 (Report ID: 1020358):
SOPs: ia-pcm(26)
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a greater than optimal variability and are probably biased.
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as follows:
0.154 (5-20 fibers/100 fields)

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 15-SEP-17 Account No.: 90734
Date Received: 19-SEP-17 Login No. : L418930
Date Analyzed: 20-SEP-17 - 25-SEP-17

L418930 (Report ID: 1020358):
0.100 (>20-50 fibers/100 fields)
0.069 (>50-100 fibers/100 fields)
0.090 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take into account any uncertainty associated with the sampling process.

L418930 (Report ID: 1019971):
SOPs: GRAV-SOP-8(17)
Gravimetric analytical accuracy of the sampling media is -0.001 +/- 0.030 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.

L418930 (Report ID: 1019442):
TLV for RESPIRABLE DUST: NA
SOPs: GRAV-SOP-5(18), GRAV-SOP-6(17)
Gravimetric analytical accuracy of the sampling media is 0.002 +/- 0.018 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.
PNOR = Particulates Not Otherwise Regulated.

L418930 (Report ID: 1020045):
TLV for QUARTZ: 0.025 mg/m3 Respirable
TLV for TRIDYMITE: NA
TLV for CRISTOBALITE: 0.025 mg/m3 Respirable
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26)

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 15-SEP-17 Account No.: 90734
Date Received: 19-SEP-17 Login No. : L418930
Date Analyzed: 20-SEP-17 - 25-SEP-17

L418930 (Report ID: 1020045):

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-10.3%	102%
Quartz	+/-10.9%	93.4%
Tridymite	+/-13.6%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

SGS GALSON

1Z5X626A6646025995
Date:09/19/17
Shipper:UPS
Initials:MAK
Prep:UNKNOWN
L418930

☐ New Client?

Report To*: Toronto Transit Commission
1920 Yonge St.
Client Account No.*: Suite 600
TORONTO, ON M4S 3E2
Phone No.*: 416-393-6668
Cell No.:
Email Results To: Virgil.Umali@ttc.ca
Email Address: $ ohe results@oheconsultants.com

Invoice To*: Toronto Transit Commission
1920 Yonge St.
Suite 600
TORONTO ON M4S 3E2
Phone No.:
Email:
Purchase Order No.: R05
Credit Card: ☐ Credit Card on File ☐ Call for Credit Card Info

☐ Samples submitted using the FreePumpLoan™ Program.
☐ Samples submitted using the FreeSamplingBadges™ Program.

Need Results By*:	(surcharge)
☒ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%
☐ Next Day by Noon	150%
☐ Same Day	200%

Site Name: Project: 22152 Sampled By: OHE Consultants

Comments:
See attached document for metal analysis

List description of industry or process/interferences present in sampling area:

State samples were collected in (ex. NY):

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify):

Sample Identification* (Maximum of 20 characters, ID's longer than 20 characters will be abbreviated.)	Date Sampled* (mm/dd/yy)	Collection Medium	Sample Volume, Sample Time, or Sample Area*	Sample Units*: L, ml, min., in2, cm2, ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (ex. welding, plating, painting, etc.)*
Example	01/01/11	2pc UW PVC	960	L	Hexavalent Chromium (Cr6)	mod. OSHA ID-215	Welding
22152-A29	09/15/17	25mm PCM	561.6	L	Asbestos	NIOSH 7400	
22152-A30		25mm PCM	Ø		"	"	
22152-S29		PW PVC in PPI	1130.0		Crystalline Silica (all forms)	NIOSH 7500 + Resp	Dust NIOSH 0600
22152-S30		"	Ø		"	"	
22152-I27		PW PVC in PPI	1133.5		Metals (Inhalable)	NIOSH 7300 + Inh. Dust	NIOSH 0500
22152-I28		"	Ø		"	"	
22152-M29		UW MCE in PPI	1132.1		Metals (Respirable)	NIOSH 7300	
22152-M30		"	Ø		"	"	
22152-T29		UW MCE	1140.4		Metals (Total)	"	
22152-T30		"	Ø		"	"	

^Galson Laboratories will substitute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ please indicate if the lower LOQ is required (only available for certain analytes see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*: ALL FORMS

Chain of Custody	Print Name/Signature	Date/Time		Print Name/Signature	Date/Time
Relinquished by:	Romeo Methavet	Sept. 18 '17 9am	Received by:		9/18/17 5:24pm
Relinquished by:		9/18/17 6:00pm	Received by:		9/19/17 0939

Samples received after 3pm will be considered as next day's business.
*Required fields, failure to complete these fields may result in a delay in your samples being processed.

Page 1 of 1

LAB ORIGINAL

Respirable – Aluminum, Cadmium, Iron Oxide, Molybdenum (total), Zinc Oxide

Inhalable – Magnesium Oxide, Molybdenum (total), Nickel – metal, Thallium, Vanadium Pentoxide

Total – Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium Oxide, Chromium III, Cobalt, Copper, Lead, Manganese, Selenium

SGS GALSON

Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Canada

September 25, 2017

AIHA-LAP #100324 Account# 90734 Login# L418938

Dear Mr. Umali:

Enclosed are the analytical results for the samples received by our laboratory on September 19, 2017. All test results meet the quality control requirements of AIHA-LAP and NELAC unless otherwise stated in this report. All samples on the chain of custody were received in good condition unless otherwise noted.

Results in this report are based on the sampling data provided by the client and refer only to the samples as they were received at the laboratory. Unless otherwise requested, samples for asbestos analysis will be discarded 60 days from the date of this report and all other non-IOM samples will be retained for 14 days following the date of this report (when possible). IOMs will be cleaned & disposed of after seven calendar days.

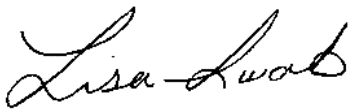
To ensure the safety of laboratory receiving personnel, always seal bulk samples securely to prevent possible escape of material. Also, please double-bag bulk samples individually prior to shipping. Samples not received in this manner will be noted on the chain of custody form.

Current Scopes of Accreditation can be viewed at www.galsonlabs.com in the accreditations section under the "about Galson" tab.

Please contact Katrina Ahchong at (888) 432-5227, if you would like any additional information regarding this report. Thank you for using SGS Galson Laboratories.

Sincerely,

SGS Galson Laboratories



Lisa Swab
Laboratory Director

Enclosure(s)

Galson Laboratories, Inc. is now a part of SGS, the world's leading inspection, verification, testing, and certification company. As part of our transition to SGS, you will begin to see some formatting changes with reports that willimprove the presentation of data and allow for the transition to the new logo.

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 15-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418938
Date Analyzed : 21-SEP-17
Report ID : 1019862

Client ID : 22152-M31 **Lab ID : L418938-7** **Air Volume : 1143.6 L**
Date Sampled : 09/15/17 **Date Analyzed : 09/21/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.0066	mg/m3
Cadmium	0.15	<0.15	<0.00013	mg/m3
Iron Oxide	11.	20	0.017	mg/m3
Molybdenum	0.15	<0.15	<0.00013	mg/m3
Zinc Oxide	2.8	<2.8	<0.0024	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 22-SEP-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 15-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418938
Date Analyzed : 21-SEP-17
Report ID : 1019862

Client ID : 22152-M32 **Lab ID : L418938-8** **Air Volume : NA**
Date Sampled : 09/15/17 **Date Analyzed : 09/21/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 22-SEP-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 15-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418938

Date Analyzed : 21-SEP-17
Report ID : 1019862

Client ID : 22152-T31 **Lab ID : L418938-9** **Air Volume : 1146.3 L**
Date Sampled : 09/15/17 **Date Analyzed : 09/21/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.00079	mg/m3
Arsenic	0.30	<0.30	<0.00026	mg/m3
Barium	0.15	0.48	0.00042	mg/m3
Beryllium	0.15	<0.15	<0.00013	mg/m3
Cadmium	0.15	<0.15	<0.00013	mg/m3
Calcium Oxide	100.	<100	<0.092	mg/m3
Chromium	7.5	<7.5	<0.0065	mg/m3
Cobalt	0.45	<0.45	<0.00039	mg/m3
Copper	0.30	<0.30	<0.00026	mg/m3
Lead	0.38	<0.38	<0.00033	mg/m3
Manganese	0.15	0.21	0.00018	mg/m3
Selenium	2.3	<2.3	<0.0020	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 22-SEP-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 15-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418938
Date Analyzed : 21-SEP-17
Report ID : 1019862

Client ID : 22152-T32 **Lab ID : L418938-10** **Air Volume : NA**
Date Sampled : 09/15/17 **Date Analyzed : 09/21/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.30	<0.30	NA	mg/m3
Barium	0.15	<0.15	NA	mg/m3
Beryllium	0.15	<0.15	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.45	<0.45	NA	mg/m3
Copper	0.30	<0.30	NA	mg/m3
Lead	0.38	<0.38	NA	mg/m3
Manganese	0.15	<0.15	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 22-SEP-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 15-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418938
Date Analyzed : 21-SEP-17
Report ID : 1019861

Client ID : 22152-I29 **Lab ID : L418938-5** **Air Volume : 1162.4 L**
Date Sampled : 09/15/17 **Date Analyzed : 09/21/17**

Parameter	LOQ ug	Total ug	Conc	Units
Magnesium Oxide	12.	<12	<0.011	mg/m3
Molybdenum	0.15	<0.15	<0.00013	mg/m3
Nickel	0.30	<0.30	<0.00026	mg/m3
Thallium	1.5	<1.5	<0.0013	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.00069	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 22-SEP-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 15-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418938
Date Analyzed : 21-SEP-17
Report ID : 1019861

Client ID : 22152-I30 **Lab ID : L418938-6** **Air Volume : NA**
Date Sampled : 09/15/17 **Date Analyzed : 09/21/17**

Parameter	LOQ ug	Total ug	Conc	Units
Magnesium Oxide	12.	<12	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Nickel	0.30	<0.30	NA	mg/m3
Thallium	1.5	<1.5	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 22-SEP-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 15-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418938
Date Analyzed : 25-SEP-17
Report ID : 1020359

Asbestos Fiber Count (A Rules)

Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
22152-A31	L418938-1	6/100	7.6	2926	594,670	0.005
22152-A32	L418938-2	1/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : BTM
Approved by : BDB
Date : 25-SEP-17
QC by: AMD
Supervisor: BDB

< -Less Than
> -Greater Than
ND -Not Detected
NA -Not Applicable
cc -Cubic Centimeters
NS -Not Specified
mm2 -Square millimeters

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 15-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418938
Date Analyzed : 20-SEP-17
Report ID : 1019317

Inhalable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-I29	L418938-5	1162.4	<0.10	<0.086
22152-I30	L418938-6	NA	<0.10	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.10 mg
Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV
OSHA PEL : NA
Collection Media : IOM 25mm PW PVC

Submitted by: NRH
Approved by : SPR
Date : 20-SEP-17
Supervisor: KRK

NYS DOH # : 11626
QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 15-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418938
Date Analyzed : 20-SEP-17
Report ID : 1019316

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-S31	L418938-3	1122.8	<0.050	<0.045
22152-S32	L418938-4	NA	<0.050	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg
Analytical Method : mod. NIOSH 0600; Gravimetric
OSHA PEL : PNOR 5 mg/m3 (TWA)
Collection Media : PVC PW 37mm

Submitted by: NRH/HVN
Approved by : SPR
Date : 20-SEP-17 NYS DOH # : 11626
Supervisor: KRK QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 15-SEP-17
Date Received : 19-SEP-17

Account No.: 90734
Login No. : L418938
Date Analyzed : 20-SEP-17 - 22-SEP-17
Report ID : 1020037

Respirable Crystalline Silica (RCS): Quartz, Cristobalite, Tridymite

Sample ID	Lab ID	Analyte	Air Vol l	ug	ug/m3
22152-S31	L418938-3	Quartz	1122.8	<5.0	<4.5
		Cristobalite	1122.8	<5.0	<4.5
		Tridymite	1122.8	<20	<18
		RCS	1122.8	<5.0	<4.5
22152-S32	L418938-4	Quartz	NA	<5.0	NA
		Cristobalite	NA	<5.0	NA
		Tridymite	NA	<20	NA
		RCS	NA	<5.0	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: Q:5.0ug C:5.0ug T:20.ug
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD
OSHA PEL : 50 ug/m3 RCS
Collection Media : PVC PW 37mm

Submitted: NLO
Approved: CMR
Date : 25-SEP-17 NYS DOH # : 11626
Supervisor: KRK QC by: AMD

< -Less Than
> -Greater Than
NA -Not Applicable
mg -Milligrams
ug -Micrograms
ND -Not Detected
kg -Kilograms
m3 -Cubic Meters
l -Liters
ppm -Parts per Million
NS -Not Specified
mppcf -Million Particles per Cubic Foot

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 15-SEP-17 Account No.: 90734
Date Received: 19-SEP-17 Login No. : L418938
Date Analyzed: 20-SEP-17 - 25-SEP-17

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L418938 (Report ID: 1019861):
TLV for Vanadium pentoxide: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for Magnesium Oxide: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(32), im-mwvfilt(28)
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3; as Fume, Ceiling = 0.1 mg/m3.

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 15-SEP-17 Account No.: 90734
Date Received: 19-SEP-17 Login No. : L418938
Date Analyzed: 20-SEP-17 - 25-SEP-17

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Magnesium Oxide	+/-9.2%	99.2%
Molybdenum	+/-7.6%	100%
Nickel	+/-8%	101%
Thallium	+/-7.9%	101%
Vanadium Pentoxide	+/-6.5%	100%

Parameter	Method	PEL
Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	See footnote

L418938 (Report ID: 1019862):
TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for COBALT: 0.02 mg/m3
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for Calcium Oxide: 2 mg/m3
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3
TLV for SELENIUM: 0.2 mg/m3
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for CHROMIUM: 0.5 mg/m3
TLV for IRON OXIDE: 5 mg/m3

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 15-SEP-17 Account No.: 90734
Date Received: 19-SEP-17 Login No. : L418938
Date Analyzed: 20-SEP-17 - 25-SEP-17

L418938 (Report ID: 1019862):
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(32), im-mwvfilt(28)
PEL listed refers to Aluminum as total dust.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.

L418938 (Report ID: 1019862):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-7.7%	96.9%
Antimony	+/-9.8%	97.3%
Arsenic	+/-7.6%	103%
Barium	+/-6.5%	101%
Beryllium	+/-10.8%	103%
Cadmium	+/-8.6%	102%
Calcium Oxide	+/-10.6%	105%
Chromium	+/-11.2%	103%
Cobalt	+/-8.5%	103%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 15-SEP-17 Account No.: 90734
Date Received: 19-SEP-17 Login No. : L418938
Date Analyzed: 20-SEP-17 - 25-SEP-17

Copper	+/-10.3%	103%
Iron Oxide	+/-9.6%	106%
Lead	+/-9.1%	100%
Manganese	+/-8.3%	99.8%
Molybdenum	+/-7.6%	100%
Selenium	+/-11.6%	105%
Zinc Oxide	+/-8.9%	102%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)
Chromium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Selenium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

L418938 (Report ID: 1020359):
SOPs: ia-pcm(26)
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a greater than optimal variability and are probably biased.
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as follows:
0.154 (5-20 fibers/100 fields)

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 15-SEP-17 Account No.: 90734
Date Received: 19-SEP-17 Login No. : L418938
Date Analyzed: 20-SEP-17 - 25-SEP-17

L418938 (Report ID: 1020359):
0.100 (>20-50 fibers/100 fields)
0.069 (>50-100 fibers/100 fields)
0.090 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take into account any uncertainty associated with the sampling process.

L418938 (Report ID: 1019317):
SOPs: GRAV-SOP-8(17)
Gravimetric analytical accuracy of the sampling media is -0.001 +/- 0.030 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.

L418938 (Report ID: 1019316):
TLV for RESPIRABLE DUST: NA
SOPs: GRAV-SOP-5(18), GRAV-SOP-6(17)
Gravimetric analytical accuracy of the sampling media is 0.002 +/- 0.018 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.
PNOR = Particulates Not Otherwise Regulated.

L418938 (Report ID: 1020037):
TLV for QUARTZ: 0.025 mg/m3 Respirable
TLV for TRIDYMITE: NA
TLV for CRISTOBALITE: 0.025 mg/m3 Respirable
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26)

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 15-SEP-17 Account No.: 90734
Date Received: 19-SEP-17 Login No. : L418938
Date Analyzed: 20-SEP-17 - 25-SEP-17

L418938 (Report ID: 1020037):

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-10.3%	102%
Quartz	+/-10.9%	93.4%
Tridymite	+/-13.6%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

SGS GALSON

1Z5X626A6646025995
Date:09/19/17
Shipper:
Initials:DTE
Prep:UNKNOWN
L418938

☐ New Client?

Report To*: Toronto Transit Commission
1920 Yonge St.
Suite 600
Toronto, ON M4S 3E2
Phone No.*: 416-393-6668
Cell No.:
Email Results To: Virgil.Umali@ttc.ca & ohereults@
Email Address: oheconsultants.com

Invoice To*: Toronto Transit Commission
1920 Yonge St.
Suite 600
Toronto, ON M4S 3E2
Phone No.:
Email:
Purchase Order No.: PU240835
Credit Card: ☐ Credit Card on File ☐ Call for Credit Info

Client Account No.*:

☐ Samples submitted using the FreePumpLoan™ Program. ☐ Samples submitted using the FreeSamplingBadges™ Program.

Need Results By*:	(surcharge)
☒ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%
☐ Next Day by Noon	150%
☐ Same Day	200%

Site Name: Project: 22152 Sampled By: ~~OHE~~ Consultants

Comments: R 113

List description of industry or process/interferences present in sampling area: -

State samples were collected in (ex. NY): -

Please indicate which OEL this data will be used for: ☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA ☐ MSHA ☐ Other (specify): - -

Sample Identification* (Maximum of 20 characters, ID's longer than 20 characters will be abbreviated.)	Date Sampled* (mm/dd/yy)	Collection Medium	~~Sample Volume, Sample Time, or Sample Area~~*	Sample Units*: L, ml, min., in2, cm2, ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (ex. welding, plating, painting, etc.)*
Example	01/01/11	2pc UW PVC	960	L	Hexavalent Chromium (Cr6)	mod. OSHA ID-215	Welding
22152-A31	09/15/17	25mm PCM	566	594.67	Asbestos	NIOSH 7400	
22152-A32	↓	25mm PCM	Ø	Ø	"	"	
22152-S31		PW PVC in PPI	566	1122.8	Crystalline Silica (all forms)	NIOSH 7500 + Resp.	Dust NIOSH 0600
22152-S32		PW PVC in PPI	Ø	Ø	"	"	"
22152-I29		PW PVC in IOM	566	1162.4	Metals (Inhalable)	NIOSH 7300 + Inh.	Dust NIOSH 0500
22152-I30		PW PVC in IOM	Ø	Ø	"	"	"
22152-M31		UW MCE in PPI	566	1143.6	Metals (Respirable)	NIOSH 7300	
22152-M32		UW MCE in PPI	Ø	Ø	"	"	
22152-T31		UW MCE	566	1146.3	Metals (Total)	NIOSH 7300	
22152-T32		UW MCE	Ø	Ø	"	"	

^Galson Laboratories will substitute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ please indicate if the lower LOQ is required (only available for certain analytes see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date/Time		Print Name/Signature	Date/Time
Relinquished by:	Yunny Desiangyee	Sep 18/17 9:30AM	Received by:	Herman Lau	9/18/17 5:27p
Relinquished by:	Herman Lau	9/19/17 6:40p	Received by:		9/19/17 0935

Samples received after 3pm will be considered as next day's business.
*Required fields, failure to complete these fields may result in a delay in your samples being processed.

Page 1 of 1

LAB ORIGINAL

Respirable – Aluminum, Cadmium, Iron Oxide, Molybdenum (total), Zinc Oxide

Inhalable – Magnesium Oxide, Molybdenum (total), Nickel – metal, Thallium, Vanadium Pentoxide

Total – Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium Oxide, Chromium III, Cobalt, Copper, Lead, Manganese, Selenium

Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Canada

October 03, 2017

AIHA-LAP #100324 Account# 90734 Login# L419912

Dear Mr. Umali:

Enclosed are the analytical results for the samples received by our laboratory on September 27, 2017. All test results meet the quality control requirements of AIHA-LAP and NELAC unless otherwise stated in this report. All samples on the chain of custody were received in good condition unless otherwise noted.

Results in this report are based on the sampling data provided by the client and refer only to the samples as they were received at the laboratory. Unless otherwise requested, samples for asbestos analysis will be discarded 60 days from the date of this report and all other non-IOM samples will be retained for 14 days following the date of this report (when possible). IOMs will be cleaned & disposed of after seven calendar days.

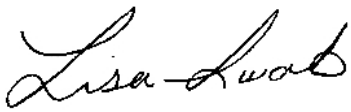
To ensure the safety of laboratory receiving personnel, always seal bulk samples securely to prevent possible escape of material. Also, please double-bag bulk samples individually prior to shipping. Samples not received in this manner will be noted on the chain of custody form.

Current Scopes of Accreditation can be viewed at www.galsonlabs.com in the accreditations section under the "about Galson" tab.

Please contact Katrina Ahchong at (888) 432-5227, if you would like any additional information regarding this report. Thank you for using SGS Galson Laboratories.

Sincerely,

SGS Galson Laboratories



Lisa Swab
Laboratory Director

Enclosure(s)

Galson Laboratories, Inc. is now a part of SGS, the world's leading inspection, verification, testing, and certification company. As part of our transition to SGS, you will begin to see some formatting changes with reports that will improve the presentation of data and allow for the transition to the new logo.

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 19-SEP-17
Date Received : 27-SEP-17

Account No.: 90734
Login No. : L419912
Date Analyzed : 28-SEP-17 - 03-OCT-17
Report ID : 1021827

Client ID : 22152-M33 **Lab ID : L419912-7** **Air Volume : 964.95 L**
Date Sampled : 09/19/17 **Date Analyzed : 09/29/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.0078	mg/m3
Cadmium	0.15	<0.15	<0.00016	mg/m3
Iron Oxide	11.	430	0.45	mg/m3
Molybdenum	0.15	<0.15	<0.00016	mg/m3
Zinc Oxide	2.8	<2.8	<0.0029	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 02-OCT-17

Submitted by: SJW/JMR/KEG/JJL/JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: MLN

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 19-SEP-17
Date Received : 27-SEP-17

Account No.: 90734
Login No. : L419912

Date Analyzed : 28-SEP-17 - 03-OCT-17
Report ID : 1021827

Client ID : 22152-M34 **Lab ID : L419912-8** **Air Volume : NA**
Date Sampled : 09/19/17 **Date Analyzed : 09/29/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 02-OCT-17

Submitted by: SJW/JMR/KEG/JJL/JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: MLN

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 19-SEP-17
Date Received : 27-SEP-17

Account No.: 90734
Login No. : L419912

Date Analyzed : 28-SEP-17 - 03-OCT-17
Report ID : 1021827

Client ID : 22152-T33 **Lab ID : L419912-9** **Air Volume : 973.31 L**
Date Sampled : 09/19/17 **Date Analyzed : 09/29/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.00092	mg/m3
Arsenic	0.15	<0.15	<0.00015	mg/m3
Barium	0.15	25	0.026	mg/m3
Beryllium	0.0075	<0.0075	<0.0000077	mg/m3
Cadmium	0.015	<0.015	<0.000015	mg/m3
Calcium Oxide	100.	<100	<0.11	mg/m3
Chromium	7.5	<7.5	<0.0077	mg/m3
Cobalt	0.045	<0.045	<0.000046	mg/m3
Copper	0.30	1.9	0.0019	mg/m3
Lead	0.075	<0.075	<0.000077	mg/m3
Manganese	0.15	3.8	0.0039	mg/m3
Selenium	2.3	<2.3	<0.0023	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 02-OCT-17

Submitted by: SJW/JMR/KEG/JJL/JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: MLN

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 19-SEP-17
Date Received : 27-SEP-17

Account No.: 90734
Login No. : L419912

Date Analyzed : 28-SEP-17 - 03-OCT-17
Report ID : 1021827

Client ID : 22152-T34 **Lab ID : L419912-10** **Air Volume : NA**
Date Sampled : 09/19/17 **Date Analyzed : 09/28/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.15	<0.15	NA	mg/m3
Barium	0.15	<0.15	NA	mg/m3
Beryllium	0.0075	<0.0075	NA	mg/m3
Cadmium	0.015	<0.015	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.045	<0.045	NA	mg/m3
Copper	0.30	<0.30	NA	mg/m3
Lead	0.075	<0.075	NA	mg/m3
Manganese	0.15	<0.15	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 02-OCT-17

Submitted by: SJW/JMR/KEG/JJL/JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: MLN

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 19-SEP-17
Date Received : 27-SEP-17

Account No.: 90734
Login No. : L419912

Date Analyzed : 28-SEP-17 - 03-OCT-17
Report ID : 1022031

Client ID : 22152-I31 **Lab ID : L419912-5** **Air Volume : 972.97 L**
Date Sampled : 09/19/17 **Date Analyzed : 10/03/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	<0.0000077	mg/m3
Magnesium Oxide	12.	<12	<0.013	mg/m3
Molybdenum	0.075	<0.075	<0.000077	mg/m3
Nickel	0.15	0.15	0.00016	mg/m3
Thallium	0.75	<0.75	<0.00077	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.00083	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 03-OCT-17

Submitted by: JMR/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: MLN

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 19-SEP-17
Date Received : 27-SEP-17

Account No.: 90734
Login No. : L419912

Date Analyzed : 28-SEP-17 - 03-OCT-17
Report ID : 1022031

Client ID : 22152-I32 **Lab ID : L419912-6** **Air Volume : NA**
Date Sampled : 09/19/17 **Date Analyzed : 10/02/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	NA	mg/m3
Magnesium Oxide	12.	<12	NA	mg/m3
Molybdenum	0.075	<0.075	NA	mg/m3
Nickel	0.15	<0.15	NA	mg/m3
Thallium	0.75	<0.75	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 03-OCT-17

Submitted by: JMR/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: MLN

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 19-SEP-17
Date Received : 27-SEP-17

Account No.: 90734
Login No. : L419912
Date Analyzed : 03-OCT-17
Report ID : 1022148

Asbestos Fiber Count (A Rules)

	Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
+	22152-A33	L419912-1	VOID	VOID	VOID	486,770	VOID
	22152-A34	L419912-2	1/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : BTM
Approved by : RCF
Date : 03-OCT-17
QC by: MLN
Supervisor: BDB

< -Less Than
> -Greater Than
ND -Not Detected
NA -Not Applicable
cc -Cubic Centimeters
NS -Not Specified
mm2 -Square millimeters

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 19-SEP-17
Date Received : 27-SEP-17

Account No.: 90734
Login No. : L419912
Date Analyzed : 02-OCT-17
Report ID : 1021630

Inhalable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-I31	L419912-5	972.97	0.65	0.67
22152-I32	L419912-6	NA	<0.10	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.10 mg
Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV
OSHA PEL : NA
Collection Media : IOM 25mm PW PVC

Submitted by: HVN
Approved by : KRK
Date : 02-OCT-17
Supervisor: KRK

NYS DOH # : 11626
QC by: MLN

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 19-SEP-17
Date Received : 27-SEP-17

Account No.: 90734
Login No. : L419912
Date Analyzed : 02-OCT-17
Report ID : 1021637

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-S33	L419912-3	970.35	0.67	0.69
22152-S34	L419912-4	NA	<0.050	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg
Analytical Method : mod. NIOSH 0600; Gravimetric
OSHA PEL : PNOR 5 mg/m3 (TWA)
Collection Media : PVC PW 37mm

Submitted by: HVN
Approved by : SPR
Date : 02-OCT-17
Supervisor: KRK

NYS DOH # : 11626
QC by: MLN

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 19-SEP-17
Date Received : 27-SEP-17

Account No.: 90734
Login No. : L419912
Date Analyzed : 02-OCT-17
Report ID : 1022048

Respirable Crystalline Silica (RCS): Quartz, Cristobalite, Tridymite

Sample ID	Lab ID	Analyte	Air Vol l	ug	ug/m3
22152-S33	L419912-3	Quartz	970.35	<5.0	<5.2
		Cristobalite	970.35	<5.0	<5.2
		Tridymite	970.35	<20	<21
		RCS	970.35	<5.0	<5.2
22152-S34	L419912-4	Quartz	NA	<5.0	NA
		Cristobalite	NA	<5.0	NA
		Tridymite	NA	<20	NA
		RCS	NA	<5.0	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: Q:5.0ug C:5.0ug T:20.ug
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD
OSHA PEL : 50 ug/m3 RCS
Collection Media : PVC PW 37mm

Submitted: AJD
Approved: KRK
Date : 03-OCT-17 NYS DOH # : 11626
Supervisor: KRK QC by: MLN

< -Less Than	mg -Milligrams	kg -Kilograms	ppm -Parts per Million
> -Greater Than	ug -Micrograms	m3 -Cubic Meters	NS -Not Specified
NA -Not Applicable	ND -Not Detected	l -Liters	mppcf -Million Particles per Cubic Foot

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Client Name : Toronto Transit Commission Ltd.
Site :
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Date Sampled : 19-SEP-17 Account No.: 90734
Date Received: 27-SEP-17 Login No. : L419912
Date Analyzed: 28-SEP-17 - 03-OCT-17

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L419912 (Report ID: 1022031):
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: im-mwvfilt(28), MT-SOP-21(9)
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3; as Fume, Ceiling = 0.1 mg/m3.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
TLV for VANADIUM PENTOXIDE: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for MAGNESIUM OXIDE: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 19-SEP-17 Account No.: 90734
Date Received: 27-SEP-17 Login No. : L419912
Date Analyzed: 28-SEP-17 - 03-OCT-17

L419912 (Report ID: 1022031):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Beryllium	+/-12.6%	103%
Magnesium Oxide	+/-9.1%	102%
Molybdenum	+/-10.3%	99.4%
Nickel	+/-10%	103%
Thallium	+/-6.6%	99.5%
Vanadium Pentoxide	+/-9.1%	102%

Parameter	Method	PEL
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/M	0.0002 mg/m3 (TWA)
Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	See footnote

L419912 (Report ID: 1021827):
TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for COBALT: 0.02 mg/m3
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for Calcium Oxide: 2 mg/m3
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3
TLV for SELENIUM: 0.2 mg/m3

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
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Date Sampled : 19-SEP-17 Account No.: 90734
Date Received: 27-SEP-17 Login No. : L419912
Date Analyzed: 28-SEP-17 - 03-OCT-17

L419912 (Report ID: 1021827):
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for CHROMIUM: 0.5 mg/m3
TLV for IRON OXIDE: 5 mg/m3
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(32), im-mwvfilt(28), MT-SOP-21(9)
PEL listed refers to Aluminum as total dust.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.

L419912 (Report ID: 1021827):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-7.7%	96.9%
Antimony	+/-8.2%	104%
Arsenic	+/-8.1%	107%
Barium	+/-8.1%	103%
Beryllium	+/-12.6%	103%
Cadmium (L419912-7,8)	+/-8.62%	102%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
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Date Sampled : 19-SEP-17 Account No.: 90734
Date Received: 27-SEP-17 Login No. : L419912
Date Analyzed: 28-SEP-17 - 03-OCT-17

Cadmium	+/-8.96%	105%
Chromium	+/-9.1%	102%
Cobalt	+/-10.2%	103%
Copper	+/-9.3%	104%
Iron Oxide	+/-9.6%	106%
Lead	+/-8.1%	103%
Manganese	+/-8.9%	103%
Molybdenum	+/-7.6%	100%
Selenium	+/-11.4%	105%
Zinc Oxide	+/-8.9%	102%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/M	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)
Chromium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Selenium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

+L419912-1 (Report ID: 1022148):
VOID-Filter overloaded with particulate, fiber counts can not be provided.

L419912 (Report ID: 1022148):
SOPs: ia-pcm(26)

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
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Project No. : 22152

Date Sampled : 19-SEP-17 Account No.: 90734
Date Received: 27-SEP-17 Login No. : L419912
Date Analyzed: 28-SEP-17 - 03-OCT-17

L419912 (Report ID: 1022148):
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a greater than optimal variability and are probably biased.
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as follows:
0.154 (5-20 fibers/100 fields)
0.100 (>20-50 fibers/100 fields)
0.069 (>50-100 fibers/100 fields)
0.090 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take into account any uncertainty associated with the sampling process.

L419912 (Report ID: 1021630):
SOPs: GRAV-SOP-8(17)
Gravimetric analytical accuracy of the sampling media is -0.001 +/- 0.030 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.

L419912 (Report ID: 1021637):
TLV for RESPIRABLE DUST: NA
SOPs: GRAV-SOP-5(18), GRAV-SOP-6(17)
Gravimetric analytical accuracy of the sampling media is 0.002 +/- 0.018 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.
PNOR = Particulates Not Otherwise Regulated.

L419912 (Report ID: 1022048):
TLV for QUARTZ: 0.025 mg/m3 Respirable
TLV for TRIDYMITE: NA
TLV for CRISTOBALITE: 0.025 mg/m3 Respirable
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26)

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 19-SEP-17 Account No.: 90734
Date Received: 27-SEP-17 Login No. : L419912
Date Analyzed: 28-SEP-17 - 03-OCT-17

L419912 (Report ID: 1022048):

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-10.3%	102%
Quartz	+/-10.9%	93.4%
Tridymite	+/-13.6%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

SGS GALSON

125X626A6646386435
Date: 09/27/17
Shipper: UPS
Initials: CEM

Prep: UNKNOWN
L419912

☐ New Client?

Client Account No.*:

Report To*: Toronto Transit Commision
1920 Yonge st.
Suite 600
Toronto, ON M4S 3E2
Phone No.*: 416-393-6668
Cell No.:
Email Results To: Virgil.Umali@ttc.ca & oheresults@oheconsultants.com
Email Address: .com

Invoice To*: Toronto Transit Commission
1920 Yonge st.
Suite 600
Toronto, ON M4S 3E2
Phone No.:
Email:
Purchase Order No.: PU 240835
Credit Card: ☐ Credit Card on File ☐ Call for Credit Card Info

☐ Samples submitted using the FreePumpLoan™ Program. ☐ Samples submitted using the FreeSamplingBadges™ Program.

Need Results By*:	(surcharge)
☒ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%
☐ Next Day by Noon	150%
☐ Same Day	200%

Site Name: Project: 22152 Sampled By: OHE Consultants

Comments: Please see attached document for metal list. For Beryllium, please use ICP-MS.

List description of industry or process/interferences present in sampling area:

State samples were collected in (ex. NY):

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA ☐ MSHA ☐ Other (specify):

Sample Identification* (Maximum of 20 characters, ID's longer than 20 characters will be abbreviated.)	Date Sampled* (mm/dd/yy)	Collection Medium	Sample Volume, Sample Time, or Sample Area*	Sample Units*: L, ml, min., in2, cm2, ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (ex. welding, plating, painting, etc.)*
Example	01/01/11	2pc UW PVC	960	L	Hexavalent Chromium (Cr6)	mod. OSHA ID-215	Welding
22152-A33	09/19/17	25mm PCM	486	486.77	Asbestos	NIOSH 7400	
22152-A34		25mm PCM	Ø	Ø	"	"	
22152-S33		PW PVC in PPI	486	970.35	Crystalline Silica (all forms)	NIOSH 7500 + Resp. Dust NIOSH 0600	
22152-S34		PW PVC in PPI	Ø	Ø	"	"	
22152-I31		PW PVC in IOM	486	972.97	Metals (Inhalable) NIOSH	7300 + Inhalable Dust NIOSH 0500	
22152-I32		PW PVC in IOM	Ø	Ø	"	"	
22152-M33		UW MCE in PPI	486	964.95	Metals (Respirable)	NIOSH 7300	
22152-M34		UW MCE in PPI	Ø	Ø	"	"	
22152-T33		UW MCE	486	973.31	Metals (Total)		
22152-T34		UW MCE	Ø	Ø	"	"	

^Galson Laboratories will substitute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ please indicate if the lower LOQ is required (only available for certain analytes see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date/Time		Print Name/Signature	Date/Time
Relinquished by:	Yunny Desiana Lee	Sep 25/2017 8:02AM	Received by:	Herman Lai	9/26/17 9:35
Relinquished by:	Herman Lai	9/26/17 6:00pm	Received by:	Kris Stone	9/27/17 11:18

Samples received after 3pm will be considered as next day's business.

*Required fields, failure to complete these fields may result in a delay in your samples being processed.

Page 1 of 1

LAB ORIGINAL

The TTC file number/purchase order number is PU240835:

1) Total Metals by NIOSH 7300. Analyze for antimony, arsenic, barium, beryllium, cadmium, calcium oxide, chromium III, cobalt, copper, lead, manganese, and selenium.

2) Asbestos fibre count by NIOSH 7400. In addition, analyze specifically for asbestos by TEM if the fibre count result exceeds 0.01 f/cc.

3) Respirable silica and respirable dust by NIOSH 7500/0600. Analyze for quartz, cristobalite, tridymite, and dust.

4) Respirable metals by NIOSH 7300. Analyze for aluminum, cadmium, iron oxide, molybdenum, and zinc oxide.

5) Inhalable metals and inhalable dust by NIOSH 7300/0500. Analyze for magnesium oxide, molybdenum, nickel, thallium, vanadium pentoxide, and dust. Beryllium should also be analyzed by ICP-MS to get a lower limit of detection.

Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Canada

October 03, 2017

AIHA-LAP #100324 Account# 90734 Login# L419904

Dear Mr. Umali:

Enclosed are the analytical results for the samples received by our laboratory on September 27, 2017. All test results meet the quality control requirements of AIHA-LAP and NELAC unless otherwise stated in this report. All samples on the chain of custody were received in good condition unless otherwise noted.

Results in this report are based on the sampling data provided by the client and refer only to the samples as they were received at the laboratory. Unless otherwise requested, samples for asbestos analysis will be discarded 60 days from the date of this report and all other non-IOM samples will be retained for 14 days following the date of this report (when possible). IOMs will be cleaned & disposed of after seven calendar days.

To ensure the safety of laboratory receiving personnel, always seal bulk samples securely to prevent possible escape of material. Also, please double-bag bulk samples individually prior to shipping. Samples not received in this manner will be noted on the chain of custody form.

Current Scopes of Accreditation can be viewed at www.galsonlabs.com in the accreditations section under the "about Galson" tab.

Please contact Katrina Ahchong at (888) 432-5227, if you would like any additional information regarding this report. Thank you for using SGS Galson Laboratories.

Sincerely,

SGS Galson Laboratories

Lisa Swab
Laboratory Director

Enclosure(s)

Galson Laboratories, Inc. is now a part of SGS, the world's leading inspection, verification, testing, and certification company. As part of our transition to SGS, you will begin to see some formatting changes with reports that will improve the presentation of data and allow for the transition to the new logo.

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East Syracuse, NY 13057
(315) 432-5227
FAX: (315) 437-0571
www.galsonlabs.com

LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 21-SEP-17
Date Received : 27-SEP-17

Account No.: 90734
Login No. : L419904

Date Analyzed : 28-SEP-17 - 02-OCT-17
Report ID : 1022038

Client ID : 22152-M35 **Lab ID : L419904-7** **Air Volume : 973.27 L**
Date Sampled : 09/21/17 **Date Analyzed : 10/02/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.0077	mg/m3
Cadmium	0.15	<0.15	<0.00015	mg/m3
Iron Oxide	11.	80	0.082	mg/m3
Molybdenum	0.15	0.27	0.00028	mg/m3
Zinc Oxide	2.8	<2.8	<0.0029	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 03-OCT-17

Submitted by: JMR/KEG/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: MLN

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 21-SEP-17
Date Received : 27-SEP-17

Account No.: 90734
Login No. : L419904

Date Analyzed : 28-SEP-17 - 02-OCT-17
Report ID : 1022038

Client ID : 22152-M36 **Lab ID : L419904-8** **Air Volume : NA**
Date Sampled : 09/21/17 **Date Analyzed : 10/02/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 03-OCT-17

Submitted by: JMR/KEG/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: MLN

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 21-SEP-17
Date Received : 27-SEP-17

Account No.: 90734
Login No. : L419904

Date Analyzed : 28-SEP-17 - 02-OCT-17
Report ID : 1022038

Client ID : 22152-T35 **Lab ID : L419904-9** **Air Volume : 977.11 L**
Date Sampled : 09/21/17 **Date Analyzed : 09/29/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.00092	mg/m3
Arsenic	0.15	<0.15	<0.00015	mg/m3
Barium	0.15	1.7	0.0017	mg/m3
Beryllium	0.0075	<0.0075	<0.0000077	mg/m3
Cadmium	0.015	<0.015	<0.000015	mg/m3
Calcium Oxide	100.	<100	<0.11	mg/m3
Chromium	7.5	<7.5	<0.0077	mg/m3
Cobalt	0.045	<0.045	<0.000046	mg/m3
Copper	0.30	0.42	0.00043	mg/m3
Lead	0.075	<0.075	<0.000077	mg/m3
Manganese	0.15	0.71	0.00073	mg/m3
Selenium	2.3	<2.3	<0.0023	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 03-OCT-17

Submitted by: JMR/KEG/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: MLN

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 21-SEP-17
Date Received : 27-SEP-17

Account No.: 90734
Login No. : L419904

Date Analyzed : 28-SEP-17 - 02-OCT-17
Report ID : 1022038

Client ID : 22152-T36 **Lab ID : L419904-10** **Air Volume : NA**
Date Sampled : 09/21/17 **Date Analyzed : 09/28/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.15	<0.15	NA	mg/m3
Barium	0.15	<0.15	NA	mg/m3
Beryllium	0.0075	<0.0075	NA	mg/m3
Cadmium	0.015	<0.015	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.045	<0.045	NA	mg/m3
Copper	0.30	<0.30	NA	mg/m3
Lead	0.075	<0.075	NA	mg/m3
Manganese	0.15	<0.15	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 03-OCT-17

Submitted by: JMR/KEG/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: MLN

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 21-SEP-17
Date Received : 27-SEP-17

Account No.: 90734
Login No. : L419904

Date Analyzed : 28-SEP-17 - 02-OCT-17
Report ID : 1022047

Client ID : 22152-I33 **Lab ID : L419904-5** **Air Volume : 972.21 L**
Date Sampled : 09/21/17 **Date Analyzed : 10/02/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	<0.0000077	mg/m3
Magnesium Oxide	12.	<12	<0.013	mg/m3
Molybdenum	0.075	0.16	0.00016	mg/m3
Nickel	0.15	<0.15	<0.00015	mg/m3
Thallium	0.75	<0.75	<0.00077	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.00083	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 03-OCT-17

Submitted by: JMR/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: MLN

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 21-SEP-17
Date Received : 27-SEP-17

Account No.: 90734
Login No. : L419904

Date Analyzed : 28-SEP-17 - 02-OCT-17
Report ID : 1022047

Client ID : 22152-I34 **Lab ID : L419904-6** **Air Volume : NA**
Date Sampled : 09/21/17 **Date Analyzed : 10/02/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	NA	mg/m3
Magnesium Oxide	12.	<12	NA	mg/m3
Molybdenum	0.075	<0.075	NA	mg/m3
Nickel	0.15	<0.15	NA	mg/m3
Thallium	0.75	<0.75	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 03-OCT-17

Submitted by: JMR/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: MLN

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 21-SEP-17
Date Received : 27-SEP-17

Account No.: 90734
Login No. : L419904
Date Analyzed : 03-OCT-17
Report ID : 1022147

Asbestos Fiber Count (A Rules)

	Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
+	22152-A35	L419904-1	4/100	<7	<2700	489,730	<0.006
	22152-A36	L419904-2	0/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : BTM
Approved by : RCF
Date : 03-OCT-17
QC by: MLN
Supervisor: BDB

< -Less Than
> -Greater Than
ND -Not Detected
NA -Not Applicable
cc -Cubic Centimeters
NS -Not Specified
mm2 -Square millimeters

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 21-SEP-17
Date Received : 27-SEP-17

Account No.: 90734
Login No. : L419904
Date Analyzed : 02-OCT-17
Report ID : 1021629

Inhalable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-I33	L419904-5	972.21	0.12	0.12
22152-I34	L419904-6	NA	<0.10	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.10 mg
Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV
OSHA PEL : NA
Collection Media : IOM 25mm PW PVC

Submitted by: HVN
Approved by : KRK
Date : 02-OCT-17
Supervisor: KRK

NYS DOH # : 11626
QC by: MLN

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 21-SEP-17
Date Received : 27-SEP-17

Account No.: 90734
Login No. : L419904
Date Analyzed : 02-OCT-17
Report ID : 1021635

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-S35	L419904-3	968.59	0.092	0.095
22152-S36	L419904-4	NA	<0.050	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg
Analytical Method : mod. NIOSH 0600; Gravimetric
OSHA PEL : PNOR 5 mg/m3 (TWA)
Collection Media : PVC PW 37mm

Submitted by: HVN/PAH
Approved by : SPR
Date : 02-OCT-17 NYS DOH # : 11626
Supervisor: KRK QC by: MLN

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 21-SEP-17
Date Received : 27-SEP-17

Account No.: 90734
Login No. : L419904

Date Analyzed : 02-OCT-17 - 03-OCT-17
Report ID : 1022160

Respirable Crystalline Silica (RCS): Quartz, Cristobalite, Tridymite

Sample ID	Lab ID	Analyte	Air Vol l	ug	ug/m3
22152-S35	L419904-3	Quartz	968.59	<5.0	<5.2
		Cristobalite	968.59	<5.0	<5.2
		Tridymite	968.59	<20	<21
		RCS	968.59	<5.0	<5.2
22152-S36	L419904-4	Quartz	NA	<5.0	NA
		Cristobalite	NA	<5.0	NA
		Tridymite	NA	<20	NA
		RCS	NA	<5.0	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: Q:5.0ug C:5.0ug T:20.ug
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD
OSHA PEL : 50 ug/m3 RCS
Collection Media : PVC PW 37mm

Submitted: AJD
Approved: KRK
Date : 03-OCT-17 NYS DOH # : 11626
Supervisor: KRK QC by: MLN

< -Less Than
> -Greater Than
NA -Not Applicable
mg -Milligrams
ug -Micrograms
ND -Not Detected
kg -Kilograms
m3 -Cubic Meters
l -Liters
ppm -Parts per Million
NS -Not Specified
mppcf -Million Particles per Cubic Foot

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 21-SEP-17 Account No.: 90734
Date Received: 27-SEP-17 Login No. : L419904
Date Analyzed: 28-SEP-17 - 03-OCT-17

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L419904 (Report ID: 1022047):
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: im-mwvfilt(28), MT-SOP-21(9)
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3; as Fume, Ceiling = 0.1 mg/m3.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
TLV for VANADIUM PENTOXIDE: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for MAGNESIUM OXIDE: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 21-SEP-17 Account No.: 90734
Date Received: 27-SEP-17 Login No. : L419904
Date Analyzed: 28-SEP-17 - 03-OCT-17

L419904 (Report ID: 1022047):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Beryllium	+/-12.6%	103%
Magnesium Oxide	+/-9.1%	102%
Molybdenum	+/-10.3%	99.4%
Nickel	+/-10%	103%
Thallium	+/-6.6%	99.5%
Vanadium Pentoxide	+/-9.1%	102%

Parameter	Method	PEL
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/M	0.0002 mg/m3 (TWA)
Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	See footnote

L419904 (Report ID: 1022038):
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: im-mwvfilt(28), MT-SOP-21(9)
PEL listed refers to Aluminum as total dust.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 21-SEP-17 Account No.: 90734
Date Received: 27-SEP-17 Login No. : L419904
Date Analyzed: 28-SEP-17 - 03-OCT-17

L419904 (Report ID: 1022038):
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for COBALT: 0.02 mg/m3
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for CALCIUM OXIDE: 2 mg/m3
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3
TLV for SELENIUM: 0.2 mg/m3
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for CHROMIUM: 0.5 mg/m3
TLV for IRON OXIDE: 5 mg/m3
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote

L419904 (Report ID: 1022038):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-10.6%	104%
Antimony	+/-8.2%	104%
Arsenic	+/-8.1%	107%
Barium	+/-8.1%	103%
Beryllium	+/-12.6%	103%
Cadmium	+/-9%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 21-SEP-17 Account No.: 90734
Date Received: 27-SEP-17 Login No. : L419904
Date Analyzed: 28-SEP-17 - 03-OCT-17

Calcium Oxide	+/-8.84%	103%
Chromium	+/-9.1%	102%
Cobalt	+/-10.2%	103%
Copper	+/-9.3%	104%
Iron Oxide	+/-10%	102%
Lead	+/-8.1%	103%
Manganese	+/-8.9%	103%
Molybdenum	+/-10.3%	99.4%
Selenium	+/-11.4%	105%
Zinc Oxide	+/-9.9%	106%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/M	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)
Chromium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Selenium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

+L419904-1 (Report ID: 1022147):
The sample results may have a negative bias; the filter surface was covered by fine particulate that may have obscured fibers.

L419904 (Report ID: 1022147):
SOPs: ia-pcm(26)

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 21-SEP-17 Account No.: 90734
Date Received: 27-SEP-17 Login No. : L419904
Date Analyzed: 28-SEP-17 - 03-OCT-17

L419904 (Report ID: 1022147):
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a greater than optimal variability and are probably biased.
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as follows:
0.154 (5-20 fibers/100 fields)
0.100 (>20-50 fibers/100 fields)
0.069 (>50-100 fibers/100 fields)
0.090 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take into account any uncertainty associated with the sampling process.

L419904 (Report ID: 1021629):
SOPs: GRAV-SOP-8(17)
Gravimetric analytical accuracy of the sampling media is -0.001 +/- 0.030 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.

L419904 (Report ID: 1021635):
TLV for RESPIRABLE DUST: NA
SOPs: GRAV-SOP-5(18), GRAV-SOP-6(17)
Gravimetric analytical accuracy of the sampling media is 0.002 +/- 0.018 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.
PNOR = Particulates Not Otherwise Regulated.

L419904 (Report ID: 1022160):
TLV for QUARTZ: 0.025 mg/m3 Respirable
TLV for TRIDYMITE: NA
TLV for CRISTOBALITE: 0.025 mg/m3 Respirable
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26)

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 21-SEP-17 Account No.: 90734
Date Received: 27-SEP-17 Login No. : L419904
Date Analyzed: 28-SEP-17 - 03-OCT-17

L419904 (Report ID: 1022160):

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-10.3%	102%
Quartz	+/-10.9%	93.4%
Tridymite	+/-13.6%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

SGS GALSON

1Z5X626A6646386435
Date: 09/27/17
Shipper: UPS
Initials: CEM
Prep: UNKNOWN
L4199024

☐ New Client?

Report To*: Toronto Transit Commission
1920 Yonge St.
Suite 600
Toronto, ON M4S 3E2
Phone No.*: 416-393-6668
Cell No.:
Email Results To: Virgil.Umali@ttc.ca & oheresults@oheconsultants.com

Invoice To*: Toronto Transit Commission
1920 Yonge St.
Suite 600
Toronto, ON M4S 3E2
Phone No.: 416-393-6668
Email:
Purchase Order No.: PU 240835
Credit Card: ☐ Credit Card on File ☐ Call for Credit Card Info

Client Account No.*:

☐ Samples submitted using the FreePumpLoan™ Program.
☐ Samples submitted using the FreeSamplingBadges™ Program.

Need Results By*:	(surcharge)
☒ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%
☐ Next Day by Noon	150%
☐ Same Day	200%

Site Name:
Project: 22152
Sampled By: OHE Consultants.

Comments:
Please see attached document for metal list. For Beryllium, please use ICP-MS.

List description of industry or process/interferences present in sampling area:

State samples were collected in (ex. NY):

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify):

Sample Identification* (Maximum of 20 charectors, ID's longer than 20 characters will be abbreviated.)	Date Sampled* (mm/dd/yy)	Collection Medium	Sample Volume, Sample Time, or Sample Area*	Sample Units*: L, ml, min., in2, cm2, ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (ex. welding, plating, painting, etc.)*
Example	01/01/11	2pc UW PVC	960	L	Hexavalent Chromium (Cr6)	mod. OSHA ID-215	Welding
22152-A35	09/21/17	25mm PCM	485	489.73	Asbestos	NIOSH 7400	
22152-A36		25mm PCM	Ø	Ø	—"—	—"—	
22152-S35		PW PVC in PPI	485	968.59	Crystalline Silica (all forms)	NIOSH 7500 + Resp. Dust NIOSH 0600	
22152-S36		PW PVC in PPI	Ø	Ø	—"—	—"—	
22152-I33		PW PVC in IOM	485	972.21	Metals (Inhalable) NIOSH	7300 + Inhalable Dust NIOSH 0500	
22152-I34		PW PVC in IOM	Ø	Ø	—"—	—"—	
22152-M35		UW MCE in PPI	485	973.27	Metals (Respirable)	NIOSH 7300	
22152-M36		UW MCE in PPI	Ø	Ø	—"—		
22152-T35		UW MCE	485	977.11	Metals (Total)		
22152-T36		UW MCE	Ø	Ø	—"—		

^Galson Laboratories will substitute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ please indicate if the lower LOQ is required (only available for certain analytes see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date/Time		Print Name/Signature	Date/Time
Relinquished by:	Yunny Desiana Lee	Sep 25/17 8:50 AM	Received by:	Usman Sanai	9/26/17 9:33
Relinquished by:	Usman Sanai	9/26/17 6:00 Pm	Received by:	Kris Stone	9/27/17 11:18

Samples received after 3pm will be considered as next day's business.
*Required fields, failure to complete these fields may result in a delay in your samples being processed.

Page 1 of 1

LAB ORIGINAL

The TTC file number/purchase order number is PU240835:

1) Total Metals by NIOSH 7300. Analyze for antimony, arsenic, barium, beryllium, cadmium, calcium oxide, chromium III, cobalt, copper, lead, manganese, and selenium.

2) Asbestos fibre count by NIOSH 7400. In addition, analyze specifically for asbestos by TEM if the fibre count result exceeds 0.01 f/cc.

3) Respirable silica and respirable dust by NIOSH 7500/0600. Analyze for quartz, cristobalite, tridymite, and dust.

4) Respirable metals by NIOSH 7300. Analyze for aluminum, cadmium, iron oxide, molybdenum, and zinc oxide.

5) Inhalable metals and inhalable dust by NIOSH 7300/0500. Analyze for magnesium oxide, molybdenum, nickel, thallium, vanadium pentoxide, and dust. Beryllium should also be analyzed by ICP-MS to get a lower limit of detection.

Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Canada

October 06, 2017

AIHA-LAP #100324 Account# 90734 Login# L420331

Dear Mr. Umali:

Enclosed are the analytical results for the samples received by our laboratory on September 30, 2017. All test results meet the quality control requirements of AIHA-LAP and NELAC unless otherwise stated in this report. All samples on the chain of custody were received in good condition unless otherwise noted.

Results in this report are based on the sampling data provided by the client and refer only to the samples as they were received at the laboratory. Unless otherwise requested, samples for asbestos analysis will be discarded 60 days from the date of this report and all other non-IOM samples will be retained for 14 days following the date of this report (when possible). IOMs will be cleaned & disposed of after seven calendar days.

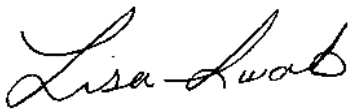
To ensure the safety of laboratory receiving personnel, always seal bulk samples securely to prevent possible escape of material. Also, please double-bag bulk samples individually prior to shipping. Samples not received in this manner will be noted on the chain of custody form.

Current Scopes of Accreditation can be viewed at www.galsonlabs.com in the accreditations section under the "about Galson" tab.

Please contact Katrina Ahchong at (888) 432-5227, if you would like any additional information regarding this report. Thank you for using SGS Galson Laboratories.

Sincerely,

SGS Galson Laboratories



Lisa Swab
Laboratory Director

Enclosure(s)

Galson Laboratories, Inc. is now a part of SGS, the world's leading inspection, verification, testing, and certification company. As part of our transition to SGS, you will begin to see some formatting changes with reports that will improve the presentation of data and allow for the transition to the new logo.

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 26-SEP-17
Date Received : 30-SEP-17

Account No.: 90734
Login No. : L420331

Date Analyzed : 03-OCT-17 - 05-OCT-17
Report ID : 1023025

Client ID : 22152-I35 **Lab ID : L420331-5** **Air Volume : 964.2 L**
Date Sampled : 09/26/17 **Date Analyzed : 10/05/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	<0.0000078	mg/m3
Magnesium Oxide	12.	<12	<0.013	mg/m3
Molybdenum	0.075	<0.075	<0.000078	mg/m3
Nickel	0.15	0.20	0.00021	mg/m3
Thallium	0.75	<0.75	<0.00078	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.00083	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 06-OCT-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 26-SEP-17
Date Received : 30-SEP-17

Account No.: 90734
Login No. : L420331

Date Analyzed : 03-OCT-17 - 05-OCT-17
Report ID : 1023025

Client ID : 22152-I36 **Lab ID : L420331-6** **Air Volume : NA**
Date Sampled : 09/26/17 **Date Analyzed : 10/05/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	NA	mg/m3
Magnesium Oxide	12.	<12	NA	mg/m3
Molybdenum	0.075	<0.075	NA	mg/m3
Nickel	0.15	<0.15	NA	mg/m3
Thallium	0.75	<0.75	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 06-OCT-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 26-SEP-17
Date Received : 30-SEP-17

Account No.: 90734
Login No. : L420331

Date Analyzed : 03-OCT-17 - 05-OCT-17
Report ID : 1022354

Client ID : 22152-M37 **Lab ID : L420331-7** **Air Volume : 967.2 L**
Date Sampled : 09/26/17 **Date Analyzed : 10/03/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.0078	mg/m3
Cadmium	0.15	<0.15	<0.00016	mg/m3
Iron Oxide	11.	450	0.46	mg/m3
Molybdenum	0.15	<0.15	<0.00016	mg/m3
Zinc Oxide	2.8	<2.8	<0.0029	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 06-OCT-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 26-SEP-17
Date Received : 30-SEP-17

Account No.: 90734
Login No. : L420331

Date Analyzed : 03-OCT-17 - 05-OCT-17
Report ID : 1022354

Client ID : 22152-M38 **Lab ID : L420331-8** **Air Volume : NA**
Date Sampled : 09/26/17 **Date Analyzed : 10/03/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 06-OCT-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 26-SEP-17
Date Received : 30-SEP-17

Account No.: 90734
Login No. : L420331

Date Analyzed : 03-OCT-17 - 05-OCT-17
Report ID : 1022354

Client ID : 22152-T37 **Lab ID : L420331-9** **Air Volume : 970.5 L**
Date Sampled : 09/26/17 **Date Analyzed : 10/04/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.00093	mg/m3
Arsenic	0.15	<0.15	<0.00015	mg/m3
Barium	0.15	<0.15	<0.00015	mg/m3
Beryllium	0.0075	<0.0075	<0.0000077	mg/m3
Cadmium	0.015	<0.015	<0.000015	mg/m3
Calcium Oxide	100.	<100	<0.11	mg/m3
Chromium	7.5	<7.5	<0.0077	mg/m3
Cobalt	0.045	<0.045	<0.000046	mg/m3
Copper	0.30	<0.30	<0.00031	mg/m3
Lead	0.075	<0.075	<0.000077	mg/m3
Manganese	0.15	<0.15	<0.00015	mg/m3
Selenium	2.3	<2.3	<0.0023	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 06-OCT-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 26-SEP-17
Date Received : 30-SEP-17

Account No.: 90734
Login No. : L420331

Date Analyzed : 03-OCT-17 - 05-OCT-17
Report ID : 1022354

Client ID : 22152-T38 **Lab ID : L420331-10** **Air Volume : NA**
Date Sampled : 09/26/17 **Date Analyzed : 10/04/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.15	<0.15	NA	mg/m3
Barium	0.15	30	NA	mg/m3
Beryllium	0.0075	<0.0075	NA	mg/m3
Cadmium	0.015	<0.015	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.045	<0.045	NA	mg/m3
Copper	0.30	2.2	NA	mg/m3
Lead	0.075	<0.075	NA	mg/m3
Manganese	0.15	4.6	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 06-OCT-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 26-SEP-17
Date Received : 30-SEP-17

Account No.: 90734
Login No. : L420331
Date Analyzed : 05-OCT-17
Report ID : 1022913

Asbestos Fiber Count (A Rules)

	Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
+	22152-A37	L420331-1	VOID	VOID	VOID	495,200	VOID
	22152-A38	L420331-2	2/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : BTM
Approved by : BDB
Date : 06-OCT-17
QC by: CRD
Supervisor: BDB

< -Less Than
> -Greater Than
ND -Not Detected
NA -Not Applicable
cc -Cubic Centimeters
NS -Not Specified
mm2 -Square millimeters

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 26-SEP-17
Date Received : 30-SEP-17

Account No.: 90734
Login No. : L420331
Date Analyzed : 04-OCT-17
Report ID : 1021954

Inhalable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-I35	L420331-5	964.2	1.0	1.0
22152-I36	L420331-6	NA	<0.10	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.10 mg
Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV
OSHA PEL : NA
Collection Media : IOM 25mm PW PVC

Submitted by: NRH
Approved by : SPR
Date : 04-OCT-17
Supervisor: KRK

NYS DOH # : 11626
QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 26-SEP-17
Date Received : 30-SEP-17

Account No.: 90734
Login No. : L420331
Date Analyzed : 05-OCT-17
Report ID : 1021955

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-S37	L420331-3	962.3	0.64	0.66
22152-S38	L420331-4	NA	<0.050	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg
Analytical Method : mod. NIOSH 0600; Gravimetric
OSHA PEL : PNOR 5 mg/m3 (TWA)
Collection Media : PVC PW 37mm

Submitted by: HVN
Approved by : SPR
Date : 05-OCT-17
Supervisor: KRK

NYS DOH # : 11626
QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 26-SEP-17
Date Received : 30-SEP-17

Account No.: 90734
Login No. : L420331
Date Analyzed : 05-OCT-17
Report ID : 1022793

Hexavalent Chromium

Sample ID	Lab ID	Air Vol liter	Total ug	Conc ug/m3
22152-H1	L420331-11	952.8	<0.030	<0.031
22152-H2	L420331-12	NA	<0.030	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.030 ug
Analytical Method : mod. OSHA ID-215 (version 2); IC/UV
OSHA PEL : 5 ug/m3 (TWA)
Collection Media : PVC UW 37mm

Submitted by: KLS
Approved by : DNF
Date : 06-OCT-17
Supervisor: MWJ

NYS DOH # : 11626
QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 26-SEP-17
Date Received : 30-SEP-17

Account No.: 90734
Login No. : L420331

Date Analyzed : 05-OCT-17 - 06-OCT-17
Report ID : 1023115

Respirable Crystalline Silica (RCS): Quartz, Cristobalite, Tridymite

Sample ID	Lab ID	Analyte	Air Vol l	ug	ug/m3
22152-S37	L420331-3	Quartz	962.3	<5.0	<5.2
		Cristobalite	962.3	<5.0	<5.2
		Tridymite	962.3	<20	<21
		RCS	962.3	<5.0	<5.2
22152-S38	L420331-4	Quartz	NA	<5.0	NA
		Cristobalite	NA	<5.0	NA
		Tridymite	NA	<20	NA
		RCS	NA	<5.0	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: Q:5.0ug C:5.0ug T:20.ug
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD
OSHA PEL : 50 ug/m3 RCS
Collection Media : PVC PW 37mm

Submitted: AJD
Approved: CMR
Date : 06-OCT-17 NYS DOH # : 11626
Supervisor: KRK QC by: CRD

< -Less Than
> -Greater Than
NA -Not Applicable
mg -Milligrams
ug -Micrograms
ND -Not Detected
kg -Kilograms
m3 -Cubic Meters
l -Liters
ppm -Parts per Million
NS -Not Specified
mppcf -Million Particles per Cubic Foot

LABORATORY FOOTNOTE REPORT

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 26-SEP-17 Account No.: 90734
Date Received: 30-SEP-17 Login No. : L420331
Date Analyzed: 03-OCT-17 - 06-OCT-17

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L420331 (Report ID: 1023025):
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: im-mwvfilt(28), MT-SOP-21(10)
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3; as Fume, Ceiling = 0.1 mg/m3.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
TLV for VANADIUM PENTOXIDE: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for MAGNESIUM OXIDE: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 26-SEP-17 Account No.: 90734
Date Received: 30-SEP-17 Login No. : L420331
Date Analyzed: 03-OCT-17 - 06-OCT-17

L420331 (Report ID: 1023025):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Beryllium	+/-12.6%	103%
Magnesium Oxide	+/-9.1%	102%
Molybdenum	+/-10.3%	99.4%
Nickel	+/-10%	103%
Thallium	+/-6.6%	99.5%
Vanadium Pentoxide	+/-9.1%	102%

Parameter	Method	PEL
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/M	0.0002 mg/m3 (TWA)
Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	See footnote

L420331 (Report ID: 1022354):
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: im-mwvfilt(28), MT-SOP-21(9)
PEL listed refers to Aluminum as total dust.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 26-SEP-17 Account No.: 90734
Date Received: 30-SEP-17 Login No. : L420331
Date Analyzed: 03-OCT-17 - 06-OCT-17

L420331 (Report ID: 1022354):
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for COBALT: 0.02 mg/m3
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for CALCIUM OXIDE: 2 mg/m3
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3
TLV for SELENIUM: 0.2 mg/m3
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for CHROMIUM: 0.5 mg/m3
TLV for IRON OXIDE: 5 mg/m3
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote

L420331-10 (Report ID: 1022354):
Client-submitted blank result is above the LOQ at 4.6 ug for Manganese, 2.2 ug for Copper, and 30 ug for Barium.
Sample results not blank-corrected.

L420331 (Report ID: 1022354):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-10.6%	104%
Antimony	+/-8.2%	104%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 26-SEP-17 Account No.: 90734
Date Received: 30-SEP-17 Login No. : L420331
Date Analyzed: 03-OCT-17 - 06-OCT-17

Arsenic	+/-8.1%	107%
Barium	+/-8.1%	103%
Beryllium	+/-12.6%	103%
Cadmium	+/-9%	105%
Calcium Oxide	+/-11.3%	100%
Chromium	+/-9.1%	102%
Cobalt	+/-10.2%	103%
Copper	+/-9.3%	104%
Iron Oxide	+/-10%	102%
Lead	+/-8.1%	103%
Manganese	+/-8.9%	103%
Molybdenum	+/-10.3%	99.4%
Selenium	+/-11.4%	105%
Zinc Oxide	+/-9.9%	106%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/M	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)
Chromium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Selenium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

+L420331-1 (Report ID: 1022913):
VOID-Filter overloaded with particulate, fiber counts can not be provided.

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 26-SEP-17 Account No.: 90734
Date Received: 30-SEP-17 Login No. : L420331
Date Analyzed: 03-OCT-17 - 06-OCT-17

L420331 (Report ID: 1022913):
SOPs: ia-pcm(26)
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a
greater than optimal variability and are probably biased.
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as
follows:
0.154 (5-20 fibers/100 fields)
0.100 (>20-50 fibers/100 fields)
0.069 (>50-100 fibers/100 fields)
0.090 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take
into account any uncertainty associated with the sampling process.

L420331 (Report ID: 1021954):
SOPs: GRAV-SOP-8(17)
Gravimetric analytical accuracy of the sampling media is -0.001 +/- 0.030 mg (average blank
weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and
SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.

L420331 (Report ID: 1021955):
TLV for RESPIRABLE DUST: NA
SOPs: GRAV-SOP-5(18), GRAV-SOP-6(17)
Gravimetric analytical accuracy of the sampling media is 0.002 +/- 0.018 mg (average blank
weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and
SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.
PNOR = Particulates Not Otherwise Regulated.

L420331 (Report ID: 1022793):
TLV for Hexavalent Chromium: 0.01 mg/m3 (as Cr, Insol)
SOPs: IC-SOP-15(19)
Total ug corrected for a desorption efficiency of 100%.
SGS Galson Laboratories pretests all media lots distributed for Hexavalent Chromium analysis
and can provide data confirming that no significant background is present. We may not be
able to verify lot background levels for media obtained through alternate vendors.

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 26-SEP-17 Account No.: 90734
Date Received: 30-SEP-17 Login No. : L420331
Date Analyzed: 03-OCT-17 - 06-OCT-17

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Hexavalent Chromium	+/-12.7%	96.3%

L420331 (Report ID: 1023115):
TLV for QUARTZ: 0.025 mg/m3 Respirable
TLV for TRIDYMITE: NA
TLV for CRISTOBALITE: 0.025 mg/m3 Respirable
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26)

L420331 (Report ID: 1023115):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-10.3%	102%
Quartz	+/-10.9%	93.4%
Tridymite	+/-13.6%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

SGS GALSON

1Z5X626A6948549723
Date:09/30/17
Shipper:UPS
Initials:ZRK

Prep:UNKNOWN
(42033)

☐ New Client?

Report To*: Toronto Transit Commission
1920 Yonge St.
Suite 600
Toronto, ON M4S 3E2
Phone No.*: 416-393-6668
Cell No.:
Email Results To: Virgil.Umali@ttc.ca & oheresults@oheconsultants.com

Invoice To*: Toronto Transit Commission
1920 Yonge St.
Suite 600
Toronto, ON M4S 3E2
Phone No.:
Email:
Purchase Order No.: PU 240835

Client Account No.*:

Credit Card: ☐ Credit Card on File ☐ Call for Credit Card Info

☐ Samples submitted using the FreePumpLoan™ Program. ☐ Samples submitted using the FreeSamplingBadges™ Program.

Need Results By*:	(surcharge)
☒ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%
☐ Next Day by Noon	150%
☐ Same Day	200%

Site Name:
Project: 22152
Sampled By: OHE Consultants
Comments: TTC Subway Air Quality

List description of industry or process/interferences present in sampling area:

State samples were collected in (ex. NY):

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify):

Sample Identification* (Maximum of 20 characters, ID's longer than 20 characters will be abbreviated.)	Date Sampled* (mm/dd/yy)	Collection Medium	Sample Volume, Sample Time, or Sample Area*	Sample Units*: L, ml, min., in2, cm2, ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (ex. welding, plating, painting, etc.)*
Example	01/01/11	2pc UW PVC	960	L	Hexavalent Chromium (Cr6)	mod. OSHA ID-215	Welding
22152-A37	09/26/17	25mm PCM	480	495.2	Standardized List of Analyses for TTC Subway	Air Quality Study	
22152-A38		25mm PCM	Ø	Ø			
22152-S37		PW PVC in PPI	480	962.3			
22152-S38		PW PVC in PPI	Ø	Ø			
22152-I35		PW PVC in IOM	480	964.2			
22152-I36		PW PVC in IOM	Ø	Ø			
22152-M37		UW MCE in PPI	480	967.2			
22152-M38		UW MCE in PPI	Ø	Ø			
22152-T37		UW MCE	480	970.5			
22152-T38		UW MCE	Ø	Ø			

^Galson Laboratories will substitute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ please indicate if the lower LOQ is required (only available for certain analytes see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date/Time		Print Name/Signature	Date/Time
Relinquished by:	Yuonny Desiapa Lee	Sep 29/17 11:08AM	Received by:	Herman Sau	9/29/17 1:37pm
Relinquished by:	Herman Sau	9/29/17 6:00pm	Received by:	L Stone	9/30/17 1037

Samples received after 3pm will be considered as next day's business.
*Required fields, failure to complete these fields may result in a delay in your samples being processed.

Page 1 of 2

LAB ORIGINAL

SGS GALSON

1Z5X626A6948549723
Date:09/30/17
Shipper:UPS
Initials:ZRK
Prep:UNKNOWN

☐ New Client?

Report To*: Toronto Transit Commission
1920 Yonge St.
Suite 600
Toronto, ON M4S 3E2

Client Account No.*: _____

Phone No.*: 416-393-6668

Cell No.: _____

Email Results To: Virgil.Umali@ttc.ca & oheresults@oheconsultants.com

Email Address: _____

Invoice To*: Toronto Transit Commission
1920 Yonge St.
Suite 600
Toronto, ON M4S 3E2

Phone No.: _____

Email: _____

Purchase Order No.: PU 240835

Credit Card: ☐ Credit Card on File ☐ Call for Credit Card Info

☐ Samples submitted using the FreePumpLoan™ Program.

☐ Samples submitted using the FreeSamplingBadges™ Program.

Need Results By*:	(surcharge)
☒ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%
☐ Next Day by Noon	150%
☐ Same Day	200%

Site Name: _____ Project: 22152 Sampled By: OHE Consultants

Comments: TTC Subway Air Quality

List description of industry or process/interferences present in sampling area:

State samples were collected in (ex. NY):

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify):

Sample Identification* (Maximum of 20 characters, ID's longer than 20 characters will be abbreviated.)	Date Sampled* (mm/dd/yy)	Collection Medium	~~Sample Volume~~, Sample Time, or ~~Sample Area~~*	Sample Units*: L, ml, min., in2, cm2, ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (ex. welding, plating, painting, etc.)*
Example	01/01/11	2pc UW PVC	960	L	Hexavalent Chromium (Cr6)	mod. OSHA ID-215	Welding
22152-H1	09/26/17	2pc UW PVC	480	952.8	Hexavalent Chromium	mod. OSHA ID 215	
22152-H2	↓	2pc UW PVC	Ø	Ø	〃	〃	

^Galson Laboratories will substitute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ please indicate if the lower LOQ is required (only available for certain analytes see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date/Time		Print Name/Signature	Date/Time
Relinquished by:	Yunny Desiang Lee	Sep 29/17 11:05AM	Received by:		9/29/17 1:37pm
Relinquished by:		9/29/17 6:00pm	Received by:		9/30/17 1037

Samples received after 3pm will be considered as next day's business.

*Required fields, failure to complete these fields may result in a delay in your samples being processed.

Page 2 of 2

LAB ORIGINAL

SGS GALSON

Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Canada

October 06, 2017

AIHA-LAP #100324 Account# 90734 Login# L420327

Dear Mr. Umali:

Enclosed are the analytical results for the samples received by our laboratory on September 30, 2017. All test results meet the quality control requirements of AIHA-LAP and NELAC unless otherwise stated in this report. All samples on the chain of custody were received in good condition unless otherwise noted.

Results in this report are based on the sampling data provided by the client and refer only to the samples as they were received at the laboratory. Unless otherwise requested, samples for asbestos analysis will be discarded 60 days from the date of this report and all other non-IOM samples will be retained for 14 days following the date of this report (when possible). IOMs will be cleaned & disposed of after seven calendar days.

To ensure the safety of laboratory receiving personnel, always seal bulk samples securely to prevent possible escape of material. Also, please double-bag bulk samples individually prior to shipping. Samples not received in this manner will be noted on the chain of custody form.

Current Scopes of Accreditation can be viewed at www.galsonlabs.com in the accreditations section under the "about Galson" tab.

Please contact Katrina Ahchong at (888) 432-5227, if you would like any additional information regarding this report. Thank you for using SGS Galson Laboratories.

Sincerely,

SGS Galson Laboratories

Lisa Swab
Laboratory Director

Enclosure(s)

Galson Laboratories, Inc. is now a part of SGS, the world's leading inspection, verification, testing, and certification company. As part of our transition to SGS, you will begin to see some formatting changes with reports that will improve the presentation of data and allow for the transition to the new logo.

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FAX: (315) 437-0571
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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 28-SEP-17
Date Received : 30-SEP-17

Account No.: 90734
Login No. : L420327

Date Analyzed : 03-OCT-17 - 05-OCT-17
Report ID : 1023021

Client ID : 22152-I37 **Lab ID : L420327-5** **Air Volume : 973.9 L**
Date Sampled : 09/28/17 **Date Analyzed : 10/05/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	<0.0000077	mg/m3
Magnesium Oxide	12.	<12	<0.013	mg/m3
Molybdenum	0.075	1.0	0.0010	mg/m3
Nickel	0.15	0.16	0.00017	mg/m3
Thallium	0.75	<0.75	<0.00077	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.00082	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 06-OCT-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 28-SEP-17
Date Received : 30-SEP-17

Account No.: 90734
Login No. : L420327

Date Analyzed : 03-OCT-17 - 05-OCT-17
Report ID : 1023021

Client ID : 22152-I38 **Lab ID : L420327-6** **Air Volume : NA**
Date Sampled : 09/28/17 **Date Analyzed : 10/05/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	NA	mg/m3
Magnesium Oxide	12.	<12	NA	mg/m3
Molybdenum	0.075	<0.075	NA	mg/m3
Nickel	0.15	<0.15	NA	mg/m3
Thallium	0.75	<0.75	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 06-OCT-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 28-SEP-17
Date Received : 30-SEP-17

Account No.: 90734
Login No. : L420327

Date Analyzed : 03-OCT-17 - 05-OCT-17
Report ID : 1022364

Client ID : 22152-M39 **Lab ID : L420327-7** **Air Volume : 975.8 L**
Date Sampled : 09/28/17 **Date Analyzed : 10/03/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.0077	mg/m3
Cadmium	0.15	<0.15	<0.00015	mg/m3
Iron Oxide	11.	130	0.14	mg/m3
Molybdenum	0.15	0.38	0.00039	mg/m3
Zinc Oxide	2.8	<2.8	<0.0029	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 05-OCT-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 28-SEP-17
Date Received : 30-SEP-17

Account No.: 90734
Login No. : L420327

Date Analyzed : 03-OCT-17 - 05-OCT-17
Report ID : 1022364

Client ID : 22152-M40 **Lab ID : L420327-8** **Air Volume : NA**
Date Sampled : 09/28/17 **Date Analyzed : 10/03/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 05-OCT-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 28-SEP-17
Date Received : 30-SEP-17

Account No.: 90734
Login No. : L420327

Date Analyzed : 03-OCT-17 - 05-OCT-17
Report ID : 1022364

Client ID : 22152-T39 **Lab ID : L420327-9** **Air Volume : 972.3 L**
Date Sampled : 09/28/17 **Date Analyzed : 10/04/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.00093	mg/m3
Arsenic	0.15	<0.15	<0.00015	mg/m3
Barium	0.15	4.0	0.0041	mg/m3
Beryllium	0.0075	<0.0075	<0.0000077	mg/m3
Cadmium	0.015	<0.015	<0.000015	mg/m3
Calcium Oxide	100.	<100	<0.11	mg/m3
Chromium	7.5	<7.5	<0.0077	mg/m3
Cobalt	0.045	<0.045	<0.000046	mg/m3
Copper	0.30	1.0	0.0010	mg/m3
Lead	0.075	0.15	0.00016	mg/m3
Manganese	0.15	1.5	0.0015	mg/m3
Selenium	2.3	<2.3	<0.0023	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 05-OCT-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 28-SEP-17
Date Received : 30-SEP-17

Account No.: 90734
Login No. : L420327

Date Analyzed : 03-OCT-17 - 05-OCT-17
Report ID : 1022364

Client ID : 22152-T40 **Lab ID : L420327-10** **Air Volume : NA**
Date Sampled : 09/28/17 **Date Analyzed : 10/04/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.15	<0.15	NA	mg/m3
Barium	0.15	<0.15	NA	mg/m3
Beryllium	0.0075	<0.0075	NA	mg/m3
Cadmium	0.015	<0.015	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.045	<0.045	NA	mg/m3
Copper	0.30	<0.30	NA	mg/m3
Lead	0.075	<0.075	NA	mg/m3
Manganese	0.15	<0.15	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 05-OCT-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 28-SEP-17
Date Received : 30-SEP-17

Account No.: 90734
Login No. : L420327
Date Analyzed : 05-OCT-17
Report ID : 1022911

Asbestos Fiber Count (A Rules)

	Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
-	22152-A39	L420327-1	5/100	<7	<2700	490,800	<0.006
	22152-A40	L420327-2	0/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : BTM
Approved by : BDB
Date : 06-OCT-17
QC by: CRD
Supervisor: BDB

< -Less Than > -Greater Than ND -Not Detected
NA -Not Applicable cc -Cubic Centimeters NS -Not Specified
mm2 -Square millimeters

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 28-SEP-17
Date Received : 30-SEP-17

Account No.: 90734
Login No. : L420327
Date Analyzed : 04-OCT-17
Report ID : 1021956

Inhalable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-I37	L420327-5	973.9	0.47	0.48
22152-I38	L420327-6	NA	<0.10	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.10 mg
Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV
OSHA PEL : NA
Collection Media : IOM 25mm PW PVC

Submitted by: HVN/NRH
Approved by : SPR
Date : 04-OCT-17
Supervisor: KRK

NYS DOH # : 11626
QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 28-SEP-17
Date Received : 30-SEP-17

Account No.: 90734
Login No. : L420327
Date Analyzed : 05-OCT-17
Report ID : 1021957

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-S39	L420327-3	973.9	0.19	0.19
22152-S40	L420327-4	NA	<0.050	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg
Analytical Method : mod. NIOSH 0600; Gravimetric
OSHA PEL : PNOR 5 mg/m3 (TWA)
Collection Media : PVC PW 37mm

Submitted by: HVN
Approved by : SPR
Date : 05-OCT-17
Supervisor: KRK

NYS DOH # : 11626
QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 28-SEP-17
Date Received : 30-SEP-17

Account No.: 90734
Login No. : L420327

Date Analyzed : 05-OCT-17
Report ID : 1022792

Hexavalent Chromium

Sample ID	Lab ID	Air Vol liter	Total ug	Conc ug/m3
22152-H3	L420327-11	967.2	<0.030	<0.031
22152-H4	L420327-12	NA	<0.030	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.030 ug
Analytical Method : mod. OSHA ID-215 (version 2); IC/UV
OSHA PEL : 5 ug/m3 (TWA)
Collection Media : PVC UW 37mm

Submitted by: KLS
Approved by : DNF
Date : 06-OCT-17
Supervisor: MWJ

NYS DOH # : 11626
QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 28-SEP-17
Date Received : 30-SEP-17

Account No.: 90734
Login No. : L420327

Date Analyzed : 05-OCT-17 - 06-OCT-17
Report ID : 1023113

Respirable Crystalline Silica (RCS): Quartz, Cristobalite, Tridymite

Sample ID	Lab ID	Analyte	Air Vol l	ug	ug/m3
22152-S39	L420327-3	Quartz	973.9	<5.0	<5.1
		Cristobalite	973.9	<5.0	<5.1
		Tridymite	973.9	<20	<21
		RCS	973.9	<5.0	<5.1
22152-S40	L420327-4	Quartz	NA	<5.0	NA
		Cristobalite	NA	<5.0	NA
		Tridymite	NA	<20	NA
		RCS	NA	<5.0	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: Q:5.0ug C:5.0ug T:20.ug
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD
OSHA PEL : 50 ug/m3 RCS
Collection Media : PVC PW 37mm

Submitted: AJD
Approved: CMR
Date : 06-OCT-17 NYS DOH # : 11626
Supervisor: KRK QC by: CRD

< -Less Than
> -Greater Than
NA -Not Applicable
mg -Milligrams
ug -Micrograms
ND -Not Detected
kg -Kilograms
m3 -Cubic Meters
l -Liters
ppm -Parts per Million
NS -Not Specified
mppcf -Million Particles per Cubic Foot

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 28-SEP-17 Account No.: 90734
Date Received: 30-SEP-17 Login No. : L420327
Date Analyzed: 03-OCT-17 - 06-OCT-17

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L420327 (Report ID: 1023021):
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: im-mwvfilt(28), MT-SOP-21(10)
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3; as Fume, Ceiling = 0.1 mg/m3.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
TLV for VANADIUM PENTOXIDE: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for MAGNESIUM OXIDE: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote

< -Less Than	mg -Milligrams	m3 -Cubic Meters	kg -Kilograms	ppm -Parts per Million		
> -Greater Than	ug -Micrograms	l -Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable	

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 28-SEP-17 Account No.: 90734
Date Received: 30-SEP-17 Login No. : L420327
Date Analyzed: 03-OCT-17 - 06-OCT-17

L420327 (Report ID: 1023021):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Beryllium	+/-12.6%	103%
Magnesium Oxide	+/-9.1%	102%
Molybdenum	+/-10.3%	99.4%
Nickel	+/-10%	103%
Thallium	+/-6.6%	99.5%
Vanadium Pentoxide	+/-9.1%	102%

Parameter	Method	PEL
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/M	0.0002 mg/m3 (TWA)
Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	See footnote

L420327 (Report ID: 1022364):
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: im-mwvfilt(28), MT-SOP-21(9)
PEL listed refers to Aluminum as total dust.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 28-SEP-17 Account No.: 90734
Date Received: 30-SEP-17 Login No. : L420327
Date Analyzed: 03-OCT-17 - 06-OCT-17

L420327 (Report ID: 1022364):
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for COBALT: 0.02 mg/m3
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for CALCIUM OXIDE: 2 mg/m3
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3
TLV for SELENIUM: 0.2 mg/m3
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for CHROMIUM: 0.5 mg/m3
TLV for IRON OXIDE: 5 mg/m3
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote

L420327 (Report ID: 1022364):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-10.6%	104%
Antimony	+/-8.2%	104%
Arsenic	+/-8.1%	107%
Barium	+/-8.1%	103%
Beryllium	+/-12.6%	103%
Cadmium	+/-9%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 28-SEP-17 Account No.: 90734
Date Received: 30-SEP-17 Login No. : L420327
Date Analyzed: 03-OCT-17 - 06-OCT-17

Calcium Oxide	+/-11.3%	100%
Chromium	+/-9.1%	102%
Cobalt	+/-10.2%	103%
Copper	+/-9.3%	104%
Iron Oxide	+/-10%	102%
Lead	+/-8.1%	103%
Manganese	+/-8.9%	103%
Molybdenum	+/-10.3%	99.4%
Selenium	+/-11.4%	105%
Zinc Oxide	+/-9.9%	106%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/M	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)
Chromium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Selenium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

-L420327-1 (Report ID: 1022911):
The sample results may have a negative bias; the filter surface was covered by fine particulate that may have obscured fibers.

L420327 (Report ID: 1022911):
SOPs: ia-pcm(26)

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 28-SEP-17 Account No.: 90734
Date Received: 30-SEP-17 Login No. : L420327
Date Analyzed: 03-OCT-17 - 06-OCT-17

L420327 (Report ID: 1022911):
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a greater than optimal variability and are probably biased.
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as follows:
0.154 (5-20 fibers/100 fields)
0.100 (>20-50 fibers/100 fields)
0.069 (>50-100 fibers/100 fields)
0.090 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take into account any uncertainty associated with the sampling process.

L420327 (Report ID: 1021956):
SOPs: GRAV-SOP-8(17)
Gravimetric analytical accuracy of the sampling media is -0.001 +/- 0.030 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.

L420327 (Report ID: 1021957):
TLV for RESPIRABLE DUST: NA
SOPs: GRAV-SOP-5(18), GRAV-SOP-6(17)
Gravimetric analytical accuracy of the sampling media is 0.002 +/- 0.018 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.
PNOR = Particulates Not Otherwise Regulated.

L420327 (Report ID: 1022792):
TLV for Hexavalent Chromium: 0.01 mg/m3 (as Cr, Insol)
SOPs: IC-SOP-15(19)
Total ug corrected for a desorption efficiency of 100%.
SGS Galson Laboratories pretests all media lots distributed for Hexavalent Chromium analysis and can provide data confirming that no significant background is present. We may not be able to verify lot background levels for media obtained through alternate vendors.

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

---

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 28-SEP-17 Account No.: 90734
Date Received: 30-SEP-17 Login No. : L420327
Date Analyzed: 03-OCT-17 - 06-OCT-17

L420327 (Report ID: 1022792):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Hexavalent Chromium	+/-12.7%	96.3%

L420327 (Report ID: 1023113):
TLV for QUARTZ: 0.025 mg/m3 Respirable
TLV for TRIDYMITE: NA
TLV for CRISTOBALITE: 0.025 mg/m3 Respirable
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26)

L420327 (Report ID: 1023113):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-10.3%	102%
Quartz	+/-10.9%	93.4%
Tridymite	+/-13.6%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

SGS GALSON

1Z5X626A6948549723
Date:09/30/17
Shipper:UPS
Initials:ZRK
Prep:UNKNOWN

L420327

☐ New Client?

Report To*: Toronto Transit Commission
1920 Yonge St.
Suite 600
Toronto, ON M4S 3E2
Phone No.*: 416-393-6668
Cell No.:
Email Results To: Virgil.Umali@ttc.ca & cheresults@
Email Address: checonsultants.com

Invoice To*: Toronto Transit Commission
1920 Yonge St.
Suite 600
Toronto, ON M4S 3E2
Phone No.:
Email:
Purchase Order No.: PU 240835
Credit Card: ☐ Credit Card on File ☐ Call for Credit Card Info

Client Account No.*:

☐ Samples submitted using the FreePumpLoan™ Program.
☐ Samples submitted using the FreeSamplingBadges™ Program.

Need Results By*:	(surcharge)
☒ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%
☐ Next Day by Noon	150%
☐ Same Day	200%

Site Name:
Project: 22152
Sampled By: OHE Consultants
Comments: TTC Subway Air Quality

List description of industry or process/interferences present in sampling area:

State samples were collected in (ex. NY):

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify):

Sample Identification* (Maximum of 20 characters, ID's longer than 20 characters will be abbreviated.)	Date Sampled* (mm/dd/yy)	Collection Medium	Sample Volume, Sample Time, or Sample Area*	Sample Units*: L, ml, min., in2, cm2, ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (ex. welding, plating, painting, etc.)*
Example	01/01/11	2pc UW PVC	960	L	Hexavalent Chromium (Cr6)	mod. OSHA ID-215	Welding
22152-A39	09/28/17	25mm PCM	480	490.8	Standardized List of Analyses for TTC Subway Air Quality Study		
22152-A40		25mm PCM	Ø	Ø			
22152-S39		PW PVC in PPI	480	973.9			
22152-S40		PW PVC in PPI	Ø	Ø			
22152-I37		PW PVC in IOM	480	973.9			
22152-I38		PW PVC in IOM	Ø	Ø			
22152-M39		UW MCE in PPI	480	975.8			
22152-M40		UW MCE in PPI	Ø	Ø			
22152-T39		UW MCE	480	972.3			
22152-T40		UW MCE	Ø	Ø			

^Galson Laboratories will substitute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ please indicate if the lower LOQ is required (only available for certain analytes see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date/Time		Print Name/Signature	Date/Time
Relinquished by:	Yunny Desiang Lee	Sep 29/17 11:40AM	Received by:		9/29/17 1:33pm
Relinquished by:		9/29/17 6:00pm	Received by:		9/30/17 1037

Samples received after 3pm will be considered as next day's business.
*Required fields, failure to complete these fields may result in a delay in your samples being processed.

Page 1 of 2

LAB ORIGINAL

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Fax: 315-437-0571
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☐ New Client?

Client Account No.* : _____

Report To* : Toronto Transit Commission
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Phone No.* : 416-393-6668
Cell No. : _____
Email Results To : Virgil.Umali@ttc.ca & oheresults@oheconsultants.com
Email Address : _____

Invoice To* : Toronto Transit Commission
1920 Yonge St.
Suite 600
Toronto, ON M4S 3E2
Phone No. : _____
Email : _____
Purchase Order No. : PU 240835
Credit Card : ☐ Credit Card on File ☐ Call for Credit Card Info

☐ Samples submitted using the FreePumpLoan™ Program.
☐ Samples submitted using the FreeSamplingBadges™ Program.

Need Results By*:	(surcharge)
☒ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%
☐ Next Day by Noon	150%
☐ Same Day	200%

Site Name : _____ Project : 22152 Sampled By : OHE Consultants

Comments: TTC Subway Air Quality

List description of industry or process/interferences present in sampling area:

State samples were collected in (ex. NY):

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify): —

Sample Identification* (Maximum of 20 characters, ID's longer than 20 characters will be abbreviated.)	Date Sampled* (mm/dd/yy)	Collection Medium	Sample Volume, Sample Time, or Sample Area*	Sample Units*: L, ml, min., in2, cm2, ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (ex. welding, plating, painting, etc.)*
Example	01/01/11	2pc UW PVC	960	L	Hexavalent Chromium (Cr6)	mod. OSHA ID-215	Welding
22152-H3	09/28/17	2pc UW PVC	480	967.2	Hexavalent Chromium	mod. OSHA ID 215	
22152-H4	09/28/17	— " —	Ø	Ø	— " —	— " —	

^Galson Laboratories will substitute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ please indicate if the lower LOQ is required (only available for certain analytes see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date/Time		Print Name/Signature	Date/Time
Relinquished by :	Yunny Desiana Lee	Sep 29/17 11:40AM	Received by:	Herman Sau	9/29/17 17:35
Relinquished by :	Herman Sau	9/29/17	Received by:	KNW Stone	9/30/17 10:37

Samples received after 3pm will be considered as next day's business.
*Required fields, failure to complete these fields may result in a delay in your samples being processed.

Page 2 of 2

LAB ORIGINAL

SGS GALSON

Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Canada

October 19, 2017

AIHA-LAP #100324 Account# 90734 Login# L421598

Dear Mr. Umali:

Enclosed are the analytical results for the samples received by our laboratory on October 11, 2017. All test results meet the quality control requirements of AIHA-LAP and NELAC unless otherwise stated in this report. All samples on the chain of custody were received in good condition unless otherwise noted.

Results in this report are based on the sampling data provided by the client and refer only to the samples as they were received at the laboratory. Unless otherwise requested, samples for asbestos analysis will be discarded 60 days from the date of this report and all other non-IOM samples will be retained for 14 days following the date of this report (when possible). IOMs will be cleaned & disposed of after seven calendar days.

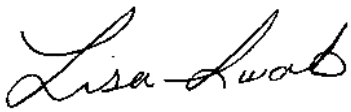
To ensure the safety of laboratory receiving personnel, always seal bulk samples securely to prevent possible escape of material. Also, please double-bag bulk samples individually prior to shipping. Samples not received in this manner will be noted on the chain of custody form.

Current Scopes of Accreditation can be viewed at www.galsonlabs.com in the accreditations section under the "about Galson" tab.

Please contact Katrina Ahchong at (888) 432-5227, if you would like any additional information regarding this report. Thank you for using SGS Galson Laboratories.

Sincerely,

SGS Galson Laboratories



Lisa Swab
Laboratory Director

Enclosure(s)

Galson Laboratories, Inc. is now a part of SGS, the world's leading inspection, verification, testing, and certification company. As part of our transition to SGS, you will begin to see some formatting changes with reports that will improve the presentation of data and allow for the transition to the new logo.

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 03-OCT-17
Date Received : 11-OCT-17

Account No.: 90734
Login No. : L421598
Date Analyzed : 14-OCT-17
Report ID : 1024784

Client ID : 22152-M41 **Lab ID : L421598-7** **Air Volume : 1007.3 L**
Date Sampled : 10/03/17 **Date Analyzed : 10/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.0074	mg/m3
Cadmium	0.015	<0.015	<0.000015	mg/m3
Iron Oxide	11.	19	0.019	mg/m3
Molybdenum	0.075	<0.075	<0.000074	mg/m3
Zinc Oxide	2.8	<2.8	<0.0028	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 16-OCT-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 03-OCT-17
Date Received : 11-OCT-17

Account No.: 90734
Login No. : L421598
Date Analyzed : 14-OCT-17
Report ID : 1024784

Client ID : 22152-M42 **Lab ID : L421598-8** **Air Volume : NA**
Date Sampled : 10/03/17 **Date Analyzed : 10/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.015	<0.015	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.075	<0.075	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 16-OCT-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 03-OCT-17
Date Received : 11-OCT-17

Account No.: 90734
Login No. : L421598

Date Analyzed : 14-OCT-17
Report ID : 1024784

Client ID : 22152-T41 **Lab ID : L421598-9** **Air Volume : 1005.8 L**
Date Sampled : 10/03/17 **Date Analyzed : 10/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.00089	mg/m3
Arsenic	0.15	<0.15	<0.00015	mg/m3
Barium	0.15	0.52	0.00051	mg/m3
Beryllium	0.0075	<0.0075	<0.0000075	mg/m3
Cadmium	0.015	<0.015	<0.000015	mg/m3
Calcium Oxide	100.	<100	<0.10	mg/m3
Chromium	7.5	<7.5	<0.0075	mg/m3
Cobalt	0.045	<0.045	<0.000045	mg/m3
Copper	0.30	<0.30	<0.00030	mg/m3
Lead	0.075	<0.075	<0.000075	mg/m3
Manganese	0.15	0.21	0.00021	mg/m3
Selenium	2.3	<2.3	<0.0022	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 16-OCT-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 03-OCT-17
Date Received : 11-OCT-17

Account No.: 90734
Login No. : L421598
Date Analyzed : 14-OCT-17
Report ID : 1024784

Client ID : 22152-T42 **Lab ID : L421598-10** **Air Volume : NA**
Date Sampled : 10/03/17 **Date Analyzed : 10/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.15	<0.15	NA	mg/m3
Barium	0.15	<0.15	NA	mg/m3
Beryllium	0.0075	<0.0075	NA	mg/m3
Cadmium	0.015	<0.015	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.045	<0.045	NA	mg/m3
Copper	0.30	<0.30	NA	mg/m3
Lead	0.075	<0.075	NA	mg/m3
Manganese	0.15	<0.15	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 16-OCT-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 03-OCT-17
Date Received : 11-OCT-17

Account No.: 90734
Login No. : L421598
Date Analyzed : 14-OCT-17
Report ID : 1024781

Client ID : 22152-I39 **Lab ID : L421598-5** **Air Volume : 1019 L**
Date Sampled : 10/03/17 **Date Analyzed : 10/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	<0.0000074	mg/m3
Magnesium Oxide	12.	<12	<0.012	mg/m3
Molybdenum	0.075	0.095	0.000094	mg/m3
Nickel	0.15	<0.15	<0.00015	mg/m3
Thallium	0.75	<0.75	<0.00074	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.00079	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 16-OCT-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 03-OCT-17
Date Received : 11-OCT-17

Account No.: 90734
Login No. : L421598
Date Analyzed : 14-OCT-17
Report ID : 1024781

Client ID : 22152-I40 **Lab ID : L421598-6** **Air Volume : NA**
Date Sampled : 10/03/17 **Date Analyzed : 10/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	NA	mg/m3
Magnesium Oxide	12.	<12	NA	mg/m3
Molybdenum	0.075	<0.075	NA	mg/m3
Nickel	0.15	<0.15	NA	mg/m3
Thallium	0.75	<0.75	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 16-OCT-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 03-OCT-17
Date Received : 11-OCT-17

Account No.: 90734
Login No. : L421598
Date Analyzed : 16-OCT-17
Report ID : 1024816

Asbestos Fiber Count (A Rules)

Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
22152-A41	L421598-1	10/100	12.7	4890	516,500	0.009
22152-A42	L421598-2	1.5/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : BTM
Approved by : BDB
Date : 17-OCT-17
QC by: TJB
Supervisor: BDB

< -Less Than
> -Greater Than
ND -Not Detected
NA -Not Applicable
cc -Cubic Centimeters
NS -Not Specified
mm2 -Square millimeters

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 03-OCT-17
Date Received : 11-OCT-17

Account No.: 90734
Login No. : L421598
Date Analyzed : 13-OCT-17
Report ID : 1023998

Inhalable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-I39	L421598-5	1019	<0.10	<0.098
22152-I40	L421598-6	NA	<0.10	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.10 mg
Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV
OSHA PEL : NA
Collection Media : IOM 25mm PW PVC

Submitted by: GMG
Approved by : KRK
Date : 17-OCT-17
Supervisor: KRK

NYS DOH # : 11626
QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 03-OCT-17
Date Received : 11-OCT-17

Account No.: 90734
Login No. : L421598
Date Analyzed : 16-OCT-17
Report ID : 1023999

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-S41	L421598-3	1008.5	<0.050	<0.050
22152-S42	L421598-4	NA	<0.050	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg
Analytical Method : mod. NIOSH 0600; Gravimetric
OSHA PEL : PNOR 5 mg/m3 (TWA)
Collection Media : PVC PW 37mm

Submitted by: HVN
Approved by : SPR
Date : 16-OCT-17
Supervisor: KRK

NYS DOH # : 11626
QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 03-OCT-17
Date Received : 11-OCT-17

Account No.: 90734
Login No. : L421598
Date Analyzed : 13-OCT-17
Report ID : 1024461

Hexavalent Chromium

Sample ID	Lab ID	Air Vol liter	Total ug	Conc ug/m3
22152-H5	L421598-11	1002.5	<0.030	<0.030
22152-H6	L421598-12	NA	<0.030	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.030 ug
Analytical Method : mod. OSHA ID-215 (version 2); IC/UV
OSHA PEL : 5 ug/m3 (TWA)
Collection Media : PVC UW 37mm

Submitted by: MCM
Approved by : MWJ
Date : 16-OCT-17
Supervisor: MWJ

NYS DOH # : 11626
QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 03-OCT-17
Date Received : 11-OCT-17

Account No.: 90734
Login No. : L421598
Date Analyzed : 16-OCT-17 - 17-OCT-17
Report ID : 1025157

Respirable Crystalline Silica (RCS): Quartz, Cristobalite, Tridymite

Sample ID	Lab ID	Analyte	Air Vol l	ug	ug/m3
22152-S41	L421598-3	Quartz	1008.5	<5.0	<5.0
		Cristobalite	1008.5	<5.0	<5.0
		Tridymite	1008.5	<20	<20
		RCS	1008.5	<5.0	<5.0
22152-S42	L421598-4	Quartz	NA	<5.0	NA
		Cristobalite	NA	<5.0	NA
		Tridymite	NA	<20	NA
		RCS	NA	<5.0	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: Q:5.0ug C:5.0ug T:20.ug
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD
OSHA PEL : 50 ug/m3 RCS
Collection Media : PVC PW 37mm

Submitted: AJD
Approved: KRK
Date : 17-OCT-17 NYS DOH # : 11626
Supervisor: KRK QC by: TJB

< -Less Than
> -Greater Than
NA -Not Applicable
mg -Milligrams
ug -Micrograms
ND -Not Detected
kg -Kilograms
m3 -Cubic Meters
l -Liters
ppm -Parts per Million
NS -Not Specified
mppcf -Million Particles per Cubic Foot

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Client Name : Toronto Transit Commission Ltd.
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Date Sampled : 03-OCT-17 Account No.: 90734
Date Received: 11-OCT-17 Login No. : L421598
Date Analyzed: 13-OCT-17 - 17-OCT-17

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L421598 (Report ID: 1024781):
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: im-mwvfilt(28), MT-SOP-21(10)
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3; as Fume, Ceiling = 0.1 mg/m3.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
TLV for VANADIUM PENTOXIDE: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for MAGNESIUM OXIDE: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote

< -Less Than	mg -Milligrams	m3 -Cubic Meters	kg -Kilograms	ppm -Parts per Million		
> -Greater Than	ug -Micrograms	l -Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable	

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 03-OCT-17 Account No.: 90734
Date Received: 11-OCT-17 Login No. : L421598
Date Analyzed: 13-OCT-17 - 17-OCT-17

L421598 (Report ID: 1024781):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Beryllium	+/-12.6%	103%
Magnesium Oxide	+/-9.1%	102%
Molybdenum	+/-10.3%	99.4%
Nickel	+/-10%	103%
Thallium	+/-6.6%	99.5%
Vanadium Pentoxide	+/-9.1%	102%

Parameter	Method	PEL
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/M	0.0002 mg/m3 (TWA)
Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	See footnote

L421598 (Report ID: 1024784):
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: im-mwvfilt(28), MT-SOP-21(10)
PEL listed refers to Aluminum as total dust.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
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Date Sampled : 03-OCT-17 Account No.: 90734
Date Received: 11-OCT-17 Login No. : L421598
Date Analyzed: 13-OCT-17 - 17-OCT-17

L421598 (Report ID: 1024784):
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for COBALT: 0.02 mg/m3
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for CALCIUM OXIDE: 2 mg/m3
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3
TLV for SELENIUM: 0.2 mg/m3
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for CHROMIUM: 0.5 mg/m3
TLV for IRON OXIDE: 5 mg/m3
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote
Two out of four blank spikes recovered below control limits (94.7 to 119%) at 91.1% and 94.3% for Arsenic.
One out of four blank spikes recovered below control limits (90.6 to 115%) at 88.4% for Barium.
One out of four blank spikes recovered below control limits (89.9 to 118%) at 88.8% for Copper.

L421598 (Report ID: 1024784):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-10.6%	104%
Antimony	+/-8.2%	104%
Arsenic	+/-8.1%	107%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Date Sampled : 03-OCT-17 Account No.: 90734
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Date Analyzed: 13-OCT-17 - 17-OCT-17

Barium	+/-8.1%	103%
Beryllium	+/-12.6%	103%
Cadmium	+/-9%	105%
Calcium Oxide	+/-11.3%	100%
Chromium	+/-9.1%	102%
Cobalt	+/-10.2%	103%
Copper	+/-9.3%	104%
Iron Oxide	+/-10%	102%
Lead	+/-8.1%	103%
Manganese	+/-8.9%	103%
Molybdenum	+/-10.3%	99.4%
Selenium	+/-11.4%	105%
Zinc Oxide	+/-9.9%	106%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/M	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)
Chromium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Selenium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

L421598 (Report ID: 1024816):
SOPs: ia-pcm(26)

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 03-OCT-17 Account No.: 90734
Date Received: 11-OCT-17 Login No. : L421598
Date Analyzed: 13-OCT-17 - 17-OCT-17

L421598 (Report ID: 1024816):
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a greater than optimal variability and are probably biased.
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as follows:
0.154 (5-20 fibers/100 fields)
0.100 (>20-50 fibers/100 fields)
0.069 (>50-100 fibers/100 fields)
0.090 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take into account any uncertainty associated with the sampling process.

L421598 (Report ID: 1023998):
SOPs: GRAV-SOP-8(17)
Gravimetric analytical accuracy of the sampling media is -0.001 +/- 0.030 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.

L421598 (Report ID: 1023999):
TLV for RESPIRABLE DUST: NA
SOPs: GRAV-SOP-5(18), GRAV-SOP-6(17)
Gravimetric analytical accuracy of the sampling media is 0.002 +/- 0.018 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.
PNOR = Particulates Not Otherwise Regulated.

L421598 (Report ID: 1024461):
TLV for Hexavalent Chromium: 0.01 mg/m3 (as Cr, Insol)
SOPs: IC-SOP-15(19)
Total ug corrected for a desorption efficiency of 100%.
SGS Galson Laboratories pretests all media lots distributed for Hexavalent Chromium analysis and can provide data confirming that no significant background is present. We may not be able to verify lot background levels for media obtained through alternate vendors.

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
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Date Sampled : 03-OCT-17 Account No.: 90734
Date Received: 11-OCT-17 Login No. : L421598
Date Analyzed: 13-OCT-17 - 17-OCT-17

L421598 (Report ID: 1024461):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Hexavalent Chromium	+/-12.7%	96.3%

L421598 (Report ID: 1025157):
TLV for QUARTZ: 0.025 mg/m3 Respirable
TLV for TRIDYMITE: NA
TLV for CRISTOBALITE: 0.025 mg/m3 Respirable
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26)

L421598 (Report ID: 1025157):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-13.8%	101%
Quartz	+/-10.9%	93.4%
Tridymite	+/-13.6%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

L421598

R118

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1Z5X626A6646795458
Date:10/11/17
Shipper:UPS
Initials:KMS

Prep:UNKNOWN

2A2

☐ New Client?

Client Account No.*:

Report To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2

Phone No.*: 416-393-6668
Cell No.:
Email Results to: Virgil.Umali@ttc.ca & oheresults@oheconsultants.com
Email address:

Invoice To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2

Phone No.:
Email:
P.O. No.: PU240835
Credit Card ☐ Card on File ☐ Call for Credit Card Info.

☐ Samples submitted using the FreePumpLoan™ Program ☐ Samples submitted using the FreeSamplingBadges™ Program

Need Results By*:	(surcharge)
☑ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%

Check for availability an pricing for quicker turn around times.

Site Name: Project: 22152 Sampled by: OHE Consultants

Comments:

TTC Subway Air Quality

List description of industry or Process/interferences present in sampling area:

Province samples were collected in (ex. ON)

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify):

Sample Identification* (Maxmium of 20 Characters. ID's longer than 20 characters will be abbreviated.)	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (e.g., welding plating, painting, etc.)*
22152 - A41	10/03/17	25 mm PCM	516.5	L	Standardized List of Analysis for TTC		
22152 - A42	10/03/17	25 mm PCM	-	-	-		
22152 - S41	10/03/17	PW PVC in PPI	1008.5	L	-		
22152 - S42	10/03/17	PW PVC in PPI	-	-	-		
22152 - I39	10/03/17	PW PVC in IOM	1019.0	L	-		
22152 - I40	10/03/17	PW PVC in IOM	-	-	-		
22152 - M41	10/03/17	UW MCE in PPI	1007.3	L	-		
22152 - M42	10/03/17	UW MCE in PPI	-	-	-		
22152 - T41	10/03/17	UW MCE	1005.8	L	-		
22152 - T42	10/03/17	UW MCE	-	-	-		

^Galson Laboratories will subsititute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ, please indicate if the lower LOQ is required (only available for certain analytes - see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date	Time		Print Name/Signature	Date	Time
Relinquished by:	Romain Mathevet	10/10/17	11:30	Received by:		10/10/17	7:04pm
Relinquished by:		10/10/17	6pm	Received by:		10/11/17	1554

Samples received after 3pm will be considered as next day's business

* Required fields, failure to complete these fields may result in a delay in your samples being processed.

SGS GALSON

1140 Sheppard Avenue West
Unit 5
North York, Ontario, Canada M3K 2A2
Tel: 888-432-5227
www.galsonlabs.ca

☐ New Client?

Client Account No.*:

Report To*: Toronto Transit Commission
1920 Yonge Street
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Toronto, ON M4S 3E2

Phone No.*: 416-393-6668
Cell No.:
Email Results to: Virgil.Umali@ttc.ca & oheresults@oheconsultants.com
Email address:

Invoice To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2

Phone No.:
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P.O. No.: PU240835
Credit Card ☐ Card on File ☐ Call for Credit Card Info.

☐ Samples submitted using the FreePumpLoan™ Program ☐ Samples submitted using the FreeSamplingBadges™ Program

Need Results By*:	(surcharge)
☑ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%

Check for availability an pricing for quicker turn around times.

Site Name: Project: 22152 Sampled by: OHE Consultants

Comments:

TTC Subway Air Quality

List description of industry or Process/interferences present in sampling area:

Province samples were collected in (ex. ON)

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify):

Sample Identification* (Maxmium of 20 Characters. ID's longer than 20 characters will be abbreviated.)	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (e.g., welding plating, painting, etc.)*
22152 - H5	10/03/17	2pc UW PVC	1002.5	L	Hexavalent Chromium	mod.OSHA 215	Other
22152 - H6	10/03/17	2pc UW PVC	-	-	-	-	-
					-		
					-		
					-		
					-		
					-		
					-		
					-		
					-		

^Galson Laboratories will subsititute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ, please indicate if the lower LOQ is required (only available for certain analytes - see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date	Time		Print Name/Signature	Date	Time
Relinquished by	Romain Mathevet	10/10/17	11:30	Received by:		10/10/17	3:04 pm
Relinquished by		10/10/17	6:00	Received by:		10/11/17	1554

Samples received after 3pm will be considered as next day's business
*Required fields, failure to complete these fields may result in a delay in your samples being processed.

SGS GALSON

Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Canada

October 18, 2017

AIHA-LAP #100324 Account# 90734 Login# L421594

Dear Mr. Umali:

Enclosed are the analytical results for the samples received by our laboratory on October 11, 2017. All test results meet the quality control requirements of AIHA-LAP and NELAC unless otherwise stated in this report. All samples on the chain of custody were received in good condition unless otherwise noted.

Results in this report are based on the sampling data provided by the client and refer only to the samples as they were received at the laboratory. Unless otherwise requested, samples for asbestos analysis will be discarded 60 days from the date of this report and all other non-IOM samples will be retained for 14 days following the date of this report (when possible). IOMs will be cleaned & disposed of after seven calendar days.

To ensure the safety of laboratory receiving personnel, always seal bulk samples securely to prevent possible escape of material. Also, please double-bag bulk samples individually prior to shipping. Samples not received in this manner will be noted on the chain of custody form.

Current Scopes of Accreditation can be viewed at www.galsonlabs.com in the accreditations section under the "about Galson" tab.

Please contact Katrina Ahchong at (888) 432-5227, if you would like any additional information regarding this report. Thank you for using SGS Galson Laboratories.

Sincerely,

SGS Galson Laboratories

Lisa Swab
Laboratory Director

Enclosure(s)

Galson Laboratories, Inc. is now a part of SGS, the world's leading inspection, verification, testing, and certification company. As part of our transition to SGS, you will begin to see some formatting changes with reports that will improve the presentation of data and allow for the transition to the new logo.

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6601 Kirkville Road
East Syracuse, NY 13057
(315) 432-5227
FAX: (315) 437-0571
www.galsonlabs.com

LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 05-OCT-17
Date Received : 11-OCT-17

Account No.: 90734
Login No. : L421594

Date Analyzed : 14-OCT-17
Report ID : 1024758

Client ID : 22152-M43 **Lab ID : L421594-7** **Air Volume : 1023.6 L**
Date Sampled : 10/05/17 **Date Analyzed : 10/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.0073	mg/m3
Cadmium	0.015	<0.015	<0.000015	mg/m3
Iron Oxide	11.	63	0.061	mg/m3
Molybdenum	0.075	<0.075	<0.000073	mg/m3
Zinc Oxide	2.8	<2.8	<0.0027	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 16-OCT-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 05-OCT-17
Date Received : 11-OCT-17

Account No.: 90734
Login No. : L421594
Date Analyzed : 14-OCT-17
Report ID : 1024758

Client ID : 22152-M44 **Lab ID : L421594-8** **Air Volume : NA**
Date Sampled : 10/05/17 **Date Analyzed : 10/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.015	<0.015	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.075	<0.075	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 16-OCT-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 05-OCT-17
Date Received : 11-OCT-17

Account No.: 90734
Login No. : L421594

Date Analyzed : 14-OCT-17
Report ID : 1024758

Client ID : 22152-T43 **Lab ID : L421594-9** **Air Volume : 1022.8 L**
Date Sampled : 10/05/17 **Date Analyzed : 10/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.00088	mg/m3
Arsenic	0.15	<0.15	<0.00015	mg/m3
Barium	0.15	4.2	0.0041	mg/m3
Beryllium	0.0075	<0.0075	<0.0000073	mg/m3
Cadmium	0.015	<0.015	<0.000015	mg/m3
Calcium Oxide	100.	<100	<0.10	mg/m3
Chromium	7.5	<7.5	<0.0073	mg/m3
Cobalt	0.045	<0.045	<0.000044	mg/m3
Copper	0.30	0.47	0.00046	mg/m3
Lead	0.075	<0.075	<0.000073	mg/m3
Manganese	0.15	0.85	0.00083	mg/m3
Selenium	2.3	<2.3	<0.0022	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 16-OCT-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 05-OCT-17
Date Received : 11-OCT-17

Account No.: 90734
Login No. : L421594

Date Analyzed : 14-OCT-17
Report ID : 1024758

Client ID : 22152-T44 **Lab ID : L421594-10** **Air Volume : NA**
Date Sampled : 10/05/17 **Date Analyzed : 10/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.15	<0.15	NA	mg/m3
Barium	0.15	<0.15	NA	mg/m3
Beryllium	0.0075	<0.0075	NA	mg/m3
Cadmium	0.015	<0.015	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.045	<0.045	NA	mg/m3
Copper	0.30	<0.30	NA	mg/m3
Lead	0.075	<0.075	NA	mg/m3
Manganese	0.15	<0.15	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 16-OCT-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 05-OCT-17
Date Received : 11-OCT-17

Account No.: 90734
Login No. : L421594

Date Analyzed : 14-OCT-17
Report ID : 1024756

Client ID : 22152-I41 **Lab ID : L421594-5** **Air Volume : 1026.6 L**
Date Sampled : 10/05/17 **Date Analyzed : 10/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	<0.0000073	mg/m3
Magnesium Oxide	12.	<12	<0.012	mg/m3
Molybdenum	0.075	<0.075	<0.000073	mg/m3
Nickel	0.15	<0.15	<0.00015	mg/m3
Thallium	0.75	<0.75	<0.00073	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.00078	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 16-OCT-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 05-OCT-17
Date Received : 11-OCT-17

Account No.: 90734
Login No. : L421594

Date Analyzed : 14-OCT-17
Report ID : 1024756

Client ID : 22152-I42 **Lab ID : L421594-6** **Air Volume : NA**
Date Sampled : 10/05/17 **Date Analyzed : 10/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	NA	mg/m3
Magnesium Oxide	12.	<12	NA	mg/m3
Molybdenum	0.075	<0.075	NA	mg/m3
Nickel	0.15	<0.15	NA	mg/m3
Thallium	0.75	<0.75	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 16-OCT-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 05-OCT-17
Date Received : 11-OCT-17

Account No.: 90734
Login No. : L421594
Date Analyzed : 16-OCT-17
Report ID : 1024815

Asbestos Fiber Count (A Rules)

	Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
%	22152-A43	L421594-1	7/100	8.9	3427	507,450	0.007
	22152-A44	L421594-2	2/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : BTM
Approved by : BDB
Date : 17-OCT-17
QC by: AMD
Supervisor: BDB

< -Less Than > -Greater Than ND -Not Detected
NA -Not Applicable cc -Cubic Centimeters NS -Not Specified
mm2 -Square millimeters

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 05-OCT-17
Date Received : 11-OCT-17

Account No.: 90734
Login No. : L421594
Date Analyzed : 13-OCT-17
Report ID : 1023995

Inhalable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-I41	L421594-5	1026.6	0.33	0.32
22152-I42	L421594-6	NA	<0.10	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.10 mg
Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV
OSHA PEL : NA
Collection Media : IOM 25mm PW PVC

Submitted by: GMG
Approved by : KRK
Date : 17-OCT-17
Supervisor: KRK

NYS DOH # : 11626
QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 05-OCT-17
Date Received : 11-OCT-17

Account No.: 90734
Login No. : L421594
Date Analyzed : 16-OCT-17
Report ID : 1023996

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-S43	L421594-3	1041.2	0.11	0.11
22152-S44	L421594-4	NA	<0.050	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg
Analytical Method : mod. NIOSH 0600; Gravimetric
OSHA PEL : PNOR 5 mg/m3 (TWA)
Collection Media : PVC PW 37mm

Submitted by: HVN
Approved by : SPR
Date : 16-OCT-17
Supervisor: KRK

NYS DOH # : 11626
QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 05-OCT-17
Date Received : 11-OCT-17

Account No.: 90734
Login No. : L421594
Date Analyzed : 13-OCT-17
Report ID : 1024460

Hexavalent Chromium

Sample ID	Lab ID	Air Vol liter	Total ug	Conc ug/m3
22152-H7	L421594-11	1010.3	<0.030	<0.030
22152-H8	L421594-12	NA	<0.030	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.030 ug
Analytical Method : mod. OSHA ID-215 (version 2); IC/UV
OSHA PEL : 5 ug/m3 (TWA)
Collection Media : PVC UW 37mm

Submitted by: MCM
Approved by : MWJ
Date : 16-OCT-17
Supervisor: MWJ

NYS DOH # : 11626
QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 05-OCT-17
Date Received : 11-OCT-17

Account No.: 90734
Login No. : L421594
Date Analyzed : 16-OCT-17 - 18-OCT-17
Report ID : 1025394

Respirable Crystalline Silica (RCS): Quartz, Cristobalite, Tridymite

Sample ID	Lab ID	Analyte	Air Vol l	ug	ug/m3
22152-S43	L421594-3	Quartz	1041.2	<5.0	<4.8
		Cristobalite	1041.2	<5.0	<4.8
		Tridymite	1041.2	<20	<19
		RCS	1041.2	<5.0	<4.8
22152-S44	L421594-4	Quartz	NA	<5.0	NA
		Cristobalite	NA	<5.0	NA
		Tridymite	NA	<20	NA
		RCS	NA	<5.0	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: Q:5.0ug C:5.0ug T:20.ug
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD
OSHA PEL : 50 ug/m3 RCS
Collection Media : PVC PW 37mm

Submitted: NLO
Approved: KRK
Date : 18-OCT-17 NYS DOH # : 11626
Supervisor: KRK QC by: AMD

< -Less Than
> -Greater Than
NA -Not Applicable
mg -Milligrams
ug -Micrograms
ND -Not Detected
kg -Kilograms
m3 -Cubic Meters
l -Liters
ppm -Parts per Million
NS -Not Specified
mppcf -Million Particles per Cubic Foot

SGS GALSON

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East Syracuse, NY 13057
(315) 432-5227
FAX: (315) 437-0571
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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 05-OCT-17 Account No.: 90734
Date Received: 11-OCT-17 Login No. : L421594
Date Analyzed: 13-OCT-17 - 18-OCT-17

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L421594 (Report ID: 1024756):
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: im-mwvfilt(28), MT-SOP-21(10)
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3; as Fume, Ceiling = 0.1 mg/m3.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
TLV for VANADIUM PENTOXIDE: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for MAGNESIUM OXIDE: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote

< -Less Than	mg -Milligrams	m3 -Cubic Meters	kg -Kilograms	ppm -Parts per Million		
> -Greater Than	ug -Micrograms	l -Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable	

SGS GALSON

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East Syracuse, NY 13057
(315) 432-5227
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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 05-OCT-17 Account No.: 90734
Date Received: 11-OCT-17 Login No. : L421594
Date Analyzed: 13-OCT-17 - 18-OCT-17

L421594 (Report ID: 1024756):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Beryllium	+/-12.6%	103%
Magnesium Oxide	+/-9.1%	102%
Molybdenum	+/-10.3%	99.4%
Nickel	+/-10%	103%
Thallium	+/-6.6%	99.5%
Vanadium Pentoxide	+/-9.1%	102%

Parameter	Method	PEL
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/M	0.0002 mg/m3 (TWA)
Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	See footnote

L421594 (Report ID: 1024758):
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: im-mwvfilt(28), MT-SOP-21(10)
PEL listed refers to Aluminum as total dust.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 05-OCT-17 Account No.: 90734
Date Received: 11-OCT-17 Login No. : L421594
Date Analyzed: 13-OCT-17 - 18-OCT-17

L421594 (Report ID: 1024758):
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for COBALT: 0.02 mg/m3
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for CALCIUM OXIDE: 2 mg/m3
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3
TLV for SELENIUM: 0.2 mg/m3
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for CHROMIUM: 0.5 mg/m3
TLV for IRON OXIDE: 5 mg/m3
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote
Two out of four blank spikes recovered below control limits (94.7 to 119%) at 91.1% and 94.3% for Arsenic.
One out of four blank spikes recovered below control limits (90.6 to 115%) at 88.4% for Barium.
One out of four blank spikes recovered below control limits (89.9 to 118%) at 88.8% for Copper.

L421594 (Report ID: 1024758):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-10.6%	104%
Antimony	+/-8.2%	104%
Arsenic	+/-8.1%	107%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 05-OCT-17
Date Received: 11-OCT-17
Date Analyzed: 13-OCT-17 - 18-OCT-17

Account No.: 90734
Login No. : L421594

Barium	+/-8.1%	103%
Beryllium	+/-12.6%	103%
Cadmium	+/-9%	105%
Calcium Oxide	+/-11.3%	100%
Chromium	+/-9.1%	102%
Cobalt	+/-10.2%	103%
Copper	+/-9.3%	104%
Iron Oxide	+/-10%	102%
Lead	+/-8.1%	103%
Manganese	+/-8.9%	103%
Molybdenum	+/-10.3%	99.4%
Selenium	+/-11.4%	105%
Zinc Oxide	+/-9.9%	106%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/M	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)
Chromium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Selenium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

%L421594-1 (Report ID: 1024815):
The sample results may have a negative bias; the filter surface was covered by

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 05-OCT-17 Account No.: 90734
Date Received: 11-OCT-17 Login No. : L421594
Date Analyzed: 13-OCT-17 - 18-OCT-17

%L421594-1 (Report ID: 1024815):
fine particulate that may have obscured fibers.

L421594 (Report ID: 1024815):
SOPs: ia-pcm(26)
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a
greater than optimal variability and are probably biased.
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as
follows:
0.154 (5-20 fibers/100 fields)
0.100 (>20-50 fibers/100 fields)
0.069 (>50-100 fibers/100 fields)
0.090 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take
into account any uncertainty associated with the sampling process.

L421594 (Report ID: 1023995):
SOPs: GRAV-SOP-8(17)
Gravimetric analytical accuracy of the sampling media is -0.001 +/- 0.030 mg (average blank
weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and
SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.

L421594 (Report ID: 1023996):
TLV for RESPIRABLE DUST: NA
SOPs: GRAV-SOP-5(18), GRAV-SOP-6(17)
Gravimetric analytical accuracy of the sampling media is 0.002 +/- 0.018 mg (average blank
weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and
SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.
PNOR = Particulates Not Otherwise Regulated.

L421594 (Report ID: 1024460):
TLV for Hexavalent Chromium: 0.01 mg/m3 (as Cr, Insol)
SOPs: IC-SOP-15(19)
Total ug corrected for a desorption efficiency of 100%.

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 05-OCT-17 Account No.: 90734
Date Received: 11-OCT-17 Login No. : L421594
Date Analyzed: 13-OCT-17 - 18-OCT-17

L421594 (Report ID: 1024460):
SGS Galson Laboratories pretests all media lots distributed for Hexavalent Chromium analysis and can provide data confirming that no significant background is present. We may not be able to verify lot background levels for media obtained through alternate vendors.

L421594 (Report ID: 1024460):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Hexavalent Chromium	+/-12.7%	96.3%

L421594 (Report ID: 1025394):
TLV for QUARTZ: 0.025 mg/m3 Respirable
TLV for TRIDYMITE: NA
TLV for CRISTOBALITE: 0.025 mg/m3 Respirable
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26)

L421594 (Report ID: 1025394):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-13.8%	101%
Quartz	+/-10.9%	93.4%
Tridymite	+/-13.6%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

L421594

R117

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1Z5X626A6646795458
Date:10/11/17
Shipper:UPS
Initials:KMS

Prep:UNKNOWN

☐ New Client?

Client Account No.*:

Report To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2
Phone No.*: 416-393-6668
Cell No.:
Email Results to: Virgil.Umali@ttc.ca & oheresults@oheconsultants.com
Email address:

Invoice To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2
Phone No.:
Email:
P.O. No.: PU240835
Credit Card ☐ Card on File ☐ Call for Credit Card Info.

☐ Samples submitted using the FreePumpLoan™ Program ☐ Samples submitted using the FreeSamplingBadges™ Program

Need Results By*:	(surcharge)
☑ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%

Check for availability an pricing for quicker turn around times.

Site Name: Project: 22152 Sampled by: OHE Consultants

Comments:

TTC Subway Air Quality

List description of industry or Process/interferences present in sampling area: —

Province samples were collected in (ex. ON)

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify):

Sample Identification* (Maxmium of 20 Characters. ID's longer than 20 characters will be abbreviated.)	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (e.g., welding plating, painting, etc.)*
22152 - A43	10/05/17	25 mm PCM	507.45	L	Standardized List of Analysis for TTC		
22152 - A44	10/05/17	25 mm PCM	-	-	-		
22152 - S43	10/05/17	PW PVC in PPI	1041.2	L	-		
22152 - S44	10/05/17	PW PVC in PPI	-	-	-		
22152 - I41	10/05/17	PW PVC in IOM	1026.6	L	-		
22152 - I42	10/05/17	PW PVC in IOM	-	-	-		
22152 - M43	10/05/17	UW MCE in PPI	1023.6	L	-		
22152 - M44	10/05/17	UW MCE in PPI	-	-	-		
22152 - T43	10/05/17	UW MCE	1022.8	L	-		
22152 - T44	10/05/17	UW MCE	-	-	-		

^Galson Laboratories will subsititute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ, please indicate if the lower LOQ is required (only available for certain analytes - see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date	Time		Print Name/Signature	Date	Time
Relinquished by	Romain Mathevet	10/10/17	11:30	Received by:		10/10/17	3:07 pm
Relinquished by		10/10/17	6pm	Received by:		10/11/17	1554

Samples received after 3pm will be considered as next day's business

* Required fields, failure to complete these fields may result in a delay in your samples being processed.

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Unit 5
North York, Ontario, Canada M3K 2A2
Tel: 888-432-5227
www.galsonlabs.ca

☐ New Client?

Client Account No.*:

Report To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2

Phone No.*: 416-393-6668
Cell No.:
Email Results to: Virgil.Umali@ttc.ca & oheresults@oheconsultants.com
Email address:

Invoice To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2

Phone No.:
Email:
P.O. No.: PU240835
Credit Card ☐ Card on File ☐ Call for Credit Card Info.

☐ Samples submitted using the FreePumpLoan™ Program ☐ Samples submitted using the FreeSamplingBadges™ Program

Need Results By*:	(surcharge)
☑ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%

Check for availability an pricing for quicker turn around times.

Site Name: Project: 22152 Sampled by: OHE Consultants

Comments:

TTC Subway Air Quality

List description of industry or Process/interferences present in sampling area:

Province samples were collected in (ex. ON)

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify):

Sample Identification* (Maximum of 20 Characters. ID's longer than 20 characters will be abbreviated.)	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (e.g., welding plating, painting, etc.)*
22152 - H7	10/05/17	2pc UW PVC	1010.3	L	Hexavalent Chromium	mod.OSHA 215	Other
22152 - H8	10/05/17	2pc UW PVC	-	-	-	-	-
					-		
					-		
					-		
					-		
					-		
					-		
					-		
					-		

^Galson Laboratories will subsititute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ, please indicate if the lower LOQ is required (only available for certain analytes - see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date	Time		Print Name/Signature	Date	Time
Relinquished by:	Romain Mathevet	10/10/17	11:30	Received by:		10/10/17	23:57
Relinquished by:		10/10/17	6:00pm	Received by:		10/11/17	15:54

Samples received after 3pm will be considered as next day's business
* Required fields, failure to complete these fields may result in a delay in your samples being processed.

SGS GALSON

Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Canada

October 23, 2017

AIHA-LAP #100324 Account# 90734 Login# L422140

Dear Mr. Umali:

Enclosed are the analytical results for the samples received by our laboratory on October 17, 2017. All test results meet the quality control requirements of AIHA-LAP and NELAC unless otherwise stated in this report. All samples on the chain of custody were received in good condition unless otherwise noted.

Results in this report are based on the sampling data provided by the client and refer only to the samples as they were received at the laboratory. Unless otherwise requested, samples for asbestos analysis will be discarded 60 days from the date of this report and all other non-IOM samples will be retained for 14 days following the date of this report (when possible). IOMs will be cleaned & disposed of after seven calendar days.

To ensure the safety of laboratory receiving personnel, always seal bulk samples securely to prevent possible escape of material. Also, please double-bag bulk samples individually prior to shipping. Samples not received in this manner will be noted on the chain of custody form.

Current Scopes of Accreditation can be viewed at www.galsonlabs.com in the accreditations section under the "about Galson" tab.

Please contact Katrina Ahchong at (888) 432-5227, if you would like any additional information regarding this report. Thank you for using SGS Galson Laboratories.

Sincerely,

SGS Galson Laboratories

Lisa Swab
Laboratory Director

Enclosure(s)

Galson Laboratories, Inc. is now a part of SGS, the world's leading inspection, verification, testing, and certification company. As part of our transition to SGS, you will begin to see some formatting changes with reports that will improve the presentation of data and allow for the transition to the new logo.

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 10-OCT-17
Date Received : 17-OCT-17

Account No.: 90734
Login No. : L422140
Date Analyzed : 19-OCT-17 - 20-OCT-17
Report ID : 1025792

Client ID : 22152-M45 **Lab ID : L422140-7** **Air Volume : 931.9 L**
Date Sampled : 10/10/17 **Date Analyzed : 10/19/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.0080	mg/m3
Cadmium	0.015	<0.015	<0.000016	mg/m3
Iron Oxide	11.	18	0.019	mg/m3
Molybdenum	0.075	<0.075	<0.000080	mg/m3
Zinc Oxide	2.8	<2.8	<0.0030	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 19-OCT-17

Submitted by: JMR/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 10-OCT-17
Date Received : 17-OCT-17

Account No.: 90734
Login No. : L422140

Date Analyzed : 19-OCT-17 - 20-OCT-17
Report ID : 1025792

Client ID : 22152-M46 **Lab ID : L422140-8** **Air Volume : NA**
Date Sampled : 10/10/17 **Date Analyzed : 10/19/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.015	<0.015	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.075	<0.075	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 19-OCT-17

Submitted by: JMR/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 10-OCT-17
Date Received : 17-OCT-17

Account No.: 90734
Login No. : L422140

Date Analyzed : 19-OCT-17 - 20-OCT-17
Report ID : 1025792

Client ID : 22152-T45 **Lab ID : L422140-9** **Air Volume : 935.6 L**
Date Sampled : 10/10/17 **Date Analyzed : 10/19/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.00096	mg/m3
Arsenic	0.15	<0.15	<0.00016	mg/m3
Barium	0.15	0.52	0.00056	mg/m3
Beryllium	0.0075	<0.0075	<0.0000080	mg/m3
Cadmium	0.015	<0.015	<0.000016	mg/m3
Calcium Oxide	100.	<100	<0.11	mg/m3
Chromium	7.5	<7.5	<0.0080	mg/m3
Cobalt	0.045	<0.045	<0.000048	mg/m3
Copper	0.30	<0.30	<0.00032	mg/m3
Lead	0.075	<0.075	<0.000080	mg/m3
Manganese	0.15	0.19	0.00021	mg/m3
Selenium	2.3	<2.3	<0.0024	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 19-OCT-17

Submitted by: JMR/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 10-OCT-17
Date Received : 17-OCT-17

Account No.: 90734
Login No. : L422140

Date Analyzed : 19-OCT-17 - 20-OCT-17
Report ID : 1025792

Client ID : 22152-T46 **Lab ID : L422140-10** **Air Volume : NA**
Date Sampled : 10/10/17 **Date Analyzed : 10/19/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.15	<0.15	NA	mg/m3
Barium	0.15	<0.15	NA	mg/m3
Beryllium	0.0075	<0.0075	NA	mg/m3
Cadmium	0.015	<0.015	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.045	<0.045	NA	mg/m3
Copper	0.30	<0.30	NA	mg/m3
Lead	0.075	<0.075	NA	mg/m3
Manganese	0.15	<0.15	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 19-OCT-17

Submitted by: JMR/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 10-OCT-17
Date Received : 17-OCT-17

Account No.: 90734
Login No. : L422140
Date Analyzed : 19-OCT-17 - 20-OCT-17
Report ID : 1026386

Client ID : 22152-I43 **Lab ID : L422140-5** **Air Volume : 933.7 L**
Date Sampled : 10/10/17 **Date Analyzed : 10/20/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	<0.0000080	mg/m3
Magnesium Oxide	12.	<12	<0.013	mg/m3
Molybdenum	0.075	<0.075	<0.000080	mg/m3
Nickel	0.15	0.21	0.00022	mg/m3
Thallium	0.75	<0.75	<0.00080	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.00086	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 23-OCT-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 10-OCT-17
Date Received : 17-OCT-17

Account No.: 90734
Login No. : L422140
Date Analyzed : 19-OCT-17 - 20-OCT-17
Report ID : 1026386

Client ID : 22152-I44 **Lab ID : L422140-6** **Air Volume : NA**
Date Sampled : 10/10/17 **Date Analyzed : 10/20/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	NA	mg/m3
Magnesium Oxide	12.	<12	NA	mg/m3
Molybdenum	0.075	<0.075	NA	mg/m3
Nickel	0.15	<0.15	NA	mg/m3
Thallium	0.75	<0.75	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 23-OCT-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 10-OCT-17
Date Received : 17-OCT-17

Account No.: 90734
Login No. : L422140
Date Analyzed : 19-OCT-17
Report ID : 1025904

Asbestos Fiber Count (A Rules)

Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
22152-A45	L422140-1	10/100	12.7	4890	469,700	0.010
22152-A46	L422140-2	1/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : BTM
Approved by : CDT
Date : 20-OCT-17
QC by: TJB
Supervisor: BDB

< -Less Than
> -Greater Than
ND -Not Detected
NA -Not Applicable
cc -Cubic Centimeters
NS -Not Specified
mm2 -Square millimeters

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 10-OCT-17
Date Received : 17-OCT-17

Account No.: 90734
Login No. : L422140
Date Analyzed : 20-OCT-17
Report ID : 1025250

Inhalable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-I43	L422140-5	933.7	<0.10	<0.11
22152-I44	L422140-6	NA	<0.10	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.10 mg
Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV
OSHA PEL : NA
Collection Media : IOM 25mm PW PVC

Submitted by: NRH/HVN
Approved by : SPR
Date : 20-OCT-17 NYS DOH # : 11626
Supervisor: KRK QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 10-OCT-17
Date Received : 17-OCT-17

Account No.: 90734
Login No. : L422140
Date Analyzed : 20-OCT-17
Report ID : 1025251

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-S45	L422140-3	939.8	<0.050	<0.053
22152-S46	L422140-4	NA	<0.050	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg
Analytical Method : mod. NIOSH 0600; Gravimetric
OSHA PEL : PNOR 5 mg/m3 (TWA)
Collection Media : PVC PW 37mm

Submitted by: HVN
Approved by : SPR
Date : 20-OCT-17
Supervisor: KRK

NYS DOH # : 11626
QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 10-OCT-17
Date Received : 17-OCT-17

Account No.: 90734
Login No. : L422140
Date Analyzed : 20-OCT-17 - 23-OCT-17
Report ID : 1026466

Respirable Crystalline Silica (RCS): Quartz, Cristobalite, Tridymite

Sample ID	Lab ID	Analyte	Air Vol l	ug	ug/m3
22152-S45	L422140-3	Quartz	939.8	<5.0	<5.3
		Cristobalite	939.8	<5.0	<5.3
		Tridymite	939.8	<20	<21
		RCS	939.8	<5.0	<5.3
22152-S46	L422140-4	Quartz	NA	<5.0	NA
		Cristobalite	NA	<5.0	NA
		Tridymite	NA	<20	NA
		RCS	NA	<5.0	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: Q:5.0ug C:5.0ug T:20.ug
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD
OSHA PEL : 50 ug/m3 RCS
Collection Media : PVC PW 37mm

Submitted: AJD
Approved: KRK
Date : 23-OCT-17 NYS DOH # : 11626
Supervisor: KRK QC by: TJB

< -Less Than
> -Greater Than
NA -Not Applicable
mg -Milligrams
ug -Micrograms
ND -Not Detected
kg -Kilograms
m3 -Cubic Meters
l -Liters
ppm -Parts per Million
NS -Not Specified
mppcf -Million Particles per Cubic Foot

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 10-OCT-17 Account No.: 90734
Date Received: 17-OCT-17 Login No. : L422140
Date Analyzed: 19-OCT-17 - 23-OCT-17

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L422140 (Report ID: 1026386):
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: im-mwvfilt(28), MT-SOP-21(10)
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3; as Fume, Ceiling = 0.1 mg/m3.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
TLV for VANADIUM PENTOXIDE: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for MAGNESIUM OXIDE: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 10-OCT-17 Account No.: 90734
Date Received: 17-OCT-17 Login No. : L422140
Date Analyzed: 19-OCT-17 - 23-OCT-17

L422140 (Report ID: 1026386):

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Beryllium	+/-12.6%	103%
Magnesium Oxide	+/-9.1%	102%
Molybdenum	+/-10.3%	99.4%
Nickel	+/-10%	103%
Thallium	+/-6.6%	99.5%
Vanadium Pentoxide	+/-9.1%	102%

Parameter	Method	PEL
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/M	0.0002 mg/m3 (TWA)
Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	See footnote

L422140 (Report ID: 1025792):

TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for COBALT: 0.02 mg/m3
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for Calcium Oxide: 2 mg/m3
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3
TLV for SELENIUM: 0.2 mg/m3

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 10-OCT-17 Account No.: 90734
Date Received: 17-OCT-17 Login No. : L422140
Date Analyzed: 19-OCT-17 - 23-OCT-17

L422140 (Report ID: 1025792):
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for CHROMIUM: 0.5 mg/m3
TLV for IRON OXIDE: 5 mg/m3
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: im-mwvfilt(28), MT-SOP-21(10)
PEL listed refers to Aluminum as total dust.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.

L422140-9-10 (Report ID: 1025792):
0.36 ug of Copper was found to be in the associated method blank.

L422140 (Report ID: 1025792):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-10.6%	104%
Antimony	+/-8.2%	104%
Arsenic	+/-8.1%	107%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
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Project No. : 22152

Date Sampled : 10-OCT-17 Account No.: 90734
Date Received: 17-OCT-17 Login No. : L422140
Date Analyzed: 19-OCT-17 - 23-OCT-17

Barium	+/-8.1%	103%
Beryllium	+/-12.6%	103%
Cadmium	+/-9%	105%
Calcium Oxide	+/-11.3%	100%
Chromium	+/-9.1%	102%
Cobalt	+/-10.2%	103%
Copper	+/-9.3%	104%
Iron Oxide	+/-10%	102%
Lead	+/-8.1%	103%
Manganese	+/-8.9%	103%
Molybdenum	+/-10.3%	99.4%
Selenium	+/-11.4%	105%
Zinc Oxide	+/-9.9%	106%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/M	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)
Chromium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Selenium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

L422140 (Report ID: 1025904):
SOPs: ia-pcm(26)

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 10-OCT-17 Account No.: 90734
Date Received: 17-OCT-17 Login No. : L422140
Date Analyzed: 19-OCT-17 - 23-OCT-17

L422140 (Report ID: 1025904):
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a greater than optimal variability and are probably biased.
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as follows:
0.154 (5-20 fibers/100 fields)
0.100 (>20-50 fibers/100 fields)
0.069 (>50-100 fibers/100 fields)
0.090 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take into account any uncertainty associated with the sampling process.

L422140 (Report ID: 1025250):
SOPs: GRAV-SOP-8(17)
Gravimetric analytical accuracy of the sampling media is -0.001 +/- 0.030 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.

L422140 (Report ID: 1025251):
TLV for RESPIRABLE DUST: NA
SOPs: GRAV-SOP-5(18), GRAV-SOP-6(17)
Gravimetric analytical accuracy of the sampling media is 0.002 +/- 0.018 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.
PNOR = Particulates Not Otherwise Regulated.

L422140 (Report ID: 1026466):
TLV for QUARTZ: 0.025 mg/m3 Respirable
TLV for TRIDYMITE: NA
TLV for CRISTOBALITE: 0.025 mg/m3 Respirable
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26)

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 10-OCT-17 Account No.: 90734
Date Received: 17-OCT-17 Login No. : L422140
Date Analyzed: 19-OCT-17 - 23-OCT-17

L422140 (Report ID: 1026466):

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-13.8%	101%
Quartz	+/-10.9%	93.4%
Tridymite	+/-13.6%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

L422140

SGS GALSON

1Z5X626A6648547794
Date: 10/17/17
Shipper: UPS
Initials: MAK

Prep: UNKNOWN

☐ New Client?

Client Account No.*:

2A2

Report To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2

Phone No.*: 416-393-6668
Cell No.:
Email Results to: Virgil.Umali@ttc.ca & oheresults@oheconsultants.com
Email address:

Invoice To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2

Bill

Phone No.:
Email:
P.O. No.: PU240835
Credit Card ☐ Card on File ☐ Call for Credit Card Info.

☐ Samples submitted using the FreePumpLoan™ Program ☐ Samples submitted using the FreeSamplingBadges™ Program

Need Results By*:	(surcharge)
☑ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%

Check for availability an pricing for quicker turn around times.

Site Name: Project: 22152 Sampled by: OHE Consultants

Comments:

TTC Subway Air Quality

List description of industry or Process/interferences present in sampling area:

Province samples were collected in (ex. ON)

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify):

Sample Identification* (Maxmium of 20 Characters. ID's longer than 20 characters will be abbreviated.)	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (e.g., welding plating, painting, etc.)*
22152 - A45	10/10/17	25 mm PCM	469.7	L	Standardized List of Analysis for TTC		
22152 - A46	10/10/17	25 mm PCM	-	-	Subway Air Quality Study		
22152 - S45	10/10/17	PW PVC in PPI	939.8	L	-		
22152 - S46	10/10/17	PW PVC in PPI	-	-	-		
22152 - I43	10/10/17	PW PVC in IOM	933.7	L	-		
22152 - I44	10/10/17	PW PVC in IOM	-	-	-		
22152 - M45	10/10/17	UW MCE in PPI	931.9	L	-		
22152 - M46	10/10/17	UW MCE in PPI	-	-	-		
22152 - T45	10/10/17	UW MCE EMC	935.6	L	-		
22152 - T46	10/10/17	UW MCE ↓	-	-	-		
		SLW 10/17/17					

^Galson Laboratories will subsitute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ, please indicate if the lower LOQ is required (only available for certain analytes - see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date	Time		Print Name/Signature	Date	Time
Relinquished by	Yunny Desiana Lee	10/13/17	15:09	Received by:		10/16/17	
Relinquished by		10/16/17	6:40 PM	Received by:		10/17/17	0950

Samples received after 3pm will be considered as next day's business

* Required fields, failure to complete these fields may result in a delay in your samples being processed.

Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Canada

November 01, 2017

AIHA-LAP #100324 Account# 90734 Login# L422141

Dear Mr. Umali:

Enclosed are the analytical results for the samples received by our laboratory on October 17, 2017. All test results meet the quality control requirements of AIHA-LAP unless otherwise stated in this report. All samples on the chain of custody were received in good condition unless otherwise noted.

Results in this report are based on the sampling data provided by the client and refer only to the samples as they were received at the laboratory. Unless otherwise requested, all samples will be discarded 14 days from the date of this report. Fiber count samples are retained for 60 days.

To ensure the safety of laboratory receiving personnel, always seal bulk samples securely to prevent possible escape of material. Also, please double-bag bulk samples individually prior to shipping. Samples not received in this manner will be noted on the chain of custody form.

Samples requiring TEM analysis were subcontracted to AMA Analytical Services, Inc. Their report is enclosed in its entirety.

Current scopes of accreditation can be viewed at www.galsonlabs.com in the accreditations section under the "about Galson" tab. Please contact Katrina Ahchong, at (888) 432-5227, if you require additional information regarding this report. Thank you for using SGS Galson Laboratories.

Sincerely,

SGS Galson Laboratories

Pamela Weaver
Asbestos Technical Manager

Enclosure(s)

Galson Laboratories, Inc. is now a part of SGS, the world's leading inspection, verification, testing, and certification company. As part of our transition to SGS, you will begin to see some formatting changes with reports that will improvethe presentation of data and allow for the transition to the new logo.

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East Syracuse, NY 13057
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FAX: (315) 437-0571
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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 12-OCT-17
Date Received : 17-OCT-17

Account No.: 90734
Login No. : L422141
Date Analyzed : 19-OCT-17 - 20-OCT-17
Report ID : 1025797

Client ID : 22152-M47 **Lab ID : L422141-7** **Air Volume : 941.2 L**
Date Sampled : 10/12/17 **Date Analyzed : 10/19/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.0080	mg/m3
Cadmium	0.015	<0.015	<0.000016	mg/m3
Iron Oxide	11.	55	0.059	mg/m3
Molybdenum	0.075	<0.075	<0.000080	mg/m3
Zinc Oxide	2.8	<2.8	<0.0030	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 19-OCT-17
Submitted by: JMR/JJL
NYS DOH # : 11626
Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 12-OCT-17
Date Received : 17-OCT-17

Account No.: 90734
Login No. : L422141

Date Analyzed : 19-OCT-17 - 20-OCT-17
Report ID : 1025797

Client ID : 22152-M48 **Lab ID : L422141-8** **Air Volume : NA**
Date Sampled : 10/12/17 **Date Analyzed : 10/19/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.015	<0.015	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.075	<0.075	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 19-OCT-17

Submitted by: JMR/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 12-OCT-17
Date Received : 17-OCT-17

Account No.: 90734
Login No. : L422141

Date Analyzed : 19-OCT-17 - 20-OCT-17
Report ID : 1025797

Client ID : 22152-T47 **Lab ID : L422141-9** **Air Volume : 957.9 L**
Date Sampled : 10/12/17 **Date Analyzed : 10/19/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.00094	mg/m3
Arsenic	0.15	<0.15	<0.00016	mg/m3
Barium	0.15	3.2	0.0033	mg/m3
Beryllium	0.0075	<0.0075	<0.0000078	mg/m3
Cadmium	0.015	<0.015	<0.000016	mg/m3
Calcium Oxide	100.	<100	<0.11	mg/m3
Chromium	7.5	<7.5	<0.0078	mg/m3
Cobalt	0.045	<0.045	<0.000047	mg/m3
Copper	0.30	0.39	0.00040	mg/m3
Lead	0.075	<0.075	<0.000078	mg/m3
Manganese	0.15	0.71	0.00074	mg/m3
Selenium	2.3	<2.3	<0.0023	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 19-OCT-17

Submitted by: JMR/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 12-OCT-17
Date Received : 17-OCT-17

Account No.: 90734
Login No. : L422141

Date Analyzed : 19-OCT-17 - 20-OCT-17
Report ID : 1025797

Client ID : 22152-T48 **Lab ID : L422141-10** **Air Volume : NA**
Date Sampled : 10/12/17 **Date Analyzed : 10/19/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.15	<0.15	NA	mg/m3
Barium	0.15	<0.15	NA	mg/m3
Beryllium	0.0075	<0.0075	NA	mg/m3
Cadmium	0.015	<0.015	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.045	<0.045	NA	mg/m3
Copper	0.30	<0.30	NA	mg/m3
Lead	0.075	<0.075	NA	mg/m3
Manganese	0.15	<0.15	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 19-OCT-17

Submitted by: JMR/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 12-OCT-17
Date Received : 17-OCT-17

Account No.: 90734
Login No. : L422141

Date Analyzed : 19-OCT-17 - 20-OCT-17
Report ID : 1026392

Client ID : 22152-I45 **Lab ID : L422141-5** **Air Volume : 941.6 L**
Date Sampled : 10/12/17 **Date Analyzed : 10/20/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	<0.0000080	mg/m3
Magnesium Oxide	12.	<12	<0.013	mg/m3
Molybdenum	0.075	<0.075	<0.000080	mg/m3
Nickel	0.15	0.17	0.00018	mg/m3
Thallium	0.75	<0.75	<0.00080	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.00085	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 23-OCT-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 12-OCT-17
Date Received : 17-OCT-17

Account No.: 90734
Login No. : L422141
Date Analyzed : 19-OCT-17 - 20-OCT-17
Report ID : 1026392

Client ID : 22152-I46 **Lab ID : L422141-6** **Air Volume : NA**
Date Sampled : 10/12/17 **Date Analyzed : 10/20/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	NA	mg/m3
Magnesium Oxide	12.	<12	NA	mg/m3
Molybdenum	0.075	<0.075	NA	mg/m3
Nickel	0.15	<0.15	NA	mg/m3
Thallium	0.75	<0.75	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 23-OCT-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 12-OCT-17
Date Received : 17-OCT-17

Account No.: 90734
Login No. : L422141
Date Analyzed : 19-OCT-17
Report ID : 1025905

Asbestos Fiber Count (A Rules)

Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
22152-A47	L422141-1	13/100	16.6	6391	485,900	0.013
22152-A48	L422141-2	0/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : BTM
Approved by : CDT
Date : 20-OCT-17
QC by: AMD
Supervisor: BDB

< -Less Than
> -Greater Than
ND -Not Detected
NA -Not Applicable
cc -Cubic Centimeters
NS -Not Specified
mm2 -Square millimeters

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 12-OCT-17
Date Received : 17-OCT-17

Account No.: 90734
Login No. : L422141
Date Analyzed : 20-OCT-17
Report ID : 1025248

Inhalable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-I45	L422141-5	941.6	0.19	0.20
22152-I46	L422141-6	NA	<0.10	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.10 mg
Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV
OSHA PEL : NA
Collection Media : IOM 25mm PW PVC

Submitted by: HVN
Approved by : SPR
Date : 20-OCT-17
Supervisor: KRK

NYS DOH # : 11626
QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 12-OCT-17
Date Received : 17-OCT-17

Account No.: 90734
Login No. : L422141
Date Analyzed : 20-OCT-17
Report ID : 1025249

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-S47	L422141-3	960.7	0.071	0.074
22152-S48	L422141-4	NA	<0.050	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg
Analytical Method : mod. NIOSH 0600; Gravimetric
OSHA PEL : PNOR 5 mg/m3 (TWA)
Collection Media : PVC PW 37mm

Submitted by: HVN
Approved by : SPR
Date : 20-OCT-17
Supervisor: KRK

NYS DOH # : 11626
QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 12-OCT-17
Date Received : 17-OCT-17

Account No.: 90734
Login No. : L422141
Date Analyzed : 20-OCT-17 - 22-OCT-17
Report ID : 1026445

Respirable Crystalline Silica (RCS): Quartz, Cristobalite, Tridymite

Sample ID	Lab ID	Analyte	Air Vol l	ug	ug/m3
22152-S47	L422141-3	Quartz	960.7	<5.0	<5.2
		Cristobalite	960.7	<5.0	<5.2
		Tridymite	960.7	<20	<21
		RCS	960.7	<5.0	<5.2
22152-S48	L422141-4	Quartz	NA	<5.0	NA
		Cristobalite	NA	<5.0	NA
		Tridymite	NA	<20	NA
		RCS	NA	<5.0	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: Q:5.0ug C:5.0ug T:20.ug
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD
OSHA PEL : 50 ug/m3 RCS
Collection Media : PVC PW 37mm

Submitted: AJD
Approved: KRK
Date : 23-OCT-17 NYS DOH # : 11626
Supervisor: KRK QC by: AMD

< -Less Than
> -Greater Than
NA -Not Applicable
mg -Milligrams
ug -Micrograms
ND -Not Detected
kg -Kilograms
m3 -Cubic Meters
l -Liters
ppm -Parts per Million
NS -Not Specified
mppcf -Million Particles per Cubic Foot

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 12-OCT-17 Account No.: 90734
Date Received: 17-OCT-17 Login No. : L422141
Date Analyzed: 19-OCT-17 - 22-OCT-17

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L422141 (Report ID: 1026392):
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: im-mwvfilt(28), MT-SOP-21(10)
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3; as Fume, Ceiling = 0.1 mg/m3.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
TLV for VANADIUM PENTOXIDE: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for MAGNESIUM OXIDE: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 12-OCT-17 Account No.: 90734
Date Received: 17-OCT-17 Login No. : L422141
Date Analyzed: 19-OCT-17 - 22-OCT-17

L422141 (Report ID: 1026392):

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Beryllium	+/-12.6%	103%
Magnesium Oxide	+/-9.1%	102%
Molybdenum	+/-10.3%	99.4%
Nickel	+/-10%	103%
Thallium	+/-6.6%	99.5%
Vanadium Pentoxide	+/-9.1%	102%

Parameter	Method	PEL
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/M	0.0002 mg/m3 (TWA)
Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	See footnote

L422141 (Report ID: 1025797):

TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for COBALT: 0.02 mg/m3
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for Calcium Oxide: 2 mg/m3
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3
TLV for SELENIUM: 0.2 mg/m3

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 12-OCT-17 Account No.: 90734
Date Received: 17-OCT-17 Login No. : L422141
Date Analyzed: 19-OCT-17 - 22-OCT-17

L422141 (Report ID: 1025797):
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for CHROMIUM: 0.5 mg/m3
TLV for IRON OXIDE: 5 mg/m3
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: im-mwvfilt(28), MT-SOP-21(10)
PEL listed refers to Aluminum as total dust.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.

L422141-9-10 (Report ID: 1025797):
The method blank prepared with the sample contained 0.36 ug Copper.

L422141 (Report ID: 1025797):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-10.6%	104%
Antimony	+/-8.2%	104%
Arsenic	+/-8.1%	107%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

GALSON

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East Syracuse, NY 13057
(315) 432-5227
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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 12-OCT-17 Account No.: 90734
Date Received: 17-OCT-17 Login No. : L422141
Date Analyzed: 19-OCT-17 - 22-OCT-17

Barium	+/-8.1%	103%
Beryllium	+/-12.6%	103%
Cadmium	+/-9%	105%
Calcium Oxide	+/-11.3%	100%
Chromium	+/-9.1%	102%
Cobalt	+/-10.2%	103%
Copper	+/-9.3%	104%
Iron Oxide	+/-10%	102%
Lead	+/-8.1%	103%
Manganese	+/-8.9%	103%
Molybdenum	+/-10.3%	99.4%
Selenium	+/-11.4%	105%
Zinc Oxide	+/-9.9%	106%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/M	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)
Chromium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Selenium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

L422141 (Report ID: 1025905):
SOPs: ia-pcm(26)

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 12-OCT-17 Account No.: 90734
Date Received: 17-OCT-17 Login No. : L422141
Date Analyzed: 19-OCT-17 - 22-OCT-17

L422141 (Report ID: 1025905):
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a greater than optimal variability and are probably biased.
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as follows:
0.154 (5-20 fibers/100 fields)
0.100 (>20-50 fibers/100 fields)
0.069 (>50-100 fibers/100 fields)
0.090 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take into account any uncertainty associated with the sampling process.

L422141 (Report ID: 1025248):
SOPs: GRAV-SOP-8(17)
Gravimetric analytical accuracy of the sampling media is -0.001 +/- 0.030 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.

L422141 (Report ID: 1025249):
TLV for RESPIRABLE DUST: NA
SOPs: GRAV-SOP-5(18), GRAV-SOP-6(17)
Gravimetric analytical accuracy of the sampling media is 0.002 +/- 0.018 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.
PNOR = Particulates Not Otherwise Regulated.

L422141 (Report ID: 1026445):
TLV for QUARTZ: 0.025 mg/m3 Respirable
TLV for TRIDYMITE: NA
TLV for CRISTOBALITE: 0.025 mg/m3 Respirable
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26)

< -Less Than	mg -Milligrams	m3 -Cubic Meters	kg -Kilograms	ppm -Parts per Million		
> -Greater Than	ug -Micrograms	l -Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable	

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FAX: (315) 437-0571
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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 12-OCT-17 Account No.: 90734
Date Received: 17-OCT-17 Login No. : L422141
Date Analyzed: 19-OCT-17 - 22-OCT-17

L422141 (Report ID: 1026445):

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-13.8%	101%
Quartz	+/-10.9%	93.4%
Tridymite	+/-13.6%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

NVLAP®
Lab Code 101143-0
NY ELAP
Lab ID 10920

Chain of Custody: 285005
Client: Galson Laboratories
Address: 6601 Kirkville Road
East Syracuse, NY 13057-9672
Attention: Pam Weaver

Job Name: Not Provided
Job Location: Not Provided
Job Number: L422141
P.O. Number: 90734

Date Submitted: 10/24/2017
Date Analyzed: 10/31/2017
Report Date: 10/31/2017
Date Sampled: 10/12/2017
Person Submitting: Zach King

Summary of Transmission Electron Microscopy

Filter Type: MCE **Pore Size:** 0.8 um **Filter Size:** 25 mm (385 mm²)

AMA Sample Number	Client Sample Number	Volume (L)	Area Analyzed (mm²)	Analytical Sensitivity f/cc	Asbestos Type Amount	# Non Asbestos Structures	Concentration f/mm²	Concentration f/cc	Fraction	Sample Type	Comments
285005-1	22152-A47	485.9	0.532	0.0015	0	1	<8	<0.006	0.0	N/P	

Analytical procedures used meet or exceed NIOSH 7402 protocols.

** - To calculate the asbestos concentration of the PCM result multiply the original PCM result by the fraction.

All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

Analyst(s): Michael Greenberg

Technical Director Andreas Saldivar

4475 Forbes Blvd. · Lanham, MD, 20706 · (301) 459-2640 · Toll Free (800) 346-0961 · Fax (301) 459-2643

AMA Analytical Services, Inc.
Focused on Results www.amalab.com
AIHA-LAP (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 285005

Mailing/Billing Information:

1. Client Name: Galson
2. Address 1:
3. Address 2:
4. Address 3:
5. Phone #: Fax #:

Submittal Information:

1. Job Name:
2. Job Location:
3. Job #: L422141 P.O. #: 90734
4. Contact Person: Pam Waevar Cell:
5. Collected by: Cell:

Reporting Info (Results provided as soon as technically feasible). If no TAT/Reporting Info is provided, AMA will assign defaults of 5-Day and email/fax to contacts on file.

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
❑ 4 Hours ❑ Immediate Date Due: ❑ 24 Hours Time Due: Comments:	❑ 4 Hours ❑ 3 Day ❑ Same Day ☑ 5 Day + ❑ Next Day Date Due: 10/31/17 ❑ 2 Day ❑ Results Required By Noon	❑ Email: ❑ Email 2: ❑ Verbals:

Asbestos Analysis

*PCM Air – Please Indicate Filter Type:
- ❑ NIOSH 7400 (QTY)
- ❑ Fiberglass (QTY)

TEM Air* – Please Indicate Filter Type:
- ❑ AHERA (QTY)
- ❑ NIOSH 7402 (QTY)
- ❑ Other (specify) (QTY)

PLM Bulk
- ❑ EPA 600 – Visual Estimate (QTY) ❑ Pos Stop
- ❑ EPA Point Count (QTY)
- ❑ NY State Friable 198.1 (QTY)
- ❑ Grav. Reduction ELAP 198.6 (QTY)
- ❑ Other (specify) (QTY)

MISC
- ❑ Vermiculite
- ❑ Asbestos Soil PLM (Qual) PLM (Quan) PLM/TEM (Qual) PLM/TEM (Quan)

*It is recommended that blank samples be submitted with all air and surface samples

TEM Bulk
- ❑ ELAP 198.4/Chatfield (QTY)
- ❑ NY State PLM/TEM (QTY)
- ❑ Residual Ash (QTY)

TEM Dust*
- ❑ Qual. (pres/abs) Vacuum/Dust (QTY)
- ❑ Quan. (s/area) Vacuum D5755-95 (QTY)
- ❑ Quan. (s/area)Dust D6480-99 (QTY)

TEM Water
- ❑ Qual. (pres/abs) (QTY)
- ❑ ELAP 198.2/EPA 100.2 (QTY)
- ❑ EPA 100.1 (QTY)

☑ All samples received in good condition unless otherwise noted.
(TEM Water samples °C)

If field data sheets are submitted, there is no need to complete bottom section.

Metals Analysis
- ❑ Pb Paint Chip (QTY)
- ❑ *Pb Dust Wipe (wipe type) (QTY)
- ❑ *Pb Air (QTY)
- ❑ Pb Soil/Solid (QTY)
- ❑ Pb TCLP (QTY)
- ❑ Drinking Water ❑ Pb (QTY) ❑ Cu (QTY) ❑ As (QTY)
- ❑ Waste Water ❑ Pb (QTY) ❑ Cu (QTY) ❑ As (QTY)
- ❑ Pb Furnace (Media) (QTY)

Fungal Analysis

Collection Apparatus for Spore Traps/Air Samples:
Collection Media
- ❑ *Spore-Trap (QTY) ❑ Surface Vacuum Dust (QTY)
- ❑ *Surface Swab (QTY) ❑ Culturable ID Genus (Media) (QTY)
- ❑ *Surface Tape (QTY) ❑ Culturable ID Species (Media) (QTY)
- ❑ Other (Specify) (QTY

CLIENT ID #	SAMPLE INFORMATION SAMPLE LOCATION/ ID	DATE/ TIME	VOL (L)/ Wipe Area	ANALYSIS TEM	PCM	PLM	LEAD	MOLD	MATRIX AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB	CLIENT CONTACT (LABORATORY STAFF ONLY)
																Date/Time: Contact:By:
																Date/Time: Contact:By:
																Date/Time: Contact:By:

	Print Name	Signature	Date	Time
Relinquished by:				
Received by:				
Relinquished by:				
Received for Lab by:	Tibo		10/24/17	945

Shipping Information
☑ UPS ☐ In-Person ☐ Other
☐ FedEx ☐ Drop Box
☐ USPS ☐ Courrier
Airbill/Tracking No:

AMA

GALSON LABORATORIES
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888-432-LABS(5227)
Fax: 315-437-0571
www.galsonlabs.com

Check if change of address ☐
New Client ? yes ☐ no ☐

Report To :	**Shelly Krause**	Invoice To :	**Jeanne Glisson**
	SGS Galson Laboratory		SGS Galson Laboratory
	6601 Kirkville Road		6601 Kirkville Road
	East Syracuse, NY 13057		East Syracuse, NY 13057
Phone No. :	888-432-5227	Phone No. :	888-432-5227
		Fax No.	315-437-0571

Site Name : **Project :** L422141 **Sampled By :** Client

Turnaround Time	Due Date
☑ Standard	10/31/17
☐ 4 Business Days	
☐ 3 Business Days	
☐ 2 Business Days	
☐ Next Day by 6pm	
☐ Next Day by Noon	
☐ Same day	

Verbal Authorization : 90734

Credit Card No. : Card Holder Name : Exp. :

Fax Results To : Email Only Please Fax No. : Email Only Please

Email Results To : Syracuse.Subcontracting@sgs.com

Sample Identification	Date Sampled	Collection Medium	*Air Volume (liters)/ Passive Monitors (Min)	Analysis Requested	Method Reference	Fiber/fields
22152-A47	10/12/2017	25mm MCE PCM	485.9	Transmission Electron Microscopy	NIOSH 7402; TEM	13/100

Comments:

State/Province of sampling event: Ontario

If the method being reported is not on your laboratory's current AIHA scope of accreditation, please state that in your report.
Please provide an uncertainty statement in accordance with AIHA LQAP policy document Section 2A.5.4.3.

Chain of Custody	Print Name	Signature	Date/Time
Relinquished by :	Zach King		10/23/2017 14:43
Received by LAB :			

SGS GALSON

1Z5X626A6648547794
Date: 10/17/17
Shipper: UPS
Initials: MAK
Prep: UNKNOWN

L422141

☐ New Client?

Client Account No.*: _____

2A2

Report To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2
Phone No.*: 416-393-6668
Cell No.: _____
Email Results to: Virgil.Umali@ttc.ca & oheresults@oheconsultants.com
Email address: _____

Invoice To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2
Phone No.: _____ 2110
Email: _____
P.O. No.: PU240835
Credit Card ☐ Card on File ☐ Call for Credit Card Info.

☐ Samples submitted using the FreePumpLoan™ Program ☐ Samples submitted using the FreeSamplingBadges™ Program

Need Results By*:	(surcharge)
☑ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%

Check for availability an pricing for quicker turn around times.

Site Name: Project: 22152 Sampled by: OHE Consultants

Comments:

TTC Subway Air Quality

List description of industry or Process/interferences present in sampling area:

Province samples were collected in (ex. ON)

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify):

Sample Identification* (Maximum of 20 Characters. ID's longer than 20 characters will be abbreviated.)	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (e.g., welding plating, painting, etc.)*
22152 - A47	10/12/17	25 mm PCM	485.9	L	Standardized List of Analysis for TTC		
22152 - A48	10/12/17	25 mm PCM	-	-	Subway Air Quality Study		
22152 - S47	10/12/17	PW PVC in PPI	960.7	L	-		
22152 - S48	10/12/17	PW PVC in PPI	-	-	-		
22152 - I45	10/12/17	PW PVC in IOM	941.6	L	-		
22152 - I46	10/12/17	PW PVC in IOM	-	-	-		
22152 - M47	10/12/17	UW MCE in PPI	941.2	L	-		
22152 - M48	10/12/17	UW MCE in PPI	-	-	-		
22152 - T47	10/12/17	UW MCE 3pc	957.9	L	-		
22152 - T48	10/12/17	UW MCE ✓	-	-	-		
		SL 10/12/17					

^Galson Laboratories will subsitute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ, please indicate if the lower LOQ is required (only available for certain analytes - see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date	Time		Print Name/Signature	Date	Time
Relinquished by	Yunny Desiana Lee	10/13/17	15:20	Received by:		10/16/17	5:00pm
Relinquished by		10/16/17	6:00pm	Received by:		10/17/17	0950

Samples received after 3pm will be considered as next day's business
* Required fields, failure to complete these fields may result in a delay in your samples being processed.

Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Canada

November 02, 2017

AIHA-LAP #100324 Account# 90734 Login# L423091

Dear Mr. Umali:

Enclosed are the analytical results for the samples received by our laboratory on October 25, 2017. All test results meet the quality control requirements of AIHA-LAP and NELAC unless otherwise stated in this report. All samples on the chain of custody were received in good condition unless otherwise noted.

Results in this report are based on the sampling data provided by the client and refer only to the samples as they were received at the laboratory. Unless otherwise requested, samples for asbestos analysis will be discarded 60 days from the date of this report and all other non-IOM samples will be retained for 14 days following the date of this report (when possible). IOMs will be cleaned & disposed of after seven calendar days.

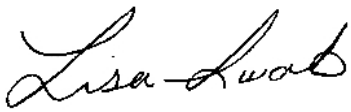
To ensure the safety of laboratory receiving personnel, always seal bulk samples securely to prevent possible escape of material. Also, please double-bag bulk samples individually prior to shipping. Samples not received in this manner will be noted on the chain of custody form.

Current Scopes of Accreditation can be viewed at www.galsonlabs.com in the accreditations section under the "about Galson" tab.

Please contact Katrina Ahchong at (888) 432-5227, if you would like any additional information regarding this report. Thank you for using SGS Galson Laboratories.

Sincerely,

SGS Galson Laboratories



Lisa Swab
Laboratory Director

Enclosure(s)

Galson Laboratories, Inc. is now a part of SGS, the world's leading inspection, verification, testing, and certification company. As part of our transition to SGS, you will begin to see some formatting changes with reports that will improve the presentation of data and allow for the transition to the new logo.

SGS GALSON

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 17-OCT-17
Date Received : 25-OCT-17

Account No.: 90734
Login No. : L423091
Date Analyzed : 26-OCT-17 - 28-OCT-17
Report ID : 1027517

Client ID : 22152-M49 **Lab ID : L423091-7** **Air Volume : 897.6 L**
Date Sampled : 10/17/17 **Date Analyzed : 10/26/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.0084	mg/m3
Cadmium	0.15	<0.15	<0.00017	mg/m3
Iron Oxide	11.	27	0.030	mg/m3
Molybdenum	0.15	<0.15	<0.00017	mg/m3
Zinc Oxide	2.8	<2.8	<0.0031	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 27-OCT-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 17-OCT-17
Date Received : 25-OCT-17

Account No.: 90734
Login No. : L423091

Date Analyzed : 26-OCT-17 - 28-OCT-17
Report ID : 1027517

Client ID : 22152-M50 **Lab ID : L423091-8** **Air Volume : NA**
Date Sampled : 10/17/17 **Date Analyzed : 10/26/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 27-OCT-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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FAX: (315) 437-0571
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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 17-OCT-17
Date Received : 25-OCT-17

Account No.: 90734
Login No. : L423091

Date Analyzed : 26-OCT-17 - 28-OCT-17
Report ID : 1027517

Client ID : 22152-T49 **Lab ID : L423091-9** **Air Volume : 899.6 L**
Date Sampled : 10/17/17 **Date Analyzed : 10/26/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.0010	mg/m3
Arsenic	0.30	<0.30	<0.00033	mg/m3
Barium	0.15	0.33	0.00037	mg/m3
Beryllium	0.15	<0.15	<0.00017	mg/m3
Cadmium	0.15	<0.15	<0.00017	mg/m3
Calcium Oxide	100.	<100	<0.12	mg/m3
Chromium	7.5	<7.5	<0.0083	mg/m3
Cobalt	0.45	<0.45	<0.00050	mg/m3
Copper	0.30	<0.30	<0.00033	mg/m3
Lead	0.38	<0.38	<0.00042	mg/m3
Manganese	0.15	0.26	0.00029	mg/m3
Selenium	2.3	<2.3	<0.0025	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 27-OCT-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 17-OCT-17
Date Received : 25-OCT-17

Account No.: 90734
Login No. : L423091

Date Analyzed : 26-OCT-17 - 28-OCT-17
Report ID : 1027517

Client ID : 22152-T50 **Lab ID : L423091-10** **Air Volume : NA**
Date Sampled : 10/17/17 **Date Analyzed : 10/26/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.30	<0.30	NA	mg/m3
Barium	0.15	<0.15	NA	mg/m3
Beryllium	0.15	<0.15	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.45	<0.45	NA	mg/m3
Copper	0.30	<0.30	NA	mg/m3
Lead	0.38	<0.38	NA	mg/m3
Manganese	0.15	<0.15	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 27-OCT-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 17-OCT-17
Date Received : 25-OCT-17

Account No.: 90734
Login No. : L423091

Date Analyzed : 26-OCT-17 - 28-OCT-17
Report ID : 1027991

Client ID : 22152-I47 **Lab ID : L423091-5** **Air Volume : 888.3 L**
Date Sampled : 10/17/17 **Date Analyzed : 10/28/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	<0.0000084	mg/m3
Magnesium Oxide	12.	<12	<0.014	mg/m3
Molybdenum	0.075	0.15	0.00017	mg/m3
Nickel	0.15	0.20	0.00022	mg/m3
Thallium	0.75	<0.75	<0.00084	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.00090	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 30-OCT-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 17-OCT-17
Date Received : 25-OCT-17

Account No.: 90734
Login No. : L423091

Date Analyzed : 26-OCT-17 - 28-OCT-17
Report ID : 1027991

Client ID : 22152-I48 **Lab ID : L423091-6** **Air Volume : NA**
Date Sampled : 10/17/17 **Date Analyzed : 10/27/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	NA	mg/m3
Magnesium Oxide	12.	<12	NA	mg/m3
Molybdenum	0.075	<0.075	NA	mg/m3
Nickel	0.15	0.68	NA	mg/m3
Thallium	0.75	<0.75	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 30-OCT-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 17-OCT-17
Date Received : 25-OCT-17

Account No.: 90734
Login No. : L423091
Date Analyzed : 30-OCT-17
Report ID : 1027940

Asbestos Fiber Count (A Rules)

Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
22152-A49	L423091-1	6/100	7.6	2926	446,500	0.007
22152-A50	L423091-2	0/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : BDB
Approved by : RCF
Date : 30-OCT-17
QC by: TJB
Supervisor: BDB

< -Less Than
> -Greater Than
ND -Not Detected
NA -Not Applicable
cc -Cubic Centimeters
NS -Not Specified
mm2 -Square millimeters

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 17-OCT-17
Date Received : 25-OCT-17

Account No.: 90734
Login No. : L423091
Date Analyzed : 26-OCT-17
Report ID : 1027109

Inhalable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-I47	L423091-5	888.3	0.11	0.12
22152-I48	L423091-6	NA	<0.10	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.10 mg
Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV
OSHA PEL : NA
Collection Media : IOM 25mm PW PVC

Submitted by: GMG
Approved by : SPR
Date : 26-OCT-17
Supervisor: KRK

NYS DOH # : 11626
QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 17-OCT-17
Date Received : 25-OCT-17

Account No.: 90734
Login No. : L423091
Date Analyzed : 26-OCT-17
Report ID : 1027110

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-S49	L423091-3	892	<0.050	<0.056
22152-S50	L423091-4	NA	<0.050	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg
Analytical Method : mod. NIOSH 0600; Gravimetric
OSHA PEL : PNOR 5 mg/m3 (TWA)
Collection Media : PVC PW 37mm

Submitted by: HVN
Approved by : SPR
Date : 27-OCT-17
Supervisor: KRK

NYS DOH # : 11626
QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 17-OCT-17
Date Received : 25-OCT-17

Account No.: 90734
Login No. : L423091

Date Analyzed : 26-OCT-17 - 02-NOV-17
Report ID : 1028866

Respirable Crystalline Silica (RCS): Quartz, Cristobalite, Tridymite

Sample ID	Lab ID	Analyte	Air Vol l	ug	ug/m3
22152-S49	L423091-3	Quartz	892	<5.0	<5.6
		Cristobalite	892	<5.0	<5.6
		Tridymite	892	<20	<22
		RCS	892	<5.0	<5.6
22152-S50	L423091-4	Quartz	NA	<5.0	NA
		Cristobalite	NA	<5.0	NA
		Tridymite	NA	<20	NA
		RCS	NA	<5.0	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: Q:5.0ug C:5.0ug T:20.ug
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD
OSHA PEL : 50 ug/m3 RCS
Collection Media : PVC PW 37mm

Submitted: SPR
Approved: KRK
Date : 02-NOV-17 NYS DOH # : 11626
Supervisor: KRK QC by: TJB

< -Less Than
> -Greater Than
NA -Not Applicable
mg -Milligrams
ug -Micrograms
ND -Not Detected
kg -Kilograms
m3 -Cubic Meters
l -Liters
ppm -Parts per Million
NS -Not Specified
mppcf -Million Particles per Cubic Foot

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 17-OCT-17 Account No.: 90734
Date Received: 25-OCT-17 Login No. : L423091
Date Analyzed: 26-OCT-17 - 02-NOV-17

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L423091 (Report ID: 1027991):
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: im-mwvfilt(28), MT-SOP-21(10)
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3; as Fume, Ceiling = 0.1 mg/m3.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
TLV for VANADIUM PENTOXIDE: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for MAGNESIUM OXIDE: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote

L423091-6 (Report ID: 1027991):
Client-submitted blank result is above the LOQ at 0.68 ug for Nickel. Sample results not blank-corrected.

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 17-OCT-17 Account No.: 90734
Date Received: 25-OCT-17 Login No. : L423091
Date Analyzed: 26-OCT-17 - 02-NOV-17

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Beryllium	+/-12.6%	103%
Magnesium Oxide	+/-9.1%	102%
Molybdenum	+/-10.3%	99.4%
Nickel	+/-10%	103%
Thallium	+/-6.6%	99.5%
Vanadium Pentoxide	+/-9.1%	102%

Parameter	Method	PEL
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/M	0.0002 mg/m3 (TWA)
Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	See footnote

L423091 (Report ID: 1027517):
TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for COBALT: 0.02 mg/m3
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for Calcium Oxide: 2 mg/m3
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3
TLV for SELENIUM: 0.2 mg/m3
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 17-OCT-17 Account No.: 90734
Date Received: 25-OCT-17 Login No. : L423091
Date Analyzed: 26-OCT-17 - 02-NOV-17

L423091 (Report ID: 1027517):
TLV for CHROMIUM: 0.5 mg/m3
TLV for IRON OXIDE: 5 mg/m3
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(32), im-mwvfilt(28)
PEL listed refers to Aluminum as total dust.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.

L423091 (Report ID: 1027517):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-7.7%	96.9%
Antimony	+/-9.8%	97.3%
Arsenic	+/-7.6%	103%
Barium	+/-6.5%	101%
Beryllium	+/-10.8%	103%
Cadmium	+/-8.6%	102%
Calcium Oxide	+/-10.6%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
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Date Sampled : 17-OCT-17 Account No.: 90734
Date Received: 25-OCT-17 Login No. : L423091
Date Analyzed: 26-OCT-17 - 02-NOV-17

Chromium	+/-11.2%	103%
Cobalt	+/-8.5%	103%
Copper	+/-10.3%	103%
Iron Oxide	+/-9.6%	106%
Lead	+/-9.1%	100%
Manganese	+/-8.3%	99.8%
Molybdenum	+/-7.6%	100%
Selenium	+/-11.6%	105%
Zinc Oxide	+/-8.9%	102%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)
Chromium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Selenium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

L423091 (Report ID: 1027940):
SOPs: ia-pcm(26)
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a
greater than optimal variability and are probably biased.
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 17-OCT-17 Account No.: 90734
Date Received: 25-OCT-17 Login No. : L423091
Date Analyzed: 26-OCT-17 - 02-NOV-17

L423091 (Report ID: 1027940):
follows:
0.154 (5-20 fibers/100 fields)
0.100 (>20-50 fibers/100 fields)
0.069 (>50-100 fibers/100 fields)
0.090 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take into account any uncertainty associated with the sampling process.

L423091 (Report ID: 1027109):
SOPs: GRAV-SOP-8(17)
Gravimetric analytical accuracy of the sampling media is -0.001 +/- 0.030 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.

L423091 (Report ID: 1027110):
TLV for RESPIRABLE DUST: NA
SOPs: GRAV-SOP-5(18), GRAV-SOP-6(17)
Gravimetric analytical accuracy of the sampling media is 0.002 +/- 0.018 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.
PNOR = Particulates Not Otherwise Regulated.

L423091 (Report ID: 1028866):
TLV for QUARTZ: 0.025 mg/m3 Respirable
TLV for TRIDYMITE: NA
TLV for CRISTOBALITE: 0.025 mg/m3 Respirable
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26)

< -Less Than	mg -Milligrams	m3 -Cubic Meters	kg -Kilograms	ppm -Parts per Million		
> -Greater Than	ug -Micrograms	l -Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable	

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 17-OCT-17 Account No.: 90734
Date Received: 25-OCT-17 Login No. : L423091
Date Analyzed: 26-OCT-17 - 02-NOV-17

L423091 (Report ID: 1028866):

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-13.8%	101%
Quartz	+/-10.9%	93.4%
Tridymite	+/-13.6%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

L423091 D65

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☐ New Client?

Client Account No.*:

Report To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2

Phone No.*: 416-393-6668

Cell No.:

Email Results to: Virgil.Umali@ttc.ca & oheresuits@oheconsultants.com

Email address:

Invoice To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2

Phone No.:

Email:

P.O. No.: PU240835

Credit Card ☐ Card on File ☐ Call for Credit Card Info.

☐ Samples submitted using the FreePumpLoan™ Program ☐ Samples submitted using the FreeSamplingBadges™ Program

Need Results By*:	(surcharge)
☑ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%

Check for availability an pricing for quicker turn around times.

Site Name: Project: 22152 Sampled by: OHE Consultants

Comments:

TTC Subway Air Quality

List description of industry or Process/interferences present in sampling area:

Province samples were collected in (ex. ON)

Please indicate which OEL this data will be used for: ☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA ☐ MSHA ☐ Other (specify):

Sample Identification* (Maxmium of 20 Characters. ID's longer than 20 characters will be abbreviated.)	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (e.g., welding plating, painting, etc.)*
22152 - A49	10/17/17	25 mm PCM	446.5	L	Standardized List of Analysis for TTC		
22152 - A50	10/17/17	25 mm PCM	-	-	Subway Air Quality Study		
22152 - S49	10/17/17	PW PVC in PPI	892.0	L	- Resp Silica		
22152 - S50	10/17/17	PW PVC in PPI	-	-	- "		
22152 - I47	10/17/17	PW PVC in IOM	888.3	L	- Inhalable Met		
22152 - I48	10/17/17	PW PVC in IOM	-	-	- "		
22152 - M49	10/17/17	UW MCE in PPI	897.6	L	- Resp Met		
22152 - M50	10/17/17	UW MCE in PPI	-	-	- "		
22152 - T49	10/17/17	UW MCE	899.6	L	- Total Met		
22152 - T50	10/17/17	UW MCE	-	-	- "		
					[initials]		

^Galson Laboratories will subsititute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ, please indicate if the lower LOQ is required (only available for certain analytes - see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date	Time		Print Name/Signature	Date	Time
Relinquished by	Romain Mathevet	10/18/17	15:20	Received by:	[signature]	10/23/17	2:09pm
Relinquished by	[signature]	10/23/17	6:4p	Received by:	[signature]	10-25-17	1014

Samples received after 3pm will be considered as next day's business

* Required fields, failure to complete these fields may result in a delay in your samples being processed.

Page 1 of 1

The TTC file number/purchase order number is PU240835:

ICP-MS can

1) Total Metals by NIOSH 7300. Analyze for antimony, arsenic, barium, beryllium, cadmium, calcium oxide, chromium III, cobalt, copper, lead, manganese, and selenium.

2) Asbestos fibre count by NIOSH 7400. In addition, analyze specifically for asbestos by TEM if the fibre count result exceeds 0.01 f/cc.

3) Respirable silica and respirable dust by NIOSH 7500/0600. Analyze for quartz, cristobalite, tridymite, and dust.

4) Respirable metals by NIOSH 7300. Analyze for aluminum, cadmium, iron oxide, molybdenum, and zinc oxide.

5) Inhalable metals and inhalable dust by NIOSH 7300/0500. Analyze for magnesium oxide, molybdenum, nickel, thallium, vanadium pentoxide, and dust. Beryllium should also be analyzed by ICP-MS to get a lower limit of detection.

SGS GALSON

Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Canada

November 02, 2017

AIHA-LAP #100324 Account# 90734 Login# L423110

Dear Mr. Umali:

Enclosed are the analytical results for the samples received by our laboratory on October 25, 2017. All test results meet the quality control requirements of AIHA-LAP and NELAC unless otherwise stated in this report. All samples on the chain of custody were received in good condition unless otherwise noted.

Results in this report are based on the sampling data provided by the client and refer only to the samples as they were received at the laboratory. Unless otherwise requested, samples for asbestos analysis will be discarded 60 days from the date of this report and all other non-IOM samples will be retained for 14 days following the date of this report (when possible). IOMs will be cleaned & disposed of after seven calendar days.

To ensure the safety of laboratory receiving personnel, always seal bulk samples securely to prevent possible escape of material. Also, please double-bag bulk samples individually prior to shipping. Samples not received in this manner will be noted on the chain of custody form.

Current Scopes of Accreditation can be viewed at www.galsonlabs.com in the accreditations section under the "about Galson" tab.

Please contact Katrina Ahchong at (888) 432-5227, if you would like any additional information regarding this report. Thank you for using SGS Galson Laboratories.

Sincerely,

SGS Galson Laboratories

Lisa Swab
Laboratory Director

Enclosure(s)

Galson Laboratories, Inc. is now a part of SGS, the world's leading inspection, verification, testing, and certification company. As part of our transition to SGS, you will begin to see some formatting changes with reports that will improve the presentation of data and allow for the transition to the new logo.

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FAX: (315) 437-0571
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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 19-OCT-17
Date Received : 25-OCT-17

Account No.: 90734
Login No. : L423110

Date Analyzed : 26-OCT-17 - 31-OCT-17
Report ID : 1027442

Client ID : 22152-M51 **Lab ID : L423110-7** **Air Volume : 919.1 L**
Date Sampled : 10/19/17 **Date Analyzed : 10/26/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.0082	mg/m3
Cadmium	0.15	<0.15	<0.00016	mg/m3
Iron Oxide	11.	19	0.021	mg/m3
Molybdenum	0.15	<0.15	<0.00016	mg/m3
Zinc Oxide	2.8	<2.8	<0.0030	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 27-OCT-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 19-OCT-17
Date Received : 25-OCT-17

Account No.: 90734
Login No. : L423110
Date Analyzed : 26-OCT-17 - 31-OCT-17
Report ID : 1027442

Client ID : 22152-M52 **Lab ID : L423110-8** **Air Volume : NA**
Date Sampled : 10/19/17 **Date Analyzed : 10/26/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 27-OCT-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 19-OCT-17
Date Received : 25-OCT-17

Account No.: 90734
Login No. : L423110
Date Analyzed : 26-OCT-17 - 31-OCT-17
Report ID : 1027442

Client ID : 22152-T51 **Lab ID : L423110-9** **Air Volume : 921.8 L**
Date Sampled : 10/19/17 **Date Analyzed : 10/26/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.00098	mg/m3
Arsenic	0.30	<0.30	<0.00033	mg/m3
Barium	0.15	0.56	0.00061	mg/m3
Beryllium	0.15	<0.15	<0.00016	mg/m3
Cadmium	0.15	<0.15	<0.00016	mg/m3
Calcium Oxide	100.	<100	<0.11	mg/m3
Chromium	7.5	<7.5	<0.0081	mg/m3
Cobalt	0.45	<0.45	<0.00049	mg/m3
Copper	0.30	<0.30	<0.00033	mg/m3
Lead	0.38	<0.38	<0.00041	mg/m3
Manganese	0.15	0.20	0.00021	mg/m3
Selenium	2.3	<2.3	<0.0024	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 27-OCT-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 19-OCT-17
Date Received : 25-OCT-17

Account No.: 90734
Login No. : L423110
Date Analyzed : 26-OCT-17 - 31-OCT-17
Report ID : 1027442

Client ID : 22152-T52 **Lab ID : L423110-10** **Air Volume : NA**
Date Sampled : 10/19/17 **Date Analyzed : 10/26/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.30	<0.30	NA	mg/m3
Barium	0.15	<0.15	NA	mg/m3
Beryllium	0.15	<0.15	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.45	<0.45	NA	mg/m3
Copper	0.30	<0.30	NA	mg/m3
Lead	0.38	<0.38	NA	mg/m3
Manganese	0.15	<0.15	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 27-OCT-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 19-OCT-17
Date Received : 25-OCT-17

Account No.: 90734
Login No. : L423110

Date Analyzed : 26-OCT-17 - 31-OCT-17
Report ID : 1028148

Client ID : 22152-I49 **Lab ID : L423110-5** **Air Volume : 930.5 L**
Date Sampled : 10/19/17 **Date Analyzed : 10/31/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	<0.0000081	mg/m3
Magnesium Oxide	12.	<12	<0.013	mg/m3
Molybdenum	0.075	<0.075	<0.000081	mg/m3
Nickel	0.15	<0.15	<0.00016	mg/m3
Thallium	0.75	<0.75	<0.00081	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.00086	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 31-OCT-17

Submitted by: JMR/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 19-OCT-17
Date Received : 25-OCT-17

Account No.: 90734
Login No. : L423110

Date Analyzed : 26-OCT-17 - 31-OCT-17
Report ID : 1028149

Client ID : 22152-I50 **Lab ID : L423110-6** **Air Volume : NA**
Date Sampled : 10/19/17 **Date Analyzed : 10/30/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	NA	mg/m3
Magnesium Oxide	12.	<12	NA	mg/m3
Molybdenum	0.075	<0.075	NA	mg/m3
Nickel	0.15	<0.15	NA	mg/m3
Thallium	0.75	<0.75	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm MCE
Date : 31-OCT-17

Submitted by: JMR/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 19-OCT-17
Date Received : 25-OCT-17

Account No.: 90734
Login No. : L423110
Date Analyzed : 30-OCT-17
Report ID : 1027942

Asbestos Fiber Count (A Rules)

Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
22152-A51	L423110-1	7/100	8.9	3427	468,700	0.007
22152-A52	L423110-2	0/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : BDB
Approved by : RCF
Date : 30-OCT-17
QC by: TJB
Supervisor: BDB

< -Less Than
> -Greater Than
ND -Not Detected
NA -Not Applicable
cc -Cubic Centimeters
NS -Not Specified
mm2 -Square millimeters

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LABORATORY ANALYSIS REPORT

Client	: Toronto Transit Commission Ltd	Account No.:	90734
Site	: NS	Login No. :	L423110
Project No.	: 22152		
Date Sampled	: 19-OCT-17	Date Analyzed :	26-OCT-17
Date Received	: 25-OCT-17	Report ID :	1027113

Inhalable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-I49	L423110-5	930.5	<0.10	<0.11

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.10 mg
Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV
OSHA PEL : NA
Collection Media : IOM 25mm PW PVC

Submitted by: PAH
Approved by : SPR
Date : 27-OCT-17 NYS DOH # : 11626
Supervisor: KRK QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 19-OCT-17
Date Received : 25-OCT-17

Account No.: 90734
Login No. : L423110
Date Analyzed : 27-OCT-17
Report ID : 1027644

Inhalable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-I50	L423110-6	NA	<0.10	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.10 mg
Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV
OSHA PEL : NA
Collection Media : IOM 25mm MCE

Submitted by: HVN
Approved by : SPR
Date : 27-OCT-17
Supervisor: KRK

NYS DOH # : 11626
QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 19-OCT-17
Date Received : 25-OCT-17

Account No.: 90734
Login No. : L423110
Date Analyzed : 26-OCT-17
Report ID : 1027114

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-S51	L423110-3	918.2	<0.050	<0.054
22152-S52	L423110-4	NA	<0.050	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg
Analytical Method : mod. NIOSH 0600; Gravimetric
OSHA PEL : PNOR 5 mg/m3 (TWA)
Collection Media : PVC PW 37mm

Submitted by: HVN
Approved by : SPR
Date : 27-OCT-17
Supervisor: KRK

NYS DOH # : 11626
QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 19-OCT-17
Date Received : 25-OCT-17

Account No.: 90734
Login No. : L423110
Date Analyzed : 26-OCT-17 - 02-NOV-17
Report ID : 1028867

Respirable Crystalline Silica (RCS): Quartz, Cristobalite, Tridymite

Sample ID	Lab ID	Analyte	Air Vol l	ug	ug/m3
22152-S51	L423110-3	Quartz	918.2	<5.0	<5.4
		Cristobalite	918.2	<5.0	<5.4
		Tridymite	918.2	<20	<22
		RCS	918.2	<5.0	<5.4
22152-S52	L423110-4	Quartz	NA	<5.0	NA
		Cristobalite	NA	<5.0	NA
		Tridymite	NA	<20	NA
		RCS	NA	<5.0	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: Q:5.0ug C:5.0ug T:20.ug
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD
OSHA PEL : 50 ug/m3 RCS
Collection Media : PVC PW 37mm

Submitted: SPR
Approved: KRK
Date : 02-NOV-17 NYS DOH # : 11626
Supervisor: KRK QC by: TJB

< -Less Than
> -Greater Than
NA -Not Applicable
mg -Milligrams
ug -Micrograms
ND -Not Detected
kg -Kilograms
m3 -Cubic Meters
l -Liters
ppm -Parts per Million
NS -Not Specified
mppcf -Million Particles per Cubic Foot

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 19-OCT-17 Account No.: 90734
Date Received: 25-OCT-17 Login No. : L423110
Date Analyzed: 26-OCT-17 - 02-NOV-17

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L423110 (Report ID: 1028149):
TLV for Vanadium pentoxide: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for Magnesium Oxide: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: im-mwvfilt(28), MT-SOP-21(10)
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3;

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 19-OCT-17 Account No.: 90734
Date Received: 25-OCT-17 Login No. : L423110
Date Analyzed: 26-OCT-17 - 02-NOV-17

L423110 (Report ID: 1028149):
as Fume, Ceiling = 0.1 mg/m3.

L423110 (Report ID: 1028149):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Beryllium	+/-12.6%	103%
Magnesium Oxide	+/-9.1%	102%
Molybdenum	+/-10.3%	99.4%
Nickel	+/-10%	103%
Thallium	+/-6.6%	99.5%
Vanadium Pentoxide	+/-9.1%	102%

Parameter	Method	PEL
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/M	0.0002 mg/m3 (TWA)
Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	See footnote

L423110 (Report ID: 1028148):
TLV for Vanadium pentoxide: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for Magnesium Oxide: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 19-OCT-17 Account No.: 90734
Date Received: 25-OCT-17 Login No. : L423110
Date Analyzed: 26-OCT-17 - 02-NOV-17

L423110 (Report ID: 1028148):
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: im-mwvfilt(28), MT-SOP-21(10)
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3; as Fume, Ceiling = 0.1 mg/m3.

L423110 (Report ID: 1028148):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Beryllium	+/-12.6%	103%
Magnesium Oxide	+/-9.1%	102%
Molybdenum	+/-10.3%	99.4%
Nickel	+/-10%	103%
Thallium	+/-6.6%	99.5%
Vanadium Pentoxide	+/-9.1%	102%

Parameter	Method	PEL
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/M	0.0002 mg/m3 (TWA)
Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 19-OCT-17 Account No.: 90734
Date Received: 25-OCT-17 Login No. : L423110
Date Analyzed: 26-OCT-17 - 02-NOV-17

L423110 (Report ID: 1028148):

Parameter	Method	PEL
Thallium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	See footnote

L423110 (Report ID: 1027442):
TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for COBALT: 0.02 mg/m3
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for Calcium Oxide: 2 mg/m3
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3
TLV for SELENIUM: 0.2 mg/m3
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for CHROMIUM: 0.5 mg/m3
TLV for IRON OXIDE: 5 mg/m3
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(32), im-mwvfilt(28)
PEL listed refers to Aluminum as total dust.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 19-OCT-17 Account No.: 90734
Date Received: 25-OCT-17 Login No. : L423110
Date Analyzed: 26-OCT-17 - 02-NOV-17

L423110 (Report ID: 1027442):
compounds, as Mo (total dust) = 15 mg/m3.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.

L423110 (Report ID: 1027442):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-7.7%	96.9%
Antimony	+/-9.8%	97.3%
Arsenic	+/-7.6%	103%
Barium	+/-6.5%	101%
Beryllium	+/-10.8%	103%
Cadmium	+/-8.6%	102%
Calcium Oxide	+/-10.6%	105%
Chromium	+/-11.2%	103%
Cobalt	+/-8.5%	103%
Copper	+/-10.3%	103%
Iron Oxide	+/-9.6%	106%
Lead	+/-9.1%	100%
Manganese	+/-8.3%	99.8%
Molybdenum	+/-7.6%	100%
Selenium	+/-11.6%	105%
Zinc Oxide	+/-8.9%	102%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 19-OCT-17 Account No.: 90734
Date Received: 25-OCT-17 Login No. : L423110
Date Analyzed: 26-OCT-17 - 02-NOV-17

Parameter	Method	PEL
Aluminum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)
Chromium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Selenium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

L423110 (Report ID: 1027942):
SOPs: ia-pcm(26)
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a greater than optimal variability and are probably biased.
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as follows:
0.154 (5-20 fibers/100 fields)
0.100 (>20-50 fibers/100 fields)
0.069 (>50-100 fibers/100 fields)
0.090 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take into account any uncertainty associated with the sampling process.

L423110 (Report ID: 1027644):
SOPs: GRAV-SOP-8(17)

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 19-OCT-17 Account No.: 90734
Date Received: 25-OCT-17 Login No. : L423110
Date Analyzed: 26-OCT-17 - 02-NOV-17

L423110 (Report ID: 1027644):
Gravimetric analytical accuracy of the sampling media is 0.013 +/- 0.062 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.

L423110 (Report ID: 1027113):
SOPs: GRAV-SOP-8(17)
Gravimetric analytical accuracy of the sampling media is -0.001 +/- 0.030 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.

L423110 (Report ID: 1027114):
TLV for RESPIRABLE DUST: NA
SOPs: GRAV-SOP-5(18), GRAV-SOP-6(17)
Gravimetric analytical accuracy of the sampling media is 0.002 +/- 0.018 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.
PNOR = Particulates Not Otherwise Regulated.

L423110 (Report ID: 1028867):
TLV for QUARTZ: 0.025 mg/m3 Respirable
TLV for TRIDYMITE: NA
TLV for CRISTOBALITE: 0.025 mg/m3 Respirable
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26),

L423110 (Report ID: 1028867):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-13.8%	101%
Quartz	+/-10.9%	93.4%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 19-OCT-17 Account No.: 90734
Date Received: 25-OCT-17 Login No. : L423110
Date Analyzed: 26-OCT-17 - 02-NOV-17

Tridymite	+/-13.6%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

L423110

R11

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☐ New Client?

Client Account No.*:

Report To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2

Phone No.*: 416-393-6668
Cell No.:
Email Results to: Virgil.Umali@ttc.ca & oheresults@oheconsultants.com
Email address:

Invoice To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2

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Email:
P.O. No.: PU240835
Credit Card ☐ Card on File ☐ Call for Credit Card Info.

☐ Samples submitted using the FreePumpLoan™ Program ☐ Samples submitted using the FreeSamplingBadges™ Program

Need Results By*:	(surcharge)
☑ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%

Check for availability an pricing for quicker turn around times.

Site Name: Project: 22152 Sampled by: OHE Consultants

Comments:

TTC Subway Air Quality

List description of industry or Process/interferences present in sampling area:

Province samples were collected in (ex. ON)

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify):

Sample Identification* (Maxmium of 20 Characters. ID's longer than 20 characters will be abbreviated.)	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (e.g., welding plating, painting, etc.)*
22152 - A51	10/19/17	25 mm PCM	468.7	L	Standardized List of Analyses for TTC		
22152 - A52	10/19/17	25 mm PCM	-	-	Subway Air Quality Study		
22152 - S51	10/19/17	PW PVC in PPI	918.2	L	-		
22152 - S52	10/19/17	PW PVC in PPI	-	-	-		
22152 - I49	10/19/17	PW PVC in IOM	930.5	L	-		
22152 - I50	10/19/17	PW PVC in IOM	-	-	-		
22152 - M51	10/19/17	UW MCE in PPI	919.1	L	-		
22152 - M52	10/19/17	UW MCE in PPI	-	-	-		
22152 - T51	10/19/17	UW MCE	921.8	L	-		
22152 - T52	10/19/17	UW MCE	-	-	-		

^Galson Laboratories will subsititute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ, please indicate if the lower LOQ is required (only available for certain analytes - see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date	Time		Print Name/Signature	Date	Time
Relinquished by:	Yunny Desiana Lee	10/20/17	13:50	Received by:	Herman San	10/23/17	2:07pm
Relinquished by	Herman San	10/23/17	6:00pm	Received by:		10-25-17	1012

Samples received after 3pm will be considered as next day's business

* Required fields, failure to complete these fields may result in a delay in your samples being processed.

The TTC file number/purchase order number is PU240835:

1) Total Metals by NIOSH 7300. Analyze for antimony, arsenic, barium, beryllium, cadmium, calcium oxide, chromium III, cobalt, copper, lead, manganese, and selenium.

2) Asbestos fibre count by NIOSH 7400. In addition, analyze specifically for asbestos by TEM if the fibre count result exceeds 0.01 f/cc.

3) Respirable silica and respirable dust by NIOSH 7500/0600. Analyze for quartz, cristobalite, tridymite, and dust.

4) Respirable metals by NIOSH 7300. Analyze for aluminum, cadmium, iron oxide, molybdenum, and zinc oxide.

5) Inhalable metals and inhalable dust by NIOSH 7300/0500. Analyze for magnesium oxide, molybdenum, nickel, thallium, vanadium pentoxide, and dust. Beryllium should also be analyzed by ICP-MS to get a lower limit of detection.

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Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Canada

November 08, 2017

AIHA-LAP #100324 Account# 90734 Login# L423757

Dear Mr. Umali:

Enclosed are the analytical results for the samples received by our laboratory on October 31, 2017. All test results meet the quality control requirements of AIHA-LAP and NELAC unless otherwise stated in this report. All samples on the chain of custody were received in good condition unless otherwise noted.

Results in this report are based on the sampling data provided by the client and refer only to the samples as they were received at the laboratory. Unless otherwise requested, samples for asbestos analysis will be discarded 60 days from the date of this report and all other non-IOM samples will be retained for 14 days following the date of this report (when possible). IOMs will be cleaned & disposed of after seven calendar days.

To ensure the safety of laboratory receiving personnel, always seal bulk samples securely to prevent possible escape of material. Also, please double-bag bulk samples individually prior to shipping. Samples not received in this manner will be noted on the chain of custody form.

Current Scopes of Accreditation can be viewed at www.galsonlabs.com in the accreditations section under the "about Galson" tab.

Please contact Katrina Ahchong at (888) 432-5227, if you would like any additional information regarding this report. Thank you for using SGS Galson Laboratories.

Sincerely,

SGS Galson Laboratories

Lisa Swab
Laboratory Director

Enclosure(s)

Galson Laboratories, Inc. is now a part of SGS, the world's leading inspection, verification, testing, and certification company. As part of our transition to SGS, you will begin to see some formatting changes with reports that will improve the presentation of data and allow for the transition to the new logo.

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 24-OCT-17
Date Received : 31-OCT-17

Account No.: 90734
Login No. : L423757
Date Analyzed : 02-NOV-17 - 05-NOV-17
Report ID : 1029030

Client ID : 22152 - M53 **Lab ID : L423757-7** **Air Volume : 1153.7 L**
Date Sampled : 10/24/17 **Date Analyzed : 11/02/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.0065	mg/m3
Cadmium	0.15	<0.15	<0.00013	mg/m3
Iron Oxide	11.	25	0.022	mg/m3
Molybdenum	0.15	<0.15	<0.00013	mg/m3
Zinc Oxide	2.8	<2.8	<0.0024	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 03-NOV-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 24-OCT-17
Date Received : 31-OCT-17

Account No.: 90734
Login No. : L423757

Date Analyzed : 02-NOV-17 - 05-NOV-17
Report ID : 1029030

Client ID : 22152 - M54 **Lab ID : L423757-8** **Air Volume : NA**
Date Sampled : 10/24/17 **Date Analyzed : 11/02/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 03-NOV-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 24-OCT-17
Date Received : 31-OCT-17

Account No.: 90734
Login No. : L423757

Date Analyzed : 02-NOV-17 - 05-NOV-17
Report ID : 1029030

Client ID : 22152 - T53 **Lab ID : L423757-9** **Air Volume : 1156.0 L**
Date Sampled : 10/24/17 **Date Analyzed : 11/02/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.00078	mg/m3
Arsenic	0.30	<0.30	<0.00026	mg/m3
Barium	0.15	0.42	0.00036	mg/m3
Beryllium	0.15	<0.15	<0.00013	mg/m3
Cadmium	0.15	<0.15	<0.00013	mg/m3
Calcium Oxide	100.	<100	<0.091	mg/m3
Chromium	7.5	<7.5	<0.0065	mg/m3
Cobalt	0.45	<0.45	<0.00039	mg/m3
Copper	0.30	<0.30	<0.00026	mg/m3
Lead	0.38	<0.38	<0.00032	mg/m3
Manganese	0.15	0.24	0.00021	mg/m3
Selenium	2.3	<2.3	<0.0019	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 03-NOV-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 24-OCT-17
Date Received : 31-OCT-17

Account No.: 90734
Login No. : L423757

Date Analyzed : 02-NOV-17 - 05-NOV-17
Report ID : 1029030

Client ID : 22152 - T54 **Lab ID : L423757-10** **Air Volume : NA**
Date Sampled : 10/24/17 **Date Analyzed : 11/02/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.30	<0.30	NA	mg/m3
Barium	0.15	<0.15	NA	mg/m3
Beryllium	0.15	<0.15	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.45	<0.45	NA	mg/m3
Copper	0.30	<0.30	NA	mg/m3
Lead	0.38	<0.38	NA	mg/m3
Manganese	0.15	<0.15	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 03-NOV-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 24-OCT-17
Date Received : 31-OCT-17

Account No.: 90734
Login No. : L423757

Date Analyzed : 02-NOV-17 - 05-NOV-17
Report ID : 1029241

Client ID : 22152 - I51 **Lab ID : L423757-5** **Air Volume : 1175.7 L**
Date Sampled : 10/24/17 **Date Analyzed : 11/05/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	<0.0000064	mg/m3
Magnesium Oxide	12.	<12	<0.011	mg/m3
Molybdenum	0.075	0.092	0.000078	mg/m3
Nickel	0.15	<0.15	<0.00013	mg/m3
Thallium	0.75	<0.75	<0.00064	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.00068	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm MCE
Date : 06-NOV-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 24-OCT-17
Date Received : 31-OCT-17

Account No.: 90734
Login No. : L423757

Date Analyzed : 02-NOV-17 - 05-NOV-17
Report ID : 1029241

Client ID : 22152 - I52 **Lab ID : L423757-6** **Air Volume : NA**
Date Sampled : 10/24/17 **Date Analyzed : 11/05/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	NA	mg/m3
Magnesium Oxide	12.	<12	NA	mg/m3
Molybdenum	0.075	<0.075	NA	mg/m3
Nickel	0.15	<0.15	NA	mg/m3
Thallium	0.75	<0.75	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm MCE
Date : 06-NOV-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 24-OCT-17
Date Received : 31-OCT-17

Account No.: 90734
Login No. : L423757
Date Analyzed : 06-NOV-17
Report ID : 1029384

Asbestos Fiber Count (A Rules)

Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
22152 - A53	L423757-1	4/100	<7	<2700	597,300	<0.005
22152 - A54	L423757-2	0/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : BTM
Approved by : BDB
Date : 06-NOV-17
QC by: TJB
Supervisor: BDB

< -Less Than
> -Greater Than
ND -Not Detected
NA -Not Applicable
cc -Cubic Centimeters
NS -Not Specified
mm2 -Square millimeters

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 24-OCT-17
Date Received : 31-OCT-17

Account No.: 90734
Login No. : L423757
Date Analyzed : 01-NOV-17
Report ID : 1028392

Inhalable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152 - I51	L423757-5	1175.7	<0.10	<0.085
22152 - I52	L423757-6	NA	<0.10	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.10 mg
Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV
OSHA PEL : NA
Collection Media : IOM 25mm MCE

Submitted by: PAH
Approved by : SPR
Date : 01-NOV-17
Supervisor: KRK

NYS DOH # : 11626
QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 24-OCT-17
Date Received : 31-OCT-17

Account No.: 90734
Login No. : L423757
Date Analyzed : 01-NOV-17
Report ID : 1028393

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152 - S53	L423757-3	1168	<0.050	<0.043
22152 - S54	L423757-4	NA	<0.050	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg
Analytical Method : mod. NIOSH 0600; Gravimetric
OSHA PEL : PNOR 5 mg/m3 (TWA)
Collection Media : PVC PW 37mm

Submitted by: HVN
Approved by : SPR
Date : 01-NOV-17
Supervisor: KRK

NYS DOH # : 11626
QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 24-OCT-17
Date Received : 31-OCT-17

Account No.: 90734
Login No. : L423757
Date Analyzed : 02-NOV-17
Report ID : 1028923

Hexavalent Chromium

Sample ID	Lab ID	Air Vol liter	Total ug	Conc ug/m3
22152 - H9	L423757-11	1164.3	<0.030	<0.026
22152 - H10	L423757-12	NA	<0.030	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.030 ug
Analytical Method : mod. OSHA ID-215 (version 2); IC/UV
OSHA PEL : 5 ug/m3 (TWA)
Collection Media : PVC UW 37mm

Submitted by: TMK
Approved by : NKP
Date : 03-NOV-17
Supervisor: MWJ

NYS DOH # : 11626
QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 24-OCT-17
Date Received : 31-OCT-17

Account No.: 90734
Login No. : L423757
Date Analyzed : 01-NOV-17 - 07-NOV-17
Report ID : 1030031

Respirable Crystalline Silica (RCS): Quartz, Cristobalite, Tridymite

Sample ID	Lab ID	Analyte	Air Vol l	ug	ug/m3
22152 - S53	L423757-3	Quartz	1168	<5.0	<4.3
		Cristobalite	1168	<5.0	<4.3
		Tridymite	1168	<20	<17
		RCS	1168	<5.0	<4.3
22152 - S54	L423757-4	Quartz	NA	<5.0	NA
		Cristobalite	NA	<5.0	NA
		Tridymite	NA	<20	NA
		RCS	NA	<5.0	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: Q:5.0ug C:5.0ug T:20.ug
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD
OSHA PEL : 50 ug/m3 RCS
Collection Media : PVC PW 37mm

Submitted: AJD
Approved: CMR
Date : 08-NOV-17 NYS DOH # : 11626
Supervisor: KRK QC by: TJB

< -Less Than
> -Greater Than
NA -Not Applicable
mg -Milligrams
ug -Micrograms
ND -Not Detected
kg -Kilograms
m3 -Cubic Meters
l -Liters
ppm -Parts per Million
NS -Not Specified
mppcf -Million Particles per Cubic Foot

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 24-OCT-17 Account No.: 90734
Date Received: 31-OCT-17 Login No. : L423757
Date Analyzed: 01-NOV-17 - 07-NOV-17

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L423757 (Report ID: 1029241):
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: im-mwvfilt(28), MT-SOP-21(10)
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3; as Fume, Ceiling = 0.1 mg/m3.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
TLV for VANADIUM PENTOXIDE: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for MAGNESIUM OXIDE: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 24-OCT-17 Account No.: 90734
Date Received: 31-OCT-17 Login No. : L423757
Date Analyzed: 01-NOV-17 - 07-NOV-17

L423757 (Report ID: 1029241):

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Beryllium	+/-12.6%	103%
Magnesium Oxide	+/-9.1%	102%
Molybdenum	+/-10.3%	99.4%
Nickel	+/-10%	103%
Thallium	+/-6.6%	99.5%
Vanadium Pentoxide	+/-9.1%	102%

Parameter	Method	PEL
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/M	0.0002 mg/m3 (TWA)
Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	See footnote

L423757 (Report ID: 1029030):

TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for COBALT: 0.02 mg/m3
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for Calcium Oxide: 2 mg/m3
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3
TLV for SELENIUM: 0.2 mg/m3

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 24-OCT-17 Account No.: 90734
Date Received: 31-OCT-17 Login No. : L423757
Date Analyzed: 01-NOV-17 - 07-NOV-17

L423757 (Report ID: 1029030):
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for CHROMIUM: 0.5 mg/m3
TLV for IRON OXIDE: 5 mg/m3
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(33), im-mwvfilt(28)
PEL listed refers to Aluminum as total dust.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.

L423757-7-8 (Report ID: 1029030):
Results are reported as respirable metals.

L423757 (Report ID: 1029030):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-7.7%	96.9%
Antimony	+/-9.8%	97.3%
Arsenic	+/-7.6%	103%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 24-OCT-17 Account No.: 90734
Date Received: 31-OCT-17 Login No. : L423757
Date Analyzed: 01-NOV-17 - 07-NOV-17

Barium	+/-6.5%	101%
Beryllium	+/-10.8%	103%
Cadmium	+/-8.6%	102%
Calcium Oxide	+/-10.6%	105%
Chromium	+/-11.2%	103%
Cobalt	+/-8.5%	103%
Copper	+/-10.3%	103%
Iron Oxide	+/-9.6%	106%
Lead	+/-9.1%	100%
Manganese	+/-8.3%	99.8%
Molybdenum	+/-7.6%	100%
Selenium	+/-11.6%	105%
Zinc Oxide	+/-8.9%	102%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)
Chromium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Selenium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

L423757 (Report ID: 1029384):
SOPs: ia-pcm(26)

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 24-OCT-17 Account No.: 90734
Date Received: 31-OCT-17 Login No. : L423757
Date Analyzed: 01-NOV-17 - 07-NOV-17

L423757 (Report ID: 1029384):
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a greater than optimal variability and are probably biased.
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as follows:
0.154 (5-20 fibers/100 fields)
0.100 (>20-50 fibers/100 fields)
0.069 (>50-100 fibers/100 fields)
0.090 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take into account any uncertainty associated with the sampling process.

L423757 (Report ID: 1028392):
SOPs: GRAV-SOP-8(17)
Gravimetric analytical accuracy of the sampling media is 0.013 +/- 0.062 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.

L423757 (Report ID: 1028393):
TLV for RESPIRABLE DUST: NA
SOPs: GRAV-SOP-5(18), GRAV-SOP-6(17)
Gravimetric analytical accuracy of the sampling media is 0.002 +/- 0.018 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.
PNOR = Particulates Not Otherwise Regulated.

L423757 (Report ID: 1028923):
TLV for Hexavalent Chromium: 0.01 mg/m3 (as Cr, Insol)
SOPs: IC-SOP-15(19)
Total ug corrected for a desorption efficiency of 100%.
SGS Galson Laboratories pretests all media lots distributed for Hexavalent Chromium analysis and can provide data confirming that no significant background is present. We may not be able to verify lot background levels for media obtained through alternate vendors.

< -Less Than	mg -Milligrams	m3 -Cubic Meters	kg -Kilograms	ppm -Parts per Million		
> -Greater Than	ug -Micrograms	l -Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable	

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 24-OCT-17 Account No.: 90734
Date Received: 31-OCT-17 Login No. : L423757
Date Analyzed: 01-NOV-17 - 07-NOV-17

L423757 (Report ID: 1028923):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Hexavalent Chromium	+/-12.7%	96.3%

L423757 (Report ID: 1030031):
TLV for QUARTZ: 0.025 mg/m3 Respirable
TLV for TRIDYMITE: NA
TLV for CRISTOBALITE: 0.025 mg/m3 Respirable
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26)

L423757 (Report ID: 1030031):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-13.8%	101%
Quartz	+/-10.9%	93.4%
Tridymite	+/-13.6%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

L423757 R 101

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1140 Sheppard Avenue West
Unit 5
North York, Ontario, Canada M3K 2A2
Tel: 888-432-5227
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☐ New Client?

Client Account No.*:

Report To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2
Phone No.*: 416-393-6668
Cell No.:
Email Results to: Virgil.Umali@ttc.ca & oheresults@oheconsultants.com
Email address:

Invoice To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2
Phone No.:
Email:
P.O. No.: PU240835
Credit Card ☐ Card on File ☐ Call for Credit Card Info.

☐ Samples submitted using the FreePumpLoan™ Program ☐ Samples submitted using the FreeSamplingBadges™ Program

Need Results By*:	(surcharge)
☑ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%

Check for availability an pricing for quicker turn around times.

Site Name: Project: 22152 Sampled by: OHE Consultants

Comments:

TTC Subway Air Quality

List description of industry or Process/interferences present in sampling area:

Province samples were collected in (ex. ON)

Please indicate which OEL this data will be used for: ☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA ☐ MSHA ☐ Other (specify):

Sample Identification* (Maxmium of 20 Characters. ID's longer than 20 characters will be abbreviated.)	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml, min, in2, cm2, ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (e.g., welding plating, painting, etc.)*
22152 - A53	10/24/17	25 mm PCM	597.3	L	Standardized List of Analyses for TTC		
22152 - A54	10/24/17	25 mm PCM	-	-	Subway Air Quality Study		
22152 - S53	10/24/17	PW PVC in PPI	1168.0	L	-		
22152 - S54	10/24/17	PW PVC in PPI	-	-	-		
22152 - I51	10/24/17	PW ~~PVC~~ ACE in IOM	1175.7	L	-		
22152 - I52	10/24/17	PW ~~PVC~~ in IOM	-	-	-		
22152 - M53	10/24/17	UW MCE in PPI	1153.7	L	-		
22152 - M54	10/24/17	UW MCE in PPI	-	-	-		
22152 - T53	10/24/17	UW MCE	1156.0	L	-		
22152 - T54	10/24/17	UW MCE	-	-	-		

^Galson Laboratories will subsititute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ, please indicate if the lower LOQ is required (only available for certain analytes - see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date	Time		Print Name/Signature	Date	Time
Relinquished by	Yunny Desiana Lee [signature]	10/25/17	14:50	Received by:	[signature]	10/30/17	3:38pm
Relinquished by	[signature]	10/30/17	6:00p	Received by:	[signature]	10/31/17	1024

Samples received after 3pm will be considered as next day's business

* Required fields, failure to complete these fields may delay sample processing.

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☐ New Client?

Client Account No.*: _____

Report To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2

Phone No.*: 416-393-6668
Cell No.: _____
Email Results to: Virgil.Umali@ttc.ca & oheresults@oheconsultants.com
Email address: _____

Invoice To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2

Phone No.: _____
Email: _____
P.O. No.: PU240835
Credit Card ☐ Card on File ☐ Call for Credit Card Info.

☐ Samples submitted using the FreePumpLoan™ Program ☐ Samples submitted using the FreeSamplingBadges™ Program

Need Results By*:	(surcharge)
☑ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%

Check for availability an pricing for quicker turn around times.

Site Name: Project: 22152 Sampled by: OHE Consultants

Comments:

TTC Subway Air Quality

List description of industry or Process/interferences present in sampling area:

Province samples were collected in (ex. ON)

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify):

Sample Identification* (Maxmium of 20 Characters. ID's longer than 20 characters will be abbreviated.)	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (e.g., welding plating, painting, etc.)*
22152 - H9	10/24/17	2pc UW PVC	1164.3	L	Hexavalent Chromium	mod.OSHA 215	Other
22152 - H10	10/24/17	2pc UW PVC	-	-	-	-	-
					-		
					-		
					-		
					-		
					-		
					-		
					-		
					-		
					-		

^Galson Laboratories will subsitute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ, please indicate if the lower LOQ is required (only available for certain analytes - see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date	Time		Print Name/Signature	Date	Time
Relinquished by	Yunny Desiana Lee	10/25/17	14:50	Received by:		10/26/17	3:30pm
Relinquished by		10/30/17		Received by:		10-31-17 1024	

Samples received after 3pm will be considered as next day's business

* Required fields, failure to complete these fields may result in your samples not being processed.

90734

The TTC file number/purchase order number is PU240835:

1) Total Metals by NIOSH 7300. Analyze for antimony, arsenic, barium, beryllium, cadmium, calcium oxide, chromium III, cobalt, copper, lead, manganese, and selenium. UW MCE

2) Asbestos fibre count by NIOSH 7400. In addition, analyze specifically for asbestos by TEM if the fibre count result exceeds 0.01 f/cc. PCM

3) Respirable silica and respirable dust by NIOSH 7500/0600. Analyze for quartz, cristobalite, tridymite, and dust. PPI PW PVC

4) Respirable metals by NIOSH 7300. Analyze for aluminum, cadmium, iron oxide, molybdenum, and zinc oxide. PPI UW MCE

5) Inhalable metals and inhalable dust by NIOSH 7300/0500. Analyze for magnesium oxide, molybdenum, nickel, thallium, vanadium pentoxide, and dust. Beryllium should also be analyzed by ICP-MS to get a lower limit of detection. IOM

Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Canada

November 08, 2017

AIHA-LAP #100324 Account# 90734 Login# L423780

Dear Mr. Umali:

Enclosed are the analytical results for the samples received by our laboratory on October 31, 2017. All test results meet the quality control requirements of AIHA-LAP and NELAC unless otherwise stated in this report. All samples on the chain of custody were received in good condition unless otherwise noted.

Results in this report are based on the sampling data provided by the client and refer only to the samples as they were received at the laboratory. Unless otherwise requested, samples for asbestos analysis will be discarded 60 days from the date of this report and all other non-IOM samples will be retained for 14 days following the date of this report (when possible). IOMs will be cleaned & disposed of after seven calendar days.

To ensure the safety of laboratory receiving personnel, always seal bulk samples securely to prevent possible escape of material. Also, please double-bag bulk samples individually prior to shipping. Samples not received in this manner will be noted on the chain of custody form.

Current Scopes of Accreditation can be viewed at www.galsonlabs.com in the accreditations section under the "about Galson" tab.

Please contact Katrina Ahchong at (888) 432-5227, if you would like any additional information regarding this report. Thank you for using SGS Galson Laboratories.

Sincerely,

SGS Galson Laboratories

Lisa Swab
Laboratory Director

Enclosure(s)

Galson Laboratories, Inc. is now a part of SGS, the world's leading inspection, verification, testing, and certification company. As part of our transition to SGS, you will begin to see some formatting changes with reports that will improve the presentation of data and allow for the transition to the new logo.

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East Syracuse, NY 13057
(315) 432-5227
FAX: (315) 437-0571
www.galsonlabs.com

LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 26-OCT-17
Date Received : 31-OCT-17

Account No.: 90734
Login No. : L423780

Date Analyzed : 02-NOV-17 - 05-NOV-17
Report ID : 1029044

Client ID : 22152-M55 **Lab ID : L423780-7** **Air Volume : 995.9 L**
Date Sampled : 10/26/17 **Date Analyzed : 11/02/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.0075	mg/m3
Cadmium	0.15	<0.15	<0.00015	mg/m3
Iron Oxide	11.	27	0.027	mg/m3
Molybdenum	0.15	<0.15	<0.00015	mg/m3
Zinc Oxide	2.8	<2.8	<0.0028	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 03-NOV-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 26-OCT-17
Date Received : 31-OCT-17

Account No.: 90734
Login No. : L423780

Date Analyzed : 02-NOV-17 - 05-NOV-17
Report ID : 1029044

Client ID : 22152-M56 **Lab ID : L423780-8** **Air Volume : NA**
Date Sampled : 10/26/17 **Date Analyzed : 11/02/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 03-NOV-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 26-OCT-17
Date Received : 31-OCT-17

Account No.: 90734
Login No. : L423780

Date Analyzed : 02-NOV-17 - 05-NOV-17
Report ID : 1029044

Client ID : 22152-T55 **Lab ID : L423780-9** **Air Volume : 995.7 L**
Date Sampled : 10/26/17 **Date Analyzed : 11/02/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.00090	mg/m3
Arsenic	0.30	<0.30	<0.00030	mg/m3
Barium	0.15	0.59	0.00060	mg/m3
Beryllium	0.15	<0.15	<0.00015	mg/m3
Cadmium	0.15	<0.15	<0.00015	mg/m3
Calcium Oxide	100.	<100	<0.11	mg/m3
Chromium	7.5	<7.5	<0.0075	mg/m3
Cobalt	0.45	<0.45	<0.00045	mg/m3
Copper	0.30	<0.30	<0.00030	mg/m3
Lead	0.38	<0.38	<0.00038	mg/m3
Manganese	0.15	0.24	0.00024	mg/m3
Selenium	2.3	<2.3	<0.0023	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 03-NOV-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 26-OCT-17
Date Received : 31-OCT-17

Account No.: 90734
Login No. : L423780

Date Analyzed : 02-NOV-17 - 05-NOV-17
Report ID : 1029044

Client ID : 22152-T56 **Lab ID : L423780-10** **Air Volume : NA**
Date Sampled : 10/26/17 **Date Analyzed : 11/02/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.30	<0.30	NA	mg/m3
Barium	0.15	<0.15	NA	mg/m3
Beryllium	0.15	<0.15	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.45	<0.45	NA	mg/m3
Copper	0.30	<0.30	NA	mg/m3
Lead	0.38	<0.38	NA	mg/m3
Manganese	0.15	<0.15	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 03-NOV-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 26-OCT-17
Date Received : 31-OCT-17

Account No.: 90734
Login No. : L423780

Date Analyzed : 02-NOV-17 - 05-NOV-17
Report ID : 1029242

Client ID : 22152-I53 **Lab ID : L423780-5** **Air Volume : 1018.9 L**
Date Sampled : 10/26/17 **Date Analyzed : 11/05/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	<0.0000074	mg/m3
Magnesium Oxide	12.	<12	<0.012	mg/m3
Molybdenum	0.075	<0.075	<0.000074	mg/m3
Nickel	0.15	<0.15	<0.00015	mg/m3
Thallium	0.75	<0.75	<0.00074	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.00079	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm MCE
Date : 06-NOV-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 26-OCT-17
Date Received : 31-OCT-17

Account No.: 90734
Login No. : L423780

Date Analyzed : 02-NOV-17 - 05-NOV-17
Report ID : 1029242

Client ID : 22152-I54 **Lab ID : L423780-6** **Air Volume : NA**
Date Sampled : 10/26/17 **Date Analyzed : 11/05/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	NA	mg/m3
Magnesium Oxide	12.	<12	NA	mg/m3
Molybdenum	0.075	<0.075	NA	mg/m3
Nickel	0.15	<0.15	NA	mg/m3
Thallium	0.75	<0.75	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm MCE
Date : 06-NOV-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 26-OCT-17
Date Received : 31-OCT-17

Account No.: 90734
Login No. : L423780
Date Analyzed : 06-NOV-17
Report ID : 1029385

Asbestos Fiber Count (A Rules)

Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
22152-A55	L423780-1	9.5/100	12.1	4659	521,700	0.009
22152-A56	L423780-2	2/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : BTM
Approved by : BDB
Date : 06-NOV-17
QC by: TJB
Supervisor: BDB

< -Less Than
> -Greater Than
ND -Not Detected
NA -Not Applicable
cc -Cubic Centimeters
NS -Not Specified
mm2 -Square millimeters

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 26-OCT-17
Date Received : 31-OCT-17

Account No.: 90734
Login No. : L423780
Date Analyzed : 01-NOV-17
Report ID : 1028380

Inhalable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-I53	L423780-5	1018.9	0.15	0.15
22152-I54	L423780-6	NA	<0.10	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.10 mg
Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV
OSHA PEL : NA
Collection Media : IOM 25mm MCE

Submitted by: PAH
Approved by : SPR
Date : 02-NOV-17
Supervisor: KRK

NYS DOH # : 11626
QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 26-OCT-17
Date Received : 31-OCT-17

Account No.: 90734
Login No. : L423780
Date Analyzed : 01-NOV-17
Report ID : 1028381

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-S55	L423780-3	1009.3	<0.050	<0.050
22152-S56	L423780-4	NA	<0.050	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg
Analytical Method : mod. NIOSH 0600; Gravimetric
OSHA PEL : PNOR 5 mg/m3 (TWA)
Collection Media : PVC PW 37mm

Submitted by: HVN
Approved by : SPR
Date : 01-NOV-17
Supervisor: KRK

NYS DOH # : 11626
QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 26-OCT-17
Date Received : 31-OCT-17

Account No.: 90734
Login No. : L423780

Date Analyzed : 01-NOV-17 - 08-NOV-17
Report ID : 1030115

Respirable Crystalline Silica (RCS): Quartz, Cristobalite, Tridymite

Sample ID	Lab ID	Analyte	Air Vol l	ug	ug/m3
22152-S55	L423780-3	Quartz	1009.3	<5.0	<5.0
		Cristobalite	1009.3	<5.0	<5.0
		Tridymite	1009.3	<20	<20
		RCS	1009.3	<5.0	<5.0
22152-S56	L423780-4	Quartz	NA	<5.0	NA
		Cristobalite	NA	<5.0	NA
		Tridymite	NA	<20	NA
		RCS	NA	<5.0	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: Q:5.0ug C:5.0ug T:20.ug
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD
OSHA PEL : 50 ug/m3 RCS
Collection Media : PVC PW 37mm

Submitted: AJD
Approved: KRK
Date : 08-NOV-17 NYS DOH # : 11626
Supervisor: KRK QC by: TJB

< -Less Than
> -Greater Than
NA -Not Applicable
mg -Milligrams
ug -Micrograms
ND -Not Detected
kg -Kilograms
m3 -Cubic Meters
l -Liters
ppm -Parts per Million
NS -Not Specified
mppcf -Million Particles per Cubic Foot

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East Syracuse, NY 13057
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www.galsonlabs.com

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 26-OCT-17 Account No.: 90734
Date Received: 31-OCT-17 Login No. : L423780
Date Analyzed: 01-NOV-17 - 08-NOV-17

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L423780 (Report ID: 1029242):
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: im-mwvfilt(28), MT-SOP-21(10)
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3; as Fume, Ceiling = 0.1 mg/m3.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
TLV for VANADIUM PENTOXIDE: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for MAGNESIUM OXIDE: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote

< -Less Than	mg -Milligrams	m3 -Cubic Meters	kg -Kilograms	ppm -Parts per Million		
> -Greater Than	ug -Micrograms	l -Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable	

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 26-OCT-17 Account No.: 90734
Date Received: 31-OCT-17 Login No. : L423780
Date Analyzed: 01-NOV-17 - 08-NOV-17

L423780 (Report ID: 1029242):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Beryllium	+/-12.6%	103%
Magnesium Oxide	+/-9.1%	102%
Molybdenum	+/-10.3%	99.4%
Nickel	+/-10%	103%
Thallium	+/-6.6%	99.5%
Vanadium Pentoxide	+/-9.1%	102%

Parameter	Method	PEL
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/M	0.0002 mg/m3 (TWA)
Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	See footnote

L423780 (Report ID: 1029044):
TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for COBALT: 0.02 mg/m3
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for Calcium Oxide: 2 mg/m3
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3
TLV for SELENIUM: 0.2 mg/m3

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 26-OCT-17 Account No.: 90734
Date Received: 31-OCT-17 Login No. : L423780
Date Analyzed: 01-NOV-17 - 08-NOV-17

L423780 (Report ID: 1029044):
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for CHROMIUM: 0.5 mg/m3
TLV for IRON OXIDE: 5 mg/m3
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(33), im-mwvfilt(28)
PEL listed refers to Aluminum as total dust.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.

L423780-7-8 (Report ID: 1029044):
Reported results are reported as Respirable Metals.

L423780 (Report ID: 1029044):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-7.7%	96.9%
Antimony	+/-9.8%	97.3%
Arsenic	+/-7.6%	103%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 26-OCT-17 Account No.: 90734
Date Received: 31-OCT-17 Login No. : L423780
Date Analyzed: 01-NOV-17 - 08-NOV-17

Barium	+/-6.5%	101%
Beryllium	+/-10.8%	103%
Cadmium	+/-8.6%	102%
Calcium Oxide	+/-10.6%	105%
Chromium	+/-11.2%	103%
Cobalt	+/-8.5%	103%
Copper	+/-10.3%	103%
Iron Oxide	+/-9.6%	106%
Lead	+/-9.1%	100%
Manganese	+/-8.3%	99.8%
Molybdenum	+/-7.6%	100%
Selenium	+/-11.6%	105%
Zinc Oxide	+/-8.9%	102%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)
Chromium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Selenium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

L423780 (Report ID: 1029385):
SOPs: ia-pcm(26)

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 26-OCT-17 Account No.: 90734
Date Received: 31-OCT-17 Login No. : L423780
Date Analyzed: 01-NOV-17 - 08-NOV-17

L423780 (Report ID: 1029385):
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a greater than optimal variability and are probably biased.
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as follows:
0.154 (5-20 fibers/100 fields)
0.100 (>20-50 fibers/100 fields)
0.069 (>50-100 fibers/100 fields)
0.090 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take into account any uncertainty associated with the sampling process.

L423780 (Report ID: 1028380):
SOPs: GRAV-SOP-8(17)
Gravimetric analytical accuracy of the sampling media is 0.013 +/- 0.062 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.

L423780 (Report ID: 1028381):
TLV for RESPIRABLE DUST: NA
SOPs: GRAV-SOP-5(18), GRAV-SOP-6(17)
Gravimetric analytical accuracy of the sampling media is 0.002 +/- 0.018 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.
PNOR = Particulates Not Otherwise Regulated.

L423780 (Report ID: 1030115):
TLV for QUARTZ: 0.025 mg/m3 Respirable
TLV for TRIDYMITE: NA
TLV for CRISTOBALITE: 0.025 mg/m3 Respirable
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26)

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 26-OCT-17 Account No.: 90734
Date Received: 31-OCT-17 Login No. : L423780
Date Analyzed: 01-NOV-17 - 08-NOV-17

L423780 (Report ID: 1030115):

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-13.8%	101%
Quartz	+/-10.9%	93.4%
Tridymite	+/-13.6%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

L4237780

51

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☐ New Client?

Client Account No.*: _____

Report To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2

Phone No.*: 416-393-6668
Cell No.:
Email Results to: Virgil.Umali@ttc.ca & oheresults@oheconsultants.com
Email address:

Invoice To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2

Phone No.:
Email:
P.O. No.: PU240835
Credit Card ☐ Card on File ☐ Call for Credit Card Info.

☐ Samples submitted using the FreePumpLoan™ Program ☐ Samples submitted using the FreeSamplingBadges™ Program

Need Results By*:	(surcharge)
☑ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%

Check for availability an pricing for quicker turn around times.

Site Name: Project: 22152 Sampled by: OHE Consultants

Comments:

TTC Subway Air Quality

List description of industry or Process/interferences present in sampling area:

Province samples were collected in (ex. ON)

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify):

Sample Identification* (Maxmium of 20 Characters. ID's longer than 20 characters will be abbreviated.)	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (e.g., welding plating, painting, etc.)*
22152 - A55	10/26/17	25 mm PCM	521.7	L	Standardized List of Analyses for TTC		
22152 - A56	10/26/17	25 mm PCM	-	-	Subway Air Quality Study		
22152 - S55	10/26/17	PW PVC in PPI	1009.3	L	-		
22152 - S56	10/26/17	PW PVC in PPI	-	-	-		
22152 - I53	10/26/17	PW PVC in IOM	1018.9	L	-		
22152 - I54	10/26/17	PW PVC in IOM	-	-	-		
22152 - M55	10/26/17	UW MCE in PPI	995.9	L	-		
22152 - M56	10/26/17	UW MCE in PPI	-	-	-		
22152 - T55	10/26/17	UW MCE	995.7	L	-		
22152 - T56	10/26/17	UW MCE	-	-	-		

^Galson Laboratories will subsititute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ, please indicate if the lower LOQ is required (only available for certain analytes - see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date	Time		Print Name/Signature	Date	Time
Relinquished by	Larysa Kokarovtseva	10/26/17	14:50	Received by:		10/30/17	3:40pm
Relinquished by		10/29/17	6:00pm	Received by:		10-31-17	0837

Samples received after 3pm will be considered as next day's business

* Required fields, failure to complete these fields may result in a delay in your samples being processed.

Page 1 of 1

The TTC file number/purchase order number is PU240835:

1) Total Metals by NIOSH 7300. Analyze for antimony, arsenic, barium, beryllium, cadmium, calcium oxide, chromium III, cobalt, copper, lead, manganese, and selenium.

2) Asbestos fibre count by NIOSH 7400. In addition, analyze specifically for asbestos by TEM if the fibre count result exceeds 0.01 f/cc.

3) Respirable silica and respirable dust by NIOSH 7500/0600. Analyze for quartz, cristobalite, tridymite, and dust.

4) Respirable metals by NIOSH 7300. Analyze for aluminum, cadmium, iron oxide, molybdenum, and zinc oxide.

5) Inhalable metals and inhalable dust by NIOSH 7300/0500. Analyze for magnesium oxide, molybdenum, nickel, thallium, vanadium pentoxide, and dust. Beryllium should also be analyzed by ICP-MS to get a lower limit of detection.

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Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Canada

November 14, 2017

AIHA-LAP #100324 Account# 90734 Login# L424375

Dear Mr. Umali:

Enclosed are the analytical results for the samples received by our laboratory on November 04, 2017. All test results meet the quality control requirements of AIHA-LAP and NELAC unless otherwise stated in this report. All samples on the chain of custody were received in good condition unless otherwise noted.

Results in this report are based on the sampling data provided by the client and refer only to the samples as they were received at the laboratory. Unless otherwise requested, samples for asbestos analysis will be discarded 60 days from the date of this report and all other non-IOM samples will be retained for 14 days following the date of this report (when possible). IOMs will be cleaned & disposed of after seven calendar days.

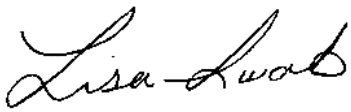
To ensure the safety of laboratory receiving personnel, always seal bulk samples securely to prevent possible escape of material. Also, please double-bag bulk samples individually prior to shipping. Samples not received in this manner will be noted on the chain of custody form.

Current Scopes of Accreditation can be viewed at www.sgsgalson.com in the accreditations section of the "About" page.

Please contact Katrina Ahchong at (888) 432-5227, if you would like any additional information regarding this report. Thank you for using SGS Galson Laboratories.

Sincerely,

SGS Galson Laboratories



Lisa Swab
Laboratory Director

Enclosure(s)

Galson Laboratories, Inc. is now a part of SGS, the world's leading inspection, verification, testing, and certification company. As part of our transition to SGS, you will begin to see some formatting changes withreports that will improve thepresentation of data and allow for the transition to the new logo.

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 30-OCT-17
Date Received : 04-NOV-17

Account No.: 90734
Login No. : L424375
Date Analyzed : 07-NOV-17 - 08-NOV-17
Report ID : 1029992

Client ID : 22152 - M57 **Lab ID : L424375-7** **Air Volume : 1095.9 L**
Date Sampled : 10/30/17 **Date Analyzed : 11/07/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.0068	mg/m3
Cadmium	0.15	<0.15	<0.00014	mg/m3
Iron Oxide	11.	19	0.017	mg/m3
Molybdenum	0.15	<0.15	<0.00014	mg/m3
Zinc Oxide	2.8	<2.8	<0.0026	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 08-NOV-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 30-OCT-17
Date Received : 04-NOV-17

Account No.: 90734
Login No. : L424375

Date Analyzed : 07-NOV-17 - 08-NOV-17
Report ID : 1029992

Client ID : 22152 - M58 **Lab ID : L424375-8** **Air Volume : NA**
Date Sampled : 10/30/17 **Date Analyzed : 11/07/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 08-NOV-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 30-OCT-17
Date Received : 04-NOV-17

Account No.: 90734
Login No. : L424375

Date Analyzed : 07-NOV-17 - 08-NOV-17
Report ID : 1029992

Client ID : 22152 - T57 **Lab ID : L424375-9** **Air Volume : 1099.7 L**
Date Sampled : 10/30/17 **Date Analyzed : 11/07/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.00082	mg/m3
Arsenic	0.30	<0.30	<0.00027	mg/m3
Barium	0.15	0.69	0.00063	mg/m3
Beryllium	0.15	<0.15	<0.00014	mg/m3
Cadmium	0.15	<0.15	<0.00014	mg/m3
Calcium Oxide	100.	<100	<0.095	mg/m3
Chromium	7.5	<7.5	<0.0068	mg/m3
Cobalt	0.45	<0.45	<0.00041	mg/m3
Copper	0.30	<0.30	<0.00027	mg/m3
Lead	0.38	<0.38	<0.00034	mg/m3
Manganese	0.15	0.23	0.00021	mg/m3
Selenium	2.3	<2.3	<0.0020	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 08-NOV-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 30-OCT-17
Date Received : 04-NOV-17

Account No.: 90734
Login No. : L424375
Date Analyzed : 07-NOV-17 - 08-NOV-17
Report ID : 1029992

Client ID : 22152 - T58 **Lab ID : L424375-10** **Air Volume : NA**
Date Sampled : 10/30/17 **Date Analyzed : 11/07/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.30	<0.30	NA	mg/m3
Barium	0.15	<0.15	NA	mg/m3
Beryllium	0.15	<0.15	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.45	<0.45	NA	mg/m3
Copper	0.30	<0.30	NA	mg/m3
Lead	0.38	<0.38	NA	mg/m3
Manganese	0.15	<0.15	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 08-NOV-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 30-OCT-17
Date Received : 04-NOV-17

Account No.: 90734
Login No. : L424375
Date Analyzed : 07-NOV-17 - 08-NOV-17
Report ID : 1030143

Client ID : 22152 - I55 **Lab ID : L424375-5** **Air Volume : 1098.4 L**
Date Sampled : 10/30/17 **Date Analyzed : 11/08/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	<0.0000068	mg/m3
Magnesium Oxide	12.	<12	<0.011	mg/m3
Molybdenum	0.075	0.21	0.00019	mg/m3
Nickel	0.15	0.17	0.00016	mg/m3
Thallium	0.75	<0.75	<0.00068	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.00073	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm MCE
Date : 08-NOV-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 30-OCT-17
Date Received : 04-NOV-17

Account No.: 90734
Login No. : L424375

Date Analyzed : 07-NOV-17 - 08-NOV-17
Report ID : 1030143

Client ID : 22152 - I56 **Lab ID : L424375-6** **Air Volume : NA**
Date Sampled : 10/30/17 **Date Analyzed : 11/07/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	NA	mg/m3
Magnesium Oxide	12.	<12	NA	mg/m3
Molybdenum	0.075	<0.075	NA	mg/m3
Nickel	0.15	<0.15	NA	mg/m3
Thallium	0.75	<0.75	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm MCE
Date : 08-NOV-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 30-OCT-17
Date Received : 04-NOV-17

Account No.: 90734
Login No. : L424375
Date Analyzed : 09-NOV-17
Report ID : 1030332

Asbestos Fiber Count (A Rules)

Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
22152 - A57	L424375-1	7.5/100	9.6	3696	550,800	0.007
22152 - A58	L424375-2	1/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : BTM
Approved by : BDB
Date : 09-NOV-17
QC by: TJB
Supervisor: BDB

< -Less Than
> -Greater Than
ND -Not Detected
NA -Not Applicable
cc -Cubic Centimeters
NS -Not Specified
mm2 -Square millimeters

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 30-OCT-17
Date Received : 04-NOV-17

Account No.: 90734
Login No. : L424375
Date Analyzed : 07-NOV-17
Report ID : 1029719

Inhalable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152 - I55	L424375-5	1098.4	0.20	0.18
22152 - I56	L424375-6	NA	<0.10	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.10 mg
Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV
OSHA PEL : NA
Collection Media : IOM 25mm MCE

Submitted by: PAH
Approved by : SPR
Date : 07-NOV-17
Supervisor: KRK

NYS DOH # : 11626
QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 30-OCT-17
Date Received : 04-NOV-17

Account No.: 90734
Login No. : L424375
Date Analyzed : 07-NOV-17
Report ID : 1029720

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152 - S57	L424375-3	1084.6	<0.050	<0.046
22152 - S58	L424375-4	NA	<0.050	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg
Analytical Method : mod. NIOSH 0600; Gravimetric
OSHA PEL : PNOR 5 mg/m3 (TWA)
Collection Media : PVC PW 37mm

Submitted by: HVN
Approved by : SPR
Date : 07-NOV-17
Supervisor: KRK

NYS DOH # : 11626
QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 30-OCT-17
Date Received : 04-NOV-17

Account No.: 90734
Login No. : L424375
Date Analyzed : 09-NOV-17
Report ID : 1030346

Hexavalent Chromium

Sample ID	Lab ID	Air Vol liter	Total ug	Conc ug/m3
22152 - H11	L424375-11	1085.9	<0.030	<0.028
22152 - H12	L424375-12	NA	<0.030	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.030 ug
Analytical Method : mod. OSHA ID-215 (version 2); IC/UV
OSHA PEL : 5 ug/m3 (TWA)
Collection Media : PVC UW 37mm

Submitted by: KLS
Approved by : DNF
Date : 10-NOV-17
Supervisor: MWJ

NYS DOH # : 11626
QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 30-OCT-17
Date Received : 04-NOV-17

Account No.: 90734
Login No. : L424375
Date Analyzed : 07-NOV-17 - 12-NOV-17
Report ID : 1031150

Respirable Crystalline Silica (RCS): Quartz, Cristobalite, Tridymite

Sample ID	Lab ID	Analyte	Air Vol l	ug	ug/m3
22152 - S57	L424375-3	Quartz	1084.6	<5.0	<4.6
		Cristobalite	1084.6	<5.0	<4.6
		Tridymite	1084.6	<20	<18
		RCS	1084.6	<5.0	<4.6
22152 - S58	L424375-4	Quartz	NA	<5.0	NA
		Cristobalite	NA	<5.0	NA
		Tridymite	NA	<20	NA
		RCS	NA	<5.0	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: Q:5.0ug C:5.0ug T:20.ug
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD
OSHA PEL : 50 ug/m3 RCS
Collection Media : PVC PW 37mm

Submitted: NLO
Approved: CMR
Date : 13-NOV-17 NYS DOH # : 11626
Supervisor: KRK QC by: TJB

< -Less Than
> -Greater Than
NA -Not Applicable
mg -Milligrams
ug -Micrograms
ND -Not Detected
kg -Kilograms
m3 -Cubic Meters
l -Liters
ppm -Parts per Million
NS -Not Specified
mppcf -Million Particles per Cubic Foot

LABORATORY FOOTNOTE REPORT

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 30-OCT-17 Account No.: 90734
Date Received: 04-NOV-17 Login No. : L424375
Date Analyzed: 07-NOV-17 - 12-NOV-17

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L424375 (Report ID: 1030143):
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: im-mwvfilt(28), MT-SOP-21(10)
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3; as Fume, Ceiling = 0.1 mg/m3.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
TLV for VANADIUM PENTOXIDE: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for MAGNESIUM OXIDE: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote

L424375-5-6 (Report ID: 1030143):
Reported results represent Inhalable Metals.

< -Less Than	mg -Milligrams	m3 -Cubic Meters	kg -Kilograms	ppm -Parts per Million		
> -Greater Than	ug -Micrograms	l -Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable	

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 30-OCT-17 Account No.: 90734
Date Received: 04-NOV-17 Login No. : L424375
Date Analyzed: 07-NOV-17 - 12-NOV-17

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Beryllium	+/-12.6%	103%
Magnesium Oxide	+/-9.1%	102%
Molybdenum	+/-10.3%	99.4%
Nickel	+/-10%	103%
Thallium	+/-6.6%	99.5%
Vanadium Pentoxide	+/-9.1%	102%

Parameter	Method	PEL
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/M	0.0002 mg/m3 (TWA)
Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	See footnote

L424375 (Report ID: 1029992):
TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for COBALT: 0.02 mg/m3
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for Calcium Oxide: 2 mg/m3
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3
TLV for SELENIUM: 0.2 mg/m3
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 30-OCT-17 Account No.: 90734
Date Received: 04-NOV-17 Login No. : L424375
Date Analyzed: 07-NOV-17 - 12-NOV-17

L424375 (Report ID: 1029992):
TLV for CHROMIUM: 0.5 mg/m3
TLV for IRON OXIDE: 5 mg/m3
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(33), im-mwvfilt(28)
PEL listed refers to Aluminum as total dust.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.

L424375-7-8 (Report ID: 1029992):
Reported results represent Respirable Metals.

L424375 (Report ID: 1029992):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-7.7%	96.9%
Antimony	+/-9.8%	97.3%
Arsenic	+/-7.6%	103%
Barium	+/-6.5%	101%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 30-OCT-17 Account No.: 90734
Date Received: 04-NOV-17 Login No. : L424375
Date Analyzed: 07-NOV-17 - 12-NOV-17

Beryllium	+/-10.8%	103%
Cadmium	+/-8.6%	102%
Calcium Oxide	+/-10.6%	105%
Chromium	+/-11.2%	103%
Cobalt	+/-8.5%	103%
Copper	+/-10.3%	103%
Iron Oxide	+/-9.6%	106%
Lead	+/-9.1%	100%
Manganese	+/-8.3%	99.8%
Molybdenum	+/-7.6%	100%
Selenium	+/-11.6%	105%
Zinc Oxide	+/-8.9%	102%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)
Chromium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Selenium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

L424375 (Report ID: 1030332):
SOPs: ia-pcm(26)

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 30-OCT-17 Account No.: 90734
Date Received: 04-NOV-17 Login No. : L424375
Date Analyzed: 07-NOV-17 - 12-NOV-17

L424375 (Report ID: 1030332):
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a greater than optimal variability and are probably biased.
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as follows:
0.154 (5-20 fibers/100 fields)
0.100 (>20-50 fibers/100 fields)
0.069 (>50-100 fibers/100 fields)
0.090 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take into account any uncertainty associated with the sampling process.

L424375 (Report ID: 1029719):
SOPs: GRAV-SOP-8(17)
Gravimetric analytical accuracy of the sampling media is 0.013 +/- 0.062 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.

L424375 (Report ID: 1029720):
TLV for RESPIRABLE DUST: NA
SOPs: GRAV-SOP-5(18), GRAV-SOP-6(17)
Gravimetric analytical accuracy of the sampling media is 0.002 +/- 0.018 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.
PNOR = Particulates Not Otherwise Regulated.

L424375 (Report ID: 1030346):
TLV for Hexavalent Chromium: 0.01 mg/m3 (as Cr, Insol)
SOPs: IC-SOP-15(19)
Total ug corrected for a desorption efficiency of 100%.
SGS Galson Laboratories pretests all media lots distributed for Hexavalent Chromium analysis and can provide data confirming that no significant background is present. We may not be able to verify lot background levels for media obtained through alternate vendors.

< -Less Than	mg -Milligrams	m3 -Cubic Meters	kg -Kilograms	ppm -Parts per Million		
> -Greater Than	ug -Micrograms	l -Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable	

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 30-OCT-17 Account No.: 90734
Date Received: 04-NOV-17 Login No. : L424375
Date Analyzed: 07-NOV-17 - 12-NOV-17

L424375 (Report ID: 1030346):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Hexavalent Chromium	+/-12.7%	96.3%

L424375 (Report ID: 1031150):
TLV for QUARTZ: 0.025 mg/m3 Respirable
TLV for TRIDYMITE: NA
TLV for CRISTOBALITE: 0.025 mg/m3 Respirable
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26)

L424375 (Report ID: 1031150):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-13.8%	101%
Quartz	+/-10.9%	93.4%
Tridymite	+/-13.6%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

SGS GALSON

1Z5X626A6948791809
Date: 11/04/17
Shipper: UPS
Initials: KMS

Prep: UNKNOWN

L424375

☐ New Client?

Client Account No.*:

Report To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2
Phone No.*: 416-393-6668
Cell No.:
Email Results to: Virgil.Umali@ttc.ca & oheresults@oheconsultants.com
Email address:

Invoice To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2
Phone No.:
Email:
P.O. No.: PU240835
Credit Card ☐ Card on File ☐ Call for Credit Card Info.

☐ Samples submitted using the FreePumpLoan™ Program ☐ Samples submitted using the FreeSamplingBadges™ Program

Need Results By*:	(surcharge)
☑ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%

Check for availability an pricing for quicker turn around times.

Site Name: Project: 22152 Sampled by: OHE Consultants

Comments:

TTC Subway Air Quality

List description of industry or Process/interferences present in sampling area:

Province samples were collected in (ex. ON)

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify):

Sample Identification* (Maxmium of 20 Characters. ID's longer than 20 characters will be abbreviated.)	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (e.g., welding plating, painting, etc.)*
22152 - A57	10/30/17	25 mm PCM	550.8	L	Standardized List of Analyses for TTC		
22152 - A58	10/30/17	25 mm PCM	-	-	Subway Air Quality Study		
22152 - S57	10/30/17	PW PVC in PPI	1084.6	L	-		
22152 - S58	10/30/17	PW PVC in PPI	-	-	-		
22152 - I55	10/30/17	PW PVC in IOM	1098.4	L	-		
22152 - I56	10/30/17	PW PVC in IOM	-	-	-		
22152 - M57	10/30/17	UW MCE in PPI	1095.9	L	-		
22152 - M58	10/30/17	UW MCE in PPI	-	-	-		
22152 - T57	10/30/17	UW MCE	1099.7	L	-		
22152 - T58	10/30/17	UW MCE	-	-	-		

^Galson Laboratories will subsititute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ, please indicate if the lower LOQ is required (only available for certain analytes - see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date	Time		Print Name/Signature	Date	Time
Relinquished by	Yunny Desiana Lee	10/31/17	15:30	Received by:	Kris Stone	10/31/17	2:15pm
Relinquished by		10/31/17	6pm	Received by:	Kris Stone	11/4/17	12:10

Samples received after 3pm will be considered as next day's business

* Required fields, failure to complete these fields may result in a delay in your samples being processed.

Page 1 of 2

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1140 Sheppard Avenue West
Unit 5
North York, Ontario, Canada M3K 2A2
Tel: 888-432-5227
www.galsonlabs.ca

☐ New Client?

Client Account No.*:

Report To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2
Phone No.*: 416-393-6668
Cell No.:
Email Results to: Virgil.Umali@ttc.ca & oheresults@oheconsultants.com
Email address:

Invoice To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2
Phone No.:
Email:
P.O. No.: PU240835
Credit Card ☐ Card on File ☐ Call for Credit Card Info.

☐ Samples submitted using the FreePumpLoan™ Program ☐ Samples submitted using the FreeSamplingBadges™ Program

Need Results By*:	(surcharge)
☑ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%

Check for availability an pricing for quicker turn around times.

Site Name: Project: 22152 Sampled by: OHE Consultants

Comments:

TTC Subway Air Quality

List description of industry or Process/interferences present in sampling area:

Province samples were collected in (ex. ON)

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify):

Sample Identification* (Maxmium of 20 Characters. ID's longer than 20 characters will be abbreviated.)	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (e.g., welding plating, painting, etc.)*
22152 - H11	10/30/17	2pc UW PVC	1085.9	L	Hexavalent Chromium	mod.OSHA 215	Other
22152 - H12	10/30/17	2pc UW PVC	-	-	-	-	-
					-		
					-		
					-		
					-		
					-		
					-		
					-		
					-		
					-		

^Galson Laboratories will subsititute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ, please indicate if the lower LOQ is required (only available for certain analytes - see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date	Time		Print Name/Signature	Date	Time
Relinquished by	Yunny Desiana Lee	10/31/17	15:30	Received by:	Hernan Sanchez	11/3/17	2:15 pm
Relinquished by	Hernan Sanchez	11/3/17	6:00pm	Received by:	Kris Stone	11/4/17	12:10

Samples received after 3pm will be considered as next day's business
* Required fields, failure to complete these fields may result in a delay in your samples being processed.

90734

The TTC file number/purchase order number is PU240835:

1) Total Metals by NIOSH 7300. Analyze for antimony, arsenic, barium, beryllium, cadmium, calcium oxide, chromium III, cobalt, copper, lead, manganese, and selenium. UW MCE

2) Asbestos fibre count by NIOSH 7400. In addition, analyze specifically for asbestos by TEM if the fibre count result exceeds 0.01 f/cc. PCM

3) Respirable silica and respirable dust by NIOSH 7500/0600. Analyze for quartz, cristobalite, tridymite, and dust. PPI PW PVC

4) Respirable metals by NIOSH 7300. Analyze for aluminum, cadmium, iron oxide, molybdenum, and zinc oxide. PPI UW MCE

5) Inhalable metals and inhalable dust by NIOSH 7300/0500. Analyze for magnesium oxide, molybdenum, nickel, thallium, vanadium pentoxide, and dust. Beryllium should also be analyzed by ICP-MS to get a lower limit of detection. IOM

SGS GALSON

Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Canada

November 13, 2017

AIHA-LAP #100324 Account# 90734 Login# L424064

Dear Mr. Umali:

Enclosed are the analytical results for the samples received by our laboratory on November 02, 2017. All test results meet the quality control requirements of AIHA-LAP and NELAC unless otherwise stated in this report. All samples on the chain of custody were received in good condition unless otherwise noted.

Results in this report are based on the sampling data provided by the client and refer only to the samples as they were received at the laboratory. Unless otherwise requested, samples for asbestos analysis will be discarded 60 days from the date of this report and all other non-IOM samples will be retained for 14 days following the date of this report (when possible). IOMs will be cleaned & disposed of after seven calendar days.

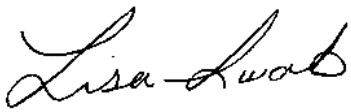
To ensure the safety of laboratory receiving personnel, always seal bulk samples securely to prevent possible escape of material. Also, please double-bag bulk samples individually prior to shipping. Samples not received in this manner will be noted on the chain of custody form.

Current Scopes of Accreditation can be viewed at www.sgsgalsonlabs.com in the accreditations section of the "About" page.

Please contact Katrina Ahchong at (888) 432-5227, if you would like any additional information regarding this report. Thank you for using SGS Galson Laboratories.

Sincerely,

SGS Galson Laboratories



Lisa Swab
Laboratory Director

Enclosure(s)

Galson Laboratories, Inc. is now a part of SGS, the world's leading inspection, verification, testing, and certification company. As part of our transition to SGS, you will begin to see some formatting changes with reports that will improvethe presentation of data and allow for the transition to the new logo.

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East Syracuse, NY 13057
(315) 432-5227
FAX: (315) 437-0571
www.galsonlabs.com

LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 30-OCT-17
Date Received : 02-NOV-17

Account No.: 90734
Login No. : L424064

Date Analyzed : 03-NOV-17 - 07-NOV-17
Report ID : 1029429

Client ID : 22152 - M59 **Lab ID : L424064-7** **Air Volume : 1084.2 L**
Date Sampled : 10/30/17 **Date Analyzed : 11/03/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.0069	mg/m3
Cadmium	0.15	<0.15	<0.00014	mg/m3
Iron Oxide	11.	28	0.026	mg/m3
Molybdenum	0.15	<0.15	<0.00014	mg/m3
Zinc Oxide	2.8	<2.8	<0.0026	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 07-NOV-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 30-OCT-17
Date Received : 02-NOV-17

Account No.: 90734
Login No. : L424064

Date Analyzed : 03-NOV-17 - 07-NOV-17
Report ID : 1029429

Client ID : 22152 - M60 **Lab ID : L424064-8** **Air Volume : NA**
Date Sampled : 10/30/17 **Date Analyzed : 11/03/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 07-NOV-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 30-OCT-17
Date Received : 02-NOV-17

Account No.: 90734
Login No. : L424064

Date Analyzed : 03-NOV-17 - 07-NOV-17
Report ID : 1029429

Client ID : 22152 - T59 **Lab ID : L424064-9** **Air Volume : 1062.2 L**
Date Sampled : 10/30/17 **Date Analyzed : 11/06/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.00085	mg/m3
Arsenic	0.30	<0.30	<0.00028	mg/m3
Barium	0.15	0.72	0.00068	mg/m3
Beryllium	0.15	<0.15	<0.00014	mg/m3
Cadmium	0.15	<0.15	<0.00014	mg/m3
Calcium Oxide	100.	<100	<0.099	mg/m3
Chromium	7.5	<7.5	<0.0071	mg/m3
Cobalt	0.45	<0.45	<0.00042	mg/m3
Copper	0.30	<0.30	<0.00028	mg/m3
Lead	0.38	<0.38	<0.00035	mg/m3
Manganese	0.15	0.34	0.00032	mg/m3
Selenium	2.3	<2.3	<0.0021	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 07-NOV-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 30-OCT-17
Date Received : 02-NOV-17

Account No.: 90734
Login No. : L424064

Date Analyzed : 03-NOV-17 - 07-NOV-17
Report ID : 1029429

Client ID : 22152 - T60 **Lab ID : L424064-10** **Air Volume : NA**
Date Sampled : 10/30/17 **Date Analyzed : 11/06/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.30	<0.30	NA	mg/m3
Barium	0.15	<0.15	NA	mg/m3
Beryllium	0.15	<0.15	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.45	<0.45	NA	mg/m3
Copper	0.30	<0.30	NA	mg/m3
Lead	0.38	<0.38	NA	mg/m3
Manganese	0.15	<0.15	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 07-NOV-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 30-OCT-17
Date Received : 02-NOV-17

Account No.: 90734
Login No. : L424064

Date Analyzed : 03-NOV-17 - 07-NOV-17
Report ID : 1029769

Client ID : 22152 - I57 **Lab ID : L424064-5** **Air Volume : 1105.3 L**
Date Sampled : 10/30/17 **Date Analyzed : 11/07/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	<0.0000068	mg/m3
Magnesium Oxide	12.	<12	<0.011	mg/m3
Molybdenum	0.075	<0.075	<0.000068	mg/m3
Nickel	0.15	<0.15	<0.00014	mg/m3
Thallium	0.75	<0.75	<0.00068	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.00073	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm MCE
Date : 07-NOV-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 30-OCT-17
Date Received : 02-NOV-17

Account No.: 90734
Login No. : L424064

Date Analyzed : 03-NOV-17 - 07-NOV-17
Report ID : 1029769

Client ID : 22152 - I58 **Lab ID : L424064-6** **Air Volume : NA**
Date Sampled : 10/30/17 **Date Analyzed : 11/07/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	NA	mg/m3
Magnesium Oxide	12.	<12	NA	mg/m3
Molybdenum	0.075	<0.075	NA	mg/m3
Nickel	0.15	<0.15	NA	mg/m3
Thallium	0.75	<0.75	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm MCE
Date : 07-NOV-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 30-OCT-17
Date Received : 02-NOV-17

Account No.: 90734
Login No. : L424064
Date Analyzed : 06-NOV-17
Report ID : 1029606

Asbestos Fiber Count (A Rules)

Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
22152 - A59	L424064-1	7/100	8.9	3427	569,200	0.006
22152 - A60	L424064-2	2/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : MJS
Approved by : BDB
Date : 07-NOV-17
QC by: TJB
Supervisor: BDB

< -Less Than
> -Greater Than
ND -Not Detected
NA -Not Applicable
cc -Cubic Centimeters
NS -Not Specified
mm2 -Square millimeters

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 30-OCT-17
Date Received : 02-NOV-17

Account No.: 90734
Login No. : L424064
Date Analyzed : 03-NOV-17
Report ID : 1029116

Inhalable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152 - I57	L424064-5	1105.3	<0.10	<0.090
22152 - I58	L424064-6	NA	<0.10	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.10 mg
Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV
OSHA PEL : NA
Collection Media : IOM 25mm MCE

Submitted by: PAH
Approved by : SPR
Date : 03-NOV-17
Supervisor: KRK

NYS DOH # : 11626
QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 26-OCT-17 - 30-OCT-17
Date Received : 02-NOV-17

Account No.: 90734
Login No. : L424064
Date Analyzed : 07-NOV-17
Report ID : 1029697

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152 - S59	L424064-3	1091.9	<0.050	<0.046
22152 - S60	L424064-4	NA	<0.050	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg
Analytical Method : mod. NIOSH 0600; Gravimetric
OSHA PEL : PNOR 5 mg/m3 (TWA)
Collection Media : PVC PW 37mm

Submitted by: HVN
Approved by : SPR
Date : 07-NOV-17
Supervisor: KRK

NYS DOH # : 11626
QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

SGS GALSON

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 30-OCT-17
Date Received : 02-NOV-17

Account No.: 90734
Login No. : L424064
Date Analyzed : 07-NOV-17
Report ID : 1029834

Hexavalent Chromium

Sample ID	Lab ID	Air Vol liter	Total ug	Conc ug/m3
22152 - H13	L424064-11	1098.6	<0.030	<0.027
22152 - H14	L424064-12	NA	<0.030	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.030 ug
Analytical Method : mod. OSHA ID-215 (version 2); IC/UV
OSHA PEL : 5 ug/m3 (TWA)
Collection Media : PVC UW 37mm

Submitted by: KLS
Approved by : DNF
Date : 08-NOV-17
Supervisor: MWJ

NYS DOH # : 11626
QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

SGS GALSON

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 26-OCT-17 - 30-OCT-17
Date Received : 02-NOV-17

Account No.: 90734
Login No. : L424064
Date Analyzed : 07-NOV-17 - 11-NOV-17
Report ID : 1030759

Respirable Crystalline Silica (RCS): Quartz, Cristobalite, Tridymite

Sample ID	Lab ID	Analyte	Air Vol l	ug	ug/m3
22152 - S59	L424064-3	Quartz	1091.9	<5.0	<4.6
		Cristobalite	1091.9	<5.0	<4.6
		Tridymite	1091.9	<20	<18
		RCS	1091.9	<5.0	<4.6
22152 - S60	L424064-4	Quartz	NA	<5.0	NA
		Cristobalite	NA	<5.0	NA
		Tridymite	NA	<20	NA
		RCS	NA	<5.0	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: Q:5.0ug C:5.0ug T:20.ug
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD
OSHA PEL : 50 ug/m3 RCS
Collection Media : PVC PW 37mm

Submitted: SPR
Approved: CMR
Date : 13-NOV-17 NYS DOH # : 11626
Supervisor: KRK QC by: TJB

< -Less Than	mg -Milligrams	kg -Kilograms	ppm -Parts per Million
> -Greater Than	ug -Micrograms	m3 -Cubic Meters	NS -Not Specified
NA -Not Applicable	ND -Not Detected	l -Liters	mppcf -Million Particles per Cubic Foot

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 26-OCT-17 - 30-OCT-17 Account No.: 90734
Date Received: 02-NOV-17 Login No. : L424064
Date Analyzed: 03-NOV-17 - 11-NOV-17

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L424064 (Report ID: 1029769):
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: im-mwvfilt(28), MT-SOP-21(10)
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3; as Fume, Ceiling = 0.1 mg/m3.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
TLV for VANADIUM PENTOXIDE: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for MAGNESIUM OXIDE: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 26-OCT-17 - 30-OCT-17 Account No.: 90734
Date Received: 02-NOV-17 Login No. : L424064
Date Analyzed: 03-NOV-17 - 11-NOV-17

L424064 (Report ID: 1029769):

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Beryllium	+/-12.6%	103%
Magnesium Oxide	+/-9.1%	102%
Molybdenum	+/-10.3%	99.4%
Nickel	+/-10%	103%
Thallium	+/-6.6%	99.5%
Vanadium Pentoxide	+/-9.1%	102%

Parameter	Method	PEL
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/M	0.0002 mg/m3 (TWA)
Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	See footnote

L424064 (Report ID: 1029429):

TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for COBALT: 0.02 mg/m3
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for Calcium Oxide: 2 mg/m3
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3
TLV for SELENIUM: 0.2 mg/m3

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

LABORATORY FOOTNOTE REPORT

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 26-OCT-17 - 30-OCT-17 Account No.: 90734
Date Received: 02-NOV-17 Login No. : L424064
Date Analyzed: 03-NOV-17 - 11-NOV-17

L424064 (Report ID: 1029429):
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for CHROMIUM: 0.5 mg/m3
TLV for IRON OXIDE: 5 mg/m3
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(33), im-mwvfilt(28)
PEL listed refers to Aluminum as total dust.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.

L424064-7-8 (Report ID: 1029429):
Reported results represent Respirable metals.

L424064 (Report ID: 1029429):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-7.7%	96.9%
Antimony	+/-9.8%	97.3%
Arsenic	+/-7.6%	103%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 26-OCT-17 - 30-OCT-17 Account No.: 90734
Date Received: 02-NOV-17 Login No. : L424064
Date Analyzed: 03-NOV-17 - 11-NOV-17

Barium	+/-6.5%	101%
Beryllium	+/-10.8%	103%
Cadmium	+/-8.6%	102%
Calcium Oxide	+/-10.6%	105%
Chromium	+/-11.2%	103%
Cobalt	+/-8.5%	103%
Copper	+/-10.3%	103%
Iron Oxide	+/-9.6%	106%
Lead	+/-9.1%	100%
Manganese	+/-8.3%	99.8%
Molybdenum	+/-7.6%	100%
Selenium	+/-11.6%	105%
Zinc Oxide	+/-8.9%	102%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)
Chromium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Selenium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

L424064 (Report ID: 1029606):
SOPs: ia-pcm(26)

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 26-OCT-17 - 30-OCT-17 Account No.: 90734
Date Received: 02-NOV-17 Login No. : L424064
Date Analyzed: 03-NOV-17 - 11-NOV-17

L424064 (Report ID: 1029606):
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a greater than optimal variability and are probably biased.
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as follows:
0.154 (5-20 fibers/100 fields)
0.100 (>20-50 fibers/100 fields)
0.069 (>50-100 fibers/100 fields)
0.090 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take into account any uncertainty associated with the sampling process.

L424064 (Report ID: 1029116):
SOPs: GRAV-SOP-8(17)
Gravimetric analytical accuracy of the sampling media is 0.013 +/- 0.062 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.

L424064 (Report ID: 1029697):
TLV for RESPIRABLE DUST: NA
SOPs: GRAV-SOP-5(18), GRAV-SOP-6(17)
Gravimetric analytical accuracy of the sampling media is 0.002 +/- 0.018 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.
PNOR = Particulates Not Otherwise Regulated.

L424064 (Report ID: 1029834):
TLV for Hexavalent Chromium: 0.01 mg/m3 (as Cr, Insol)
SOPs: IC-SOP-15(19)
Total ug corrected for a desorption efficiency of 100%.
SGS Galson Laboratories pretests all media lots distributed for Hexavalent Chromium analysis and can provide data confirming that no significant background is present. We may not be able to verify lot background levels for media obtained through alternate vendors.

< -Less Than	mg -Milligrams	m3 -Cubic Meters	kg -Kilograms	ppm -Parts per Million		
> -Greater Than	ug -Micrograms	l -Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable	

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FAX: (315) 437-0571
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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 26-OCT-17 - 30-OCT-17 Account No.: 90734
Date Received: 02-NOV-17 Login No. : L424064
Date Analyzed: 03-NOV-17 - 11-NOV-17

L424064 (Report ID: 1029834):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Hexavalent Chromium	+/-12.7%	96.3%

L424064 (Report ID: 1030759):
TLV for QUARTZ: 0.025 mg/m3 Respirable
TLV for TRIDYMITE: NA
TLV for CRISTOBALITE: 0.025 mg/m3 Respirable
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26)

L424064 (Report ID: 1030759):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-13.8%	101%
Quartz	+/-10.9%	93.4%
Tridymite	+/-13.6%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

SGS GALSON

1Z5X626A6648971629
Date: 11/02/17
Shipper: UPS
Initials: MAK

Prep: UNKNOWN

L 424064

☐ New Client?

Client Account No.*: _____

: 2A2

Report To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2

Phone No.*: 416-393-6668
Cell No.: _____
Email Results to: Virgil.Umali@ttc.ca & oheresults@oheconsultants.com
Email address: _____

Invoice To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2

Phone No.: _____
Email: _____
P.O. No.: PU240835 RIS
Credit Card ☐ Card on File ☐ Call for Credit Card Info.

☐ Samples submitted using the FreePumpLoan™ Program ☐ Samples submitted using the FreeSamplingBadges™ Program

Need Results By*:	(surcharge)
☑ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%

Check for availability an pricing for quicker turn around times.

Site Name: Project: 22152 Sampled by: OHE Consultants

Comments:

TTC Subway Air Quality

* IDs are: 22152-I59 & I60.

List description of industry or Process/interferences present in sampling area:

Province samples were collected in (ex. ON)

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify):

Sample Identification* (Maximum of 20 Characters. ID's longer than 20 characters will be abbreviated.)	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (e.g., welding plating, painting, etc.)*
22152 - A59	10/30/17	25 mm PCM	569.2	L	Standardized List of Analyses for TTC		
22152 - A60	10/30/17	25 mm PCM	-	-	Subway Air Quality Study		
22152 - S59	10/26/17	PW PVC in PPI	1091.9	L	-		
22152 - S60	10/30/17	PW PVC in PPI	-	-	-		
22152 - I57 *	10/30/17	PW PVC in IOM	1105.3	L	-		
22152 - I58 *	10/30/17	PW PVC in IOM	-	-	-		
22152 - M59	10/30/17	UW MCE in PPI	1084.2	L	-		
22152 - M60	10/30/17	UW MCE in PPI	-	-	-		
22152 - T59	10/30/17	UW MCE	1062.2	L	-		
22152 - T60	10/30/17	UW MCE	-	-	-		

^Galson Laboratories will subsititute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ, please indicate if the lower LOQ is required (only available for certain analytes - see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date	Time		Print Name/Signature	Date	Time
Relinquished by	Larysa Kokarovtseva	10/31/17	14:30	Received by:		11/1/17	12:52 pm
Relinquished by		11/1/17		Received by:	Michelle Krause	11/2/17	0945

Samples received after 3pm will be considered as next day's business

* Required fields, failure to complete these fields may result in a delay in your samples being processed.

Page 1 of 1

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Unit 5
North York, Ontario, Canada M3K 2A2
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☐ New Client?

Client Account No.*: _____

Report To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2

Phone No.*: 416-393-6668
Cell No.:
Email Results to: Virgil.Umali@ttc.ca & oheresults@oheconsultants.com
Email address:

Invoice To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2

Phone No.:
Email:
P.O. No.: PU240835
Credit Card ☐ Card on File ☐ Call for Credit Card Info.

☐ Samples submitted using the FreePumpLoan™ Program ☐ Samples submitted using the FreeSamplingBadges™ Program

Need Results By*:	(surcharge)
☑ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%

Check for availability an pricing for quicker turn around times.

Site Name: Project: 22152 Sampled by: OHE Consultants

Comments:

TTC Subway Air Quality

List description of industry or Process/interferences present in sampling area:

Province samples were collected in (ex. ON)

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify):

Sample Identification* (Maxmium of 20 Characters. ID's longer than 20 characters will be abbreviated.)	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (e.g., welding plating, painting, etc.)*
22152 - H13	10/30/17	2pc UW PVC	1098.6	L	Hexavalent Chromium	mod.OSHA 215	Other
22152 - H14	10/30/17	2pc UW PVC	-	-	-	-	-
					-		
					-		
					-		
					-		
					-		
					-		
					-		
					-		
					-		

^Galson Laboratories will subsititute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ, please indicate if the lower LOQ is required (only available for certain analytes - see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date	Time		Print Name/Signature	Date	Time
Relinquished by	Larysa KOkarovtseva	10/31/17	14:30	Received by:		11/1/17	12:15 pm
Relinquished by		11/1/17	6pm	Received by:	Michelle Krause	11/2/17	0945

Samples received after 3pm will be considered as next day's business
* Required fields, failure to complete these fields may result in a delay in your samples being processed.

90734

The TTC file number/purchase order number is PU240835:

1) Total Metals by NIOSH 7300. Analyze for antimony, arsenic, barium, beryllium, cadmium, calcium oxide, chromium III, cobalt, copper, lead, manganese, and selenium. UW MCE

2) Asbestos fibre count by NIOSH 7400. In addition, analyze specifically for asbestos by TEM if the fibre count result exceeds 0.01 f/cc. PCM

3) Respirable silica and respirable dust by NIOSH 7500/0600. Analyze for quartz, cristobalite, tridymite, and dust. PPI PW PVC

4) Respirable metals by NIOSH 7300. Analyze for aluminum, cadmium, iron oxide, molybdenum, and zinc oxide. PPI UW MCE

5) Inhalable metals and inhalable dust by NIOSH 7300/0500. Analyze for magnesium oxide, molybdenum, nickel, thallium, vanadium pentoxide, and dust. Beryllium should also be analyzed by ICP-MS to get a lower limit of detection. IOM

SGS GALSON

Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Canada

November 13, 2017

AIHA-LAP #100324 Account# 90734 Login# L424363

Dear Mr. Umali:

Enclosed are the analytical results for the samples received by our laboratory on November 04, 2017. All test results meet the quality control requirements of AIHA-LAP and NELAC unless otherwise stated in this report. All samples on the chain of custody were received in good condition unless otherwise noted.

Results in this report are based on the sampling data provided by the client and refer only to the samples as they were received at the laboratory. Unless otherwise requested, samples for asbestos analysis will be discarded 60 days from the date of this report and all other non-IOM samples will be retained for 14 days following the date of this report (when possible). IOMs will be cleaned & disposed of after seven calendar days.

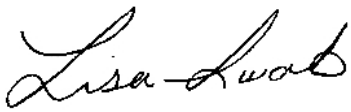
To ensure the safety of laboratory receiving personnel, always seal bulk samples securely to prevent possible escape of material. Also, please double-bag bulk samples individually prior to shipping. Samples not received in this manner will be noted on the chain of custody form.

Current Scopes of Accreditation can be viewed at www.sgsgalson.com in the accreditations section of the "About" page.

Please contact Katrina Ahchong at (888) 432-5227, if you would like any additional information regarding this report. Thank you for using SGS Galson Laboratories.

Sincerely,

SGS Galson Laboratories



Lisa Swab
Laboratory Director

Enclosure(s)

Galson Laboratories, Inc. is now a part of SGS, the world's leading inspection, verification, testing, and certification company. As part of our transition to SGS, you will begin to see some formatting changes withreports that will improve thepresentation of data and allow for the transition to the new logo.

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FAX: (315) 437-0571
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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 31-OCT-17
Date Received : 04-NOV-17

Account No.: 90734
Login No. : L424363
Date Analyzed : 07-NOV-17
Report ID : 1029989

Client ID : 22152 - M61 **Lab ID : L424363-7** **Air Volume : 779.33 L**
Date Sampled : 10/31/17 **Date Analyzed : 11/07/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.0096	mg/m3
Cadmium	0.15	<0.15	<0.00019	mg/m3
Iron Oxide	11.	130	0.17	mg/m3
Molybdenum	0.15	<0.15	<0.00019	mg/m3
Zinc Oxide	2.8	<2.8	<0.0036	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 08-NOV-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 31-OCT-17
Date Received : 04-NOV-17

Account No.: 90734
Login No. : L424363
Date Analyzed : 07-NOV-17
Report ID : 1029989

Client ID : 22152 - M62 **Lab ID : L424363-8** **Air Volume : NA**
Date Sampled : 10/31/17 **Date Analyzed : 11/07/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 08-NOV-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 31-OCT-17
Date Received : 04-NOV-17

Account No.: 90734
Login No. : L424363
Date Analyzed : 07-NOV-17
Report ID : 1029989

Client ID : 22152 - T61 **Lab ID : L424363-9** **Air Volume : 772.58 L**
Date Sampled : 10/31/17 **Date Analyzed : 11/07/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.0012	mg/m3
Arsenic	0.30	<0.30	<0.00039	mg/m3
Barium	0.15	11	0.014	mg/m3
Beryllium	0.15	<0.15	<0.00019	mg/m3
Cadmium	0.15	<0.15	<0.00019	mg/m3
Calcium Oxide	100.	<100	<0.14	mg/m3
Chromium	7.5	<7.5	<0.0097	mg/m3
Cobalt	0.45	<0.45	<0.00058	mg/m3
Copper	0.30	0.78	0.0010	mg/m3
Lead	0.38	<0.38	<0.00049	mg/m3
Manganese	0.15	1.5	0.0019	mg/m3
Selenium	2.3	<2.3	<0.0029	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 08-NOV-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 31-OCT-17
Date Received : 04-NOV-17

Account No.: 90734
Login No. : L424363
Date Analyzed : 07-NOV-17
Report ID : 1029989

Client ID : 22152 - T62 **Lab ID : L424363-10** **Air Volume : NA**
Date Sampled : 10/31/17 **Date Analyzed : 11/07/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.30	<0.30	NA	mg/m3
Barium	0.15	<0.15	NA	mg/m3
Beryllium	0.15	<0.15	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.45	<0.45	NA	mg/m3
Copper	0.30	<0.30	NA	mg/m3
Lead	0.38	<0.38	NA	mg/m3
Manganese	0.15	<0.15	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 08-NOV-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 31-OCT-17
Date Received : 04-NOV-17

Account No.: 90734
Login No. : L424363
Date Analyzed : 07-NOV-17
Report ID : 1030131

Client ID : 22152 - I59 **Lab ID : L424363-5** **Air Volume : 779.53 L**
Date Sampled : 10/31/17 **Date Analyzed : 11/07/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	<0.0000096	mg/m3
Magnesium Oxide	12.	<12	<0.016	mg/m3
Molybdenum	0.075	<0.075	<0.000096	mg/m3
Nickel	0.15	0.16	0.00021	mg/m3
Thallium	0.75	<0.75	<0.00096	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.0010	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm MCE
Date : 08-NOV-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 31-OCT-17
Date Received : 04-NOV-17

Account No.: 90734
Login No. : L424363
Date Analyzed : 07-NOV-17
Report ID : 1030131

Client ID : 22152 - I60 **Lab ID : L424363-6** **Air Volume : NA**
Date Sampled : 10/31/17 **Date Analyzed : 11/07/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	NA	mg/m3
Magnesium Oxide	12.	<12	NA	mg/m3
Molybdenum	0.075	<0.075	NA	mg/m3
Nickel	0.15	0.18	NA	mg/m3
Thallium	0.75	<0.75	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm MCE
Date : 08-NOV-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 31-OCT-17
Date Received : 04-NOV-17

Account No.: 90734
Login No. : L424363
Date Analyzed : 09-NOV-17
Report ID : 1030330

Asbestos Fiber Count (A Rules)

Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
22152 - A61	L424363-1	VOID	VOID	VOID	391,760	VOID
22152 - A62	L424363-2	2/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : BTM
Approved by : BDB
Date : 09-NOV-17
QC by: NDC
Supervisor: BDB

< -Less Than
> -Greater Than
ND -Not Detected
NA -Not Applicable
cc -Cubic Centimeters
NS -Not Specified
mm2 -Square millimeters

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 31-OCT-17
Date Received : 04-NOV-17

Account No.: 90734
Login No. : L424363
Date Analyzed : 07-NOV-17
Report ID : 1029717

Inhalable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152 - I59	L424363-5	779.53	0.42	0.54
22152 - I60	L424363-6	NA	<0.10	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.10 mg
Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV
OSHA PEL : NA
Collection Media : IOM 25mm MCE

Submitted by: PAH
Approved by : SPR
Date : 07-NOV-17
Supervisor: KRK

NYS DOH # : 11626
QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 31-OCT-17
Date Received : 04-NOV-17

Account No.: 90734
Login No. : L424363
Date Analyzed : 07-NOV-17
Report ID : 1029698

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152 - S61	L424363-3	773.54	0.18	0.23
22152 - S62	L424363-4	NA	<0.050	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg
Analytical Method : mod. NIOSH 0600; Gravimetric
OSHA PEL : PNOR 5 mg/m3 (TWA)
Collection Media : PVC PW 37mm

Submitted by: HVN
Approved by : SPR
Date : 07-NOV-17
Supervisor: KRK

NYS DOH # : 11626
QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 31-OCT-17
Date Received : 04-NOV-17

Account No.: 90734
Login No. : L424363
Date Analyzed : 07-NOV-17 - 12-NOV-17
Report ID : 1031148

Respirable Crystalline Silica (RCS): Quartz, Cristobalite, Tridymite

Sample ID	Lab ID	Analyte	Air Vol l	ug	ug/m3
22152 - S61	L424363-3	Quartz	773.54	<5.0	<6.5
		Cristobalite	773.54	<5.0	<6.5
		Tridymite	773.54	<20	<26
		RCS	773.54	<5.0	<6.5
22152 - S62	L424363-4	Quartz	NA	<5.0	NA
		Cristobalite	NA	<5.0	NA
		Tridymite	NA	<20	NA
		RCS	NA	<5.0	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: Q:5.0ug C:5.0ug T:20.ug
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD
OSHA PEL : 50 ug/m3 RCS
Collection Media : PVC PW 37mm

Submitted: NLO
Approved: AJD
Date : 13-NOV-17 NYS DOH # : 11626
Supervisor: KRK QC by: NDC

< -Less Than	mg -Milligrams	kg -Kilograms	ppm -Parts per Million
> -Greater Than	ug -Micrograms	m3 -Cubic Meters	NS -Not Specified
NA -Not Applicable	ND -Not Detected	l -Liters	mppcf -Million Particles per Cubic Foot

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 31-OCT-17 Account No.: 90734
Date Received: 04-NOV-17 Login No. : L424363
Date Analyzed: 07-NOV-17 - 12-NOV-17

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L424363 (Report ID: 1030131):
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: im-mwvfilt(28), MT-SOP-21(10)
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3; as Fume, Ceiling = 0.1 mg/m3.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
TLV for VANADIUM PENTOXIDE: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for MAGNESIUM OXIDE: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 31-OCT-17 Account No.: 90734
Date Received: 04-NOV-17 Login No. : L424363
Date Analyzed: 07-NOV-17 - 12-NOV-17

L424363 (Report ID: 1030131):

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Beryllium	+/-12.6%	103%
Magnesium Oxide	+/-9.1%	102%
Molybdenum	+/-10.3%	99.4%
Nickel	+/-10%	103%
Thallium	+/-6.6%	99.5%
Vanadium Pentoxide	+/-9.1%	102%

Parameter	Method	PEL
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/M	0.0002 mg/m3 (TWA)
Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	See footnote

L424363 (Report ID: 1029989):

TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for COBALT: 0.02 mg/m3
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for Calcium Oxide: 2 mg/m3
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3
TLV for SELENIUM: 0.2 mg/m3

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 31-OCT-17 Account No.: 90734
Date Received: 04-NOV-17 Login No. : L424363
Date Analyzed: 07-NOV-17 - 12-NOV-17

L424363 (Report ID: 1029989):
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for CHROMIUM: 0.5 mg/m3
TLV for IRON OXIDE: 5 mg/m3
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(33), im-mwvfilt(28)
PEL listed refers to Aluminum as total dust.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.

L424363 (Report ID: 1029989):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-7.7%	96.9%
Antimony	+/-9.8%	97.3%
Arsenic	+/-7.6%	103%
Barium	+/-6.5%	101%
Beryllium	+/-10.8%	103%
Cadmium	+/-8.6%	102%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
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Date Sampled : 31-OCT-17 Account No.: 90734
Date Received: 04-NOV-17 Login No. : L424363
Date Analyzed: 07-NOV-17 - 12-NOV-17

Calcium Oxide	+/-10.6%	105%
Chromium	+/-11.2%	103%
Cobalt	+/-8.5%	103%
Copper	+/-10.3%	103%
Iron Oxide	+/-9.6%	106%
Lead	+/-9.1%	100%
Manganese	+/-8.3%	99.8%
Molybdenum	+/-7.6%	100%
Selenium	+/-11.6%	105%
Zinc Oxide	+/-8.9%	102%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)
Chromium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Selenium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

L424363 (Report ID: 1030330):
VOID-Filter overloaded with particulate, fiber counts can not be provided.
SOPs: ia-pcm(26)
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 31-OCT-17 Account No.: 90734
Date Received: 04-NOV-17 Login No. : L424363
Date Analyzed: 07-NOV-17 - 12-NOV-17

L424363 (Report ID: 1030330):
greater than optimal variability and are probably biased.
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as follows:
0.154 (5-20 fibers/100 fields)
0.100 (>20-50 fibers/100 fields)
0.069 (>50-100 fibers/100 fields)
0.090 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take into account any uncertainty associated with the sampling process.

L424363 (Report ID: 1029717):
SOPs: GRAV-SOP-8(17)
Gravimetric analytical accuracy of the sampling media is 0.013 +/- 0.062 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.

L424363 (Report ID: 1029698):
TLV for RESPIRABLE DUST: NA
SOPs: GRAV-SOP-5(18), GRAV-SOP-6(17)
Gravimetric analytical accuracy of the sampling media is 0.002 +/- 0.018 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.
PNOR = Particulates Not Otherwise Regulated.

L424363 (Report ID: 1031148):
TLV for QUARTZ: 0.025 mg/m3 Respirable
TLV for TRIDYMITE: NA
TLV for CRISTOBALITE: 0.025 mg/m3 Respirable
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26)

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 31-OCT-17 Account No.: 90734
Date Received: 04-NOV-17 Login No. : L424363
Date Analyzed: 07-NOV-17 - 12-NOV-17

L424363 (Report ID: 1031148):

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-13.8%	101%
Quartz	+/-10.9%	93.4%
Tridymite	+/-13.6%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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1Z5X626A6948791809
Date: 11/04/17
Shipper: UPS
Initials: KMS

Prep: UNKNOWN

L424363

☐ New Client?

Client Account No.*: _____

Report To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2

Phone No.*: 416-393-6668
Cell No.: _____
Email Results to: Virgil.Umali@ttc.ca & oheresults@oheconsultants.com
Email address: _____

Invoice To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2

Phone No.: _____
Email: _____
P.O. No.: PU240835
Credit Card ☐ Card on File ☐ Call for Credit Card Info.

☐ Samples submitted using the FreePumpLoan™ Program ☐ Samples submitted using the FreeSamplingBadges™ Program

Need Results By*:	(surcharge)
☑ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%

Check for availability an pricing for quicker turn around times.

Site Name: Project: 22152 Sampled by: OHE Consultants

Comments:

TTC Subway Air Quality

List description of industry or Process/interferences present in sampling area:

Province samples were collected in (ex. ON)

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify):

Sample Identification* (Maxmium of 20 Characters. ID's longer than 20 characters will be abbreviated.)	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (e.g., welding plating, painting, etc.)*
22152 - A61	10/31/17	25 mm PCM	391.76	L	Standardized List of Analyses for TTC		
22152 - A62	10/31/17	25 mm PCM	-	-	Subway Air Quality Study		
22152 - S61	10/31/17	PW PVC in PPI	773.54	L	-		
22152 - S62	10/31/17	PW PVC in PPI	-	-	-		
22152 - I59	10/31/17	PW PVC in IOM	779.53	L	-		
22152 - I60	10/31/17	PW PVC in IOM	-	-	-		
22152 - M61	10/31/17	UW MCE in PPI	779.33	L	-		
22152 - M62	10/31/17	UW MCE in PPI	-	-	-		
22152 - T61	10/31/17	UW MCE	772.58	L	-		
22152 - T62	10/31/17	UW MCE	-	-	-		

^Galson Laboratories will subsititute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ, please indicate if the lower LOQ is required (only available for certain analytes - see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date	Time		Print Name/Signature	Date	Time
Relinquished by	Romain Mathevet	11/01/17	10:00	Received by:		11/3/17	2:17pm
Relinquished by		11/3/17	6:45p	Received by:	Kris Stone	11/4/17	12:10

Samples received after 3pm will be considered as next day's business

* Required fields, failure to complete these fields may result in a delay in your samples being processed.

Page 1 of 1

90734

The TTC file number/purchase order number is PU240835:

1) Total Metals by NIOSH 7300. Analyze for antimony, arsenic, barium, beryllium, cadmium, calcium oxide, chromium III, cobalt, copper, lead, manganese, and selenium. UW MCE

2) Asbestos fibre count by NIOSH 7400. In addition, analyze specifically for asbestos by TEM if the fibre count result exceeds 0.01 f/cc. PCM

3) Respirable silica and respirable dust by NIOSH 7500/0600. Analyze for quartz, cristobalite, tridymite, and dust. PPI PW PVC

4) Respirable metals by NIOSH 7300. Analyze for aluminum, cadmium, iron oxide, molybdenum, and zinc oxide. PPI UW MCE

5) Inhalable metals and inhalable dust by NIOSH 7300/0500. Analyze for magnesium oxide, molybdenum, nickel, thallium, vanadium pentoxide, and dust. Beryllium should also be analyzed by ICP-MS to get a lower limit of detection. IOM

Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Canada

November 21, 2017

AIHA-LAP #100324 Account# 90734 Login# L424369

Dear Mr. Umali:

Enclosed are the analytical results for the samples received by our laboratory on November 04, 2017. All test results meet quality control requirements of AIHA-LAP and NELAC unless otherwise stated in this report. All samples on chain of custody were received in good condition unless otherwise noted.

The sample for TEM was subcontracted to AMA. Results included.

Results in this report are based on sampling data provided by the client and refer only to samples as they were received at the laboratory. Unless otherwise requested, samples for asbestos analysis will be discarded 60 days from date of this report and all other non-IOM samples will be retained for 14 days following date of this report (when possible). IOMs will be cleaned & disposed of after seven calendar days.

To ensure safety of laboratory receiving personnel, always seal bulk samples securely to prevent possible escape of material. Also, please double-bag bulk samples individually prior to shipping. Samples not received in this manner will be noted on the chain of custody form.

Current Scopes of Accreditation can be viewed at www.sgsgalson.com in the accreditations section of the "About" page.

Please contact Katrina Ahchong at (888) 432-5227, if you would like any additional information regarding this report. Thank you for using SGS Galson Laboratories.

Sincerely,

SGS Galson Laboratories

Lisa Swab
Laboratory Director

Enclosure(s)

Galson Laboratories, Inc. is now a part of SGS, the world's leading inspection, verification, testing, and certification company. As part of our transition to SGS, you will begin to seesome formatting changes withreports that will improve the presentation of data and allow for the transition to the new logo.

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 02-NOV-17
Date Received : 04-NOV-17

Account No.: 90734
Login No. : L424369
Date Analyzed : 07-NOV-17 - 08-NOV-17
Report ID : 1029991

Client ID : 22152 - M63 **Lab ID : L424369-7** **Air Volume : 719.22 L**
Date Sampled : 11/02/17 **Date Analyzed : 11/07/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.010	mg/m3
Cadmium	0.15	<0.15	<0.00021	mg/m3
Iron Oxide	11.	47	0.065	mg/m3
Molybdenum	0.15	<0.15	<0.00021	mg/m3
Zinc Oxide	2.8	<2.8	<0.0039	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 08-NOV-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 02-NOV-17
Date Received : 04-NOV-17

Account No.: 90734
Login No. : L424369

Date Analyzed : 07-NOV-17 - 08-NOV-17
Report ID : 1029991

Client ID : 22152 - M64 **Lab ID : L424369-8** **Air Volume : NA**
Date Sampled : 11/02/17 **Date Analyzed : 11/07/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 08-NOV-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 02-NOV-17
Date Received : 04-NOV-17

Account No.: 90734
Login No. : L424369

Date Analyzed : 07-NOV-17 - 08-NOV-17
Report ID : 1029991

Client ID : 22152 - T63 **Lab ID : L424369-9** **Air Volume : 713.85 L**
Date Sampled : 11/02/17 **Date Analyzed : 11/07/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.0013	mg/m3
Arsenic	0.30	<0.30	<0.00042	mg/m3
Barium	0.15	2.4	0.0034	mg/m3
Beryllium	0.15	<0.15	<0.00021	mg/m3
Cadmium	0.15	<0.15	<0.00021	mg/m3
Calcium Oxide	100.	<100	<0.15	mg/m3
Chromium	7.5	<7.5	<0.011	mg/m3
Cobalt	0.45	<0.45	<0.00063	mg/m3
Copper	0.30	<0.30	<0.00042	mg/m3
Lead	0.38	<0.38	<0.00053	mg/m3
Manganese	0.15	0.55	0.00077	mg/m3
Selenium	2.3	<2.3	<0.0032	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 08-NOV-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 02-NOV-17
Date Received : 04-NOV-17

Account No.: 90734
Login No. : L424369

Date Analyzed : 07-NOV-17 - 08-NOV-17
Report ID : 1029991

Client ID : 22152 - T64 **Lab ID : L424369-10** **Air Volume : NA**
Date Sampled : 11/02/17 **Date Analyzed : 11/07/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.30	<0.30	NA	mg/m3
Barium	0.15	<0.15	NA	mg/m3
Beryllium	0.15	<0.15	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.45	<0.45	NA	mg/m3
Copper	0.30	<0.30	NA	mg/m3
Lead	0.38	<0.38	NA	mg/m3
Manganese	0.15	<0.15	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 08-NOV-17

Submitted by: SJW
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 02-NOV-17
Date Received : 04-NOV-17

Account No.: 90734
Login No. : L424369

Date Analyzed : 07-NOV-17 - 08-NOV-17
Report ID : 1030133

Client ID : 22152 - I61 **Lab ID : L424369-5** **Air Volume : 719.94 L**
Date Sampled : 11/02/17 **Date Analyzed : 11/08/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	<0.000010	mg/m3
Magnesium Oxide	12.	<12	<0.017	mg/m3
Molybdenum	0.075	0.21	0.00029	mg/m3
Nickel	0.15	<0.15	<0.00021	mg/m3
Thallium	0.75	<0.75	<0.0010	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.0011	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm MCE
Date : 08-NOV-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 02-NOV-17
Date Received : 04-NOV-17

Account No.: 90734
Login No. : L424369

Date Analyzed : 07-NOV-17 - 08-NOV-17
Report ID : 1030133

Client ID : 22152 - I62 **Lab ID : L424369-6** **Air Volume : NA**
Date Sampled : 11/02/17 **Date Analyzed : 11/08/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	NA	mg/m3
Magnesium Oxide	12.	<12	NA	mg/m3
Molybdenum	0.075	<0.075	NA	mg/m3
Nickel	0.15	<0.15	NA	mg/m3
Thallium	0.75	<0.75	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm MCE
Date : 08-NOV-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 02-NOV-17
Date Received : 04-NOV-17

Account No.: 90734
Login No. : L424369
Date Analyzed : 09-NOV-17
Report ID : 1030331

Asbestos Fiber Count (A Rules)

	Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
+	22152 - A63	L424369-1	14.5/100	18.5	7123	365,700	0.019
	22152 - A64	L424369-2	0/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : BTM
Approved by : BDB
Date : 09-NOV-17
QC by: TJB
Supervisor: BDB

< -Less Than
> -Greater Than
ND -Not Detected
NA -Not Applicable
cc -Cubic Centimeters
NS -Not Specified
mm2 -Square millimeters

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 02-NOV-17
Date Received : 04-NOV-17

Account No.: 90734
Login No. : L424369
Date Analyzed : 07-NOV-17
Report ID : 1029718

Inhalable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152 - I61	L424369-5	719.94	0.20	0.28
22152 - I62	L424369-6	NA	<0.10	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.10 mg
Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV
OSHA PEL : NA
Collection Media : IOM 25mm MCE

Submitted by: PAH
Approved by : SPR
Date : 07-NOV-17
Supervisor: KRK

NYS DOH # : 11626
QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 02-NOV-17
Date Received : 04-NOV-17

Account No.: 90734
Login No. : L424369
Date Analyzed : 07-NOV-17
Report ID : 1029699

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152 - S63	L424369-3	719.22	0.066	0.092
22152 - S64	L424369-4	NA	<0.050	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg
Analytical Method : mod. NIOSH 0600; Gravimetric
OSHA PEL : PNOR 5 mg/m3 (TWA)
Collection Media : PVC PW 37mm

Submitted by: HVN
Approved by : SPR
Date : 07-NOV-17
Supervisor: KRK

NYS DOH # : 11626
QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 02-NOV-17
Date Received : 04-NOV-17

Account No.: 90734
Login No. : L424369
Date Analyzed : 07-NOV-17 - 12-NOV-17
Report ID : 1031149

Respirable Crystalline Silica (RCS): Quartz, Cristobalite, Tridymite

Sample ID	Lab ID	Analyte	Air Vol l	ug	ug/m3
22152 - S63	L424369-3	Quartz	719.22	<5.0	<7.0
		Cristobalite	719.22	<5.0	<7.0
		Tridymite	719.22	<20	<28
		RCS	719.22	<5.0	<7.0
22152 - S64	L424369-4	Quartz	NA	<5.0	NA
		Cristobalite	NA	<5.0	NA
		Tridymite	NA	<20	NA
		RCS	NA	<5.0	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: Q:5.0ug C:5.0ug T:20.ug
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD
OSHA PEL : 50 ug/m3 RCS
Collection Media : PVC PW 37mm

Submitted: NLO
Approved: CMR
Date : 13-NOV-17 NYS DOH # : 11626
Supervisor: KRK QC by: TJB

< -Less Than
> -Greater Than
NA -Not Applicable
mg -Milligrams
ug -Micrograms
ND -Not Detected
kg -Kilograms
m3 -Cubic Meters
l -Liters
ppm -Parts per Million
NS -Not Specified
mppcf -Million Particles per Cubic Foot

LABORATORY FOOTNOTE REPORT

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 02-NOV-17 Account No.: 90734
Date Received: 04-NOV-17 Login No. : L424369
Date Analyzed: 07-NOV-17 - 12-NOV-17

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L424369 (Report ID: 1030133):
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: im-mwvfilt(28), MT-SOP-21(10)
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3; as Fume, Ceiling = 0.1 mg/m3.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
TLV for VANADIUM PENTOXIDE: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for MAGNESIUM OXIDE: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote

L424369-5-6 (Report ID: 1030133):
Reported results represent Inhalable Metals.

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

6601 Kirkville Road
East Syracuse, NY 13057
(315) 432-5227
FAX: (315) 437-0571
www.galsonlabs.com

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 02-NOV-17 Account No.: 90734
Date Received: 04-NOV-17 Login No. : L424369
Date Analyzed: 07-NOV-17 - 12-NOV-17

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Beryllium	+/-12.6%	103%
Magnesium Oxide	+/-9.1%	102%
Molybdenum	+/-10.3%	99.4%
Nickel	+/-10%	103%
Thallium	+/-6.6%	99.5%
Vanadium Pentoxide	+/-9.1%	102%

Parameter	Method	PEL
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/M	0.0002 mg/m3 (TWA)
Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	See footnote

L424369 (Report ID: 1029991):
TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for COBALT: 0.02 mg/m3
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for Calcium Oxide: 2 mg/m3
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3
TLV for SELENIUM: 0.2 mg/m3
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

SGS GALSON

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 02-NOV-17 Account No.: 90734
Date Received: 04-NOV-17 Login No. : L424369
Date Analyzed: 07-NOV-17 - 12-NOV-17

L424369 (Report ID: 1029991):
TLV for CHROMIUM: 0.5 mg/m3
TLV for IRON OXIDE: 5 mg/m3
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(33), im-mwvfilt(28)
PEL listed refers to Aluminum as total dust.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.

L424369-7-8 (Report ID: 1029991):
Reported results represent Respirable Metals.

L424369 (Report ID: 1029991):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-7.7%	96.9%
Antimony	+/-9.8%	97.3%
Arsenic	+/-7.6%	103%
Barium	+/-6.5%	101%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 02-NOV-17 Account No.: 90734
Date Received: 04-NOV-17 Login No. : L424369
Date Analyzed: 07-NOV-17 - 12-NOV-17

Beryllium	+/-10.8%	103%
Cadmium	+/-8.6%	102%
Calcium Oxide	+/-10.6%	105%
Chromium	+/-11.2%	103%
Cobalt	+/-8.5%	103%
Copper	+/-10.3%	103%
Iron Oxide	+/-9.6%	106%
Lead	+/-9.1%	100%
Manganese	+/-8.3%	99.8%
Molybdenum	+/-7.6%	100%
Selenium	+/-11.6%	105%
Zinc Oxide	+/-8.9%	102%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)
Chromium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Selenium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

+L424369-1 (Report ID: 1030331):
The sample results may have a negative bias; the filter surface was covered by

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 02-NOV-17 Account No.: 90734
Date Received: 04-NOV-17 Login No. : L424369
Date Analyzed: 07-NOV-17 - 12-NOV-17

+L424369-1 (Report ID: 1030331):
fine particulate that may have obscured fibers.

L424369 (Report ID: 1030331):
SOPs: ia-pcm(26)
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a
greater than optimal variability and are probably biased.
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as
follows:
0.154 (5-20 fibers/100 fields)
0.100 (>20-50 fibers/100 fields)
0.069 (>50-100 fibers/100 fields)
0.090 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take
into account any uncertainty associated with the sampling process.

L424369 (Report ID: 1029718):
SOPs: GRAV-SOP-8(17)
Gravimetric analytical accuracy of the sampling media is 0.013 +/- 0.062 mg (average blank
weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and
SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.

L424369 (Report ID: 1029699):
TLV for RESPIRABLE DUST: NA
SOPs: GRAV-SOP-5(18), GRAV-SOP-6(17)
Gravimetric analytical accuracy of the sampling media is 0.002 +/- 0.018 mg (average blank
weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and
SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.
PNOR = Particulates Not Otherwise Regulated.

L424369 (Report ID: 1031149):
TLV for QUARTZ: 0.025 mg/m3 Respirable
TLV for TRIDYMITE: NA
TLV for CRISTOBALITE: 0.025 mg/m3 Respirable

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 02-NOV-17 Account No.: 90734
Date Received: 04-NOV-17 Login No. : L424369
Date Analyzed: 07-NOV-17 - 12-NOV-17

L424369 (Report ID: 1031149):
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26)

L424369 (Report ID: 1031149):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-13.8%	101%
Quartz	+/-10.9%	93.4%
Tridymite	+/-13.6%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

NVLAP®
Lab Code 101143-0
NY ELAP
Lab ID 10920

Chain of Custody: 285038
Client: Galson Laboratories
Address: 6601 Kirkville Road
East Syracuse, NY 13057-9672
Attention: Pam Weaver

Job Name: Not Provided
Job Location: Not Provided
Job Number: L424369
P.O. Number: 90734

Date Submitted: 11/10/2017
Date Analyzed: 11/17/2017
Report Date: 11/17/2017
Date Sampled: 11/02/2017
Person Submitting: Zach King

Summary of Transmission Electron Microscopy

Filter Type: MCE **Pore Size:** 0.8 um **Filter Size:** 25 mm (385 mm²)

AMA Sample Number	Client Sample Number	Volume (L)	Area Analyzed (mm²)	Analytical Sensitivity f/cc	Asbestos Type Amount	# Non Asbestos Structures	Concentration f/mm²	Concentration f/cc	Fraction	Sample Type	Comments
285038-1	22152-A63	365.7	0.532	0.002	0	1	<8	<0.0079	0.0	N/P	

Analytical procedures used meet or exceed NIOSH 7402 protocols.

** - To calculate the asbestos concentration of the PCM result multiply the original PCM result by the fraction.

All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

Analyst(s): Michael Greenberg

Technical Director Andreas Saldivar

4475 Forbes Blvd. · Lanham, MD, 20706 · (301) 459-2640 · Toll Free (800) 346-0961 · Fax (301) 459-2643

AMA Analytical Services, Inc.
Focused on Results www.amalab.com
AIHA-LAP (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 285038

Mailing/Billing Information:

1. Client Name: Galson
2. Address 1:
3. Address 2:
4. Address 3:
5. Phone #: Fax #:

Submittal Information:

1. Job Name:
2. Job Location:
3. Job #: L424369 P.O. #: 90734
4. Contact Person: Pam Weaver Cell:
5. Collected by: Zach King Cell:

Reporting Info (Results provided as soon as technically feasible). If no TAT/Reporting Info is provided, AMA will assign defaults of 5-Day and email/fax to contacts on file.

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
❑ 4 Hours ❑ Immediate Date Due: ❑ 24 Hours Time Due: Comments:	❑ 4 Hours ❑ 3 Day ❑ Same Day ❑ 5 Day + ❑ Next Day Date Due: 11/17/17 ❑ 2 Day ❑ Results Required By Noon	❑ Email: ❑ Email 2: ❑ Verbals:

Asbestos Analysis

*PCM Air – Please Indicate Filter Type:
- ❑ NIOSH 7400 (QTY)
- ❑ Fiberglass (QTY)

TEM Air* – Please Indicate Filter Type:
- ❑ AHERA (QTY)
- ❑ NIOSH 7402 (QTY)
- ❑ Other (specify) (QTY)

PLM Bulk
- ❑ EPA 600 – Visual Estimate (QTY) ❑ Pos Stop
- ❑ EPA Point Count (QTY)
- ❑ NY State Friable 198.1 (QTY)
- ❑ Grav. Reduction ELAP 198.6 (QTY)
- ❑ Other (specify) (QTY)

MISC
- ❑ Vermiculite
- ❑ Asbestos Soil PLM (Qual) PLM (Quan) PLM/TEM (Qual) PLM/TEM (Quan)

*It is recommended that blank samples be submitted with all air and surface samples

TEM Bulk
- ❑ ELAP 198.4/Chatfield (QTY)
- ❑ NY State PLM/TEM (QTY)
- ❑ Residual Ash (QTY)

TEM Dust*
- ❑ Qual. (pres/abs) Vacuum/Dust (QTY)
- ❑ Quan. (s/area) Vacuum D5755-95 (QTY)
- ❑ Quan. (s/area)Dust D6480-99 (QTY)

TEM Water
- ❑ Qual. (pres/abs) (QTY)
- ❑ ELAP 198.2/EPA 100.2 (QTY)
- ❑ EPA 100.1 (QTY)

❑ All samples received in good condition unless otherwise noted.
(TEM Water samples °C)

If field data sheets are submitted, there is no need to complete bottom section.

Metals Analysis
- ❑ Pb Paint Chip (QTY)
- ❑ *Pb Dust Wipe (wipe type) (QTY)
- ❑ *Pb Air (QTY)
- ❑ Pb Soil/Solid (QTY)
- ❑ Pb TCLP (QTY)
- ❑ Drinking Water ❑ Pb (QTY) ❑ Cu (QTY) ❑ As (QTY)
- ❑ Waste Water ❑ Pb (QTY) ❑ Cu (QTY) ❑ As (QTY)
- ❑ Pb Furnace (Media) (QTY)

Fungal Analysis

Collection Apparatus for Spore Traps/Air Samples:
Collection Media
- ❑ *Spore-Trap (QTY)
- ❑ *Surface Swab (QTY)
- ❑ *Surface Tape (QTY)
- ❑ Other (Specify) (QTY
- ❑ Surface Vacuum Dust (QTY)
- ❑ Culturable ID Genus (Media) (QTY)
- ❑ Culturable ID Species (Media) (QTY)

SAMPLE INFORMATION				ANALYSIS					MATRIX								CLIENT CONTACT
CLIENT ID #	SAMPLE LOCATION/ ID	DATE/ TIME	VOL (L)/ Wipe Area	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB		(LABORATORY STAFF ONLY)
																	Date/Time: Contact:By:
																	Date/Time: Contact:By:
																	Date/Time: Contact:By:

	Print Name	Signature	Date	Time
Relinquished by:				
Received by:				
Relinquished by:				
Received for Lab by:	Tyler		NOV 10 2017	1000

Shipping Information
❑ UPS ❑ In-Person ❑ Other
❑ FedEx ❑ Drop Box
❑ USPS ❑ Courrier
Airbill/Tracking No:

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6601 Kirkville Rd
East Syracuse, NY 13057-9672
Tel: 315-437-5227
888-432-LABS(5227)
Fax: 315-437-0571
www.galsonlabs.com

AMA

Check if change of address ☐
New Client ? yes ☐ no ☐

Report To :	**Shelly Krause**	Invoice To :	**Jeanne Glisson**
	SGS Galson Laboratory		SGS Galson Laboratory
	6601 Kirkville Road		6601 Kirkville Road
	East Syracuse, NY 13057		East Syracuse, NY 13057
Phone No. :	888-432-5227	Phone No. :	888-432-5227
		Fax No.	315-437-0571

Site Name : **Project :** L424369 **Sampled By :** Client

Turnaround Time	Due Date
☑ Standard	11/17/17
☐ 4 Business Days	
☐ 3 Business Days	
☐ 2 Business Days	
☐ Next Day by 6pm	
☐ Next Day by Noon	
☐ Same day	

Verbal Authorization : 90734

Credit Card No. : Card Holder Name : Exp. :

Fax Results To : Email Only Please Fax No. : Email Only Please

Email Results To : Syracuse.Subcontracting@sgs.com

Sample Identification	Date Sampled	Collection Medium	*Air Volume (liters)/ Passive Monitors (Min)	Analysis Requested	Method Reference	Fibers/fields
22152 - A63	11/2/2017	25mm MCE PCM	365.70	Transmission Electron Microscopy	NIOSH 7402; TEM	14.5/100

Comments:

State/Province of sampling event: Ontario

If the method being reported is not on your laboratory's current AIHA scope of accreditation, please state that in your report.
Please provide an uncertainty statement in accordance with AIHA LQAP policy document Section 2A.5.4.3.

Chain of Custody	Print Name	Signature	Date/Time
Relinquished by :	Zach King		11/9/2017 0:00
Received by LAB :			

KSM

SGS GALSON

1Z5X626A6948791809
Date: 11/04/17
Shipper: UPS
Initials: KMS
3K 2A2
Prep: UNKNOWN
L4243G9

☐ New Client?

Client Account No.*: _____

Report To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2
Phone No.*: 416-393-6668
Cell No.: _____
Email Results to: Virgil.Umali@ttc.ca & oheresults@oheconsultants.com
Email address: _____

Invoice To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2
Phone No.: _____
Email: _____
P.O. No.: PU240835
Credit Card ☐ Card on File ☐ Call for Credit Card Info.

☐ Samples submitted using the FreePumpLoan™ Program ☐ Samples submitted using the FreeSamplingBadges™ Program

Need Results By*:	(surcharge)
☑ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%

Check for availability an pricing for quicker turn around times.

Site Name: _____ Project: 22152 Sampled by: OHE Consultants

Comments:

TTC Subway Air Quality

List description of industry or Process/interferences present in sampling area:

Province samples were collected in (ex. ON)

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify):

Sample Identification* (Maxmium of 20 Characters. ID's longer then 20 characters will be abbreviated.)	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (e.g., welding plating, painting, etc.)*
22152 - A63	11/02/17	25 mm PCM	365.70	L	Standardized List of Analyses for TTC		
22152 - A64		25 mm PCM	-	-	Subway Air Quality Study		
22152 - S63		PW PVC in PPI	719.22	L	-		
22152 - S64		PW PVC in PPI	-	-	-		
22152 - I61		PW PVC in IOM	719.94	L	-		
22152 - I62		PW PVC in IOM	-	-	-		
22152 - M63		UW MCE in PPI	719.22	L	-		
22152 - M64		UW MCE in PPI	-	-	-		
22152 - T63		UW MCE	713.85	L	-		
22152 - T64		UW MCE	-	-	-		

^Galson Laboratories will subsititute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ, please indicate if the lower LOQ is required (only available for certain analytes - see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date	Time		Print Name/Signature	Date	Time
Relinquished by	Romain Mathevet	11/03/17	10:00	Received by:	Herman	11/3/17	6:00 pm
Relinquished by		11/3/17	6:00 pm	Received by:	Kris Stone	11/4/17	12:10

Samples received after 3pm will be considered as next day's business

* Required fields, failure to complete these fields may result in a delay in your samples being processed.

90734

The TTC file number/purchase order number is PU240835:

1) Total Metals by NIOSH 7300. Analyze for antimony, arsenic, barium, beryllium, cadmium, calcium oxide, chromium III, cobalt, copper, lead, manganese, and selenium. UW MCE

2) Asbestos fibre count by NIOSH 7400. In addition, analyze specifically for asbestos by TEM if the fibre count result exceeds 0.01 f/cc. PCM

3) Respirable silica and respirable dust by NIOSH 7500/0600. Analyze for quartz, cristobalite, tridymite, and dust. PPI PW PVC

4) Respirable metals by NIOSH 7300. Analyze for aluminum, cadmium, iron oxide, molybdenum, and zinc oxide. PPI UW MCE

5) Inhalable metals and inhalable dust by NIOSH 7300/0500. Analyze for magnesium oxide, molybdenum, nickel, thallium, vanadium pentoxide, and dust. Beryllium should also be analyzed by ICP-MS to get a lower limit of detection. IOM

SGS GALSON

Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Canada

November 29, 2017

AIHA-LAP #100324 Account# 90734 Login# L425242

Dear Mr. Umali:

Enclosed are the analytical results for the samples received by our laboratory on November 13, 2017. All test results meet quality control requirements of AIHA-LAP and NELAC unless otherwise stated in this report. All samples on chain of custody were received in good condition unless otherwise noted.

TEM samples were subcontracted to AMA. Results included.

Results in this report are based on sampling data provided by the client and refer only to the samples as they were received at the laboratory. Unless otherwise requested, samples for asbestos analysis will be discarded 60 days from date of this report and all other non-IOM samples will be retained for 14 days following the date of this report (when possible). IOMs will be cleaned & disposed of after seven calendar days.

To ensure the safety of laboratory receiving personnel, always seal bulk samples securely to prevent possible escape of material. Also, please double-bag bulk samples individually prior to shipping. Samples not received in this manner will be noted on chain of custody form.

Current Scopes of Accreditation can be viewed at www.sgsgalson.com in the accreditations section of the "About" page.

Please contact Katrina Ahchong at (888) 432-5227, if you would like any additional information regarding this report. Thank you for using SGS Galson Laboratories.

Sincerely,

SGS Galson Laboratories

Lisa Swab
Laboratory Director

Enclosure(s)

Galson Laboratories, Inc. is now a part of SGS, the world's leading inspection, verification, testing, and certification company. As part of our transition to SGS, you will begin to see some formatting changes with reports that will improve the presentation of data and allow for the transition to the new logo.

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 07-NOV-17
Date Received : 13-NOV-17

Account No.: 90734
Login No. : L425242
Date Analyzed : 14-NOV-17 - 16-NOV-17
Report ID : 1031622

Client ID : 22152-M65 **Lab ID : L425242-9** **Air Volume : 974.3 L**
Date Sampled : 11/07/17 **Date Analyzed : 11/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.0077	mg/m3
Cadmium	0.15	<0.15	<0.00015	mg/m3
Iron Oxide	11.	320	0.33	mg/m3
Molybdenum	0.15	<0.15	<0.00015	mg/m3
Zinc Oxide	2.8	<2.8	<0.0029	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 15-NOV-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 07-NOV-17
Date Received : 13-NOV-17

Account No.: 90734
Login No. : L425242
Date Analyzed : 14-NOV-17 - 16-NOV-17
Report ID : 1031622

Client ID : 22152-M66 **Lab ID : L425242-10** **Air Volume : NA**
Date Sampled : 11/07/17 **Date Analyzed : 11/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 15-NOV-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 07-NOV-17
Date Received : 13-NOV-17

Account No.: 90734
Login No. : L425242

Date Analyzed : 14-NOV-17 - 16-NOV-17
Report ID : 1031622

Client ID : 22152-T65 **Lab ID : L425242-11** **Air Volume : 976.7 L**
Date Sampled : 11/07/17 **Date Analyzed : 11/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.00092	mg/m3
Arsenic	0.30	<0.30	<0.00031	mg/m3
Barium	0.15	19	0.020	mg/m3
Beryllium	0.15	<0.15	<0.00015	mg/m3
Cadmium	0.15	<0.15	<0.00015	mg/m3
Calcium Oxide	100.	<100	<0.11	mg/m3
Chromium	7.5	<7.5	<0.0077	mg/m3
Cobalt	0.45	<0.45	<0.00046	mg/m3
Copper	0.30	1.8	0.0018	mg/m3
Lead	0.38	<0.38	<0.00038	mg/m3
Manganese	0.15	2.9	0.0030	mg/m3
Selenium	2.3	<2.3	<0.0023	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 15-NOV-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 07-NOV-17
Date Received : 13-NOV-17

Account No.: 90734
Login No. : L425242

Date Analyzed : 14-NOV-17 - 16-NOV-17
Report ID : 1031622

Client ID : 22152-T66 **Lab ID : L425242-12** **Air Volume : NA**
Date Sampled : 11/07/17 **Date Analyzed : 11/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.30	<0.30	NA	mg/m3
Barium	0.15	<0.15	NA	mg/m3
Beryllium	0.15	<0.15	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.45	<0.45	NA	mg/m3
Copper	0.30	<0.30	NA	mg/m3
Lead	0.38	<0.38	NA	mg/m3
Manganese	0.15	<0.15	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 15-NOV-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 07-NOV-17
Date Received : 13-NOV-17

Account No.: 90734
Login No. : L425242

Date Analyzed : 14-NOV-17 - 16-NOV-17
Report ID : 1032253

Client ID : 22152-I63 **Lab ID : L425242-7** **Air Volume : 978.1 L**
Date Sampled : 11/07/17 **Date Analyzed : 11/16/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	<0.0000077	mg/m3
Magnesium Oxide	12.	<12	<0.013	mg/m3
Molybdenum	0.075	<0.075	<0.000077	mg/m3
Nickel	0.15	0.67	0.00069	mg/m3
Thallium	0.75	<0.75	<0.00077	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.00082	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm MCE
Date : 17-NOV-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 07-NOV-17
Date Received : 13-NOV-17

Account No.: 90734
Login No. : L425242
Date Analyzed : 14-NOV-17 - 16-NOV-17
Report ID : 1032253

Client ID : 22152-I64 **Lab ID : L425242-8** **Air Volume : NA**
Date Sampled : 11/07/17 **Date Analyzed : 11/16/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	NA	mg/m3
Magnesium Oxide	12.	<12	NA	mg/m3
Molybdenum	0.075	<0.075	NA	mg/m3
Nickel	0.15	<0.15	NA	mg/m3
Thallium	0.75	<0.75	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm MCE
Date : 17-NOV-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 07-NOV-17
Date Received : 13-NOV-17

Account No.: 90734
Login No. : L425242
Date Analyzed : 16-NOV-17
Report ID : 1032067

Asbestos Fiber Count (A Rules)

	Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
+	22152-A65A	L425242-1	VOID	VOID	VOID	261,700	VOID
$	22152-A65B	L425242-2	8/100	10.2	3927	113,800	0.03
	22152-A65C	L425242-3	11/100	14	5390	121,000	0.045
	22152-A66	L425242-4	1/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : BTM
Approved by : RCF
Date : 16-NOV-17
QC by: TJB
Supervisor: BDB

< -Less Than
> -Greater Than
ND -Not Detected
NA -Not Applicable
cc -Cubic Centimeters
NS -Not Specified
mm2 -Square millimeters

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 07-NOV-17
Date Received : 13-NOV-17

Account No.: 90734
Login No. : L425242
Date Analyzed : 15-NOV-17
Report ID : 1031084

Inhalable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-I63	L425242-7	978.1	0.66	0.67
22152-I64	L425242-8	NA	<0.10	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.10 mg
Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV
OSHA PEL : NA
Collection Media : IOM 25mm MCE

Submitted by: PAH
Approved by : SAP/SPR
Date : 15-NOV-17
Supervisor: KRK

NYS DOH # : 11626
QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 07-NOV-17
Date Received : 13-NOV-17

Account No.: 90734
Login No. : L425242
Date Analyzed : 15-NOV-17
Report ID : 1031086

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-S65	L425242-5	979.1	0.41	0.42
22152-S66	L425242-6	NA	<0.050	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg
Analytical Method : mod. NIOSH 0600; Gravimetric
OSHA PEL : PNOR 5 mg/m3 (TWA)
Collection Media : PVC PW 37mm

Submitted by: AS
Approved by : SPR
Date : 16-NOV-17
Supervisor: KRK

NYS DOH # : 11626
QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 07-NOV-17
Date Received : 13-NOV-17

Account No.: 90734
Login No. : L425242
Date Analyzed : 15-NOV-17 - 20-NOV-17
Report ID : 1032698

Respirable Crystalline Silica (RCS): Quartz, Cristobalite, Tridymite

Sample ID	Lab ID	Analyte	Air Vol l	ug	ug/m3
22152-S65	L425242-5	Quartz	979.1	<5.0	<5.1
		Cristobalite	979.1	<5.0	<5.1
		Tridymite	979.1	<20	<20
		RCS	979.1	<5.0	<5.1
22152-S66	L425242-6	Quartz	NA	<5.0	NA
		Cristobalite	NA	<5.0	NA
		Tridymite	NA	<20	NA
		RCS	NA	<5.0	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: Q:5.0ug C:5.0ug T:20.ug
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD
OSHA PEL : 50 ug/m3 RCS
Collection Media : PVC PW 37mm

Submitted: AJD
Approved: KRK
Date : 20-NOV-17 NYS DOH # : 11626
Supervisor: KRK QC by: TJB

< -Less Than
> -Greater Than
NA -Not Applicable
mg -Milligrams
ug -Micrograms
ND -Not Detected
kg -Kilograms
m3 -Cubic Meters
l -Liters
ppm -Parts per Million
NS -Not Specified
mppcf -Million Particles per Cubic Foot

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 07-NOV-17 Account No.: 90734
Date Received: 13-NOV-17 Login No. : L425242
Date Analyzed: 14-NOV-17 - 20-NOV-17

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L425242 (Report ID: 1032253):
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: im-mwvfilt(28), MT-SOP-21(10)
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3; as Fume, Ceiling = 0.1 mg/m3.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
TLV for VANADIUM PENTOXIDE: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for MAGNESIUM OXIDE: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 07-NOV-17 Account No.: 90734
Date Received: 13-NOV-17 Login No. : L425242
Date Analyzed: 14-NOV-17 - 20-NOV-17

L425242 (Report ID: 1032253):

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Beryllium	+/-12.6%	103%
Magnesium Oxide	+/-9.1%	102%
Molybdenum	+/-10.3%	99.4%
Nickel	+/-10%	103%
Thallium	+/-6.6%	99.5%
Vanadium Pentoxide	+/-9.1%	102%

Parameter	Method	PEL
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/M	0.0002 mg/m3 (TWA)
Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	See footnote

L425242 (Report ID: 1031622):

Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(33), im-mwvfilt(28)
PEL listed refers to Aluminum as total dust.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
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Date Sampled : 07-NOV-17 Account No.: 90734
Date Received: 13-NOV-17 Login No. : L425242
Date Analyzed: 14-NOV-17 - 20-NOV-17

L425242 (Report ID: 1031622):
compounds, as Mo (total dust) = 15 mg/m3.
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.
TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for COBALT: 0.02 mg/m3
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for CALCIUM OXIDE: 2 mg/m3
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3
TLV for SELENIUM: 0.2 mg/m3
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for CHROMIUM: 0.5 mg/m3
TLV for IRON OXIDE: 5 mg/m3
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote

L425242-9-10 (Report ID: 1031622):
Reported results represent Respirable Metals.

L425242 (Report ID: 1031622):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-7.7%	96.9%
Antimony	+/-9.8%	97.3%
Arsenic	+/-7.6%	103%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 07-NOV-17 Account No.: 90734
Date Received: 13-NOV-17 Login No. : L425242
Date Analyzed: 14-NOV-17 - 20-NOV-17

Barium	+/-6.5%	101%
Beryllium	+/-10.8%	103%
Cadmium	+/-8.6%	102%
Calcium Oxide	+/-10.6%	105%
Chromium	+/-11.2%	103%
Cobalt	+/-8.5%	103%
Copper	+/-10.3%	103%
Iron Oxide	+/-9.6%	106%
Lead	+/-9.1%	100%
Manganese	+/-8.3%	99.8%
Molybdenum	+/-7.6%	100%
Selenium	+/-11.6%	105%
Zinc Oxide	+/-8.9%	102%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)
Chromium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Selenium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

+L425242-1 (Report ID: 1032067):
VOID-Filter overloaded with particulate, fiber counts can not be provided.

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

6601 Kirkville Road
East Syracuse, NY 13057
(315) 432-5227
FAX: (315) 437-0571
www.galsonlabs.com

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 07-NOV-17 Account No.: 90734
Date Received: 13-NOV-17 Login No. : L425242
Date Analyzed: 14-NOV-17 - 20-NOV-17

$L425242-2 (Report ID: 1032067):
The sample results may have a negative bias; the filter surface was covered by fine particulate that may have obscured fibers.

L425242 (Report ID: 1032067):
SOPs: ia-pcm(26)
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a greater than optimal variability and are probably biased.
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as follows:
0.154 (5-20 fibers/100 fields)
0.100 (>20-50 fibers/100 fields)
0.069 (>50-100 fibers/100 fields)
0.090 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take into account any uncertainty associated with the sampling process.

L425242 (Report ID: 1031084):
SOPs: GRAV-SOP-8(17)
Gravimetric analytical accuracy of the sampling media is 0.013 +/- 0.062 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.

L425242 (Report ID: 1031086):
TLV for RESPIRABLE DUST: NA
SOPs: GRAV-SOP-5(18), GRAV-SOP-6(17)
Gravimetric analytical accuracy of the sampling media is 0.002 +/- 0.018 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.
PNOR = Particulates Not Otherwise Regulated.

L425242 (Report ID: 1032698):
TLV for QUARTZ: 0.025 mg/m3 Respirable
TLV for TRIDYMITE: NA

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

---

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www.galsonlabs.com

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 07-NOV-17 Account No.: 90734
Date Received: 13-NOV-17 Login No. : L425242
Date Analyzed: 14-NOV-17 - 20-NOV-17

L425242 (Report ID: 1032698):
TLV for CRISTOBALITE: 0.025 mg/m3 Respirable
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26)

L425242 (Report ID: 1032698):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-13.8%	101%
Quartz	+/-10.9%	93.4%
Tridymite	+/-13.6%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

Lab Code 101143-0
NY ELAP
Lab ID 10920

Chain of Custody: 286576
Client: Galson Laboratories
Address: 6601 Kirkville Road
East Syracuse, NY 13057-9672
Attention: Pam Weaver

Job Name: Not Provided
Job Location: Not Provided
Job Number: L425242
P.O. Number: 90734

Date Submitted: 11/20/2017
Date Analyzed: 11/26/2017
Report Date: 11/27/2017
Date Sampled: 11/07/2017
Person Submitting: Zach King

Summary of Transmission Electron Microscopy

Filter Type: MCE **Pore Size:** 0.8 um **Filter Size:** 25 mm (385 mm²)

AMA Sample Number	Client Sample Number	Volume (L)	Area Analyzed (mm²)	Analytical Sensitivity f/cc	Asbestos Type Amount	# Non Asbestos Structures	Concentration f/mm²	Concentration f/cc	Fraction	Sample Type	Comments
286576-1	22152-A65B	113.8	0.532	0.0064	0	3	<8	<0.0254	0.0	N/P	
286576-2	22152-A65C	121.0	0.532	0.006	0	2	<8	<0.0239	0.0	N/P	

Analytical procedures used meet or exceed NIOSH 7402 protocols.

** - To calculate the asbestos concentration of the PCM result multiply the original PCM result by the fraction.

All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

Analyst(s): Michael Creaghan

Technical Director Andreas Saldivar

4475 Forbes Blvd. · Lanham, MD, 20706 · (301) 459-2640 · Toll Free (800) 346-0961 · Fax (301) 459-2643

AMA Analytical Services, Inc.
Focused on Results www.amalab.com
AIHA-LAP (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 286576

Mailing/Billing Information:

1. Client Name: Gaston
2. Address 1:
3. Address 2:
4. Address 3:
5. Phone #: Fax #:

Submittal Information:

1. Job Name:
2. Job Location:
3. Job #: L425242 P.O. #: 90734
4. Contact Person: Cell:
5. Collected by: Cell:

Reporting Info (Results provided as soon as technically feasible). If no TAT/Reporting Info is provided, AMA will assign defaults of 5-Day and email/fax to contacts on file.

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
❑ 4 Hours ❑ Immediate Date Due: ❑ 24 Hours Time Due: Comments:	❑ 4 Hours ❑ Same Day ❑ Next Day ❑ 2 Day ❑ 3 Day ☒ 5 Day + Date Due: 11/24/17 ❑ Results Required By Noon	❑ Email: ❑ Email 2: ❑ Verbals:

Asbestos Analysis

*PCM Air – Please Indicate Filter Type:
- ❑ NIOSH 7400 (QTY)
- ❑ Fiberglass (QTY)

TEM Air* – Please Indicate Filter Type:
- ❑ AHERA (QTY)
- ☒ NIOSH 7402 2 (QTY)
- ❑ Other (specify) (QTY)

PLM Bulk
- ❑ EPA 600 – Visual Estimate (QTY) ❑ Pos Stop
- ❑ EPA Point Count (QTY)
- ❑ NY State Friable 198.1 (QTY)
- ❑ Grav. Reduction ELAP 198.6 (QTY)
- ❑ Other (specify) (QTY)

MISC
- ❑ Vermiculite
- ❑ Asbestos Soil PLM (Qual) PLM (Quan) PLM/TEM (Qual) PLM/TEM (Quan)

*It is recommended that blank samples be submitted with all air and surface samples

TEM Bulk
- ❑ ELAP 198.4/Chatfield (QTY)
- ❑ NY State PLM/TEM (QTY)
- ❑ Residual Ash (QTY)

TEM Dust*
- ❑ Qual. (pres/abs) Vacuum/Dust (QTY)
- ❑ Quan. (s/area) Vacuum D5755-95 (QTY)
- ❑ Quan. (s/area)Dust D6480-99 (QTY)

TEM Water
- ❑ Qual. (pres/abs) (QTY)
- ❑ ELAP 198.2/EPA 100.2 (QTY)
- ❑ EPA 100.1 (QTY)

AV All samples received in good condition unless otherwise noted.
(TEM Water samples °C)

If field data sheets are submitted, there is no need to complete bottom section.

Metals Analysis
- ❑ Pb Paint Chip (QTY)
- ❑ *Pb Dust Wipe (wipe type) (QTY)
- ❑ *Pb Air (QTY)
- ❑ Pb Soil/Solid (QTY)
- ❑ Pb TCLP (QTY)
- ❑ Drinking Water ❑ Pb (QTY) ❑ Cu (QTY) ❑ As (QTY)
- ❑ Waste Water ❑ Pb (QTY) ❑ Cu (QTY) ❑ As (QTY)
- ❑ Pb Furnace (Media) (QTY)

Fungal Analysis

Collection Apparatus for Spore Traps/Air Samples:
Collection Media
- ❑ *Spore-Trap (QTY)
- ❑ *Surface Swab (QTY)
- ❑ *Surface Tape (QTY)
- ❑ Other (Specify) (QTY
- ❑ Surface Vacuum Dust (QTY)
- ❑ Culturable ID Genus (Media) (QTY)
- ❑ Culturable ID Species (Media) (QTY)

CLIENT ID #	SAMPLE INFORMATION SAMPLE LOCATION/ ID	DATE/ TIME	VOL (L)/ Wipe Area	ANALYSIS: TEM	PCM	PLM	LEAD	MOLD	MATRIX: AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB	CLIENT CONTACT (LABORATORY STAFF ONLY)
																Date/Time: Contact:By:
																Date/Time: Contact:By:
																Date/Time: Contact:By:

	Print Name	Signature	Date	Time
Relinquished by:				
Received by:				
Relinquished by:				
Received for Lab by:	BW Hudson		11/20/17	0930

Shipping Information
☒ UPS ☐ In-Person ☐ Other
☐ FedEx ☐ Drop Box
☐ USPS ☐ Courier
Airbill/Tracking No:

AMA

GALSON LABORATORIES
6601 Kirkville Rd
East Syracuse, NY 13057-9672
Tel: 315-437-5227
888-432-LABS(5227)
Fax: 315-437-0571
www.galsonlabs.com

Check if change of address ☐
New Client ? yes ☐ no ☐

Report To :	**Shelly Krause**	Invoice To :	**Jeanne Glisson**
	SGS Galson Laboratory		SGS Galson Laboratory
	6601 Kirkville Road		6601 Kirkville Road
	East Syracuse, NY 13057		East Syracuse, NY 13057
Phone No. :	888-432-5227	Phone No. :	888-432-5227
		Fax No.	315-437-0571

Site Name : **Project :** L425242 **Sampled By :** Client

Turnaround Time	Due Date
☑ Standard	11/29/17
☐ 4 Business Days	
☐ 3 Business Days	
☐ 2 Business Days	
☐ Next Day by 6pm	
☐ Next Day by Noon	
☐ Same day	

Verbal Authorization : 90734

Credit Card No. : Card Holder Name : Exp. :

Fax Results To : Email Only Please Fax No. : Email Only Please

Email Results To : Syracuse.Subcontracting@sgs.com

Sample Identification	Date Sampled	Collection Medium	*Air Volume (liters)/ Passive Monitors (Min)	Analysis Requested	Method Reference	Fiber/field
22152-A65B	11/7/2017	25mm MCE PCM	113.8	Transmission Electron Microscopy	NIOSH 7402; TEM	8/100
22152-A65C	11/7/2017	25mm MCE PCM	121.0	Transmission Electron Microscopy	NIOSH 7402; TEM	11-Nov

Comments:

State/Province of sampling event: Ontario

If the method being reported is not on your laboratory's current AIHA scope of accreditation, please state that in your report.
Please provide an uncertainty statement in accordance with AIHA LQAP policy document Section 2A.5.4.3.

Chain of Custody	Print Name	Signature	Date/Time
Relinquished by :	Zach King		11/17/2017 17:01
Received by LAB :			

R CH3

SGS GALSON

1Z5X626A6948237177
Date:
Shipper: UPS
Initials: MAK
Prep: UNKNOWN

2425242

☐ New Client?

Client Account No.*:

A2

Report To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2
Phone No.*: 416-393-6668
Cell No.:
Email Results to: Virgil.Umali@ttc.ca & oheresults@oheconsultants.com
Email address:

Invoice To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2
Phone No.:
Email:
P.O. No.: PU240835
Credit Card ☐ Card on File ☐ Call for Credit Card Info.

☐ Samples submitted using the FreePumpLoan™ Program ☐ Samples submitted using the FreeSamplingBadges™ Program

Need Results By*:	(surcharge)
☑ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%

Check for availability an pricing for quicker turn around times.

Site Name:
Project: 22152
Sampled by: OHE Consultants

Comments:

TTC Subway Air Quality

List description of industry or Process/interferences present in sampling area:

Province samples were collected in (ex. ON)

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify):

Sample Identification* (Maxmium of 20 Characters. ID's longer than 20 characters will be abbreviated.)	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (e.g., welding plating, painting, etc.)*
22152 - A65a	11/07/17	25 mm PCM	261.7	L	Standardized List of Analyses for TTC		
22152 - A65b	11/07/17	25 mm PCM	113.8	L	Subway Air Quality Study		
22152 - A65c	11/07/17	25 mm PCM	121.0	L	-		
22152 - A66	11/07/17	25 mm PCM	-	-	-		
22152 - S65	11/07/17	PW PVC in PPI	979.1	L	-		
22152 - S66	11/07/17	PW PVC in PPI	-	-	-		
22152 - I63	11/07/17	PW PVC in IOM	978.1	L	-		
22152 - I64	11/07/17	PW PVC in IOM	-	-	-		
22152 - M65	11/07/17	UW MCE in PPI	974.3	L	-		
22152 - M66	11/07/17	UW MCE in PPI	-	-	-		

^Galson Laboratories will subsititute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ, please indicate if the lower LOQ is required (only available for certain analytes - see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date	Time		Print Name/Signature	Date	Time
Relinquished by	Yunny Desiana Lee	11/08/17	13:30	Received by:	Herman Sui	11/10/17	3:30 pm
Relinquished by	Herman Sui	11/10/17	6:00 pm	Received by:	Michelle Krause	11/13/17	1048

Samples received after 3pm will be considered as next day's business

* Required Fields. Failure to complete these fields may result in a delay in work starting being processed.

SGS GALSON

1140 Sheppard Avenue West
Unit 5
North York, Ontario, Canada M3K 2A2
Tel: 888-432-5227
www.galsonlabs.ca

☐ New Client?

Client Account No.*: _____

Report To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2
Phone No.*: 416-393-6668
Cell No.:
Email Results to: Virgil.Umali@ttc.ca & oheresults@oheconsultants.com
Email address:

Invoice To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2
Phone No.:
Email:
P.O. No.: PU240835
Credit Card ☐ Card on File ☐ Call for Credit Card Info.

☐ Samples submitted using the FreePumpLoan™ Program ☐ Samples submitted using the FreeSamplingBadges™ Program

Need Results By*:	(surcharge)
☑ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%

Check for availability an pricing for quicker turn around times.

Site Name: Project: 22152 Sampled by: OHE Consultants

Comments:

TTC Subway Air Quality

List description of industry or Process/interferences present in sampling area:

Province samples were collected in (ex. ON)

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify):

Sample Identification* (Maxmium of 20 Characters. ID's longer than 20 characters will be abbreviated.)	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (e.g., welding plating, painting, etc.)*
22152 - T65	11/07/17	UW MCE	976.7	L	Standardized List of Analyses for TTC		
22152 - T66	11/07/17	UW MCE	-	-	Subway Air Quality Study		

^Galson Laboratories will subsititute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ, please indicate if the lower LOQ is required (only available for certain analytes - see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date	Time		Print Name/Signature	Date	Time
Relinquished by	Yunny Desiana Lee	11/08/17	13:30	Received by:	Herman Sai	11/10/17	3:30pm
Relinquished by	Herman Sai	11/10/17	6:00pm	Received by:	Michelle Krause	11/13/17	10:48

Samples received after 3pm will be considered as next day's business

* Required Fields. Incomplete information may result in delay in your samples being processed.

Report Reference 1 Generated 20-NOV-17 17:19

90734

The TTC file number/purchase order number is PU240835:

1) Total Metals by NIOSH 7300. Analyze for antimony, arsenic, barium, beryllium, cadmium, calcium oxide, chromium III, cobalt, copper, lead, manganese, and selenium. UW MCE

2) Asbestos fibre count by NIOSH 7400. In addition, analyze specifically for asbestos by TEM if the fibre count result exceeds 0.01 f/cc. PCM

3) Respirable silica and respirable dust by NIOSH 7500/0600. Analyze for quartz, cristobalite, tridymite, and dust. PPI PW PVC

4) Respirable metals by NIOSH 7300. Analyze for aluminum, cadmium, iron oxide, molybdenum, and zinc oxide. PPI UW MCE

5) Inhalable metals and inhalable dust by NIOSH 7300/0500. Analyze for magnesium oxide, molybdenum, nickel, thallium, vanadium pentoxide, and dust. Beryllium should also be analyzed by ICP-MS to get a lower limit of detection. IOM

SGS GALSON

Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Canada

November 20, 2017

AIHA-LAP #100324 Account# 90734 Login# L425214

Dear Mr. Umali:

Enclosed are the analytical results for the samples received by our laboratory on November 13, 2017. All test results meet the quality control requirements of AIHA-LAP and NELAC unless otherwise stated in this report. All samples on the chain of custody were received in good condition unless otherwise noted.

Results in this report are based on the sampling data provided by the client and refer only to the samples as they were received at the laboratory. Unless otherwise requested, samples for asbestos analysis will be discarded 60 days from the date of this report and all other non-IOM samples will be retained for 14 days following the date of this report (when possible). IOMs will be cleaned & disposed of after seven calendar days.

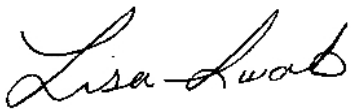
To ensure the safety of laboratory receiving personnel, always seal bulk samples securely to prevent possible escape of material. Also, please double-bag bulk samples individually prior to shipping. Samples not received in this manner will be noted on the chain of custody form.

Current Scopes of Accreditation can be viewed at www.sgsgalson.com in the accreditations section of the "About" page.

Please contact Katrina Ahchong at (888) 432-5227, if you would like any additional information regarding this report. Thank you for using SGS Galson Laboratories.

Sincerely,

SGS Galson Laboratories



Lisa Swab
Laboratory Director

Enclosure(s)

Galson Laboratories, Inc. is now a part of SGS, the world's leading inspection, verification, testing, and certification company. As part of our transition to SGS, you will begin to see some formatting changes withreports that will improve thepresentation of data and allow for the transition to the new logo.

SGS GALSON

6601 Kirkville Road
East Syracuse, NY 13057
(315) 432-5227
FAX: (315) 437-0571
www.galsonlabs.com

LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 09-NOV-17
Date Received : 13-NOV-17

Account No.: 90734
Login No. : L425214

Date Analyzed : 14-NOV-17 - 16-NOV-17
Report ID : 1031612

Client ID : 22152-M67 **Lab ID : L425214-7** **Air Volume : 672.5 L**
Date Sampled : 11/09/17 **Date Analyzed : 11/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.011	mg/m3
Cadmium	0.15	<0.15	<0.00022	mg/m3
Iron Oxide	11.	15	0.022	mg/m3
Molybdenum	0.15	<0.15	<0.00022	mg/m3
Zinc Oxide	2.8	<2.8	<0.0042	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 15-NOV-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

SGS GALSON

6601 Kirkville Road
East Syracuse, NY 13057
(315) 432-5227
FAX: (315) 437-0571
www.galsonlabs.com

LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 09-NOV-17
Date Received : 13-NOV-17

Account No.: 90734
Login No. : L425214

Date Analyzed : 14-NOV-17 - 16-NOV-17
Report ID : 1031612

Client ID : 22152-M68 **Lab ID : L425214-8** **Air Volume : NA**
Date Sampled : 11/09/17 **Date Analyzed : 11/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 15-NOV-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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East Syracuse, NY 13057
(315) 432-5227
FAX: (315) 437-0571
www.galsonlabs.com

LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 09-NOV-17
Date Received : 13-NOV-17

Account No.: 90734
Login No. : L425214

Date Analyzed : 14-NOV-17 - 16-NOV-17
Report ID : 1031612

Client ID : 22152-T67 **Lab ID : L425214-9** **Air Volume : 669.9 L**
Date Sampled : 11/09/17 **Date Analyzed : 11/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.0013	mg/m3
Arsenic	0.30	<0.30	<0.00045	mg/m3
Barium	0.15	0.50	0.00075	mg/m3
Beryllium	0.15	<0.15	<0.00022	mg/m3
Cadmium	0.15	<0.15	<0.00022	mg/m3
Calcium Oxide	100.	<100	<0.16	mg/m3
Chromium	7.5	<7.5	<0.011	mg/m3
Cobalt	0.45	<0.45	<0.00067	mg/m3
Copper	0.30	<0.30	<0.00045	mg/m3
Lead	0.38	<0.38	<0.00056	mg/m3
Manganese	0.15	0.20	0.00030	mg/m3
Selenium	2.3	<2.3	<0.0034	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 15-NOV-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 09-NOV-17
Date Received : 13-NOV-17

Account No.: 90734
Login No. : L425214

Date Analyzed : 14-NOV-17 - 16-NOV-17
Report ID : 1031612

Client ID : 22152-T68 **Lab ID : L425214-10** **Air Volume : NA**
Date Sampled : 11/09/17 **Date Analyzed : 11/14/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.30	<0.30	NA	mg/m3
Barium	0.15	<0.15	NA	mg/m3
Beryllium	0.15	<0.15	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.45	<0.45	NA	mg/m3
Copper	0.30	<0.30	NA	mg/m3
Lead	0.38	<0.38	NA	mg/m3
Manganese	0.15	<0.15	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 15-NOV-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 09-NOV-17
Date Received : 13-NOV-17

Account No.: 90734
Login No. : L425214

Date Analyzed : 14-NOV-17 - 16-NOV-17
Report ID : 1032251

Client ID : 22152-I65 **Lab ID : L425214-5** **Air Volume : 670.8 L**
Date Sampled : 11/09/17 **Date Analyzed : 11/16/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	<0.000011	mg/m3
Magnesium Oxide	12.	<12	<0.019	mg/m3
Molybdenum	0.075	0.24	0.00036	mg/m3
Nickel	0.15	<0.15	<0.00022	mg/m3
Thallium	0.75	<0.75	<0.0011	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.0012	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 17-NOV-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 09-NOV-17
Date Received : 13-NOV-17

Account No.: 90734
Login No. : L425214

Date Analyzed : 14-NOV-17 - 16-NOV-17
Report ID : 1032251

Client ID : 22152-I66 **Lab ID : L425214-6** **Air Volume : NA**
Date Sampled : 11/09/17 **Date Analyzed : 11/16/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	NA	mg/m3
Magnesium Oxide	12.	<12	NA	mg/m3
Molybdenum	0.075	<0.075	NA	mg/m3
Nickel	0.15	<0.15	NA	mg/m3
Thallium	0.75	<0.75	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 17-NOV-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 09-NOV-17
Date Received : 13-NOV-17

Account No.: 90734
Login No. : L425214
Date Analyzed : 16-NOV-17
Report ID : 1032065

Asbestos Fiber Count (A Rules)

Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
22152-A67	L425214-1	7.5/100	9.6	3696	333,500	0.01
22152-A68	L425214-2	3/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : BTM
Approved by : RCF
Date : 16-NOV-17
QC by: TJB
Supervisor: BDB

< -Less Than
> -Greater Than
ND -Not Detected
NA -Not Applicable
cc -Cubic Centimeters
NS -Not Specified
mm2 -Square millimeters

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 09-NOV-17
Date Received : 13-NOV-17

Account No.: 90734
Login No. : L425214
Date Analyzed : 15-NOV-17
Report ID : 1031070

Inhalable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-I65	L425214-5	670.8	0.11	0.16
22152-I66	L425214-6	NA	<0.10	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.10 mg
Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV
OSHA PEL : NA
Collection Media : IOM 25mm PW PVC

Submitted by: GMG
Approved by : SPR
Date : 15-NOV-17
Supervisor: KRK

NYS DOH # : 11626
QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 09-NOV-17
Date Received : 13-NOV-17

Account No.: 90734
Login No. : L425214
Date Analyzed : 15-NOV-17
Report ID : 1031071

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-S67	L425214-3	668.5	<0.050	<0.075
22152-S68	L425214-4	NA	<0.050	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg
Analytical Method : mod. NIOSH 0600; Gravimetric
OSHA PEL : PNOR 5 mg/m3 (TWA)
Collection Media : PVC PW 37mm

Submitted by: AS
Approved by : SPR
Date : 16-NOV-17
Supervisor: KRK

NYS DOH # : 11626
QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 09-NOV-17
Date Received : 13-NOV-17

Account No.: 90734
Login No. : L425214
Date Analyzed : 15-NOV-17 - 20-NOV-17
Report ID : 1032697

Respirable Crystalline Silica (RCS): Quartz, Cristobalite, Tridymite

Sample ID	Lab ID	Analyte	Air Vol l	ug	ug/m3
22152-S67	L425214-3	Quartz	668.5	<5.0	<7.5
		Cristobalite	668.5	<5.0	<7.5
		Tridymite	668.5	<20	<30
		RCS	668.5	<5.0	<7.5
22152-S68	L425214-4	Quartz	NA	<5.0	NA
		Cristobalite	NA	<5.0	NA
		Tridymite	NA	<20	NA
		RCS	NA	<5.0	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: Q:5.0ug C:5.0ug T:20.ug
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD
OSHA PEL : 50 ug/m3 RCS
Collection Media : PVC PW 37mm

Submitted: AJD
Approved: KRK
Date : 20-NOV-17 NYS DOH # : 11626
Supervisor: KRK QC by: TJB

< -Less Than
> -Greater Than
NA -Not Applicable
mg -Milligrams
ug -Micrograms
ND -Not Detected
kg -Kilograms
m3 -Cubic Meters
l -Liters
ppm -Parts per Million
NS -Not Specified
mppcf -Million Particles per Cubic Foot

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 09-NOV-17 Account No.: 90734
Date Received: 13-NOV-17 Login No. : L425214
Date Analyzed: 14-NOV-17 - 20-NOV-17

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L425214 (Report ID: 1032251):
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: im-mwvfilt(28), MT-SOP-21(10)
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3; as Fume, Ceiling = 0.1 mg/m3.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
TLV for VANADIUM PENTOXIDE: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for MAGNESIUM OXIDE: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 09-NOV-17 Account No.: 90734
Date Received: 13-NOV-17 Login No. : L425214
Date Analyzed: 14-NOV-17 - 20-NOV-17

L425214 (Report ID: 1032251):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Beryllium	+/-12.6%	103%
Magnesium Oxide	+/-9.1%	102%
Molybdenum	+/-10.3%	99.4%
Nickel	+/-10%	103%
Thallium	+/-6.6%	99.5%
Vanadium Pentoxide	+/-9.1%	102%

Parameter	Method	PEL
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/M	0.0002 mg/m3 (TWA)
Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	See footnote

L425214 (Report ID: 1031612):
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(33), im-mwvfilt(28)
PEL listed refers to Aluminum as total dust.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
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Date Sampled : 09-NOV-17 Account No.: 90734
Date Received: 13-NOV-17 Login No. : L425214
Date Analyzed: 14-NOV-17 - 20-NOV-17

L425214 (Report ID: 1031612):
compounds, as Mo (total dust) = 15 mg/m3.
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.
TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for COBALT: 0.02 mg/m3
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for CALCIUM OXIDE: 2 mg/m3
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3
TLV for SELENIUM: 0.2 mg/m3
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for CHROMIUM: 0.5 mg/m3
TLV for IRON OXIDE: 5 mg/m3
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote

L425214-7-8 (Report ID: 1031612):
Reported results represent Respirable Metals.

L425214 (Report ID: 1031612):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-7.7%	96.9%
Antimony	+/-9.8%	97.3%
Arsenic	+/-7.6%	103%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
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Date Sampled : 09-NOV-17 Account No.: 90734
Date Received: 13-NOV-17 Login No. : L425214
Date Analyzed: 14-NOV-17 - 20-NOV-17

Barium	+/-6.5%	101%
Beryllium	+/-10.8%	103%
Cadmium	+/-8.6%	102%
Calcium Oxide	+/-10.6%	105%
Chromium	+/-11.2%	103%
Cobalt	+/-8.5%	103%
Copper	+/-10.3%	103%
Iron Oxide	+/-9.6%	106%
Lead	+/-9.1%	100%
Manganese	+/-8.3%	99.8%
Molybdenum	+/-7.6%	100%
Selenium	+/-11.6%	105%
Zinc Oxide	+/-8.9%	102%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)
Chromium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Selenium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

L425214 (Report ID: 1032065):
SOPs: ia-pcm(26)

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 09-NOV-17 Account No.: 90734
Date Received: 13-NOV-17 Login No. : L425214
Date Analyzed: 14-NOV-17 - 20-NOV-17

L425214 (Report ID: 1032065):
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a greater than optimal variability and are probably biased.
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as follows:
0.154 (5-20 fibers/100 fields)
0.100 (>20-50 fibers/100 fields)
0.069 (>50-100 fibers/100 fields)
0.090 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take into account any uncertainty associated with the sampling process.

L425214 (Report ID: 1031070):
SOPs: GRAV-SOP-8(17)
Gravimetric analytical accuracy of the sampling media is -0.001 +/- 0.030 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.

L425214 (Report ID: 1031071):
TLV for RESPIRABLE DUST: NA
SOPs: GRAV-SOP-5(18), GRAV-SOP-6(17)
Gravimetric analytical accuracy of the sampling media is 0.002 +/- 0.018 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.
PNOR = Particulates Not Otherwise Regulated.

L425214 (Report ID: 1032697):
TLV for QUARTZ: 0.025 mg/m3 Respirable
TLV for TRIDYMITE: NA
TLV for CRISTOBALITE: 0.025 mg/m3 Respirable
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26)

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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Project No. : 22152

Date Sampled : 09-NOV-17 Account No.: 90734
Date Received: 13-NOV-17 Login No. : L425214
Date Analyzed: 14-NOV-17 - 20-NOV-17

L425214 (Report ID: 1032697):

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-13.8%	101%
Quartz	+/-10.9%	93.4%
Tridymite	+/-13.6%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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1Z5X626A6948237177
Date: 11/13/17
Shipper: UPS
Initials: MAK
Prep: UNKNOWN

1425214

☐ New Client?

Client Account No.*: _____

Report To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2

Phone No.*: 416-393-6668
Cell No.: _____
Email Results to: Virgil.Umali@ttc.ca & oheresults@oheconsultants.com
Email address: _____

Invoice To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2

Phone No.: _____
Email: _____
P.O. No.: PU240835
Credit Card ☐ Card on File ☐ Call for Credit Card Info.

☐ Samples submitted using the FreePumpLoan™ Program ☐ Samples submitted using the FreeSamplingBadges™ Program

Need Results By*:	(surcharge)
☑ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%

Check for availability an pricing for quicker turn around times.

Site Name: Project: 22152 Sampled by: OHE Consultants

Comments:

TTC Subway Air Quality

List description of industry or Process/interferences present in sampling area:

Province samples were collected in (ex. ON)

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify):

Sample Identification* (Maxmium of 20 Characters. ID's longer than 20 characters will be abbreviated.)	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (e.g., welding plating, painting, etc.)*
22152 - A67	11/09/17	25 mm PCM	333.5	L	Standardized List of Analyses for TTC		
22152 - A68	11/09/17	25 mm PCM	-	-	Subway Air Quality Study		
22152 - S67	11/09/17	PW PVC in PPI	668.5	L	-		
22152 - S68	11/09/17	PW PVC in PPI	-	-	-		
22152 - I65	11/09/17	PW PVC in IOM	670.8	L	-		
22152 - I66	11/09/17	PW PVC in IOM	-	-	-		
22152 - M67	11/09/17	UW MCE in PPI	672.5	L	-		
22152 - M68	11/09/17	UW MCE in PPI	-	-	-		
22152 - T67	11/09/17	UW MCE 3PC	669.9	L	-		
22152 - T68	11/09/17	UW MCE ✓	-	-	-		
		SK 11/3/17					

^Galson Laboratories will subsitute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ, please indicate if the lower LOQ is required (only available for certain analytes - see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date	Time		Print Name/Signature	Date	Time
Relinquished by	Yunny Desiana Lee	11/10/17	10:00	Received by:		11/10/17	3:30pm
Relinquished by		11/10/17	6:00pm	Received by:	Michelle Krause	11/13/17	10:19

Samples received after 3pm will be considered as next day's business

* Required fields, failure to complete these fields may result in samples being processed.

90734

The TTC file number/purchase order number is PU240835:

1) Total Metals by NIOSH 7300. Analyze for antimony, arsenic, barium, beryllium, cadmium, calcium oxide, chromium III, cobalt, copper, lead, manganese, and selenium. UW MCE

2) Asbestos fibre count by NIOSH 7400. In addition, analyze specifically for asbestos by TEM if the fibre count result exceeds 0.01 f/cc. PCM

3) Respirable silica and respirable dust by NIOSH 7500/0600. Analyze for quartz, cristobalite, tridymite, and dust. PPI PW PVC

4) Respirable metals by NIOSH 7300. Analyze for aluminum, cadmium, iron oxide, molybdenum, and zinc oxide. PPI UW MCE

5) Inhalable metals and inhalable dust by NIOSH 7300/0500. Analyze for magnesium oxide, molybdenum, nickel, thallium, vanadium pentoxide, and dust. Beryllium should also be analyzed by ICP-MS to get a lower limit of detection. IOM

Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Canada

December 11, 2017

AIHA-LAP #100324 Account# 90734 Login# L426412

Dear Mr. Umali:

Enclosed are the analytical results for the samples received by our laboratory on November 22, 2017. All test results meet the quality control requirements of AIHA-LAP and NELAC unless otherwise stated in this report. All samples on the chain of custody were received in good condition unless otherwise noted.

Samples requiring TEM analysis were subcontracted to AMA Analytical Services, Inc. Their report is enclosed in its entirety.

Results in this report are based on the sampling data provided by the client and refer only to the samples as they were received at the laboratory. Unless otherwise requested, samples for asbestos analysis will be discarded 60 days from the date of this report and all other non-IOM samples will be retained for 14 days following the date of this report (when possible). IOMs will be cleaned & disposed of after seven calendar days.

Current Scopes of Accreditation can be viewed at www.sgsgalson.com in the accreditations section of the "About" page.

Please contact Katrina Ahchong at (888) 432-5227, if you would like any additional information regarding this report. Thank you for using SGS Galson Laboratories.

Sincerely,

SGS Galson Laboratories

Lisa Swab
Laboratory Director

Enclosure(s)

Galson Laboratories, Inc. is now a part of SGS, the world's leading inspection, verification, testing, and certification company. As part of our transition to SGS, you will begin to see some formatting changes with reports that will improve the presentation of data and allow for the transition to the new logo.

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East Syracuse, NY 13057
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FAX: (315) 437-0571
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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 14-NOV-17
Date Received : 22-NOV-17

Account No.: 90734
Login No. : L426412
Date Analyzed : 28-NOV-17
Report ID : 1034209

Client ID : 22152 - M69 **Lab ID : L426412-8** **Air Volume : 683.5 L**
Date Sampled : 11/14/17 **Date Analyzed : 11/28/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.011	mg/m3
Cadmium	0.15	<0.15	<0.00022	mg/m3
Iron Oxide	11.	150	0.22	mg/m3
Molybdenum	0.15	<0.15	<0.00022	mg/m3
Zinc Oxide	2.8	<2.8	<0.0041	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 29-NOV-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 14-NOV-17
Date Received : 22-NOV-17

Account No.: 90734
Login No. : L426412

Date Analyzed : 28-NOV-17
Report ID : 1034209

Client ID : 22152 - M70 **Lab ID : L426412-9** **Air Volume : NA**
Date Sampled : 11/14/17 **Date Analyzed : 11/28/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 29-NOV-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 14-NOV-17
Date Received : 22-NOV-17

Account No.: 90734
Login No. : L426412
Date Analyzed : 28-NOV-17
Report ID : 1034209

Client ID : 22152 - T69 **Lab ID : L426412-10** **Air Volume : 693.4 L**
Date Sampled : 11/14/17 **Date Analyzed : 11/28/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.0013	mg/m3
Arsenic	0.30	<0.30	<0.00043	mg/m3
Barium	0.15	11	0.016	mg/m3
Beryllium	0.15	<0.15	<0.00022	mg/m3
Cadmium	0.15	<0.15	<0.00022	mg/m3
Calcium Oxide	100.	<100	<0.15	mg/m3
Chromium	7.5	<7.5	<0.011	mg/m3
Cobalt	0.45	<0.45	<0.00065	mg/m3
Copper	0.30	0.94	0.0014	mg/m3
Lead	0.38	<0.38	<0.00054	mg/m3
Manganese	0.15	1.7	0.0025	mg/m3
Selenium	2.3	<2.3	<0.0032	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 29-NOV-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 14-NOV-17
Date Received : 22-NOV-17

Account No.: 90734
Login No. : L426412

Date Analyzed : 28-NOV-17
Report ID : 1034209

Client ID : 22152 - T70 **Lab ID : L426412-11** **Air Volume : NA**
Date Sampled : 11/14/17 **Date Analyzed : 11/28/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.30	<0.30	NA	mg/m3
Barium	0.15	<0.15	NA	mg/m3
Beryllium	0.15	<0.15	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.45	<0.45	NA	mg/m3
Copper	0.30	<0.30	NA	mg/m3
Lead	0.38	<0.38	NA	mg/m3
Manganese	0.15	<0.15	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 29-NOV-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 14-NOV-17
Date Received : 22-NOV-17

Account No.: 90734
Login No. : L426412

Date Analyzed : 28-NOV-17
Report ID : 1034175

Client ID : 22152 - I67 **Lab ID : L426412-6** **Air Volume : 685.6 L**
Date Sampled : 11/14/17 **Date Analyzed : 11/28/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	<0.000011	mg/m3
Magnesium Oxide	12.	<12	<0.018	mg/m3
Molybdenum	0.075	<0.075	<0.00011	mg/m3
Nickel	0.15	<0.15	<0.00022	mg/m3
Thallium	0.75	<0.75	<0.0011	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.0012	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 29-NOV-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 14-NOV-17
Date Received : 22-NOV-17

Account No.: 90734
Login No. : L426412

Date Analyzed : 28-NOV-17
Report ID : 1034175

Client ID : 22152 - I68 **Lab ID : L426412-7** **Air Volume : NA**
Date Sampled : 11/14/17 **Date Analyzed : 11/28/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	NA	mg/m3
Magnesium Oxide	12.	<12	NA	mg/m3
Molybdenum	0.075	<0.075	NA	mg/m3
Nickel	0.15	<0.15	NA	mg/m3
Thallium	0.75	<0.75	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 29-NOV-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 14-NOV-17
Date Received : 22-NOV-17

Account No.: 90734
Login No. : L426412
Date Analyzed : 29-NOV-17
Report ID : 1034279

Asbestos Fiber Count (A Rules)

	Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
+	22152 - A69A	L426412-1	10.5/100	13.4	5159	143,800	0.036
+	22152 - A69B	L426412-2	7/100	8.9	3427	201,500	0.02
	22152 - A70	L426412-3	0/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : BTM
Approved by : BDB
Date : 30-NOV-17
QC by: AMD
Supervisor: BDB

< -Less Than
> -Greater Than
ND -Not Detected
NA -Not Applicable
cc -Cubic Centimeters
NS -Not Specified
mm2 -Square millimeters

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 14-NOV-17
Date Received : 22-NOV-17

Account No.: 90734
Login No. : L426412
Date Analyzed : 27-NOV-17
Report ID : 1033441

Inhalable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152 - I67	L426412-6	685.6	0.43	0.62
22152 - I68	L426412-7	NA	<0.10	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.10 mg
Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV
OSHA PEL : NA
Collection Media : IOM 25mm PW PVC

Submitted by: AS
Approved by : SPR
Date : 28-NOV-17
Supervisor: KRK

NYS DOH # : 11626
QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 14-NOV-17
Date Received : 22-NOV-17

Account No.: 90734
Login No. : L426412
Date Analyzed : 29-NOV-17
Report ID : 1033442

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152 - S69	L426412-4	689.8	0.20	0.29
22152 - S70	L426412-5	NA	<0.050	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg
Analytical Method : mod. NIOSH 0600; Gravimetric
OSHA PEL : PNOR 5 mg/m3 (TWA)
Collection Media : PVC PW 37mm

Submitted by: GMG
Approved by : SPR
Date : 29-NOV-17
Supervisor: KRK

NYS DOH # : 11626
QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 14-NOV-17
Date Received : 22-NOV-17

Account No.: 90734
Login No. : L426412
Date Analyzed : 29-NOV-17 - 02-DEC-17
Report ID : 1034982

Respirable Crystalline Silica (RCS): Quartz, Cristobalite, Tridymite

Sample ID	Lab ID	Analyte	Air Vol l	ug	ug/m3
22152 - S69	L426412-4	Quartz	689.8	<5.0	<7.2
		Cristobalite	689.8	<5.0	<7.2
		Tridymite	689.8	<20	<29
		RCS	689.8	<5.0	<7.2
22152 - S70	L426412-5	Quartz	NA	<5.0	NA
		Cristobalite	NA	<5.0	NA
		Tridymite	NA	<20	NA
		RCS	NA	<5.0	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: Q:5.0ug C:5.0ug T:20.ug
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD
OSHA PEL : 50 ug/m3 RCS
Collection Media : PVC PW 37mm

Submitted: AJD
Approved: CMR
Date : 04-DEC-17 NYS DOH # : 11626
Supervisor: KRK QC by: AMD

< -Less Than
> -Greater Than
NA -Not Applicable
mg -Milligrams
ug -Micrograms
ND -Not Detected
kg -Kilograms
m3 -Cubic Meters
l -Liters
ppm -Parts per Million
NS -Not Specified
mppcf -Million Particles per Cubic Foot

LABORATORY FOOTNOTE REPORT

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 14-NOV-17 Account No.: 90734
Date Received: 22-NOV-17 Login No. : L426412
Date Analyzed: 27-NOV-17 - 02-DEC-17

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L426412 (Report ID: 1034175):
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: im-mwvfilt(29), MT-SOP-21(11)
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3; as Fume, Ceiling = 0.1 mg/m3.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
TLV for VANADIUM PENTOXIDE: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for MAGNESIUM OXIDE: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 14-NOV-17 Account No.: 90734
Date Received: 22-NOV-17 Login No. : L426412
Date Analyzed: 27-NOV-17 - 02-DEC-17

L426412 (Report ID: 1034175):

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Beryllium	+/-12.6%	103%
Magnesium Oxide	+/-9.1%	102%
Molybdenum	+/-10.3%	99.4%
Nickel	+/-10%	103%
Thallium	+/-6.6%	99.5%
Vanadium Pentoxide	+/-9.1%	102%

Parameter	Method	PEL
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/M	0.0002 mg/m3 (TWA)
Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	See footnote

L426412 (Report ID: 1034209):

TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for COBALT: 0.02 mg/m3
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for Calcium Oxide: 2 mg/m3
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3
TLV for SELENIUM: 0.2 mg/m3

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

SGS GALSON

6601 Kirkville Road
East Syracuse, NY 13057
(315) 432-5227
FAX: (315) 437-0571
www.galsonlabs.com

LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 14-NOV-17 Account No.: 90734
Date Received: 22-NOV-17 Login No. : L426412
Date Analyzed: 27-NOV-17 - 02-DEC-17

L426412 (Report ID: 1034209):
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for CHROMIUM: 0.5 mg/m3
TLV for IRON OXIDE: 5 mg/m3
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(34), im-mwvfilt(29)
PEL listed refers to Aluminum as total dust.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.

L426412-10 (Report ID: 1034209):
We recommend a minimum sampling volume of 1250L for Beryllium analysis.

L426412-8-9 (Report ID: 1034209):
Reported Results represent Respirable Metals.

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 14-NOV-17 Account No.: 90734
Date Received: 22-NOV-17 Login No. : L426412
Date Analyzed: 27-NOV-17 - 02-DEC-17

L426412 (Report ID: 1034209):

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-7.7%	96.9%
Antimony	+/-9.8%	97.3%
Arsenic	+/-7.6%	103%
Barium	+/-6.5%	101%
Beryllium	+/-10.8%	103%
Cadmium	+/-8.6%	102%
Calcium Oxide	+/-10.6%	105%
Chromium	+/-11.2%	103%
Cobalt	+/-8.5%	103%
Copper	+/-10.3%	103%
Iron Oxide	+/-9.6%	106%
Lead	+/-9.1%	100%
Manganese	+/-8.3%	99.8%
Molybdenum	+/-7.6%	100%
Selenium	+/-11.6%	105%
Zinc Oxide	+/-8.9%	102%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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East Syracuse, NY 13057
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www.galsonlabs.com

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 14-NOV-17 Account No.: 90734
Date Received: 22-NOV-17 Login No. : L426412
Date Analyzed: 27-NOV-17 - 02-DEC-17

L426412 (Report ID: 1034209):

Parameter	Method	PEL
Chromium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Selenium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

+L426412-1-2 (Report ID: 1034279):
The sample results may have a negative bias; the filter surface was covered by fine particulate that may have obscured fibers.

L426412 (Report ID: 1034279):
SOPs: ia-pcm(26)
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a greater than optimal variability and are probably biased.
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as follows:
0.154 (5-20 fibers/100 fields)
0.100 (>20-50 fibers/100 fields)
0.069 (>50-100 fibers/100 fields)
0.090 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take into account any uncertainty associated with the sampling process.

L426412 (Report ID: 1033441):
SOPs: GRAV-SOP-8(17)
Gravimetric analytical accuracy of the sampling media is -0.001 +/- 0.030 mg (average blank

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 14-NOV-17 Account No.: 90734
Date Received: 22-NOV-17 Login No. : L426412
Date Analyzed: 27-NOV-17 - 02-DEC-17

L426412 (Report ID: 1033441):
weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.

L426412 (Report ID: 1033442):
TLV for RESPIRABLE DUST: NA
SOPs: GRAV-SOP-5(18), GRAV-SOP-6(17)
Gravimetric analytical accuracy of the sampling media is 0.002 +/- 0.018 mg (average blank
weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.
PNOR = Particulates Not Otherwise Regulated.

L426412 (Report ID: 1034982):
TLV for QUARTZ: 0.025 mg/m3 Respirable
TLV for TRIDYMITE: NA
TLV for CRISTOBALITE: 0.025 mg/m3 Respirable
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26)

L426412 (Report ID: 1034982):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-13.8%	101%
Quartz	+/-10.9%	93.4%
Tridymite	+/-13.6%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

Lab Code 101143-0
NY ELAP
Lab ID 10920

Chain of Custody: 286379
Client: Galson Laboratories
Address: 6601 Kirkville Road
East Syracuse, NY 13057-9672
Attention: Pam Weaver

Job Name: Not Provided
Job Location: Not Provided
Job Number: L426412
P.O. Number: 90734

Date Submitted: 12/01/2017
Date Analyzed: 12/08/2017
Report Date: 12/08/2017
Date Sampled: 11/14/2017
Person Submitting: Zach King

Summary of Transmission Electron Microscopy

Filter Type: MCE **Pore Size:** 0.8 um **Filter Size:** 25 mm (385 mm²)

AMA Sample Number	Client Sample Number	Volume (L)	Area Analyzed (mm²)	Analytical Sensitivity f/cc	Asbestos Type Amount	# Non Asbestos Structures	Concentration f/mm²	Concentration f/cc	Fraction	Sample Type	Comments
286379-1	22152-A69A	143.8	0.532	0.005	0	0	<8	<0.0201		N/P	
286379-2	22152-A69B	201.5	0.532	0.0036	0	0	<8	<0.0144		N/P	

Analytical procedures used meet or exceed NIOSH 7402 protocols.

** - To calculate the asbestos concentration of the PCM result multiply the original PCM result by the fraction.

All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

Analyst(s): Izabelle Mendez

Technical Director Andreas Saldivar

4475 Forbes Blvd. · Lanham, MD, 20706 · (301) 459-2640 · Toll Free (800) 346-0961 · Fax (301) 459-2643

AMA Analytical Services, Inc.
Focused on Results www.amalab.com
AIHA-LAP (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 286379

Mailing/Billing Information:
1. Client Name: Galson
2. Address 1:
3. Address 2:
4. Address 3:
5. Phone #: Fax #:

Submittal Information:
1. Job Name:
2. Job Location:
3. Job #: L426412 P.O. #: 90734
4. Contact Person: Pam Weaver Cell:
5. Collected by: Cell:

Reporting Info (Results provided as soon as technically feasible). If no TAT/Reporting Info is provided, AMA will assign defaults of 5-Day and email/fax to contacts on file.

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
❑ 4 Hours ❑ Immediate Date Due: ❑ 24 Hours Time Due: Comments:	❑ 4 Hours ❑ 3 Day ❑ Results Required By Noon ❑ Same Day ☒ 5 Day + Date Due: 12/8/17 ❑ Next Day ❑ 2 Day	❑ Email: ❑ Email 2: ❑ Verbals:

Asbestos Analysis
*PCM Air – Please Indicate Filter Type:
- ❑ NIOSH 7400 (QTY)
- ❑ Fiberglass (QTY)

TEM Air* – Please Indicate Filter Type:
- ☒ AHERA 2 (QTY)
- ❑ NIOSH 7402 (QTY)
- ❑ Other (specify) (QTY)

PLM Bulk
- ❑ EPA 600 – Visual Estimate (QTY) ❑ Pos Stop
- ❑ EPA Point Count (QTY)
- ❑ NY State Friable 198.1 (QTY)
- ❑ Grav. Reduction ELAP 198.6 (QTY)
- ❑ Other (specify) (QTY)

MISC
- ❑ Vermiculite
- ❑ Asbestos Soil PLM (Qual) PLM (Quan) PLM/TEM (Qual) PLM/TEM (Quan)

*It is recommended that blank samples be submitted with all air and surface samples

TEM Bulk
- ❑ ELAP 198.4/Chatfield (QTY)
- ❑ NY State PLM/TEM (QTY)
- ❑ Residual Ash (QTY)

TEM Dust*
- ❑ Qual. (pres/abs) Vacuum/Dust (QTY)
- ❑ Quan. (s/area) Vacuum D5755-95 (QTY)
- ❑ Quan. (s/area)Dust D6480-99 (QTY)

TEM Water
- ❑ Qual. (pres/abs) (QTY)
- ❑ ELAP 198.2/EPA 100.2 (QTY)
- ❑ EPA 100.1 (QTY)

☒ All samples received in good condition unless otherwise noted.
(TEM Water samples °C)

If field data sheets are submitted, there is no need to complete bottom section.

Metals Analysis
- ❑ Pb Paint Chip (QTY)
- ❑ *Pb Dust Wipe (wipe type) (QTY)
- ❑ *Pb Air (QTY)
- ❑ Pb Soil/Solid (QTY)
- ❑ Pb TCLP (QTY)
- ❑ Drinking Water ❑ Pb (QTY) ❑ Cu (QTY) ❑ As (QTY)
- ❑ Waste Water ❑ Pb (QTY) ❑ Cu (QTY) ❑ As (QTY)
- ❑ Pb Furnace (Media) (QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples:
Collection Media
- ❑ *Spore-Trap (QTY) ❑ Surface Vacuum Dust (QTY)
- ❑ *Surface Swab (QTY) ❑ Culturable ID Genus (Media) (QTY)
- ❑ *Surface Tape (QTY) ❑ Culturable ID Species (Media) (QTY)
- ❑ Other (Specify) (QTY

CLIENT ID #	SAMPLE INFORMATION SAMPLE LOCATION/ ID	DATE/ TIME	VOL (L)/ Wipe Area	ANALYSIS TEM	PCM	PLM	LEAD	MOLD	MATRIX AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB	CLIENT CONTACT (LABORATORY STAFF ONLY)
																Date/Time: Contact:By:
																Date/Time: Contact:By:
																Date/Time: Contact:By:

	Print Name	Signature	Date	Time
Relinquished by:	Zach King			
Received by:				
Relinquished by:				
Received for Lab by:			12/8/17	1630

Shipping Information: ☒ UPS ☐ In-Person ☐ Other ☐ FedEx ☐ Drop Box ☐ USPS ☐ Courier
Airbill/Tracking No:

AMA

GALSON LABORATORIES
6601 Kirkville Rd
East Syracuse, NY 13057-9672
Tel: 315-437-5227
888-432-LABS(5227)
Fax: 315-437-0571
www.galsonlabs.com

Check if change of address ☐
New Client ? yes ☐ no ☐

Report To :	**Shelly Krause**	Invoice To :	**Jeanne Glisson**
	SGS Galson Laboratory		SGS Galson Laboratory
	6601 Kirkville Road		6601 Kirkville Road
	East Syracuse, NY 13057		East Syracuse, NY 13057
Phone No. :	888-432-5227	Phone No. :	888-432-5227
		Fax No.	315-437-0571

Site Name : **Project :** L426412 **Sampled By :** Client

Turnaround Time	Due Date
☑ Standard	12/08/17
☐ 4 Business Days	
☐ 3 Business Days	
☐ 2 Business Days	
☐ Next Day by 6pm	
☐ Next Day by Noon	
☐ Same day	

Verbal Authorization : 90734

Credit Card No. : Card Holder Name : Exp. :

Fax Results To : Email Only Please Fax No. : Email Only Please

Email Results To : Syracuse.Subcontracting@sgs.com

Sample Identification	Date Sampled	Collection Medium	*Air Volume (liters)/ Passive Monitors (Min)	Analysis Requested	Method Reference	Fibers/field
22152 - A69A	11/14/2017	25mm MCE PCM	143.8	Transmission Electron Microscopy	NIOSH 7402; TEM	10.5/100
22152 - A69B	11/14/2017	25mm MCE PCM	201.5	Transmission Electron Microscopy	NIOSH 7402; TEM	7/100

Comments:

State/Province of sampling event: Ontario

If the method being reported is not on your laboratory's current AIHA scope of accreditation, please state that in your report.
Please provide an uncertainty statement in accordance with AIHA LQAP policy document Section 2A.5.4.3.

Chain of Custody	Print Name	Signature	Date/Time
Relinquished by :	Zach King		11/30/2017 17:12
Received by LAB :			

194

SGS GALSON

1Z5X626A6648744848
Date: 11/22/17
Shipper: UPS
Initials: KMS
Prep: UNKNOWN

L426412

☐ New Client?

Client Account No.*:

2A2

Report To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2
Phone No.*: 416-393-6668
Cell No.:
Email Results to: Virgil.Umali@ttc.ca & oheresults@oheconsultants.com
Email address:

Invoice To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2
Phone No.:
Email:
P.O. No.: PU240835
Credit Card ☐ Card on File ☐ Call for Credit Card Info.

☐ Samples submitted using the FreePumpLoan™ Program ☐ Samples submitted using the FreeSamplingBadges™ Program

Need Results By*:	(surcharge)
☑ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%

Check for availability an pricing for quicker turn around times.

Site Name: Project: 22152 Sampled by: OHE Consultants

Comments: *No Barcode - KMS 11/22/17

TTC Subway Air Quality

List description of industry or Process/interferences present in sampling area:

Province samples were collected in (ex. ON)

Please indicate which OEL this data will be used for: ☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA ☐ MSHA ☐ Other (specify):

Sample Identification* (Maxmium of 20 Characters. ID's longer than 20 characters will be abbreviated.)	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml, min, in2, cm2, ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (e.g., welding plating, painting, etc.)*
22152 - A69A	11/14/17	25 mm PCM	143.8	L	Standardized List of Analyses for TTC		
22152 - A69B	11/14/17	25 mm PCM	201.5	L	Subway Air Quality Study		
22152 - A70	11/14/17	25 mm PCM	-	-	-		
22152 - S69	11/14/17	PW PVC in PPI	689.8	L	-		
22152 - S70	11/14/17	PW PVC in PPI	-	-	-		
* 22152 - I67	11/14/17	PW PVC in IOM	685.6	L	-		
22152 - I68	11/14/17	PW PVC in IOM	-	-	-		
22152 - M69	11/14/17	UW MCE in PPI	683.5	L	-		
22152 - M70	11/14/17	UW MCE in PPI	-	-	-		
22152 - T69	11/14/17	UW MCE	693.4	L	-		
22152 - T70	11/14/17	UW MCE	-	-			

^Galson Laboratories will subsititute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ, please indicate if the lower LOQ is required (only available for certain analytes - see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date	Time		Print Name/Signature	Date	Time
Relinquished by	Yunny Desiana Lee	11/15/17	11:00	Received by:	K. Ahchong	11/21/17	1530
Relinquished by	K. Ahchong	11/21/17	1730	Received by:	Kris Stone	11/22/17	1031

Samples received after 3pm will be considered as next day's business

* Required fields, failure to complete these fields may result in a delay in your samples being processed.

90734

The TTC file number/purchase order number is PU240835:

1) Total Metals by NIOSH 7300. Analyze for antimony, arsenic, barium, beryllium, cadmium, calcium oxide, chromium III, cobalt, copper, lead, manganese, and selenium. UW MCE

2) Asbestos fibre count by NIOSH 7400. In addition, analyze specifically for asbestos by TEM if the fibre count result exceeds 0.01 f/cc. PCM

3) Respirable silica and respirable dust by NIOSH 7500/0600. Analyze for quartz, cristobalite, tridymite, and dust. PPI PW PVC

4) Respirable metals by NIOSH 7300. Analyze for aluminum, cadmium, iron oxide, molybdenum, and zinc oxide. PPI UW MCE

5) Inhalable metals and inhalable dust by NIOSH 7300/0500. Analyze for magnesium oxide, molybdenum, nickel, thallium, vanadium pentoxide, and dust. Beryllium should also be analyzed by ICP-MS to get a lower limit of detection. IOM

Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Canada

December 11, 2017

AIHA-LAP #100324 Account# 90734 Login# L426409

Dear Mr. Umali:

Enclosed are the analytical results for the samples received by our laboratory on November 22, 2017. All test results meet the quality control requirements of AIHA-LAP and NELAC unless otherwise stated in this report. All samples on the chain of custody were received in good condition unless otherwise noted.

Samples requiring TEM analysis were subcontracted to AMA Analytical Services, Inc. Their report is enclosed in its entirety.

Results in this report are based on the sampling data provided by the client and refer only to the samples as they were received at the laboratory. Unless otherwise requested, samples for asbestos analysis will be discarded 60 days from the date of this report and all other non-IOM samples will be retained for 14 days following the date of this report (when possible). IOMs will be cleaned & disposed of after seven calendar days.

Current Scopes of Accreditation can be viewed at www.sgsgalson.com in the accreditations section of the "About" page.

Please contact Katrina Ahchong at (888) 432-5227, if you would like any additional information regarding this report. Thank you for using SGS Galson Laboratories.

Sincerely,

SGS Galson Laboratories

Lisa Swab
Laboratory Director

Enclosure(s)

Galson Laboratories, Inc. is now a part of SGS, the world's leading inspection, verification, testing, and certification company. As part of our transition to SGS, you will begin to see some formatting changes with reports that will improve the presentation of data and allow for the transition to the new logo.

SGS GALSON

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East Syracuse, NY 13057
(315) 432-5227
FAX: (315) 437-0571
www.galsonlabs.com

LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 16-NOV-17
Date Received : 22-NOV-17

Account No.: 90734
Login No. : L426409

Date Analyzed : 27-NOV-17 - 28-NOV-17
Report ID : 1033906

Client ID : 22152-M71 **Lab ID : L426409-8** **Air Volume : 969.1 L**
Date Sampled : 11/16/17 **Date Analyzed : 11/27/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.0077	mg/m3
Cadmium	0.15	<0.15	<0.00015	mg/m3
Iron Oxide	11.	93	0.096	mg/m3
Molybdenum	0.15	0.26	0.00027	mg/m3
Zinc Oxide	2.8	<2.8	<0.0029	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 28-NOV-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 16-NOV-17
Date Received : 22-NOV-17

Account No.: 90734
Login No. : L426409

Date Analyzed : 27-NOV-17 - 28-NOV-17
Report ID : 1033906

Client ID : 22152-M72 **Lab ID : L426409-9** **Air Volume : NA**
Date Sampled : 11/16/17 **Date Analyzed : 11/27/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 28-NOV-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 16-NOV-17
Date Received : 22-NOV-17

Account No.: 90734
Login No. : L426409

Date Analyzed : 27-NOV-17 - 28-NOV-17
Report ID : 1033906

Client ID : 22152-T71 **Lab ID : L426409-10** **Air Volume : 967.9 L**
Date Sampled : 11/16/17 **Date Analyzed : 11/27/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.00093	mg/m3
Arsenic	0.30	<0.30	<0.00031	mg/m3
Barium	0.15	2.4	0.0024	mg/m3
Beryllium	0.15	<0.15	<0.00015	mg/m3
Cadmium	0.15	<0.15	<0.00015	mg/m3
Calcium Oxide	100.	<100	<0.11	mg/m3
Chromium	7.5	<7.5	<0.0077	mg/m3
Cobalt	0.45	<0.45	<0.00046	mg/m3
Copper	0.30	0.69	0.00071	mg/m3
Lead	0.38	<0.38	<0.00039	mg/m3
Manganese	0.15	0.82	0.00085	mg/m3
Selenium	2.3	<2.3	<0.0023	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 28-NOV-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 16-NOV-17
Date Received : 22-NOV-17

Account No.: 90734
Login No. : L426409

Date Analyzed : 27-NOV-17 - 28-NOV-17
Report ID : 1033906

Client ID : 22152-T72 **Lab ID : L426409-11** **Air Volume : NA**
Date Sampled : 11/16/17 **Date Analyzed : 11/27/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.30	<0.30	NA	mg/m3
Barium	0.15	<0.15	NA	mg/m3
Beryllium	0.15	<0.15	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.45	<0.45	NA	mg/m3
Copper	0.30	<0.30	NA	mg/m3
Lead	0.38	<0.38	NA	mg/m3
Manganese	0.15	<0.15	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 28-NOV-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 16-NOV-17
Date Received : 22-NOV-17

Account No.: 90734
Login No. : L426409

Date Analyzed : 27-NOV-17 - 28-NOV-17
Report ID : 1034491

Client ID : 22152-I69 **Lab ID : L426409-6** **Air Volume : 975.6 L**
Date Sampled : 11/16/17 **Date Analyzed : 11/28/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	<0.0000077	mg/m3
Magnesium Oxide	12.	<12	<0.013	mg/m3
Molybdenum	0.075	0.80	0.00082	mg/m3
Nickel	0.15	<0.15	<0.00015	mg/m3
Thallium	0.75	<0.75	<0.00077	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.00082	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 30-NOV-17

Submitted by: JMR/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 16-NOV-17
Date Received : 22-NOV-17

Account No.: 90734
Login No. : L426409

Date Analyzed : 27-NOV-17 - 28-NOV-17
Report ID : 1034491

Client ID : 22152-I70 **Lab ID : L426409-7** **Air Volume : NA**
Date Sampled : 11/16/17 **Date Analyzed : 11/28/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	NA	mg/m3
Magnesium Oxide	12.	<12	NA	mg/m3
Molybdenum	0.075	<0.075	NA	mg/m3
Nickel	0.15	<0.15	NA	mg/m3
Thallium	0.75	<0.75	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 30-NOV-17

Submitted by: JMR/JJL
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 16-NOV-17
Date Received : 22-NOV-17

Account No.: 90734
Login No. : L426409
Date Analyzed : 29-NOV-17
Report ID : 1034278

Asbestos Fiber Count (A Rules)

	Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
+	22152-A71A	L426409-1	5/100	<7	<2700	252,700	<0.01
+	22152-A71B	L426409-2	7.5/100	9.6	3696	244,400	0.02
	22152-A72	L426409-3	2/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : BTM
Approved by : BDB
Date : 30-NOV-17
QC by: AMD
Supervisor: BDB

< -Less Than
> -Greater Than
ND -Not Detected
NA -Not Applicable
cc -Cubic Centimeters
NS -Not Specified
mm2 -Square millimeters

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 16-NOV-17
Date Received : 22-NOV-17

Account No.: 90734
Login No. : L426409
Date Analyzed : 27-NOV-17
Report ID : 1033443

Inhalable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-I69	L426409-6	975.6	0.26	0.26
22152-I70	L426409-7	NA	<0.10	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.10 mg
Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV
OSHA PEL : NA
Collection Media : IOM 25mm PW PVC

Submitted by: AS
Approved by : SPR
Date : 30-NOV-17
Supervisor: KRK

NYS DOH # : 11626
QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 16-NOV-17
Date Received : 22-NOV-17

Account No.: 90734
Login No. : L426409
Date Analyzed : 29-NOV-17
Report ID : 1033444

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-S71	L426409-4	984.2	0.095	0.097
22152-S72	L426409-5	NA	<0.050	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg
Analytical Method : mod. NIOSH 0600; Gravimetric
OSHA PEL : PNOR 5 mg/m3 (TWA)
Collection Media : PVC PW 37mm

Submitted by: HVN
Approved by : SPR
Date : 29-NOV-17
Supervisor: KRK

NYS DOH # : 11626
QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 16-NOV-17
Date Received : 22-NOV-17

Account No.: 90734
Login No. : L426409

Date Analyzed : 29-NOV-17 - 02-DEC-17
Report ID : 1034924

Respirable Crystalline Silica (RCS): Quartz, Cristobalite, Tridymite

Sample ID	Lab ID	Analyte	Air Vol l	ug	ug/m3
22152-S71	L426409-4	Quartz	984.2	<5.0	<5.1
		Cristobalite	984.2	<5.0	<5.1
		Tridymite	984.2	<20	<20
		RCS	984.2	<5.0	<5.1
22152-S72	L426409-5	Quartz	NA	<5.0	NA
		Cristobalite	NA	<5.0	NA
		Tridymite	NA	<20	NA
		RCS	NA	<5.0	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: Q:5.0ug C:5.0ug T:20.ug
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD
OSHA PEL : 50 ug/m3 RCS
Collection Media : PVC PW 37mm

Submitted: SPR/AJD
Approved: KRK
Date : 04-DEC-17 NYS DOH # : 11626
Supervisor: KRK QC by: AMD

< -Less Than	mg -Milligrams	kg -Kilograms	ppm -Parts per Million
> -Greater Than	ug -Micrograms	m3 -Cubic Meters	NS -Not Specified
NA -Not Applicable	ND -Not Detected	l -Liters	mppcf -Million Particles per Cubic Foot

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 16-NOV-17 Account No.: 90734
Date Received: 22-NOV-17 Login No. : L426409
Date Analyzed: 27-NOV-17 - 02-DEC-17

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L426409 (Report ID: 1034491):
TLV for Vanadium pentoxide: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for Magnesium Oxide: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: im-mwvfilt(29), MT-SOP-21(11)
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3;

< -Less Than	mg -Milligrams	m3 -Cubic Meters	kg -Kilograms	ppm -Parts per Million		
> -Greater Than	ug -Micrograms	l -Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable	

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Client Name : Toronto Transit Commission Ltd.
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Date Sampled : 16-NOV-17 Account No.: 90734
Date Received: 22-NOV-17 Login No. : L426409
Date Analyzed: 27-NOV-17 - 02-DEC-17

L426409 (Report ID: 1034491):
as Fume, Ceiling = 0.1 mg/m3.

L426409 (Report ID: 1034491):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Beryllium	+/-12.6%	103%
Magnesium Oxide	+/-9.1%	102%
Molybdenum	+/-10.3%	99.4%
Nickel	+/-10%	103%
Thallium	+/-6.6%	99.5%
Vanadium Pentoxide	+/-9.1%	102%

Parameter	Method	PEL
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/M	0.0002 mg/m3 (TWA)
Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	See footnote

L426409 (Report ID: 1033906):
TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for COBALT: 0.02 mg/m3
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for Calcium Oxide: 2 mg/m3

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 16-NOV-17 Account No.: 90734
Date Received: 22-NOV-17 Login No. : L426409
Date Analyzed: 27-NOV-17 - 02-DEC-17

L426409 (Report ID: 1033906):
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3
TLV for SELENIUM: 0.2 mg/m3
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for CHROMIUM: 0.5 mg/m3
TLV for IRON OXIDE: 5 mg/m3
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(34), im-mwvfilt(29)
PEL listed refers to Aluminum as total dust.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.

L426409 (Report ID: 1033906):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-7.7%	96.9%
Antimony	+/-9.8%	97.3%
Arsenic	+/-7.6%	103%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
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Project No. : 22152

Date Sampled : 16-NOV-17 Account No.: 90734
Date Received: 22-NOV-17 Login No. : L426409
Date Analyzed: 27-NOV-17 - 02-DEC-17

Barium	+/-6.5%	101%
Beryllium	+/-10.8%	103%
Cadmium	+/-8.6%	102%
Calcium Oxide	+/-10.6%	105%
Chromium	+/-11.2%	103%
Cobalt	+/-8.5%	103%
Copper	+/-10.3%	103%
Iron Oxide	+/-9.6%	106%
Lead	+/-9.1%	100%
Manganese	+/-8.3%	99.8%
Molybdenum	+/-7.6%	100%
Selenium	+/-11.6%	105%
Zinc Oxide	+/-8.9%	102%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)
Chromium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Selenium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

+L426409-1-2 (Report ID: 1034278):
The sample results may have a negative bias; the filter surface was covered by

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 16-NOV-17 Account No.: 90734
Date Received: 22-NOV-17 Login No. : L426409
Date Analyzed: 27-NOV-17 - 02-DEC-17

+L426409-1-2 (Report ID: 1034278):
fine particulate that may have obscured fibers.

L426409 (Report ID: 1034278):
SOPs: ia-pcm(26)
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a
greater than optimal variability and are probably biased.
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as
follows:
0.154 (5-20 fibers/100 fields)
0.100 (>20-50 fibers/100 fields)
0.069 (>50-100 fibers/100 fields)
0.090 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take
into account any uncertainty associated with the sampling process.

L426409 (Report ID: 1033443):
SOPs: GRAV-SOP-8(17)
Gravimetric analytical accuracy of the sampling media is -0.001 +/- 0.030 mg (average blank
weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and
SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.

L426409 (Report ID: 1033444):
TLV for RESPIRABLE DUST: NA
SOPs: GRAV-SOP-5(18), GRAV-SOP-6(17)
Gravimetric analytical accuracy of the sampling media is 0.002 +/- 0.018 mg (average blank
weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and
SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.
PNOR = Particulates Not Otherwise Regulated.

L426409 (Report ID: 1034924):
TLV for QUARTZ: 0.025 mg/m3 Respirable
TLV for TRIDYMITE: NA
TLV for CRISTOBALITE: 0.025 mg/m3 Respirable

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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East Syracuse, NY 13057
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FAX: (315) 437-0571
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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 16-NOV-17 Account No.: 90734
Date Received: 22-NOV-17 Login No. : L426409
Date Analyzed: 27-NOV-17 - 02-DEC-17

L426409 (Report ID: 1034924):
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26)

L426409 (Report ID: 1034924):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-13.8%	101%
Quartz	+/-10.9%	93.4%
Tridymite	+/-13.6%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

NVLAP®
Lab Code 101143-0
NY ELAP
Lab ID 10920

Chain of Custody: 286378
Client: Galson Laboratories
Address: 6601 Kirkville Road
East Syracuse, NY 13057-9672
Attention: Pam Weaver

Job Name: Not Provided
Job Location: Not Provided
Job Number: L426409
P.O. Number: 90734

Date Submitted: 12/01/2017
Date Analyzed: 12/08/2017
Report Date: 12/08/2017
Date Sampled: 11/16/2017
Person Submitting: Zach King

Summary of Transmission Electron Microscopy

Filter Type: MCE **Pore Size:** 0.8 um **Filter Size:** 25 mm (385 mm²)

AMA Sample Number	Client Sample Number	Volume (L)	Area Analyzed (mm²)	Analytical Sensitivity f/cc	Asbestos Type Amount	# Non Asbestos Structures	Concentration f/mm²	Concentration f/cc	Fraction	Sample Type	Comments
286378-1	22152-A71B	244.4	0.532	0.003	0	1	<8	<0.0118	0.0	N/P	

Analytical procedures used meet or exceed NIOSH 7402 protocols.

** - To calculate the asbestos concentration of the PCM result multiply the original PCM result by the fraction.

All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

Analyst(s): Michael Greenberg

Technical Director Andreas Saldivar

4475 Forbes Blvd. · Lanham, MD, 20706 · (301) 459-2640 · Toll Free (800) 346-0961 · Fax (301) 459-2643

AMA Analytical Services, Inc.
Focused on Results www.amalab.com
AIHA-LAP (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 286378

Mailing/Billing Information:
1. Client Name: Galson
2. Address 1:
3. Address 2:
4. Address 3:
5. Phone #: Fax #:

Submittal Information:
1. Job Name:
2. Job Location:
3. Job #: L426409 P.O. #: 90734
4. Contact Person: Pam Weaver Cell:
5. Collected by: Cell:

Reporting Info (Results provided as soon as technically feasible). If no TAT/Reporting Info is provided, AMA will assign defaults of 5-Day and email/fax to contacts on file.

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
❑ 4 Hours ❑ Immediate Date Due: ❑ 24 Hours Time Due: Comments:	❑ 4 Hours ❑ 3 Day ❑ Same Day ☒ 5 Day + ❑ Next Day Date Due: 12/8/17 ❑ 2 Day ❑ Results Required By Noon	❑ Email: ❑ Email 2: ❑ Verbals:

Asbestos Analysis
*PCM Air – Please Indicate Filter Type:
- ❑ NIOSH 7400 (QTY)
- ❑ Fiberglass (QTY)

TEM Air* – Please Indicate Filter Type:
- ❑ AHERA (QTY)
- ☒ NIOSH 7402 1 (QTY)
- ❑ Other (specify) (QTY)

PLM Bulk
- ❑ EPA 600 – Visual Estimate (QTY) ❑ Pos Stop
- ❑ EPA Point Count (QTY)
- ❑ NY State Friable 198.1 (QTY)
- ❑ Grav. Reduction ELAP 198.6 (QTY)
- ❑ Other (specify) (QTY)

MISC
- ❑ Vermiculite
- ❑ Asbestos Soil PLM (Qual) PLM (Quan) PLM/TEM (Qual) PLM/TEM (Quan)

*It is recommended that blank samples be submitted with all air and surface samples

TEM Bulk
- ❑ ELAP 198.4/Chatfield (QTY)
- ❑ NY State PLM/TEM (QTY)
- ❑ Residual Ash (QTY)

TEM Dust*
- ❑ Qual. (pres/abs) Vacuum/Dust (QTY)
- ❑ Quan. (s/area) Vacuum D5755-95 (QTY)
- ❑ Quan. (s/area)Dust D6480-99 (QTY)

TEM Water
- ❑ Qual. (pres/abs) (QTY)
- ❑ ELAP 198.2/EPA 100.2 (QTY)
- ❑ EPA 100.1 (QTY)

☒ All samples received in good condition unless otherwise noted.
(TEM Water samples °C)

If field data sheets are submitted, there is no need to complete bottom section.

Metals Analysis
- ❑ Pb Paint Chip (QTY)
- ❑ *Pb Dust Wipe (wipe type) (QTY)
- ❑ *Pb Air (QTY)
- ❑ Pb Soil/Solid (QTY)
- ❑ Pb TCLP (QTY)
- ❑ Drinking Water ❑ Pb (QTY) ❑ Cu (QTY) ❑ As (QTY)
- ❑ Waste Water ❑ Pb (QTY) ❑ Cu (QTY) ❑ As (QTY)
- ❑ Pb Furnace (Media) (QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples:
Collection Media
- ❑ *Spore-Trap (QTY)
- ❑ *Surface Swab (QTY)
- ❑ *Surface Tape (QTY)
- ❑ Other (Specify) (QTY
- ❑ Surface Vacuum Dust (QTY)
- ❑ Culturable ID Genus (Media) (QTY)
- ❑ Culturable ID Species (Media) (QTY)

SAMPLE INFORMATION				ANALYSIS					MATRIX								CLIENT CONTACT
CLIENT ID #	SAMPLE LOCATION/ ID	DATE/ TIME	VOL (L)/ Wipe Area	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB	(LABORATORY STAFF ONLY)
																Date/Time: Contact:By:
																Date/Time: Contact:By:
																Date/Time: Contact:By:

	Print Name	Signature	Date	Time
Relinquished by:	Zach King			
Received by:				
Relinquished by:				
Received for Lab by:			12/1/17	1030

Shipping Information
☒ UPS ☐ In-Person ☐ Other
☐ FedEx ☐ Drop Box
☐ USPS ☐ Courier
Airbill/Tracking No:

AMA

GALSON LABORATORIES
6601 Kirkville Rd
East Syracuse, NY 13057-9672
Tel: 315-437-5227
888-432-LABS(5227)
Fax: 315-437-0571
www.galsonlabs.com

Check if change of address ☐
New Client ? yes ☐ no ☐

Report To :	**Shelly Krause**	Invoice To :	**Jeanne Glisson**
	SGS Galson Laboratory		SGS Galson Laboratory
	6601 Kirkville Road		6601 Kirkville Road
	East Syracuse, NY 13057		East Syracuse, NY 13057
Phone No. :	888-432-5227	Phone No. :	888-432-5227
		Fax No.	315-437-0571

Site Name : **Project :** L426409 **Sampled By :** Client

Turnaround Time	Due Date
☑ Standard	12/08/17
☐ 4 Business Days	
☐ 3 Business Days	
☐ 2 Business Days	
☐ Next Day by 6pm	
☐ Next Day by Noon	
☐ Same day	

Verbal Authorization : 90734

Credit Card No. : Card Holder Name : Exp. :

Fax Results To : Email Only Please Fax No. : Email Only Please

Email Results To : Syracuse.Subcontracting@sgs.com

Sample Identification	Date Sampled	Collection Medium	*Air Volume (liters)/ Passive Monitors (Min)	Analysis Requested	Method Reference	Fiber/field
22152-A71B	11/16/2017	25mm MCE PCM	244.4	Transmission Electron Microscopy	NIOSH 7402; TEM	7.5/100

Comments:

State/Province of sampling event: Ontario

If the method being reported is not on your laboratory's current AIHA scope of accreditation, please state that in your report.
Please provide an uncertainty statement in accordance with AIHA LQAP policy document Section 2A.5.4.3.

Chain of Custody	Print Name	Signature	Date/Time
Relinquished by :	Zach King		11/30/2017 17:19
Received by LAB :			

L426409 R96

SGS GALSON

1Z5X626A6648744848
Date: 11/22/17
Shipper: UPS
Initials: KMS
Prep: UNKNOWN

☐ New Client?

Client Account No.*: _____

< 2A2

Report To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2
Phone No.*: 416-393-6668
Cell No.:
Email Results to: Virgil.Umali@ttc.ca & oheresults@oheconsultants.com
Email address:

Invoice To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2
Phone No.:
Email:
P.O. No.: PU240835
Credit Card ☐ Card on File ☐ Call for Credit Card Info.

☐ Samples submitted using the FreePumpLoan™ Program ☐ Samples submitted using the FreeSamplingBadges™ Program

Need Results By*:	(surcharge)
☑ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%

Check for availability an pricing for quicker turn around times.

Site Name: Project: 22152 Sampled by: OHE Consultants

Comments: ~~*ID's are 22152-I69 & I70 - Did not rec S71 & S72 - KMS 11/22/17~~ Okay KMS

TTC Subway Air Quality

List description of industry or Process/interferences present in sampling area:

Province samples were collected in (ex. ON)

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify):

Sample Identification* (Maxmium of 20 Characters. ID's longer than 20 characters will be abbreviated.)	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (e.g., welding plating, painting, etc.)*
22152 - A71A	11/16/17	25 mm PCM	252.7	L	Standardized List of Analyses for TTC		
22152 - A71B	11/16/17	25 mm PCM	244.4	L	Subway Air Quality Study		
22152 - A72	11/16/17	25 mm PCM	-	-	-		
* 22152 - S71	11/16/17	PW PVC in PPI	984.2	L	-		
* 22152 - S72	11/16/17	PW PVC in PPI	-	-	-		
22152 - I69	11/16/17	PW PVC in IOM	975.6	L	-		
22152 - I70	11/16/17	PW PVC in IOM	-	-	-		
22152 - M71	11/16/17	UW MCE in PPI	969.1	L	-		
22152 - M72	11/16/17	UW MCE in PPI	-	-	-		
22152 - T71	11/16/17	UW MCE	967.9	L	-		
22152 - T72	11/16/17	UW MCE	-	-			

^Galson Laboratories will subsititute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ, please indicate if the lower LOQ is required (only available for certain analytes - see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date	Time		Print Name/Signature	Date	Time
Relinquished by	Yunny Desiana Lee	11/17/17	13:30	Received by:	K. Ahchong	11/21/17	1530
Relinquished by	K. Ahchong	11/21/17	1730	Received by:	Kris Stone	11/22/17	1030

Samples received after 3pm will be considered as next day's business

* Required fields, failure to complete these fields may result in a delay in your samples being processed.

Page 1 of 1

90734

The TTC file number/purchase order number is PU240835:

1) Total Metals by NIOSH 7300. Analyze for antimony, arsenic, barium, beryllium, cadmium, calcium oxide, chromium III, cobalt, copper, lead, manganese, and selenium. UW MCE

2) Asbestos fibre count by NIOSH 7400. In addition, analyze specifically for asbestos by TEM if the fibre count result exceeds 0.01 f/cc. PCM

3) Respirable silica and respirable dust by NIOSH 7500/0600. Analyze for quartz, cristobalite, tridymite, and dust. PPI PW PVC

4) Respirable metals by NIOSH 7300. Analyze for aluminum, cadmium, iron oxide, molybdenum, and zinc oxide. PPI UW MCE

5) Inhalable metals and inhalable dust by NIOSH 7300/0500. Analyze for magnesium oxide, molybdenum, nickel, thallium, vanadium pentoxide, and dust. Beryllium should also be analyzed by ICP-MS to get a lower limit of detection. IOM

SGS GALSON

Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Canada

January 05, 2018

AIHA-LAP #100324 Account# 90734 Login# L428986

Dear Mr. Umali:

Enclosed are the analytical results for the samples received by our laboratory on December 19, 2017. All test results meet the quality control requirements of AIHA-LAP unless otherwise stated in this report. All samples on the chain of custody were received in good condition unless otherwise noted.

Results in this report are based on the sampling data provided by the client and refer only to the samples as they were received at the laboratory. Unless otherwise requested, all samples will be discarded 60 days from the date of this report.

To ensure the safety of laboratory receiving personnel, always seal bulk samples securely to prevent possible escape of material. Also, please double-bag bulk samples individually prior to shipping. Samples not received in this manner will be noted on the chain of custody form.

Samples requiring TEM analysis were subcontracted to AMA Analytical Services, Inc. Their report is enclosed in its entirety.

Current Scopes of Accreditation can be viewed at www.sgsgalson.com in the accreditations section of the "About" page. Please contact Katrina Ahchong, at (888) 432-5227, if you require additional information regarding this report. Thank you for using SGS Galson.

Sincerely,

SGS Galson

Pamela Weaver
Asbestos Technical Manager

Enclosure(s)

SGS GALSON

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East Syracuse, NY 13057
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FAX: (315) 437-0571
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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 04-DEC-17
Date Received : 19-DEC-17

Account No.: 90734
Login No. : L428986
Date Analyzed : 21-DEC-17 - 23-DEC-17
Report ID : 1039388

Client ID : 22152-M73 **Lab ID : L428986-6** **Air Volume : 946.77 L**
Date Sampled : 12/04/17 **Date Analyzed : 12/21/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.0079	mg/m3
Cadmium	0.15	<0.15	<0.00016	mg/m3
Iron Oxide	11.	55	0.059	mg/m3
Molybdenum	0.15	<0.15	<0.00016	mg/m3
Zinc Oxide	2.8	<2.8	<0.0030	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 26-DEC-17

Submitted by: JMR/KEG/JPA
NYS DOH # : 11626

Approved by: JJL/SJW
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 04-DEC-17
Date Received : 19-DEC-17

Account No.: 90734
Login No. : L428986

Date Analyzed : 21-DEC-17 - 23-DEC-17
Report ID : 1039388

Client ID : 22152-M74 **Lab ID : L428986-7** **Air Volume : NA**
Date Sampled : 12/04/17 **Date Analyzed : 12/21/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 26-DEC-17

Submitted by: JMR/KEG/JPA
NYS DOH # : 11626

Approved by: JJL/SJW
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 04-DEC-17
Date Received : 19-DEC-17

Account No.: 90734
Login No. : L428986

Date Analyzed : 21-DEC-17 - 23-DEC-17
Report ID : 1039388

Client ID : 22152-T73 **Lab ID : L428986-8** **Air Volume : 930.19 L**
Date Sampled : 12/04/17 **Date Analyzed : 12/22/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.00097	mg/m3
Arsenic	0.30	<0.30	<0.00032	mg/m3
Barium	0.15	2.7	0.0029	mg/m3
Beryllium	0.15	<0.15	<0.00016	mg/m3
Cadmium	0.15	<0.15	<0.00016	mg/m3
Calcium Oxide	100.	<100	<0.11	mg/m3
Chromium	7.5	<7.5	<0.0081	mg/m3
Cobalt	0.45	<0.45	<0.00048	mg/m3
Copper	0.30	<0.30	<0.00032	mg/m3
Lead	0.38	<0.38	<0.00040	mg/m3
Manganese	0.15	0.47	0.00051	mg/m3
Selenium	2.3	<2.3	<0.0024	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 26-DEC-17

Submitted by: JMR/KEG/JPA
NYS DOH # : 11626

Approved by: JJL/SJW
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 04-DEC-17
Date Received : 19-DEC-17

Account No.: 90734
Login No. : L428986

Date Analyzed : 21-DEC-17 - 23-DEC-17
Report ID : 1039388

Client ID : 22152-T74 **Lab ID : L428986-9** **Air Volume : NA**
Date Sampled : 12/04/17 **Date Analyzed : 12/22/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.30	<0.30	NA	mg/m3
Barium	0.15	<0.15	NA	mg/m3
Beryllium	0.15	<0.15	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.45	<0.45	NA	mg/m3
Copper	0.30	<0.30	NA	mg/m3
Lead	0.38	<0.38	NA	mg/m3
Manganese	0.15	<0.15	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 26-DEC-17

Submitted by: JMR/KEG/JPA
NYS DOH # : 11626

Approved by: JJL/SJW
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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East Syracuse, NY 13057
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FAX: (315) 437-0571
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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 04-DEC-17
Date Received : 19-DEC-17

Account No.: 90734
Login No. : L428986

Date Analyzed : 21-DEC-17 - 23-DEC-17
Report ID : 1039662

Client ID : 22152-I71 **Lab ID : L428986-12** **Air Volume : 949.68 L**
Date Sampled : 12/04/17 **Date Analyzed : 12/23/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	<0.0000079	mg/m3
Magnesium Oxide	12.	<12	<0.013	mg/m3
Molybdenum	0.075	0.23	0.00024	mg/m3
Nickel	0.15	<0.15	<0.00016	mg/m3
Thallium	0.75	<0.75	<0.00079	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.00085	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 26-DEC-17

Submitted by: JMR/JJL
NYS DOH # : 11626

Approved by: SJW
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

SGS GALSON

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East Syracuse, NY 13057
(315) 432-5227
FAX: (315) 437-0571
www.galsonlabs.com

LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 04-DEC-17
Date Received : 19-DEC-17

Account No.: 90734
Login No. : L428986

Date Analyzed : 21-DEC-17 - 23-DEC-17
Report ID : 1039662

Client ID : 22152-I72 **Lab ID : L428986-13** **Air Volume : NA**
Date Sampled : 12/04/17 **Date Analyzed : 12/23/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	NA	mg/m3
Magnesium Oxide	12.	<12	NA	mg/m3
Molybdenum	0.075	<0.075	NA	mg/m3
Nickel	0.15	<0.15	NA	mg/m3
Thallium	0.75	<0.75	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 26-DEC-17

Submitted by: JMR/JJL
NYS DOH # : 11626

Approved by: SJW
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 04-DEC-17
Date Received : 19-DEC-17

Account No.: 90734
Login No. : L428986
Date Analyzed : 26-DEC-17
Report ID : 1039714

Asbestos Fiber Count (A Rules)

Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
22152-A73A	L428986-1	9/100	11.5	4428	120,980	0.04
22152-A73B	L428986-2	6/100	7.6	2926	113,920	0.03
22152-A73C	L428986-3	5/100	<7	<2700	120,980	<0.02
22152-A73D	L428986-4	8/100	10.2	3927	116,950	0.03
22152-A74	L428986-5	4/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : BTM
Approved by : BDB
Date : 26-DEC-17
QC by: CRD
Supervisor: BDB

< -Less Than
> -Greater Than
ND -Not Detected
NA -Not Applicable
cc -Cubic Centimeters
NS -Not Specified
mm2 -Square millimeters

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LABORATORY ANALYSIS REPORT

Client	: Toronto Transit Commission Ltd	Account No.:	90734
Site	: NS	Login No. :	L428986
Project No.	: 22152		
Date Sampled	: 04-DEC-17	Date Analyzed :	20-DEC-17
Date Received	: 19-DEC-17	Report ID :	1038456

Inhalable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-I71	L428986-12	949.68	0.29	0.31
22152-I72	L428986-13	NA	<0.10	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.10 mg		Submitted by: GMG	
Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV		Approved by : SPR	
OSHA PEL : NA		Date : 21-DEC-17	NYS DOH # : 11626
Collection Media : IOM 25mm PW PVC		Supervisor: KRK	QC by: CRD

< -Less Than	mg -Milligrams	m3 -Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
> -Greater Than	ug -Micrograms	l -Liters	NS -Not Specified	ppm -Parts per Million	

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 04-DEC-17
Date Received : 19-DEC-17

Account No.: 90734
Login No. : L428986
Date Analyzed : 22-DEC-17
Report ID : 1038457

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-S73	L428986-10	934.6	0.090	0.096
22152-S74	L428986-11	NA	<0.050	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg
Analytical Method : mod. NIOSH 0600; Gravimetric
OSHA PEL : PNOR 5 mg/m3 (TWA)
Collection Media : PVC PW 37mm

Submitted by: HVN
Approved by : SPR
Date : 22-DEC-17
Supervisor: KRK

NYS DOH # : 11626
QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 04-DEC-17
Date Received : 19-DEC-17

Account No.: 90734
Login No. : L428986

Date Analyzed : 22-DEC-17 - 23-DEC-17
Report ID : 1039533

Respirable Crystalline Silica (RCS): Quartz, Cristobalite, Tridymite

Sample ID	Lab ID	Analyte	Air Vol l	ug	ug/m3
22152-S73	L428986-10	Quartz	934.6	<5.0	<5.3
		Cristobalite	934.6	<5.0	<5.3
		Tridymite	934.6	<20	<21
		RCS	934.6	<5.0	<5.3
22152-S74	L428986-11	Quartz	NA	<5.0	NA
		Cristobalite	NA	<5.0	NA
		Tridymite	NA	<20	NA
		RCS	NA	<5.0	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: Q:5.0ug C:5.0ug T:20.ug
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD
OSHA PEL : 50 ug/m3 RCS
Collection Media : PVC PW 37mm

Submitted: SPR/AJD
Approved: CMR
Date : 26-DEC-17 NYS DOH # : 11626
Supervisor: KRK QC by: CRD

< -Less Than	mg -Milligrams	kg -Kilograms	ppm -Parts per Million
> -Greater Than	ug -Micrograms	m3 -Cubic Meters	NS -Not Specified
NA -Not Applicable	ND -Not Detected	l -Liters	mppcf -Million Particles per Cubic Foot

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 04-DEC-17 Account No.: 90734
Date Received: 19-DEC-17 Login No. : L428986
Date Analyzed: 20-DEC-17 - 26-DEC-17

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L428986 (Report ID: 1039662):
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: im-mwvfilt(29), MT-SOP-21(11)
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3; as Fume, Ceiling = 0.1 mg/m3.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
TLV for VANADIUM PENTOXIDE: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for MAGNESIUM OXIDE: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 04-DEC-17 Account No.: 90734
Date Received: 19-DEC-17 Login No. : L428986
Date Analyzed: 20-DEC-17 - 26-DEC-17

L428986 (Report ID: 1039662):

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Beryllium	+/-14.1%	104%
Magnesium Oxide	+/-10.8%	101%
Molybdenum	+/-14.9%	102%
Nickel	+/-11.2%	105%
Thallium	+/-8%	102%
Vanadium Pentoxide	+/-9.8%	103%

Parameter	Method	PEL
Beryllium	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/M	0.0002 mg/m3 (TWA)
Magnesium Oxide	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	See footnote

L428986 (Report ID: 1039388):

TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for COBALT: 0.02 mg/m3
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for Calcium Oxide: 2 mg/m3
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3
TLV for SELENIUM: 0.2 mg/m3

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Date Sampled : 04-DEC-17 Account No.: 90734
Date Received: 19-DEC-17 Login No. : L428986
Date Analyzed: 20-DEC-17 - 26-DEC-17

L428986 (Report ID: 1039388):
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for CHROMIUM: 0.5 mg/m3
TLV for IRON OXIDE: 5 mg/m3
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(35), im-mwvfilt(29)
PEL listed refers to Aluminum as total dust.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.

L428986 (Report ID: 1039388):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-7.4%	97.9%
Antimony	+/-10.4%	96.9%
Arsenic	+/-8.4%	103%
Barium	+/-7.3%	100%
Beryllium	+/-12.8%	103%
Cadmium	+/-8.5%	101%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 04-DEC-17 Account No.: 90734
Date Received: 19-DEC-17 Login No. : L428986
Date Analyzed: 20-DEC-17 - 26-DEC-17

Calcium Oxide	+/-10%	105%
Chromium	+/-12.5%	103%
Cobalt	+/-8.6%	102%
Copper	+/-10.5%	103%
Iron Oxide	+/-9.8%	106%
Lead	+/-9.4%	99.7%
Manganese	+/-11.2%	99.5%
Molybdenum	+/-8.5%	100%
Selenium	+/-10.5%	104%
Zinc Oxide	+/-8.8%	100%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)
Chromium	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Selenium	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

L428986 (Report ID: 1039714):
SOPs: ia-pcm(26)
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a greater than optimal variability and are probably biased.

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
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Project No. : 22152

Date Sampled : 04-DEC-17 Account No.: 90734
Date Received: 19-DEC-17 Login No. : L428986
Date Analyzed: 20-DEC-17 - 26-DEC-17

L428986 (Report ID: 1039714):
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as follows:
0.144 (5-20 fibers/100 fields)
0.093 (>20-50 fibers/100 fields)
0.104 (>50-100 fibers/100 fields)
0.092 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take into account any uncertainty associated with the sampling process.

L428986 (Report ID: 1038456):
SOPs: GRAV-SOP-8(18)
Gravimetric analytical accuracy of the sampling media is -0.001 +/- 0.030 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.

L428986 (Report ID: 1038457):
TLV for RESPIRABLE DUST: NA
SOPs: GRAV-SOP-5(18), GRAV-SOP-6(17)
Gravimetric analytical accuracy of the sampling media is 0.002 +/- 0.018 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.
PNOR = Particulates Not Otherwise Regulated.

L428986 (Report ID: 1039533):
TLV for QUARTZ: 0.025 mg/m3 Respirable
TLV for TRIDYMITE: NA
TLV for CRISTOBALITE: 0.025 mg/m3 Respirable
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26)

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 04-DEC-17 Account No.: 90734
Date Received: 19-DEC-17 Login No. : L428986
Date Analyzed: 20-DEC-17 - 26-DEC-17

L428986 (Report ID: 1039533):

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-13.8%	101%
Quartz	+/-10.9%	93.4%
Tridymite	+/-13.6%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

NVLAP®
Lab Code 101143-0
NY ELAP
Lab ID 10920

Chain of Custody: 604729
Client: Galson Laboratories
Address: 6601 Kirkville Road
East Syracuse, NY 13057-9672
Attention: Pam Weaver

Job Name: Not Provided
Job Location: Not Provided
Job Number: L428986
P.O. Number: 90734

Date Submitted: 12/27/2017
Date Analyzed: 01/04/2018
Report Date: 01/04/2018
Date Sampled: 12/04/2017
Person Submitting: Zach King

Summary of Transmission Electron Microscopy

Filter Type: MCE **Pore Size:** 0.8 um **Filter Size:** 25 mm (385 mm²)

AMA Sample Number	Client Sample Number	Volume (L)	Area Analyzed (mm^2)	Analytical Sensitivity f/cc	Asbestos Type Amount	# Non Asbestos Structures	Concentration		Fraction	Sample Type	Comments
							f/mm^2	f/cc			
604729-1	22152-A73A	120.98	0.532	0.006	0	1	<8	<0.0239	0.0	N/P	
604729-2	22152-A73B	113.92	0.532	0.0064	0	0	<8	<0.0254		N/P	
604729-3	22152-A73C	120.98	0.532	0.006	0	0	<8	<0.0239		N/P	
604729-4	22152-A73D	116.95	0.532	0.0062	0	0	<8	<0.0248		N/P	

Analytical procedures used meet or exceed NIOSH 7402 protocols.

** - To calculate the asbestos concentration of the PCM result multiply the original PCM result by the fraction.

All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

Analyst(s): Michael Greenberg

Technical Director Andreas Saldivar

4475 Forbes Blvd. · Lanham, MD, 20706 · (301) 459-2640 · Toll Free (800) 346-0961 · Fax (301) 459-2643

AMA Analytical Services, Inc.
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(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 604729

Mailing/Billing Information:

1. Client Name: GALSON
2. Address 1: _____
3. Address 2: _____
4. Address 3: _____
5. Phone #: _____ Fax #: _____

Submittal Information:

1. Job Name: _____
2. Job Location: _____
3. Job #: L428986 P.O. #: 90734
4. Contact Person: PAM WEAVER Cell: _____
5. Collected by: _____ Cell: _____

Reporting Info (Results provided as soon as technically feasible). If no TAT/Reporting Info is provided, AMA will assign defaults of 5-Day and email/fax to contacts on file.

AFTER HOURS (must be pre-scheduled)
☐ 4 Hours
☐ Immediate Date Due: _____
☐ 24 Hours Time Due: _____
Comments: _____

NORMAL BUSINESS HOURS
☐ 4 Hours ☐ 3 Day ☐ Results Required By Noon
☐ Same Day ☒ 5 Day +
☐ Next Day Date Due: 1/4/2017
☐ 2 Day

REPORT TO:
☐ Email: _____
☐ Email 2: _____
☐ Verbals: _____

Asbestos Analysis
*PCM Air – Please Indicate Filter Type: _____
☐ NIOSH 7400 _____ (QTY)
☐ Fiberglass _____ (QTY)
TEM Air* – Please Indicate Filter Type: _____
☐ AHERA _____ (QTY)
☒ NIOSH 7402 4 (QTY)
☐ Other (specify _____) _____ (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate _____ (QTY) ☐ Pos Stop
☐ EPA Point Count _____ (QTY)
☐ NY State Friable 198.1 _____ (QTY)
☐ Grav. Reduction ELAP 198.6 _____ (QTY)
☐ Other (specify _____) _____ (QTY)
MISC
☐ Vermiculite
☐ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

TEM Bulk
☐ ELAP 198.4/Chatfield _____ (QTY)
☐ NY State PLM/TEM _____ (QTY)
☐ Residual Ash _____ (QTY)
TEM Dust*
☐ Qual. (pres/abs) Vacuum/Dust _____ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 _____ (QTY)
☐ Quan. (s/area)Dust D6480-99 _____ (QTY)
TEM Water
☐ Qual. (pres/abs) _____ (QTY)
☐ ELAP 198.2/EPA 100.2 _____ (QTY)
☐ EPA 100.1 _____ (QTY)

☒ All samples received in good condition unless otherwise noted.
(TEM Water samples _____ °C)

If field data sheets are submitted, there is no need to complete bottom section.

Metals Analysis
☐ Pb Paint Chip _____ (QTY)
☐ *Pb Dust Wipe (wipe type _____) _____ (QTY)
☐ *Pb Air _____ (QTY)
☐ Pb Soil/Solid _____ (QTY)
☐ Pb TCLP _____ (QTY)
☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Pb Furnace (Media _____) _____ (QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: _____
Collection Media _____
☐ *Spore-Trap ____ (QTY) ☐ Surface Vacuum Dust ____ (QTY)
☐ *Surface Swab ____ (QTY) ☐ Culturable ID Genus (Media ____) ____ (QTY)
☐ *Surface Tape ____ (QTY) ☐ Culturable ID Species (Media ____) ____ (QTY)
☐ Other (Specify ____) ____ (QTY

*It is recommended that blank samples be submitted with all air and surface samples

CLIENT ID #	SAMPLE INFORMATION SAMPLE LOCATION/ ID	DATE/ TIME	VOL (L)/ Wipe Area	ANALYSIS: TEM	PCM	PLM	LEAD	MOLD	MATRIX: AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB	CLIENT CONTACT (LABORATORY STAFF ONLY)
																Date/Time: Contact:By:
																Date/Time: Contact:By:
																Date/Time: Contact:By:

	Print Name	Signature	Date	Time
Relinquished by:	ZACH KING			
Received by:				
Relinquished by:				
Received for Lab by:			12/27/17	1030

Shipping Information
☒ UPS ☐ In-Person ☐ Other
☐ FedEx ☐ Drop Box
☐ USPS ☐ Courrier
Airbill/Tracking No: _____

AMA

GALSON LABORATORIES
6601 Kirkville Rd
East Syracuse, NY 13057-9672
Tel: 315-437-5227
888-432-LABS(5227)
Fax: 315-437-0571
www.galsonlabs.com

Check if change of address ☐
New Client ? yes ☐ no ☐

Report To :	**Shelly Krause**	Invoice To :	**Jeanne Glisson**
	SGS Galson Laboratory		SGS Galson Laboratory
	6601 Kirkville Road		6601 Kirkville Road
	East Syracuse, NY 13057		East Syracuse, NY 13057
Phone No. :	888-432-5227	Phone No. :	888-432-5227
		Fax No.	315-437-0571

Site Name : **Project :** L428986 **Sampled By :** Client

Turnaround Time	Due Date
☑ Standard	01/04/18
☐ 4 Business Days	
☐ 3 Business Days	
☐ 2 Business Days	
☐ Next Day by 6pm	
☐ Next Day by Noon	
☐ Same day	

Verbal Authorization : 90734
Credit Card No. : Card Holder Name : Exp. :
Fax Results To : Email Only Please Fax No. : Email Only Please
Email Results To : Syracuse.Subcontracting@sgs.com

Sample Identification	Date Sampled	Collection Medium	*Air Volume (liters)/ Passive Monitors (Min)	Analysis Requested	Method Reference	Specific DL Needed
22152-A73A	12/4/2017	25mm MCE PCM	120.98	Transmission Electron Microscopy	NIOSH 7402; TEM	
22152-A73B	12/4/2017	25mm MCE PCM	113.92	Transmission Electron Microscopy	NIOSH 7402; TEM	
22152-A73C	12/4/2017	25mm MCE PCM	120.98	Transmission Electron Microscopy	NIOSH 7402; TEM	
22152-A73D	12/4/2017	25mm MCE PCM	116.95	Transmission Electron Microscopy	NIOSH 7402; TEM	

Comments:

State/Province of sampling event: Ontario

If the method being reported is not on your laboratory's current AIHA scope of accreditation, please state that in your report.
Please provide an uncertainty statement in accordance with AIHA LQAP policy document Section 2A.5.4.3.

Chain of Custody	Print Name	Signature	Date/Time
Relinquished by :	Zach King		12/26/2017 17:18
Received by LAB :			

L4289866

sgs GALSON

1Z5X626A6647630463
Date:
Shipper: UPS
Initials: CEM
Prep: UNKNOWN

2A2

New Client? ☐

Client Account No.*:

Report To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2

Phone No.*: 416-393-6668
Cell No.:
Email Results to: Virgil.Umali@ttc.ca & oheresults@oheconsultants.com
Email address:

Invoice To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2

R84

Phone No.:
Email:
P.O. No.: PU240835
Credit Card ☐ Card on File ☐ Call for Credit Card Info.

☐ Samples submitted using the FreePumpLoan™ Program ☐ Samples submitted using the FreeSamplingBadges™ Program

Need Results By*:	(surcharge)
☑ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%

Check for availability an pricing for quicker turn around times.

Site Name:
Project: 22152
Sampled by: OHE Consultants

Comments:

TTC Subway Air Quality

List description of industry or Process/interferences present in sampling area:

Province samples were collected in (ex. ON)

Please indicate which OEL this data will be used for: ☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA ☐ MSHA ☐ Other (specify):

Sample Identification* (Maximum of 20 Characters. ID's longer than 20 characters will be abbreviated.)	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml, min, in2, cm2, ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (e.g., welding plating, painting, etc.)*
22152 - A73A	12/04/17	25 mm PCM	120.98	L	Standardized List of Analyses for TTC		
22152 - A73B		25 mm PCM	113.92	L	Subway Air Quality Study		
22152 - A73C		25 mm PCM	120.98	L	-		
22152 - A73D		25 mm PCM	116.95	L	-		
22152 -A74		25 mm PCM	-	L	-		
-		-	-	-	-		
22152 - M73		UW MCE in PPI	946.77	L	-		
22152 - M74		UW MCE in PPI	-	-	-		
22152 - T73		UW MCE	930.19	L	-		
22152 - T74		UW MCE	-	-	-		

^Galson Laboratories will subsititute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ, please indicate if the lower LOQ is required (only available for certain analytes - see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date	Time		Print Name/Signature	Date	Time
Relinquished by	Romain Mathevet	12/11/17	09:00	Received by:	[signature]	13/12/17	11:23a
Relinquished by	[signature]	12/13/17	Gcp	Received by:	Candace Massurin [signature]	12/19/17	11:51

Samples received after 3pm will be considered as next day's business

* Required fields, failure to complete these fields may result in a delay in your samples being processed.

Page 1 of 2

SGS GALSON

1140 Sheppard Avenue West
Unit 5
North York, Ontario, Canada M3K 2A2
Tel: 888-432-5227
www.galsonlabs.ca

☐ New Client?

Client Account No.*: _____

Report To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2

Phone No.*: 416-393-6668
Cell No.:
Email Results to: Virgil.Umali@ttc.ca & oheresults@oheconsultants.com
Email address:

Invoice To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2

Phone No.:
Email:
P.O. No.: PU240835
Credit Card ☐ Card on File ☐ Call for Credit Card Info.

☐ Samples submitted using the FreePumpLoan™ Program ☐ Samples submitted using the FreeSamplingBadges™ Program

Need Results By*:	(surcharge)
☑ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%

Check for availability an pricing for quicker turn around times.

Site Name: Project: 22152 Sampled by: OHE Consultants

Comments:

TTC Subway Air Quality

List description of industry or Process/interferences present in sampling area:

Province samples were collected in (ex. ON)

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify):

Sample Identification* (Maximum of 20 Characters. ID's longer than 20 characters will be abbreviated.)	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (e.g., welding plating, painting, etc.)*
22152 - S73	12/04/17	PW PVC in PPI	934.6	L	Standardized List of Analyses for TTC		
22152 - S74		PW PVC in PPI	-	L	Subway Air Quality Study		
22152- I71		PW PVC in IOM	949.68	L			
22152- I72		PW PVC in IOM	-	L			
			-	-			
			-	-			
			-	-			
			-	-			

^Galson Laboratories will subsititute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ, please indicate if the lower LOQ is required (only available for certain analytes - see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date	Time		Print Name/Signature	Date	Time
Relinquished by	Romain Mathevet	12/11/17	09:00	Received by:		12/12/17	11:22
Relinquished by		12/18/17	6:45	Received by:	Candace Massurin	12 19 17	11:51

Samples received after 3pm will be considered as next day's business
* Required fields, failure to complete these fields may result in a delay in your samples being processed.

SGS GALSON

Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Canada

January 04, 2018

AIHA-LAP #100324 Account# 90734 Login# L428951

Dear Mr. Umali:

Enclosed are the analytical results for the samples received by our laboratory on December 19, 2017. All test results meet the quality control requirements of AIHA-LAP and NELAC unless otherwise stated in this report. All samples on the chain of custody were received in good condition unless otherwise noted.

Results in this report are based on the sampling data provided by the client and refer only to the samples as they were received at the laboratory. Unless otherwise requested, samples for asbestos analysis will be discarded 60 days from the date of this report and all other non-IOM samples will be retained for 14 days following the date of this report (when possible). IOMs will be cleaned & disposed of after seven calendar days.

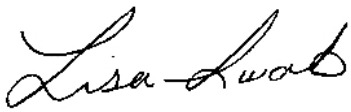
To ensure the safety of laboratory receiving personnel, always seal bulk samples securely to prevent possible escape of material. Also, please double-bag bulk samples individually prior to shipping. Samples not received in this manner will be noted on the chain of custody form.

Current Scopes of Accreditation can be viewed at www.sgsgalson.com in the accreditations section of the "About" page.

Please contact Katrina Ahchong at (888) 432-5227, if you would like any additional information regarding this report. Thank you for using SGS Galson.

Sincerely,

SGS Galson



Lisa Swab
Laboratory Director

Enclosure(s)

SGS GALSON

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East Syracuse, NY 13057
(315) 432-5227
FAX: (315) 437-0571
www.galsonlabs.com

LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 05-DEC-17
Date Received : 19-DEC-17

Account No.: 90734
Login No. : L428951
Date Analyzed : 21-DEC-17 - 23-DEC-17
Report ID : 1039384

Client ID : 22152-M75 **Lab ID : L428951-6** **Air Volume : 914.11 L**
Date Sampled : 12/05/17 **Date Analyzed : 12/21/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.0082	mg/m3
Cadmium	0.15	<0.15	<0.00016	mg/m3
Iron Oxide	11.	34	0.038	mg/m3
Molybdenum	0.15	0.21	0.00022	mg/m3
Zinc Oxide	2.8	<2.8	<0.0031	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 26-DEC-17

Submitted by: JMR/KEG/JPA
NYS DOH # : 11626

Approved by: JJL/SJW
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 05-DEC-17
Date Received : 19-DEC-17

Account No.: 90734
Login No. : L428951

Date Analyzed : 21-DEC-17 - 23-DEC-17
Report ID : 1039384

Client ID : 22152-M76 **Lab ID : L428951-7** **Air Volume : NA**
Date Sampled : 12/05/17 **Date Analyzed : 12/21/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 26-DEC-17

Submitted by: JMR/KEG/JPA
NYS DOH # : 11626

Approved by: JJL/SJW
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 05-DEC-17
Date Received : 19-DEC-17

Account No.: 90734
Login No. : L428951

Date Analyzed : 21-DEC-17 - 23-DEC-17
Report ID : 1039384

Client ID : 22152-T75 **Lab ID : L428951-8** **Air Volume : 917.08 L**
Date Sampled : 12/05/17 **Date Analyzed : 12/22/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.00098	mg/m3
Arsenic	0.30	<0.30	<0.00033	mg/m3
Barium	0.15	1.2	0.0013	mg/m3
Beryllium	0.15	<0.15	<0.00016	mg/m3
Cadmium	0.15	<0.15	<0.00016	mg/m3
Calcium Oxide	100.	<100	<0.11	mg/m3
Chromium	7.5	<7.5	<0.0082	mg/m3
Cobalt	0.45	<0.45	<0.00049	mg/m3
Copper	0.30	<0.30	<0.00033	mg/m3
Lead	0.38	<0.38	<0.00041	mg/m3
Manganese	0.15	0.47	0.00051	mg/m3
Selenium	2.3	<2.3	<0.0025	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 26-DEC-17

Submitted by: JMR/KEG/JPA
NYS DOH # : 11626

Approved by: JJL/SJW
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 05-DEC-17
Date Received : 19-DEC-17

Account No.: 90734
Login No. : L428951

Date Analyzed : 21-DEC-17 - 23-DEC-17
Report ID : 1039384

Client ID : 22152-T76 **Lab ID : L428951-9** **Air Volume : NA**
Date Sampled : 12/05/17 **Date Analyzed : 12/22/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.30	<0.30	NA	mg/m3
Barium	0.15	<0.15	NA	mg/m3
Beryllium	0.15	<0.15	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.45	<0.45	NA	mg/m3
Copper	0.30	<0.30	NA	mg/m3
Lead	0.38	<0.38	NA	mg/m3
Manganese	0.15	<0.15	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 26-DEC-17

Submitted by: JMR/KEG/JPA
NYS DOH # : 11626

Approved by: JJL/SJW
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 05-DEC-17
Date Received : 19-DEC-17

Account No.: 90734
Login No. : L428951

Date Analyzed : 21-DEC-17 - 23-DEC-17
Report ID : 1039659

Client ID : 22152-I73 **Lab ID : L428951-12** **Air Volume : 898 L**
Date Sampled : 12/05/17 **Date Analyzed : 12/23/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	<0.0000084	mg/m3
Magnesium Oxide	12.	<12	<0.014	mg/m3
Molybdenum	0.075	0.62	0.00069	mg/m3
Nickel	0.15	<0.15	<0.00017	mg/m3
Thallium	0.75	<0.75	<0.00084	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.00089	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 26-DEC-17

Submitted by: JMR/JJL
NYS DOH # : 11626

Approved by: SJW
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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East Syracuse, NY 13057
(315) 432-5227
FAX: (315) 437-0571
www.galsonlabs.com

LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 05-DEC-17
Date Received : 19-DEC-17

Account No.: 90734
Login No. : L428951

Date Analyzed : 21-DEC-17 - 23-DEC-17
Report ID : 1039659

Client ID : 22152-I74 **Lab ID : L428951-13** **Air Volume : NA**
Date Sampled : 12/05/17 **Date Analyzed : 12/23/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	NA	mg/m3
Magnesium Oxide	12.	<12	NA	mg/m3
Molybdenum	0.075	<0.075	NA	mg/m3
Nickel	0.15	<0.15	NA	mg/m3
Thallium	0.75	<0.75	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 26-DEC-17

Submitted by: JMR/JJL
NYS DOH # : 11626

Approved by: SJW
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 05-DEC-17
Date Received : 19-DEC-17

Account No.: 90734
Login No. : L428951
Date Analyzed : 26-DEC-17
Report ID : 1039712

Asbestos Fiber Count (A Rules)

Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
22152-A75A	L428951-1	3/100	<7	<2700	120,910	<0.02
22152-A75B	L428951-2	5.5/100	7	2700	100,760	0.03
22152-A75C	L428951-3	4/100	<7	<2700	120,910	<0.02
22152-A75D	L428951-4	7/100	8.9	3427	113,860	0.03
22152-A76	L428951-5	3/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : BTM
Approved by : BDB
Date : 26-DEC-17
QC by: CRD
Supervisor: BDB

< -Less Than
> -Greater Than
ND -Not Detected
NA -Not Applicable
cc -Cubic Centimeters
NS -Not Specified
mm2 -Square millimeters

SGS GALSON

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East Syracuse, NY 13057
(315) 432-5227
FAX: (315) 437-0571
www.galsonlabs.com

LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 05-DEC-17
Date Received : 19-DEC-17

Account No.: 90734
Login No. : L428951
Date Analyzed : 20-DEC-17
Report ID : 1038475

Inhalable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-I73	L428951-12	898	0.14	0.15
22152-I74	L428951-13	NA	<0.10	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.10 mg
Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV
OSHA PEL : NA
Collection Media : IOM 25mm PW PVC

Submitted by: GMG
Approved by : SPR
Date : 21-DEC-17
Supervisor: KRK

NYS DOH # : 11626
QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

SGS GALSON

6601 Kirkville Road
East Syracuse, NY 13057
(315) 432-5227
FAX: (315) 437-0571
www.galsonlabs.com

LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 05-DEC-17
Date Received : 19-DEC-17

Account No.: 90734
Login No. : L428951
Date Analyzed : 22-DEC-17
Report ID : 1038476

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-S75	L428951-10	902.15	0.080	0.089
22152-S76	L428951-11	NA	<0.050	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg
Analytical Method : mod. NIOSH 0600; Gravimetric
OSHA PEL : PNOR 5 mg/m3 (TWA)
Collection Media : PVC PW 37mm

Submitted by: HVN
Approved by : SPR
Date : 22-DEC-17
Supervisor: KRK

NYS DOH # : 11626
QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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East Syracuse, NY 13057
(315) 432-5227
FAX: (315) 437-0571
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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 05-DEC-17
Date Received : 19-DEC-17

Account No.: 90734
Login No. : L428951
Date Analyzed : 22-DEC-17
Report ID : 1039602

Hexavalent Chromium

Sample ID	Lab ID	Air Vol liter	Total ug	Conc ug/m3
22152-H15	L428951-14	911.55	<0.030	<0.033
22152-H16	L428951-15	NA	<0.030	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.030 ug
Analytical Method : mod. OSHA ID-215 (version 2); IC/UV
OSHA PEL : 5 ug/m3 (TWA)
Collection Media : PVC UW 37mm

Submitted by: MCM
Approved by : NKP
Date : 26-DEC-17
Supervisor: MWJ

NYS DOH # : 11626
QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 05-DEC-17
Date Received : 19-DEC-17

Account No.: 90734
Login No. : L428951

Date Analyzed : 22-DEC-17 - 25-DEC-17
Report ID : 1039581

Respirable Crystalline Silica (RCS): Quartz, Cristobalite, Tridymite

Sample ID	Lab ID	Analyte	Air Vol l	ug	ug/m3
22152-S75	L428951-10	Quartz	902.15	<5.0	<5.5
		Cristobalite	902.15	<5.0	<5.5
		Tridymite	902.15	<20	<22
		RCS	902.15	<5.0	<5.5
22152-S76	L428951-11	Quartz	NA	<5.0	NA
		Cristobalite	NA	<5.0	NA
		Tridymite	NA	<20	NA
		RCS	NA	<5.0	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: Q:5.0ug C:5.0ug T:20.ug
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD
OSHA PEL : 50 ug/m3 RCS
Collection Media : PVC PW 37mm

Submitted: SPR/AJD
Approved: CMR
Date : 26-DEC-17 NYS DOH # : 11626
Supervisor: KRK QC by: CRD

< -Less Than
> -Greater Than
NA -Not Applicable
mg -Milligrams
ug -Micrograms
ND -Not Detected
kg -Kilograms
m3 -Cubic Meters
l -Liters
ppm -Parts per Million
NS -Not Specified
mppcf -Million Particles per Cubic Foot

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 05-DEC-17 Account No.: 90734
Date Received: 19-DEC-17 Login No. : L428951
Date Analyzed: 20-DEC-17 - 26-DEC-17

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L428951 (Report ID: 1039659):
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: im-mwvfilt(29), MT-SOP-21(11)
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3; as Fume, Ceiling = 0.1 mg/m3.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
TLV for VANADIUM PENTOXIDE: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for MAGNESIUM OXIDE: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote

<	-Less Than	mg	-Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm	-Parts per Million
>	-Greater Than	ug	-Micrograms	l	-Liters	NS	-Not Specified	ND	-Not Detected	NA	-Not Applicable

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 05-DEC-17 Account No.: 90734
Date Received: 19-DEC-17 Login No. : L428951
Date Analyzed: 20-DEC-17 - 26-DEC-17

L428951 (Report ID: 1039659):

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Beryllium	+/-14.1%	104%
Magnesium Oxide	+/-10.8%	101%
Molybdenum	+/-14.9%	102%
Nickel	+/-11.2%	105%
Thallium	+/-8%	102%
Vanadium Pentoxide	+/-9.8%	103%

Parameter	Method	PEL
Beryllium	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/M	0.0002 mg/m3 (TWA)
Magnesium Oxide	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	See footnote

L428951 (Report ID: 1039384):

TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for COBALT: 0.02 mg/m3
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for Calcium Oxide: 2 mg/m3
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3
TLV for SELENIUM: 0.2 mg/m3

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 05-DEC-17 Account No.: 90734
Date Received: 19-DEC-17 Login No. : L428951
Date Analyzed: 20-DEC-17 - 26-DEC-17

L428951 (Report ID: 1039384):
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for CHROMIUM: 0.5 mg/m3
TLV for IRON OXIDE: 5 mg/m3
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(35), im-mwvfilt(29)
PEL listed refers to Aluminum as total dust.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.

L428951 (Report ID: 1039384):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-7.4%	97.9%
Antimony	+/-10.4%	96.9%
Arsenic	+/-8.4%	103%
Barium	+/-7.3%	100%
Beryllium	+/-12.8%	103%
Cadmium	+/-8.5%	101%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
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Calcium Oxide	+/-10%	105%
Chromium	+/-12.5%	103%
Cobalt	+/-8.6%	102%
Copper	+/-10.5%	103%
Iron Oxide	+/-9.8%	106%
Lead	+/-9.4%	99.7%
Manganese	+/-11.2%	99.5%
Molybdenum	+/-8.5%	100%
Selenium	+/-10.5%	104%
Zinc Oxide	+/-8.8%	100%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)
Chromium	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Selenium	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

L428951 (Report ID: 1039712):
SOPs: ia-pcm(26)
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a greater than optimal variability and are probably biased.

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 05-DEC-17 Account No.: 90734
Date Received: 19-DEC-17 Login No. : L428951
Date Analyzed: 20-DEC-17 - 26-DEC-17

L428951 (Report ID: 1039712):
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as follows:
0.144 (5-20 fibers/100 fields)
0.093 (>20-50 fibers/100 fields)
0.104 (>50-100 fibers/100 fields)
0.092 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take into account any uncertainty associated with the sampling process.

L428951 (Report ID: 1038475):
SOPs: GRAV-SOP-8(18)
Gravimetric analytical accuracy of the sampling media is -0.001 +/- 0.030 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.

L428951 (Report ID: 1038476):
TLV for RESPIRABLE DUST: NA
SOPs: GRAV-SOP-5(18), GRAV-SOP-6(17)
Gravimetric analytical accuracy of the sampling media is 0.002 +/- 0.018 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.
PNOR = Particulates Not Otherwise Regulated.

L428951 (Report ID: 1039602):
TLV for Hexavalent Chromium: 0.01 mg/m3 (as Cr, Insol)
SOPs: IC-SOP-15(20)
Total ug corrected for a desorption efficiency of 100%.
SGS Galson Laboratories pretests all media lots distributed for Hexavalent Chromium analysis and can provide data confirming that no significant background is present. We may not be able to verify lot background levels for media obtained through alternate vendors.

< -Less Than	mg -Milligrams	m3 -Cubic Meters	kg -Kilograms	ppm -Parts per Million		
> -Greater Than	ug -Micrograms	l -Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable	

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 05-DEC-17 Account No.: 90734
Date Received: 19-DEC-17 Login No. : L428951
Date Analyzed: 20-DEC-17 - 26-DEC-17

L428951 (Report ID: 1039602):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Hexavalent Chromium	+/-15.2%	96.7%

L428951 (Report ID: 1039581):
TLV for QUARTZ: 0.025 mg/m3 Respirable
TLV for TRIDYMITE: NA
TLV for CRISTOBALITE: 0.025 mg/m3 Respirable
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26)

L428951 (Report ID: 1039581):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-13.8%	101%
Quartz	+/-10.9%	93.4%
Tridymite	+/-13.6%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

NVLAP®
Lab Code 101143-0
NY ELAP
Lab ID 10920

Chain of Custody: 604734
Client: Galson Laboratories
Address: 6601 Kirkville Road
East Syracuse, NY 13057-9672
Attention: Pam Weaver

Job Name: Not Provided
Job Location: Not Provided
Job Number: L428951
P.O. Number: 90734

Date Submitted: 12/27/2017
Date Analyzed: 01/04/2018
Report Date: 01/04/2018
Date Sampled: 12/05/2017
Person Submitting: Zach King

Summary of Transmission Electron Microscopy

Filter Type: MCE **Pore Size:** 0.8 um **Filter Size:** 25 mm (385 mm²)

AMA Sample Number	Client Sample Number	Volume (L)	Area Analyzed (mm²)	Analytical Sensitivity f/cc	Asbestos Type Amount	# Non Asbestos Structures	Concentration f/mm²	Concentration f/cc	Fraction	Sample Type	Comments
604734-1	22152-A75A	120.91	0.532	0.006	0	0	<8	<0.0239		N/P	
604734-2	22152-A75B	100.76	0.532	0.0072	0	0	<8	<0.0287		N/P	
604734-3	22152-A75C	120.91	0.532	0.006	0	0	<8	<0.0239		N/P	
604734-4	22152-A75D	113.86	0.532	0.0064	0	0	<8	<0.0254		N/P	

Analytical procedures used meet or exceed NIOSH 7402 protocols.

** - To calculate the asbestos concentration of the PCM result multiply the original PCM result by the fraction.

All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

Analyst(s): Izabelle Mendez

Technical Director Andreas Saldivar

4475 Forbes Blvd. · Lanham, MD, 20706 · (301) 459-2640 · Toll Free (800) 346-0961 · Fax (301) 459-2643

AMA Analytical Services, Inc.
Focused on Results www.amalab.com
AIHA-LAP (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 604734

Mailing/Billing Information:

1. Client Name: GALSON
2. Address 1: _____
3. Address 2: _____
4. Address 3: _____
5. Phone #: _____ Fax #: _____

Submittal Information:

1. Job Name: _____
2. Job Location: _____
3. Job #: L428951 P.O. #: 90734
4. Contact Person: PAM WEAVER Cell: _____
5. Collected by: _____ Cell: _____

Reporting Info (Results provided as soon as technically feasible). If no TAT/Reporting Info is provided, AMA will assign defaults of 5-Day and email/fax to contacts on file.

AFTER HOURS (must be pre-scheduled)
☐ 4 Hours
☐ Immediate Date Due: _____
☐ 24 Hours Time Due: _____
Comments: _____

NORMAL BUSINESS HOURS
☐ 4 Hours ☐ 3 Day ☐ Results Required By Noon
☐ Same Day ☒ 5 Day +
☐ Next Day Date Due: 1/4/2017
☐ 2 Day

REPORT TO:
☐ Email: _____
☐ Email 2: _____
☐ Verbals: _____

Asbestos Analysis
*PCM Air – Please Indicate Filter Type: _____
☐ NIOSH 7400 _____ (QTY)
☐ Fiberglass _____ (QTY)
TEM Air* – Please Indicate Filter Type: _____
☐ AHERA _____ (QTY)
☒ NIOSH 7402 4 (QTY)
☐ Other (specify _____) _____ (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate _____ (QTY) ☐ Pos Stop
☐ EPA Point Count _____ (QTY)
☐ NY State Friable 198.1 _____ (QTY)
☐ Grav. Reduction ELAP 198.6 _____ (QTY)
☐ Other (specify _____) _____ (QTY)
MISC
☐ Vermiculite
☐ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)
*It is recommended that blank samples be submitted with all air and surface samples

TEM Bulk
☐ ELAP 198.4/Chatfield _____ (QTY)
☐ NY State PLM/TEM _____ (QTY)
☐ Residual Ash _____ (QTY)
TEM Dust*
☐ Qual. (pres/abs) Vacuum/Dust _____ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 _____ (QTY)
☐ Quan. (s/area)Dust D6480-99 _____ (QTY)
TEM Water
☐ Qual. (pres/abs) _____ (QTY)
☐ ELAP 198.2/EPA 100.2 _____ (QTY)
☐ EPA 100.1 _____ (QTY)

☒ All samples received in good condition unless otherwise noted.
(TEM Water samples _____ °C)

If field data sheets are submitted, there is no need to complete bottom section.

Metals Analysis
☐ Pb Paint Chip _____ (QTY)
☐ *Pb Dust Wipe (wipe type _____) _____ (QTY)
☐ *Pb Air _____ (QTY)
☐ Pb Soil/Solid _____ (QTY)
☐ Pb TCLP _____ (QTY)
☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Pb Furnace (Media _____) _____ (QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: _____
Collection Media _____
☐ *Spore-Trap ____ (QTY) ☐ Surface Vacuum Dust ____ (QTY)
☐ *Surface Swab ____ (QTY) ☐ Culturable ID Genus (Media ____) ____ (QTY)
☐ *Surface Tape ____ (QTY) ☐ Culturable ID Species (Media ____) ____ (QTY)
☐ Other (Specify ____) ____ (QTY

CLIENT ID #	SAMPLE INFORMATION SAMPLE LOCATION/ ID	DATE/ TIME	VOL (L)/ Wipe Area	ANALYSIS: TEM	PCM	PLM	LEAD	MOLD	MATRIX: AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB	CLIENT CONTACT (LABORATORY STAFF ONLY)
																Date/Time: Contact:By:
																Date/Time: Contact:By:
																Date/Time: Contact:By:

	Print Name	Signature	Date	Time
Relinquished by:	ZACH KING			
Received by:				
Relinquished by:				
Received for Lab by:			12/27/17	10.30

Shipping Information
☒ UPS ☐ In-Person ☐ Other
☐ FedEx ☐ Drop Box
☐ USPS ☐ Courrier
Airbill/Tracking No: _____

AMA

GALSON LABORATORIES
6601 Kirkville Rd
East Syracuse, NY 13057-9672
Tel: 315-437-5227
888-432-LABS(5227)
Fax: 315-437-0571
www.galsonlabs.com

Check if change of address ☐
New Client ? yes ☐ no ☐

Report To :	**Shelly Krause**	Invoice To :	**Jeanne Glisson**
	SGS Galson Laboratory		SGS Galson Laboratory
	6601 Kirkville Road		6601 Kirkville Road
	East Syracuse, NY 13057		East Syracuse, NY 13057
Phone No. :	888-432-5227	Phone No. :	888-432-5227
		Fax No.	315-437-0571

Site Name : **Project :** L428951 **Sampled By :** Client

Turnaround Time	Due Date
☑ Standard	01/04/18
☐ 4 Business Days	
☐ 3 Business Days	
☐ 2 Business Days	
☐ Next Day by 6pm	
☐ Next Day by Noon	
☐ Same day	

Verbal Authorization : 90734

Credit Card No. : Card Holder Name : Exp. :

Fax Results To : Email Only Please Fax No. : Email Only Please

Email Results To : Syracuse.Subcontracting@sgs.com

Sample Identification	Date Sampled	Collection Medium	*Air Volume (liters)/ Passive Monitors (Min)	Analysis Requested	Method Reference	Specific DL Needed
22152-A75A	12/5/2017	25mm MCE PCM	120.91	Transmission Electron Microscopy	NIOSH 7402; TEM	
22152-A75B	12/5/2017	25mm MCE PCM	100.76	Transmission Electron Microscopy	NIOSH 7402; TEM	
22152-A75C	12/5/2017	25mm MCE PCM	120.91	Transmission Electron Microscopy	NIOSH 7402; TEM	
22152-A75D	12/5/2017	25mm MCE PCM	113.86	Transmission Electron Microscopy	NIOSH 7402; TEM	

Comments:

State/Province of sampling event: Ontrio

If the method being reported is not on your laboratory's current AIHA scope of accreditation, please state that in your report.
Please provide an uncertainty statement in accordance with AIHA LQAP policy document Section 2A.5.4.3.

Chain of Custody	Print Name	Signature	Date/Time
Relinquished by :	Zach King		12/26/2017 17:21
Received by LAB :			

Report Reference 1 Generated:04-JAN-18 16:03

L428951

ccc

125X626A6647630463
Date: 12/19/17
Shipper: UPS
Initials: CEM

Prep: UNKNOWN

3K 2A2

☐ New Client?

Client Account No.*:

Report To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2

Phone No.*: 416-393-6668
Cell No.:
Email Results to: Virgil.Umali@ttc.ca & oheresults@oheconsultants.com
Email address:

Invoice To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2

Phone No.:
Email:
P.O. No.: PU240835
Credit Card ☐ Card on File ☐ Call for Credit Card Info.

☐ Samples submitted using the FreePumpLoan™ Program ☐ Samples submitted using the FreeSamplingBadges™ Program

Need Results By*:	(surcharge)
☑ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%

Check for availability an pricing for quicker turn around times.

Site Name: Project: 22152 Sampled by: OHE Consultants

Comments:

TTC Subway Air Quality

List description of industry or Process/interferences present in sampling area:

Province samples were collected in (ex. ON)

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify):

Sample Identification* (Maximum of 20 Characters. IDs longer than 20 characters will be abbreviated.)	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (e.g., welding plating, painting, etc.)*
22152 - A75A	12/05/17	25 mm PCM	120.91	L	Standardized List of Analyses for TTC		
22152 - A75B	12/05/17	25 mm PCM	100.76	L	Subway Air Quality Study		
22152 - A75C	12/05/17	25 mm PCM	120.91	L	-		
22152 - A75D	12/05/17	25 mm PCM	113.86	L	-		
22152 - A76	12/05/17	25 mm PCM	-	L	-		
-		-	-	-	-		
22152 - M75	12/05/17	UW MCE in PPI	914.11	L	-		
22152 - M76	12/05/17	UW MCE in PPI	-	L	-		
22152 - T75	12/05/17	UW MCE	917.08	L	-		
22152 - T76	12/05/17	UW MCE	-	L	-		

^Galson Laboratories will subsititute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ, please indicate if the lower LOQ is required (only available for certain analytes - see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date	Time		Print Name/Signature	Date	Time
Relinquished by	Romain Mathevet	12/11/17	09:00	Received by:		12/12/17	11:??am
Relinquished by		12/12/17	6:??	Received by:	Candace Massurin	12-DEC-17	1052

Samples received after 3pm will be considered as next day's business
* Required fields, failure to complete these fields may result in a delay in your samples being processed.

Page 1 of 2

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Unit 5
North York, Ontario, Canada M3K 2A2
Tel: 888-432-5227
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☐ New Client?

Client Account No.*:

Report To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2
Phone No.*: 416-393-6668
Cell No.:
Email Results to: Virgil.Umali@ttc.ca & oheresults@oheconsultants.com
Email address:

Invoice To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2
Phone No.:
Email:
P.O. No.: PU240835
Credit Card ☐ Card on File ☐ Call for Credit Card Info.

☐ Samples submitted using the FreePumpLoan™ Program ☐ Samples submitted using the FreeSamplingBadges™ Program

Need Results By*:	(surcharge)
☑ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%

Check for availability an pricing for quicker turn around times.

Site Name: Project: 22152 Sampled by: OHE Consultants

Comments:

TTC Subway Air Quality

List description of industry or Process/interferences present in sampling area:

Province samples were collected in (ex. ON)

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify):

Sample Identification* (Maximum of 20 Characters. ID's longer than 20 characters will be abbreviated)	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (e.g., welding plating, painting, etc.)*
22152 - S75	12/05/17	PW PVC in PPI	902.15	L	Standardized List of Analyses for TTC		
22152 - S76	12/05/17	PW PVC in PPI	-	L	Subway Air Quality Study		
22152 - I73	12/05/17	PW PVC in IOM	898.00	L			
22152 - I74	12/05/17	PW PVC in IOM	-	L			
			-	-			
22152 - H15	12/05/17	2pc UW PVC	911.55	L	Hexavalent Chromium	mod.OSHA 215	Other
22152 - H16	12/05/17	2pc UW PVC	-	L	Hexavalent Chromium	mod.OSHA 215	Other
			-	-			
			-	-			
			-	-			

^Galson Laboratories will subsitute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ, please indicate if the lower LOQ is required (only available for certain analytes - see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date	Time		Print Name/Signature	Date	Time
Relinquished by	Romain Mathevet	12/11/17	09:00	Received by:		12/11/17	1032
Relinquished by		12/11/17	6pm	Received by:	Candace Massurin	12/9/17	1052

Samples received after 3pm will be considered as next day's business
* Required fields, failure to complete these fields may result in a delay in your samples being processed.

Page 2 of 2

90734

The TTC file number/purchase order number is PU240835:

1) Total Metals by NIOSH 7300. Analyze for antimony, arsenic, barium, beryllium, cadmium, calcium oxide, chromium III, cobalt, copper, lead, manganese, and selenium. UW MCE

2) Asbestos fibre count by NIOSH 7400. In addition, analyze specifically for asbestos by TEM if the fibre count result exceeds 0.01 f/cc. PCM

3) Respirable silica and respirable dust by NIOSH 7500/0600. Analyze for quartz, cristobalite, tridymite, and dust. PPI PW PVC

4) Respirable metals by NIOSH 7300. Analyze for aluminum, cadmium, iron oxide, molybdenum, and zinc oxide. PPI UW MCE

5) Inhalable metals and inhalable dust by NIOSH 7300/0500. Analyze for magnesium oxide, molybdenum, nickel, thallium, vanadium pentoxide, and dust. Beryllium should also be analyzed by ICP-MS to get a lower limit of detection. IOM

SGS GALSON

Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Canada

January 05, 2018

AIHA-LAP #100324 Account# 90734 Login# L428988

Dear Mr. Umali:

Enclosed are the analytical results for the samples received by our laboratory on December 19, 2017. All test results meet the quality control requirements of AIHA-LAP unless otherwise stated in this report. All samples on the chain of custody were received in good condition unless otherwise noted.

Results in this report are based on the sampling data provided by the client and refer only to the samples as they were received at the laboratory. Unless otherwise requested, all samples will be discarded 60 days from the date of this report.

To ensure the safety of laboratory receiving personnel, always seal bulk samples securely to prevent possible escape of material. Also, please double-bag bulk samples individually prior to shipping. Samples not received in this manner will be noted on the chain of custody form.

Samples requiring TEM analysis were subcontracted to AMA Analytical Services, Inc. Their report is enclosed in its entirety.

Current Scopes of Accreditation can be viewed at www.sgsgalson.com in the accreditations section of the "About" page. Please contact Katrina Ahchong, at (888) 432-5227, if you require additional information regarding this report. Thank you for using SGS Galson.

Sincerely,

SGS Galson

Pamela Weaver
Asbestos Technical Manager

Enclosure(s)

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East Syracuse, NY 13057
(315) 432-5227
FAX: (315) 437-0571
www.galsonlabs.com

LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 06-DEC-17
Date Received : 19-DEC-17

Account No.: 90734
Login No. : L428988
Date Analyzed : 21-DEC-17 - 23-DEC-17
Report ID : 1039389

Client ID : 22152-M77 **Lab ID : L428988-6** **Air Volume : 921.47 L**
Date Sampled : 12/06/17 **Date Analyzed : 12/21/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.0081	mg/m3
Cadmium	0.15	<0.15	<0.00016	mg/m3
Iron Oxide	11.	220	0.24	mg/m3
Molybdenum	0.15	<0.15	<0.00016	mg/m3
Zinc Oxide	2.8	<2.8	<0.0030	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 26-DEC-17

Submitted by: JMR/KEG/JPA
NYS DOH # : 11626

Approved by: JJL/SJW
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 06-DEC-17
Date Received : 19-DEC-17

Account No.: 90734
Login No. : L428988

Date Analyzed : 21-DEC-17 - 23-DEC-17
Report ID : 1039389

Client ID : 22152-M78 **Lab ID : L428988-7** **Air Volume : NA**
Date Sampled : 12/06/17 **Date Analyzed : 12/21/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 26-DEC-17

Submitted by: JMR/KEG/JPA
NYS DOH # : 11626

Approved by: JJL/SJW
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 06-DEC-17
Date Received : 19-DEC-17

Account No.: 90734
Login No. : L428988

Date Analyzed : 21-DEC-17 - 23-DEC-17
Report ID : 1039389

Client ID : 22152-T77 **Lab ID : L428988-8** **Air Volume : 931.48 L**
Date Sampled : 12/06/17 **Date Analyzed : 12/22/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.00097	mg/m3
Arsenic	0.30	<0.30	<0.00032	mg/m3
Barium	0.15	15	0.016	mg/m3
Beryllium	0.15	<0.15	<0.00016	mg/m3
Cadmium	0.15	<0.15	<0.00016	mg/m3
Calcium Oxide	100.	<100	<0.11	mg/m3
Chromium	7.5	<7.5	<0.0081	mg/m3
Cobalt	0.45	<0.45	<0.00048	mg/m3
Copper	0.30	1.1	0.0012	mg/m3
Lead	0.38	<0.38	<0.00040	mg/m3
Manganese	0.15	1.9	0.0020	mg/m3
Selenium	2.3	<2.3	<0.0024	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 26-DEC-17

Submitted by: JMR/KEG/JPA
NYS DOH # : 11626

Approved by: JJL/SJW
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 06-DEC-17
Date Received : 19-DEC-17

Account No.: 90734
Login No. : L428988

Date Analyzed : 21-DEC-17 - 23-DEC-17
Report ID : 1039389

Client ID : 22152-T78 **Lab ID : L428988-9** **Air Volume : NA**
Date Sampled : 12/06/17 **Date Analyzed : 12/22/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.30	<0.30	NA	mg/m3
Barium	0.15	<0.15	NA	mg/m3
Beryllium	0.15	<0.15	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.45	<0.45	NA	mg/m3
Copper	0.30	<0.30	NA	mg/m3
Lead	0.38	<0.38	NA	mg/m3
Manganese	0.15	<0.15	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 26-DEC-17

Submitted by: JMR/KEG/JPA
NYS DOH # : 11626

Approved by: JJL/SJW
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 06-DEC-17
Date Received : 19-DEC-17

Account No.: 90734
Login No. : L428988

Date Analyzed : 21-DEC-17 - 23-DEC-17
Report ID : 1039664

Client ID : 22152-I75 **Lab ID : L428988-12** **Air Volume : 919.78 L**
Date Sampled : 12/06/17 **Date Analyzed : 12/23/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	<0.0000082	mg/m3
Magnesium Oxide	12.	<12	<0.014	mg/m3
Molybdenum	0.075	0.22	0.00024	mg/m3
Nickel	0.15	0.47	0.00051	mg/m3
Thallium	0.75	<0.75	<0.00082	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.00087	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 26-DEC-17

Submitted by: JMR/JJL
NYS DOH # : 11626

Approved by: SJW
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 06-DEC-17
Date Received : 19-DEC-17

Account No.: 90734
Login No. : L428988

Date Analyzed : 21-DEC-17 - 23-DEC-17
Report ID : 1039664

Client ID : 22152-I76 **Lab ID : L428988-13** **Air Volume : NA**
Date Sampled : 12/06/17 **Date Analyzed : 12/23/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	NA	mg/m3
Magnesium Oxide	12.	<12	NA	mg/m3
Molybdenum	0.075	<0.075	NA	mg/m3
Nickel	0.15	<0.15	NA	mg/m3
Thallium	0.75	<0.75	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 26-DEC-17

Submitted by: JMR/JJL
NYS DOH # : 11626

Approved by: SJW
Supervisor: KEG QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 06-DEC-17
Date Received : 19-DEC-17

Account No.: 90734
Login No. : L428988
Date Analyzed : 26-DEC-17
Report ID : 1039715

Asbestos Fiber Count (A Rules)

	Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
+	22152-A77A	L428988-1	5/100	<7	<2700	121,260	<0.02
+	22152-A77B	L428988-2	3/100	<7	<2700	114,190	<0.02
+	22152-A77C	L428988-3	4.5/100	<7	<2700	121,260	<0.02
	22152-A77D	L428988-4	2.5/100	<7	<2700	106,100	<0.03
	22152-A78	L428988-5	1/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : BTM
Approved by : BDB
Date : 26-DEC-17
QC by: CRD
Supervisor: BDB

< -Less Than
> -Greater Than
ND -Not Detected
NA -Not Applicable
cc -Cubic Centimeters
NS -Not Specified
mm2 -Square millimeters

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 06-DEC-17
Date Received : 19-DEC-17

Account No.: 90734
Login No. : L428988
Date Analyzed : 20-DEC-17
Report ID : 1038453

Inhalable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-I75	L428988-12	919.78	0.69	0.75
22152-I76	L428988-13	NA	<0.10	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.10 mg
Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV
OSHA PEL : NA
Collection Media : IOM 25mm PW PVC

Submitted by: GMG
Approved by : SPR
Date : 21-DEC-17
Supervisor: KRK

NYS DOH # : 11626
QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 06-DEC-17
Date Received : 19-DEC-17

Account No.: 90734
Login No. : L428988
Date Analyzed : 20-DEC-17
Report ID : 1038454

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-S77	L428988-10	922.46	0.30	0.33
22152-S78	L428988-11	NA	<0.050	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg
Analytical Method : mod. NIOSH 0600; Gravimetric
OSHA PEL : PNOR 5 mg/m3 (TWA)
Collection Media : PVC PW 37mm

Submitted by: AS
Approved by : SPR
Date : 21-DEC-17
Supervisor: KRK

NYS DOH # : 11626
QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 06-DEC-17
Date Received : 19-DEC-17

Account No.: 90734
Login No. : L428988
Date Analyzed : 22-DEC-17
Report ID : 1039603

Hexavalent Chromium

Sample ID	Lab ID	Air Vol liter	Total ug	Conc ug/m3
22152-H17	L428988-14	918.79	<0.030	<0.033
22152-H18	L428988-15	NA	<0.030	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.030 ug
Analytical Method : mod. OSHA ID-215 (version 2); IC/UV
OSHA PEL : 5 ug/m3 (TWA)
Collection Media : PVC UW 37mm

Submitted by: MCM
Approved by : NKP
Date : 26-DEC-17
Supervisor: MWJ

NYS DOH # : 11626
QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 06-DEC-17
Date Received : 19-DEC-17

Account No.: 90734
Login No. : L428988

Date Analyzed : 20-DEC-17 - 22-DEC-17
Report ID : 1039382

Respirable Crystalline Silica (RCS): Quartz, Cristobalite, Tridymite

Sample ID	Lab ID	Analyte	Air Vol l	ug	ug/m3
22152-S77	L428988-10	Quartz	922.46	<5.0	<5.4
		Cristobalite	922.46	<5.0	<5.4
		Tridymite	922.46	<20	<22
		RCS	922.46	<5.0	<5.4
22152-S78	L428988-11	Quartz	NA	<5.0	NA
		Cristobalite	NA	<5.0	NA
		Tridymite	NA	<20	NA
		RCS	NA	<5.0	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: Q:5.0ug C:5.0ug T:20.ug
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD
OSHA PEL : 50 ug/m3 RCS
Collection Media : PVC PW 37mm

Submitted: AJD
Approved: CMR
Date : 26-DEC-17 NYS DOH # : 11626
Supervisor: KRK QC by: CRD

< -Less Than
> -Greater Than
NA -Not Applicable
mg -Milligrams
ug -Micrograms
ND -Not Detected
kg -Kilograms
m3 -Cubic Meters
l -Liters
ppm -Parts per Million
NS -Not Specified
mppcf -Million Particles per Cubic Foot

SGS GALSON

6601 Kirkville Road
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FAX: (315) 437-0571
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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 06-DEC-17 Account No.: 90734
Date Received: 19-DEC-17 Login No. : L428988
Date Analyzed: 20-DEC-17 - 26-DEC-17

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L428988 (Report ID: 1039664):
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: im-mwvfilt(29), MT-SOP-21(11)
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3; as Fume, Ceiling = 0.1 mg/m3.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
TLV for VANADIUM PENTOXIDE: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for MAGNESIUM OXIDE: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote

< -Less Than	mg -Milligrams	m3 -Cubic Meters	kg -Kilograms	ppm -Parts per Million		
> -Greater Than	ug -Micrograms	l -Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable	

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 06-DEC-17 Account No.: 90734
Date Received: 19-DEC-17 Login No. : L428988
Date Analyzed: 20-DEC-17 - 26-DEC-17

L428988 (Report ID: 1039664):

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Beryllium	+/-14.1%	104%
Magnesium Oxide	+/-10.8%	101%
Molybdenum	+/-14.9%	102%
Nickel	+/-11.2%	105%
Thallium	+/-8%	102%
Vanadium Pentoxide	+/-9.8%	103%

Parameter	Method	PEL
Beryllium	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/M	0.0002 mg/m3 (TWA)
Magnesium Oxide	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	See footnote

L428988 (Report ID: 1039389):

TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for COBALT: 0.02 mg/m3
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for Calcium Oxide: 2 mg/m3
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3
TLV for SELENIUM: 0.2 mg/m3

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 06-DEC-17 Account No.: 90734
Date Received: 19-DEC-17 Login No. : L428988
Date Analyzed: 20-DEC-17 - 26-DEC-17

L428988 (Report ID: 1039389):
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for CHROMIUM: 0.5 mg/m3
TLV for IRON OXIDE: 5 mg/m3
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(35), im-mwvfilt(29)
PEL listed refers to Aluminum as total dust.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.

L428988 (Report ID: 1039389):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-7.4%	97.9%
Antimony	+/-10.4%	96.9%
Arsenic	+/-8.4%	103%
Barium	+/-7.3%	100%
Beryllium	+/-12.8%	103%
Cadmium	+/-8.5%	101%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Date Analyzed: 20-DEC-17 - 26-DEC-17

Calcium Oxide	+/-10%	105%
Chromium	+/-12.5%	103%
Cobalt	+/-8.6%	102%
Copper	+/-10.5%	103%
Iron Oxide	+/-9.8%	106%
Lead	+/-9.4%	99.7%
Manganese	+/-11.2%	99.5%
Molybdenum	+/-8.5%	100%
Selenium	+/-10.5%	104%
Zinc Oxide	+/-8.8%	100%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)
Chromium	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Selenium	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

+L428988-1-3 (Report ID: 1039715):
The sample results may have a negative bias; the filter surface was covered by fine particulate that may have obscured fibers.

L428988 (Report ID: 1039715):
SOPs: ia-pcm(26)

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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Client Name : Toronto Transit Commission Ltd.
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Date Received: 19-DEC-17 Login No. : L428988
Date Analyzed: 20-DEC-17 - 26-DEC-17

L428988 (Report ID: 1039715):
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a greater than optimal variability and are probably biased.
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as follows:
0.144 (5-20 fibers/100 fields)
0.093 (>20-50 fibers/100 fields)
0.104 (>50-100 fibers/100 fields)
0.092 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take into account any uncertainty associated with the sampling process.

L428988 (Report ID: 1038453):
SOPs: GRAV-SOP-8(18)
Gravimetric analytical accuracy of the sampling media is -0.001 +/- 0.030 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.

L428988 (Report ID: 1038454):
TLV for RESPIRABLE DUST: NA
SOPs: GRAV-SOP-5(18), GRAV-SOP-6(17)
Gravimetric analytical accuracy of the sampling media is 0.002 +/- 0.018 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.
PNOR = Particulates Not Otherwise Regulated.

L428988 (Report ID: 1039603):
TLV for Hexavalent Chromium: 0.01 mg/m3 (as Cr, Insol)
SOPs: IC-SOP-15(20)
Total ug corrected for a desorption efficiency of 100%.
SGS Galson Laboratories pretests all media lots distributed for Hexavalent Chromium analysis and can provide data confirming that no significant background is present. We may not be able to verify lot background levels for media obtained through alternate vendors.

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

---

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Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 06-DEC-17 Account No.: 90734
Date Received: 19-DEC-17 Login No. : L428988
Date Analyzed: 20-DEC-17 - 26-DEC-17

L428988 (Report ID: 1039603):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Hexavalent Chromium	+/-15.2%	96.7%

L428988 (Report ID: 1039382):
TLV for QUARTZ: 0.025 mg/m3 Respirable
TLV for TRIDYMITE: NA
TLV for CRISTOBALITE: 0.025 mg/m3 Respirable
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26)
The Quartz blank spike recovery was outside the control limits of 77.0% to 110.% at 74.2% recovery. Where possible, control limits are statistically generated in-house. The Quartz blank spike duplicate recovery was within control limits.

L428988 (Report ID: 1039382):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-13.8%	101%
Quartz	+/-10.9%	93.4%
Tridymite	+/-13.6%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

NVLAP®
Lab Code 101143-0
NY ELAP
Lab ID 10920

Chain of Custody: 604733
Client: Galson Laboratories
Address: 6601 Kirkville Road
East Syracuse, NY 13057-9672
Attention: Pam Weaver

Job Name: Not Provided
Job Location: Not Provided
Job Number: L428988
P.O. Number: 90734

Date Submitted: 12/27/2017
Date Analyzed: 01/04/2018
Report Date: 01/04/2018
Date Sampled: 12/06/2017
Person Submitting: Zach King

Summary of Transmission Electron Microscopy

Filter Type: MCE **Pore Size:** 0.8 um **Filter Size:** 25 mm (385 mm²)

AMA Sample Number	Client Sample Number	Volume (L)	Area Analyzed (mm^2)	Analytical Sensitivity f/cc	Asbestos Type Amount	# Non Asbestos Structures	Concentration f/mm^2	Concentration f/cc	Fraction	Sample Type	Comments
604733-1	22152-A77A	121.26	0.532	0.006	0	0	<8	<0.0239		N/P	
604733-2	22152-A77B	114.19	0.532	0.0063	0	1	<8	<0.0254	0.0	N/P	
604733-3	22152-A77C	121.26	0.532	0.006	0	0	<8	<0.0239		N/P	
604733-4	22152-A77D	106.1	0.532	0.0068	0	0	<8	<0.0273		N/P	

Analytical procedures used meet or exceed NIOSH 7402 protocols.

** - To calculate the asbestos concentration of the PCM result multiply the original PCM result by the fraction.

All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

Analyst(s): Michael Greenberg

Technical Director Andreas Saldivar

4475 Forbes Blvd. · Lanham, MD, 20706 · (301) 459-2640 · Toll Free (800) 346-0961 · Fax (301) 459-2643

AMA Analytical Services, Inc.
Focused on Results www.amalab.com
AIHA-LAP (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 604733

Mailing/Billing Information:

1. Client Name: GALSON
2. Address 1: _____
3. Address 2: _____
4. Address 3: _____
5. Phone #: _____ Fax #: _____

Submittal Information:

1. Job Name: _____
2. Job Location: _____
3. Job #: L428988 P.O. #: 90734
4. Contact Person: PAM WEAVER Cell: _____
5. Collected by: _____ Cell: _____

Reporting Info (Results provided as soon as technically feasible). If no TAT/Reporting Info is provided, AMA will assign defaults of 5-Day and email/fax to contacts on file.

AFTER HOURS (must be pre-scheduled)
☐ 4 Hours
☐ Immediate Date Due: _____
☐ 24 Hours Time Due: _____
Comments: _____

NORMAL BUSINESS HOURS
☐ 4 Hours ☐ 3 Day ☐ Results Required By Noon
☐ Same Day ☒ 5 Day + Date Due: 1/4/2017
☐ Next Day
☐ 2 Day

REPORT TO:
☐ Email: _____
☐ Email 2: _____
☐ Verbals: _____

Asbestos Analysis
*PCM Air – Please Indicate Filter Type: _____
☐ NIOSH 7400 _____ (QTY)
☐ Fiberglass _____ (QTY)
TEM Air* – Please Indicate Filter Type: _____
☐ AHERA _____ (QTY)
☒ NIOSH 7402 4 (QTY)
☐ Other (specify _____) _____ (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate _____ (QTY) ☐ Pos Stop
☐ EPA Point Count _____ (QTY)
☐ NY State Friable 198.1 _____ (QTY)
☐ Grav. Reduction ELAP 198.6 _____ (QTY)
☐ Other (specify _____) _____ (QTY)
MISC
☐ Vermiculite
☐ Asbestos Soil PLM__(Qual) PLM__(Quan) PLM/TEM__(Qual) PLM/TEM__(Quan)

TEM Bulk
☐ ELAP 198.4/Chatfield _____ (QTY)
☐ NY State PLM/TEM _____ (QTY)
☐ Residual Ash _____ (QTY)
TEM Dust*
☐ Qual. (pres/abs) Vacuum/Dust _____ (QTY)
☐ Quan. (s/area) Vacuum D5755-95 _____ (QTY)
☐ Quan. (s/area)Dust D6480-99 _____ (QTY)
TEM Water
☐ Qual. (pres/abs) _____ (QTY)
☐ ELAP 198.2/EPA 100.2 _____ (QTY)
☐ EPA 100.1 _____ (QTY)

☒ All samples received in good condition unless otherwise noted.
(TEM Water samples _____ °C)

Metals Analysis
☐ Pb Paint Chip _____ (QTY)
☐ *Pb Dust Wipe (wipe type _____) _____ (QTY)
☐ *Pb Air _____ (QTY)
☐ Pb Soil/Solid _____ (QTY)
☐ Pb TCLP _____ (QTY)
☐ Drinking Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Waste Water ☐ Pb ____ (QTY) ☐ Cu ____ (QTY) ☐ As ____ (QTY)
☐ Pb Furnace (Media _____) _____ (QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples: _____
Collection Media _____
☐ *Spore-Trap ____ (QTY) ☐ Surface Vacuum Dust ____ (QTY)
☐ *Surface Swab ____ (QTY) ☐ Culturable ID Genus (Media ____) ____ (QTY)
☐ *Surface Tape ____ (QTY) ☐ Culturable ID Species (Media ____) ____ (QTY)
☐ Other (Specify ____) ____ (QTY)

If field data sheets are submitted, there is no need to complete bottom section.

*It is recommended that blank samples be submitted with all air and surface samples

CLIENT ID #	SAMPLE INFORMATION SAMPLE LOCATION/ ID	DATE/ TIME	VOL (L)/ Wipe Area	ANALYSIS: ITEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	MATRIX: WATER AND OTHER	SPORE TRAP	TAPE	SWAB	CLIENT CONTACT (LABORATORY STAFF ONLY)
																Date/Time: Contact:By:
																Date/Time: Contact:By:
																Date/Time: Contact:By:

	Print Name	Signature	Date	Time
Relinquished by:	ZACH KING			
Received by:				
Relinquished by:				
Received for Lab by:			12/27/17	1030

Shipping Information
☒ UPS ☐ In-Person ☐ Other
☐ FedEx ☐ Drop Box
☐ USPS ☐ Courrier
Airbill/Tracking No: _____

AMA

GALSON LABORATORIES
6601 Kirkville Rd
East Syracuse, NY 13057-9672
Tel: 315-437-5227
888-432-LABS(5227)
Fax: 315-437-0571
www.galsonlabs.com

Check if change of address ☐
New Client ? yes ☐ no ☐

Report To : **Shelly Krause**
SGS Galson Laboratory
6601 Kirkville Road
East Syracuse, NY 13057
Phone No. : 888-432-5227

Invoice To : **Jeanne Glisson**
SGS Galson Laboratory
6601 Kirkville Road
East Syracuse, NY 13057
Phone No. : 888-432-5227
Fax No. 315-437-0571

Site Name : **Project :** L428988 **Sampled By :** Client

Turnaround Time	Due Date
☑ Standard	01/04/17
☐ 4 Business Days	
☐ 3 Business Days	
☐ 2 Business Days	
☐ Next Day by 6pm	
☐ Next Day by Noon	
☐ Same day	

Verbal Authorization :
90734
Credit Card No. : Card Holder Name : Exp. :

Fax Results To : Email Only Please Fax No. : Email Only Please
Email Results To : Syracuse.Subcontracting@sgs.com

Sample Identification	Date Sampled	Collection Medium	*Air Volume (liters)/ Passive Monitors (Min)	Analysis Requested	Method Reference	Specific DL Needed
22152-A77A	12/6/2017	25mm MCE PCM	121.26	Transmission Electron Microscopy	NIOSH 7402; TEM	
22152-A77B	12/6/2017	25mm MCE PCM	114.19	Transmission Electron Microscopy	NIOSH 7402; TEM	
22152-A77C	12/6/2017	25mm MCE PCM	121.26	Transmission Electron Microscopy	NIOSH 7402; TEM	
22152-A77D	12/6/2017	25mm MCE PCM	106.1	Transmission Electron Microscopy	NIOSH 7402; TEM	

Comments:

State/Province of sampling event: Toronto

If the method being reported is not on your laboratory's current AIHA scope of accreditation, please state that in your report.
Please provide an uncertainty statement in accordance with AIHA LQAP policy document Section 2A.5.4.3.

Chain of Custody	Print Name	Signature	Date/Time
Relinquished by :	Zach King		12/26/2017 17:15
Received by LAB :			

L428988

SGS

1Z5X626A6647630463
Date:
Shipper:UPS
Initials:CEM

Prep:UNKNOWN

☐ New Client?

Client Account No.*:

Report To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2
Phone No.*: 416-393-6668
Cell No.:
Email Results to: Virgil.Umali@ttc.ca & oheresults@oheconsultants.com
Email address:

Invoice To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2
Phone No.:
Email:
P.O. No.: PU240835
Credit Card ☐ Card on File ☐ Call for Credit Card Info.

☐ Samples submitted using the FreePumpLoan™ Program ☐ Samples submitted using the FreeSamplingBadges™ Program

Need Results By*:	(surcharge)
☑ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%

Check for availability an pricing for quicker turn around times.

Site Name: Project: 22152 Sampled by: OHE Consultants

Comments:

TTC Subway Air Quality

List description of industry or Process/interferences present in sampling area:

Province samples were collected in (ex. ON)

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify):

Sample Identification* (Maximum of 20 Characters. ID's longer than 20 characters will be abbreviated.)	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (e.g., welding plating, painting, etc.)*
22152 - A77A	12/06/17	25 mm PCM	121.26	L	Standardized List of Analyses for TTC		
22152 - A77B	12/06/17	25 mm PCM	114.19	L	Subway Air Quality Study		
22152 - A77C	12/06/17	25 mm PCM	121.26	L	-		
22152 - A77D	12/06/17	25 mm PCM	106.10	L	-		
22152 - A78	12/06/17	25 mm PCM	-	L	-		
-		-	-	-	-		
22152 - M77	12/06/17	UW MCE in PPI	921.47	L	-		
22152 - M78	12/06/17	UW MCE in PPI	-	L	-		
22152 - T77	12/06/17	UW MCE	931.48	L	-		
22152 - T78	12/06/17	UW MCE	-	L	-		

^Galson Laboratories will subsititute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ, please indicate if the lower LOQ is required (only available for certain analytes - see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date	Time		Print Name/Signature	Date	Time
Relinquished by	Romain Mathevet	12/11/17	09:00	Received by:		12/12/17	11:25
Relinquished by		12/12/17	6pm	Received by:	Candace Massurin	12 1917	11 44

Samples received after 3pm will be considered as next day's business
* Required fields, failure to complete these fields may result in a delay in your samples being processed.

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Unit 5
North York, Ontario, Canada M3K 2A2
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www.galsonlabs.ca

☐ New Client?

Client Account No.*:

Report To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2
Phone No.*: 416-393-6668
Cell No.:
Email Results to: Virgil.Umali@ttc.ca & oheresults@oheconsultants.com
Email address:

Invoice To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2
Phone No.:
Email:
P.O. No.: PU240835
Credit Card ☐ Card on File ☐ Call for Credit Card Info.

☐ Samples submitted using the FreePumpLoan™ Program ☐ Samples submitted using the FreeSamplingBadges™ Program

Need Results By*:	(surcharge)
☑ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%

Check for availability an pricing for quicker turn around times.

Site Name: Project: 22152 Sampled by: OHE Consultants

Comments:

TTC Subway Air Quality

List description of industry or Process/interferences present in sampling area:

Province samples were collected in (ex. ON)

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify):

Sample Identification* (Maxmium of 20 Characters. ID's longer than 20 characters will be abbreviated.)	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (e.g., welding plating, painting, etc.)*
22152 - S77	12/06/17	PW PVC in PPI	922.46	L	Standardized List of Analyses for TTC		
22152 - S78	12/06/17	PW PVC in PPI	-	L	Subway Air Quality Study		
22152 - I75	12/06/17	PW PVC in IOM	919.78	L			
22152 - I76	12/06/17	PW PVC in IOM	-	L			
			-	-			
22152 - H17	12/06/17	2pc UW PVC	918.79	L	Hexavalent Chromium	mod.OSHA 215	Other
22152 - H18	12/06/17	2pc UW PVC	-	L	Hexavalent Chromium	mod.OSHA 215	Other
			-	-			
			-	-			
			-	-			

^Galson Laboratories will subsitute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ, please indicate if the lower LOQ is required (only available for certain analytes - see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date	Time		Print Name/Signature	Date	Time
Relinquished by	Romain Mathevet	12/11/17	09:00	Received by:	Human Sam	12/12/17	11:25
Relinquished by	Human Sam	12/12/17	6:45	Received by:	Candace Massurin	12 19 17	11 44

Samples received after 3pm will be considered as next day's business
* Required fields, failure to complete these fields may result in a delay in your samples being processed.

Mr. Virgil Umali
Toronto Transit Commission Ltd.
1920 Yonge St
Suite 600
Toronto, ON M4S 3E2
Canada

January 16, 2018

AIHA-LAP #100324 Account# 90734 Login# L428473

Dear Mr. Umali:

Enclosed are the revised analytical results for the samples received by our laboratory on December 14, 2017. Upon review of data, inhalable dust results have been corrected for 22152-I77 & 22152-I78 (original results were switched due to a data entry error). Please note that this revision cancels & supersedes L428473 (report reference: 1) issued 1/2/18 by SGS Galson. All test results meet the quality control requirements of AIHA-LAP and NELAC unless otherwise stated in this report. All samples on the chain of custody were received in good condition unless otherwise noted.

Results in this report are based on the sampling data provided by the client and refer only to the samples as they were received at the laboratory.

Samples requiring TEM analysis were subcontracted to AMA Analytical Services, Inc. Their report is enclosed in its entirety.

Current Scopes of Accreditation can be viewed at www.sgsgalson.com in the accreditations section of the "About" page.

Please contact Katrina Ahchong at (888) 432-5227, if you would like any additional information regarding this report. Thank you for using SGS Galson Laboratories.

Sincerely,

SGS Galson Laboratories

Lisa Swab
Laboratory Director

Enclosure(s)

Galson Laboratories, Inc. is now a part of SGS, the world's leading inspection, verification, testing, and certification company. As part of our transition to SGS, you will begin to see some formatting changes with reports that will improve the presentation of data and allow for the transition to the new logo.

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FAX: (315) 437-0571
www.galsonlabs.com

LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 07-DEC-17
Date Received : 14-DEC-17

Account No.: 90734
Login No. : L428473

Date Analyzed : 18-DEC-17 - 20-DEC-17
Report ID : 1038259

Client ID : 22152-M79 **Lab ID : L428473-6** **Air Volume : 923.59 L**
Date Sampled : 12/07/17 **Date Analyzed : 12/18/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	<0.0081	mg/m3
Cadmium	0.15	<0.15	<0.00016	mg/m3
Iron Oxide	11.	380	0.41	mg/m3
Molybdenum	0.15	<0.15	<0.00016	mg/m3
Zinc Oxide	2.8	<2.8	<0.0030	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 19-DEC-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 07-DEC-17
Date Received : 14-DEC-17

Account No.: 90734
Login No. : L428473

Date Analyzed : 18-DEC-17 - 20-DEC-17
Report ID : 1038259

Client ID : 22152-M80 **Lab ID : L428473-7** **Air Volume : NA**
Date Sampled : 12/07/17 **Date Analyzed : 12/18/17**

Parameter	LOQ ug	Total ug	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Iron Oxide	11.	<11	NA	mg/m3
Molybdenum	0.15	<0.15	NA	mg/m3
Zinc Oxide	2.8	<2.8	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 19-DEC-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 07-DEC-17
Date Received : 14-DEC-17

Account No.: 90734
Login No. : L428473

Date Analyzed : 18-DEC-17 - 20-DEC-17
Report ID : 1038259

Client ID : 22152-T79 **Lab ID : L428473-8** **Air Volume : 935.25 L**
Date Sampled : 12/07/17 **Date Analyzed : 12/18/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	<0.00096	mg/m3
Arsenic	0.30	<0.30	<0.00032	mg/m3
Barium	0.15	24	0.025	mg/m3
Beryllium	0.15	<0.15	<0.00016	mg/m3
Cadmium	0.15	<0.15	<0.00016	mg/m3
Calcium Oxide	100.	<100	<0.11	mg/m3
Chromium	7.5	<7.5	<0.0080	mg/m3
Cobalt	0.45	<0.45	<0.00048	mg/m3
Copper	0.30	1.5	0.0016	mg/m3
Lead	0.38	<0.38	<0.00040	mg/m3
Manganese	0.15	3.2	0.0034	mg/m3
Selenium	2.3	<2.3	<0.0024	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 19-DEC-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 07-DEC-17
Date Received : 14-DEC-17

Account No.: 90734
Login No. : L428473

Date Analyzed : 18-DEC-17 - 20-DEC-17
Report ID : 1038259

Client ID : 22152-T80 **Lab ID : L428473-9** **Air Volume : NA**
Date Sampled : 12/07/17 **Date Analyzed : 12/18/17**

Parameter	LOQ ug	Total ug	Conc	Units
Antimony	0.90	<0.90	NA	mg/m3
Arsenic	0.30	<0.30	NA	mg/m3
Barium	0.15	<0.15	NA	mg/m3
Beryllium	0.15	<0.15	NA	mg/m3
Cadmium	0.15	<0.15	NA	mg/m3
Calcium Oxide	100.	<100	NA	mg/m3
Chromium	7.5	<7.5	NA	mg/m3
Cobalt	0.45	<0.45	NA	mg/m3
Copper	0.30	<0.30	NA	mg/m3
Lead	0.38	<0.38	NA	mg/m3
Manganese	0.15	<0.15	NA	mg/m3
Selenium	2.3	<2.3	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: MCE UW 37mm
Date : 19-DEC-17

Submitted by: JPA
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 07-DEC-17
Date Received : 14-DEC-17

Account No.: 90734
Login No. : L428473

Date Analyzed : 18-DEC-17 - 20-DEC-17
Report ID : 1038625

Client ID : 22152-I77 **Lab ID : L428473-12** **Air Volume : 935.71 L**
Date Sampled : 12/07/17 **Date Analyzed : 12/20/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	<0.0000080	mg/m3
Magnesium Oxide	12.	<12	<0.013	mg/m3
Molybdenum	0.075	0.12	0.00013	mg/m3
Nickel	0.15	0.21	0.00022	mg/m3
Thallium	0.75	<0.75	<0.00080	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.00086	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 20-DEC-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 07-DEC-17
Date Received : 14-DEC-17

Account No.: 90734
Login No. : L428473

Date Analyzed : 18-DEC-17 - 20-DEC-17
Report ID : 1038625

Client ID : 22152-I78 **Lab ID : L428473-13** **Air Volume : NA**
Date Sampled : 12/07/17 **Date Analyzed : 12/20/17**

Parameter	LOQ ug	Total ug	Conc	Units
Beryllium	0.0075	<0.0075	NA	mg/m3
Magnesium Oxide	12.	<12	NA	mg/m3
Molybdenum	0.075	<0.075	NA	mg/m3
Nickel	0.15	<0.15	NA	mg/m3
Thallium	0.75	<0.75	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media: IOM 25mm PW PVC
Date : 20-DEC-17

Submitted by: JMR
NYS DOH # : 11626

Approved by: JJL
Supervisor: KEG QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 07-DEC-17
Date Received : 14-DEC-17

Account No.: 90734
Login No. : L428473
Date Analyzed : 20-DEC-17
Report ID : 1038673

Asbestos Fiber Count (A Rules)

	Sample ID	Lab ID	Fibers/ Fields	Fibers/ mm2	Fibers/ Filter	Air Volume (cc)	Fibers/ cc
	22152-A79A	L428473-1	4/100	<7	<2700	125,700	<0.02
	22152-A79B	L428473-2	5/100	<7	<2700	113,130	<0.02
+	22152-A79C	L428473-3	7.5/100	9.6	3696	125,700	0.03
+	22152-A79D	L428473-4	5.5/100	7	2700	115,230	0.02
	22152-A80	L428473-5	3.5/100	<7	<2700	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Sample Matrix : 25mm MCE PCM
Analytical Method : mod. NIOSH 7400 "A" Rules
Limit of Quantitation : 5.5 Fibers/ 100 Fields
Microscope field area : 0.00785 mm2
Filter collection area: 385 mm2

Submitted by : BTM
Approved by : BDB
Date : 20-DEC-17
QC by: AMD
Supervisor: BDB

< -Less Than
> -Greater Than
ND -Not Detected
NA -Not Applicable
cc -Cubic Centimeters
NS -Not Specified
mm2 -Square millimeters

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 07-DEC-17
Date Received : 14-DEC-17

Account No.: 90734
Login No. : L428473
Date Analyzed : 18-DEC-17
Report ID : 1037929

Inhalable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-I77	L428473-12	935.71	1.0	1.1
22152-I78	L428473-13	NA	<0.10	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.10 mg
Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV
OSHA PEL : NA
Collection Media : IOM 25mm PW PVC

Submitted by: GMG
Approved by : KRK/SPR
Date : 15-JAN-18
Supervisor: KRK

NYS DOH # : 11626
QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 07-DEC-17
Date Received : 14-DEC-17

Account No.: 90734
Login No. : L428473
Date Analyzed : 18-DEC-17
Report ID : 1037980

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mg	Conc mg/m3
22152-S79	L428473-10	907.83	0.39	0.43
22152-S80	L428473-11	NA	<0.050	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg
Analytical Method : mod. NIOSH 0600; Gravimetric
OSHA PEL : PNOR 5 mg/m3 (TWA)
Collection Media : PVC PW 37mm

Submitted by: AS
Approved by : KRK
Date : 20-DEC-17
Supervisor: KRK

NYS DOH # : 11626
QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd
Site : NS
Project No. : 22152
Date Sampled : 07-DEC-17
Date Received : 14-DEC-17

Account No.: 90734
Login No. : L428473
Date Analyzed : 18-DEC-17 - 19-DEC-17
Report ID : 1038574

Respirable Crystalline Silica (RCS): Quartz, Cristobalite, Tridymite

Sample ID	Lab ID	Analyte	Air Vol l	ug	ug/m3
22152-S79	L428473-10	Quartz	907.83	<5.0	<5.5
		Cristobalite	907.83	<5.0	<5.5
		Tridymite	907.83	<20	<22
		RCS	907.83	<5.0	<5.5
22152-S80	L428473-11	Quartz	NA	<5.0	NA
		Cristobalite	NA	<5.0	NA
		Tridymite	NA	<20	NA
		RCS	NA	<5.0	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: Q:5.0ug C:5.0ug T:20.ug
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD
OSHA PEL : 50 ug/m3 RCS
Collection Media : PVC PW 37mm

Submitted: AMD/AJD
Approved: CMR
Date : 20-DEC-17 NYS DOH # : 11626
Supervisor: KRK QC by: AMD

< -Less Than
> -Greater Than
NA -Not Applicable
mg -Milligrams
ug -Micrograms
ND -Not Detected
kg -Kilograms
m3 -Cubic Meters
l -Liters
ppm -Parts per Million
NS -Not Specified
mppcf -Million Particles per Cubic Foot

LABORATORY FOOTNOTE REPORT

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East Syracuse, NY 13057
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FAX: (315) 437-0571
www.galsonlabs.com

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 07-DEC-17 Account No.: 90734
Date Received: 14-DEC-17 Login No. : L428473
Date Analyzed: 18-DEC-17 - 20-DEC-17

Unless otherwise noted below, all quality control results associated with the samples were within established control limits or did not impact reported results.

Note: The findings recorded within this report were drawn from analysis of the sample(s) provided to the laboratory by the Client (or a third party acting at the Client's direction). The laboratory does not have control over the sampling process. The findings herein constitute no warranty of the samples' representativeness of any sampled environment and strictly relate to the samples as they were presented to the laboratory.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

Unless otherwise noted below, reported results have not been blank corrected for any field blank or method blank.

L428473 (Report ID: 1038625):
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: im-mwvfilt(29), MT-SOP-21(11)
Reported Magnesium Oxide(MgO) results assume that all detected Magnesium is present as Magnesium Oxide.
Reported Vanadium Pentoxide (V2O5) results assume that all detected Vanadium is present as Vanadium Pentoxide.
OSHA PEL: Vanadium Pentoxide as Respirable Dust, Ceiling = 0.5 mg/m3; as Fume, Ceiling = 0.1 mg/m3.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
TLV for VANADIUM PENTOXIDE: 0.05 mg/m3 (Inhalable)
TLV for THALLIUM: 0.1 mg/m3 (Inhalable)
TLV for MAGNESIUM OXIDE: 10 mg/m3 (Inhalable)
TLV for NICKEL: 1.5 mg/m3 (Inhalable)
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for MOLYBDENUM: Varies, see footnote

< -Less Than	mg -Milligrams	m3 -Cubic Meters	kg -Kilograms	ppm -Parts per Million		
> -Greater Than	ug -Micrograms	l -Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable	

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East Syracuse, NY 13057
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FAX: (315) 437-0571
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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 07-DEC-17 Account No.: 90734
Date Received: 14-DEC-17 Login No. : L428473
Date Analyzed: 18-DEC-17 - 20-DEC-17

L428473 (Report ID: 1038625):

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Beryllium	+/-14.1%	104%
Magnesium Oxide	+/-10.8%	101%
Molybdenum	+/-14.9%	102%
Nickel	+/-11.2%	105%
Thallium	+/-8%	102%
Vanadium Pentoxide	+/-9.8%	103%

Parameter	Method	PEL
Beryllium	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/M	0.0002 mg/m3 (TWA)
Magnesium Oxide	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	See footnote

L428473 (Report ID: 1038259):

TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
TLV for COBALT: 0.02 mg/m3
TLV for ALUMINUM: 1 mg/m3
TLV for ARSENIC: 0.01 mg/m3
TLV for BARIUM: 0.5 mg/m3
TLV for Calcium Oxide: 2 mg/m3
TLV for CADMIUM: 0.01 mg/m3
TLV for ANTIMONY: 0.5 mg/m3
TLV for SELENIUM: 0.2 mg/m3

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

SGS GALSON

6601 Kirkville Road
East Syracuse, NY 13057
(315) 432-5227
FAX: (315) 437-0571
www.galsonlabs.com

LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 07-DEC-17 Account No.: 90734
Date Received: 14-DEC-17 Login No. : L428473
Date Analyzed: 18-DEC-17 - 20-DEC-17

L428473 (Report ID: 1038259):
TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)
TLV for CHROMIUM: 0.5 mg/m3
TLV for IRON OXIDE: 5 mg/m3
TLV for MANGANESE: 0.02 mg/m3 Respirable; 0.1 mg/m3 Inhalable
TLV for INORGANIC LEAD: 0.05 mg/m3
TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote
Reported results reflect elemental analysis of the requested metals. Certain compounds may not be solubilized during digestion, resulting in data that is biased low.
SOPs: MT-SOP-9(35), im-mwvfilt(29)
PEL listed refers to Aluminum as total dust.
Reported Calcium Oxide(CaO) results assume that all detected Calcium is present as Calcium Oxide.
OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3
OSHA PEL: Copper dust and mist = 1 mg/m3; Copper fume = 0.1 mg/m3
Reported Iron Oxide(Fe2O3) results assume that all detected Iron is present as Iron Oxide.
OSHA PEL: Molybdenum soluble compounds, as Mo = 5 mg/m3; Molybdenum and insoluble compounds, as Mo (total dust) = 15 mg/m3.
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.

L428473 (Report ID: 1038259):
Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Aluminum	+/-7.4%	97.9%
Antimony	+/-10.4%	96.9%
Arsenic	+/-8.4%	103%
Barium	+/-7.3%	100%
Beryllium	+/-12.8%	103%
Cadmium	+/-8.5%	101%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

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East Syracuse, NY 13057
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FAX: (315) 437-0571
www.galsonlabs.com

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 07-DEC-17 Account No.: 90734
Date Received: 14-DEC-17 Login No. : L428473
Date Analyzed: 18-DEC-17 - 20-DEC-17

Calcium Oxide	+/-10%	105%
Chromium	+/-12.5%	103%
Cobalt	+/-8.6%	102%
Copper	+/-10.5%	103%
Iron Oxide	+/-9.8%	106%
Lead	+/-9.6%	99.8%
Manganese	+/-11.2%	99.5%
Molybdenum	+/-8.5%	100%
Selenium	+/-17.8%	105%
Zinc Oxide	+/-8.8%	100%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	5 mg/m3 (TWA)
Chromium	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Cobalt	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Iron Oxide	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Selenium	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7303/mod. OSHA ID-125G; ICP/I	5 mg/m3 (Fume) (TWA)

+L428473-3-4 (Report ID: 1038673):
The sample results may have a negative bias; the filter surface was covered by fine particulate that may have obscured fibers.

L428473 (Report ID: 1038673):
SOPs: ia-pcm(26)

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

6601 Kirkville Road
East Syracuse, NY 13057
(315) 432-5227
FAX: (315) 437-0571
www.galsonlabs.com

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 07-DEC-17 Account No.: 90734
Date Received: 14-DEC-17 Login No. : L428473
Date Analyzed: 18-DEC-17 - 20-DEC-17

L428473 (Report ID: 1038673):
Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a greater than optimal variability and are probably biased.
The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as follows:
0.154 (5-20 fibers/100 fields)
0.100 (>20-50 fibers/100 fields)
0.069 (>50-100 fibers/100 fields)
0.090 (>100 fibers/100 fields)
The stated CVs apply to the media, technology, and SOP(s) referenced in the report and do not take into account any uncertainty associated with the sampling process.

L428473 (Report ID: 1037929):
SOPs: GRAV-SOP-8(18)
Gravimetric analytical accuracy of the sampling media is -0.001 +/- 0.030 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.

L428473 (Report ID: 1037980):
TLV for RESPIRABLE DUST: NA
SOPs: GRAV-SOP-5(18), GRAV-SOP-6(17)
Gravimetric analytical accuracy of the sampling media is 0.002 +/- 0.018 mg (average blank weight change +/- 95% confidence interval or k=2). The estimated uncertainty applies to the media, technology, and SOP(s) referenced in this report and does not account for any uncertainty associated with the sampling process.
PNOR = Particulates Not Otherwise Regulated.

L428473 (Report ID: 1038574):
TLV for QUARTZ: 0.025 mg/m3 Respirable
TLV for TRIDYMITE: NA
TLV for CRISTOBALITE: 0.025 mg/m3 Respirable
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26),

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

SGS GALSON

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East Syracuse, NY 13057
(315) 432-5227
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www.galsonlabs.com

LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.
Site :
Project No. : 22152

Date Sampled : 07-DEC-17 Account No.: 90734
Date Received: 14-DEC-17 Login No. : L428473
Date Analyzed: 18-DEC-17 - 20-DEC-17

L428473 (Report ID: 1038574):

Accuracy and mean recovery data presented below is based on a 95% confidence interval (k=2). The estimated accuracy applies to the media, technology, and SOP referenced in this report and does not account for the uncertainty associated with the sampling process. The accuracy is based solely on spike recovery data from internal quality control samples. Where N/A appears below, insufficient data is available to provide statistical accuracy and mean recovery values for the associated analyte.

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-13.8%	101%
Quartz	+/-10.9%	93.4%
Tridymite	+/-13.6%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

AMA Analytical Services, Inc.
Focused On Results.

CERTIFICATE OF ANALYSIS

NVLAP®
Lab Code 101143-0
NY ELAP
Lab ID 10920

Chain of Custody: 279498
Client: Galson Laboratories
Address: 6601 Kirkville Road
East Syracuse, NY 13057-9672
Attention: Pam Weaver

Job Name: L428473
Job Location: Not Provided
Job Number: Not Provided
P.O. Number: Not Provided

Date Submitted: 12/26/2017
Date Analyzed: 12/28/2017
Report Date: 12/28/2017
Date Sampled: 12/07/2017
Person Submitting: Gretchen Blanding

Summary of Transmission Electron Microscopy

Filter Type: MCE **Pore Size:** 0.8 um **Filter Size:** 25 mm (385 mm²)

AMA Sample Number	Client Sample Number	Volume (L)	Area Analyzed (mm^2)	Analytical Sensitivity f/cc	Asbestos Type Amount	# Non Asbestos Structures	Concentration f/mm^2	Concentration f/cc	Fraction	Sample Type	Comments
279498-1	22152-A79A	125.7	0.532	0.0058	0	0	<8	<0.023		N/P	
279498-2	22152-A79B	113.13	0.532	0.0064	0	0	<8	<0.0256		N/P	
279498-3	22152-A79C	125.7	0.0							N/P	Sample not analyzed, overloaded with particulate.
279498-4	22152-A79D	115.23	0.532	0.0063	0	0	<8	<0.0251		N/P	

Analytical procedures used meet or exceed NIOSH 7402 protocols.

** - To calculate the asbestos concentration of the PCM result multiply the original PCM result by the fraction.

All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

Analyst(s): Izabelle Mendez

Technical Director Andreas Saldivar

4475 Forbes Blvd. · Lanham, MD, 20706 · (301) 459-2640 · Toll Free (800) 346-0961 · Fax (301) 459-2643

AMA Analytical Services, Inc.
Focused on Results www.amalab.com
AIHA-LAP (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 279498

Mailing/Billing Information:

1. Client Name: Galson
2. Address 1:
3. Address 2:
4. Address 3:
5. Phone #: Fax #:

Submittal Information:

1. Job Name: L428473
2. Job Location:
3. Job #: P.O. #:
4. Contact Person: Cell:
5. Collected by: Cell:

Reporting Info (Results provided as soon as technically feasible). If no TAT/Reporting Info is provided, AMA will assign defaults of 5-Day and email/fax to contacts on file.

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
❑ 4 Hours ❑ Immediate Date Due: ❑ 24 Hours Time Due: Comments:	❑ 4 Hours ❑ Same Day ❑ Next Day ❑ 2 Day ☒ 3 Day ❑ 5 Day + Date Due: 12/29/17 ❑ Results Required By Noon	❑ Email: ❑ Email 2: ❑ Verbals:

Asbestos Analysis

*PCM Air – Please Indicate Filter Type:
- ❑ NIOSH 7400 (QTY)
- ❑ Fiberglass (QTY)

TEM Air* – Please Indicate Filter Type:
- ❑ AHERA (QTY)
- ☒ NIOSH 7402 4 (QTY)
- ❑ Other (specify) (QTY)

PLM Bulk
- ❑ EPA 600 – Visual Estimate (QTY) ❑ Pos Stop
- ❑ EPA Point Count (QTY)
- ❑ NY State Friable 198.1 (QTY)
- ❑ Grav. Reduction ELAP 198.6 (QTY)
- ❑ Other (specify) (QTY)

MISC
- ❑ Vermiculite
- ❑ Asbestos Soil PLM (Qual) PLM (Quan) PLM/TEM (Qual) PLM/TEM (Quan)

*It is recommended that blank samples be submitted with all air and surface samples

TEM Bulk
- ❑ ELAP 198.4/Chatfield (QTY)
- ❑ NY State PLM/TEM (QTY)
- ❑ Residual Ash (QTY)

TEM Dust*
- ❑ Qual. (pres/abs) Vacuum/Dust (QTY)
- ❑ Quan. (s/area) Vacuum D5755-95 (QTY)
- ❑ Quan. (s/area)Dust D6480-99 (QTY)

TEM Water
- ❑ Qual. (pres/abs) (QTY)
- ❑ ELAP 198.2/EPA 100.2 (QTY)
- ❑ EPA 100.1 (QTY)

❑ All samples received in good condition unless otherwise noted.
(TEM Water samples °C)

If field data sheets are submitted, there is no need to complete bottom section.

Metals Analysis
- ❑ Pb Paint Chip (QTY)
- ❑ *Pb Dust Wipe (wipe type) (QTY)
- ❑ *Pb Air (QTY)
- ❑ Pb Soil/Solid (QTY)
- ❑ Pb TCLP (QTY)
- ❑ Drinking Water ❑ Pb (QTY) ❑ Cu (QTY) ❑ As (QTY)
- ❑ Waste Water ❑ Pb (QTY) ❑ Cu (QTY) ❑ As (QTY)
- ❑ Pb Furnace (Media) (QTY)

Fungal Analysis

Collection Apparatus for Spore Traps/Air Samples:
Collection Media
- ❑ *Spore-Trap (QTY)
- ❑ *Surface Swab (QTY)
- ❑ *Surface Tape (QTY)
- ❑ Other (Specify) (QTY
- ❑ Surface Vacuum Dust (QTY)
- ❑ Culturable ID Genus (Media) (QTY)
- ❑ Culturable ID Species (Media) (QTY)

CLIENT ID #	SAMPLE INFORMATION SAMPLE LOCATION/ ID	DATE/ TIME	VOL (L)/ Wipe Area	ANALYSIS: TEM	PCM	PLM	LEAD	MOLD	MATRIX: AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB	CLIENT CONTACT (LABORATORY STAFF ONLY)
																Date/Time: Contact:By:
																Date/Time: Contact:By:
																Date/Time: Contact:By:

	Print Name	Signature	Date	Time
Relinquished by:				
Received by:				
Relinquished by:				
Received for Lab by:	IM		12/06/17	9:29

Shipping Information
☒ UPS ❑ In-Person ❑ Other
❑ FedEx ❑ Drop Box
❑ USPS ❑ Courrier
Airbill/Tracking No:

AMA

GALSON LABORATORIES
6601 Kirkville Rd
East Syracuse, NY 13057-9672
Tel: 315-437-5227
888-432-LABS(5227)
Fax: 315-437-0571
www.galsonlabs.com

Check if change of address ☐
New Client ? yes ☐ no ☐

Report To :	**Shelly Krause**	Invoice To :	**Jeanne Glisson**
	SGS Galson Laboratory		SGS Galson Laboratory
	6601 Kirkville Road		6601 Kirkville Road
	East Syracuse, NY 13057		East Syracuse, NY 13057
Phone No. :	888-432-5227	Phone No. :	888-432-5227
		Fax No.	315-437-0571

Site Name : **Project :** L428473 **Sampled By :** Client

Turnaround Time	Due Date
☑ Standard	12/29/17
☐ 4 Business Days	
☐ 3 Business Days	
☐ 2 Business Days	
☐ Next Day by 6pm	
☐ Next Day by Noon	
☐ Same day	

Verbal Authorization : 90734

Credit Card No. : Card Holder Name : Exp. :

Fax Results To : Email Only Please Fax No. : Email Only Please

Email Results To : Syracuse.Subcontracting@sgs.com

Sample Identification	Date Sampled	Collection Medium	*Air Volume (liters)/ Passive Monitors (Min)	Analysis Requested	Method Reference	fibers/ field
22152-A79A	12/7/2017	25mm MCE PCM	125.7	Transmission Electron Microscopy	NIOSH 7402; TEM	4/100
22152-A79B	12/7/2017	25mm MCE PCM	113.13	Transmission Electron Microscopy	NIOSH 7402; TEM	5/100
22152-A79C	12/7/2017	25mm MCE PCM	125.7	Transmission Electron Microscopy	NIOSH 7402; TEM	7.5/100
22152-A79D	12/7/2017	25mm MCE PCM	115.23	Transmission Electron Microscopy	NIOSH 7402; TEM	5.5/100

Comments:

State/Province of sampling event:

If the method being reported is not on your laboratory's current AIHA scope of accreditation, please state that in your report.
Please provide an uncertainty statement in accordance with AIHA LQAP policy document Section 2A.5.4.3.

Chain of Custody	Print Name	Signature	Date/Time
Relinquished by :	Gretchen Blanding		12/22/17 0914
Received by LAB :			

L428473

SGS

1Z5X626A6646919270
Date: 12/14/17
Shipper: UPS
Initials: MAK
Prep: UNKNOWN

☐ New Client?

Client Account No.*: _____

2A2

Report To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2
Phone No.*: 416-393-6668
Cell No.:
Email Results to: Virgil.Umali@ttc.ca & oheresults@oheconsultants.com
Email address:

Invoice To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2
Phone No.:
Email:
P.O. No.: PU240835
Credit Card ☐ Card on File ☐ Call for Credit Card Info.

☐ Samples submitted using the FreePumpLoan™ Program ☐ Samples submitted using the FreeSamplingBadges™ Program

Need Results By*:	(surcharge)
☑ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%

Check for availability an pricing for quicker turn around times.

Site Name: Project: 22152 Sampled by: OHE Consultants

Comments:

TTC Subway Air Quality

List description of industry or Process/interferences present in sampling area:

Province samples were collected in (ex. ON)

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify):

Sample Identification* (Maxmium of 20 Characters. ID's longer than 20 characters will be abbreviated.)	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (e.g., welding plating, painting, etc.)*
22152 - A79A	12/07/17	25 mm PCM	125.7 0	L	Standardized List of Analyses for TTC		
22152 - A79B	12/07/17	25 mm PCM	113.13	L	Subway Air Quality Study		
22152 - A79C	12/07/17	25 mm PCM	125.70	L	-		
22152 - A79D	12/07/17	25 mm PCM	115.23	L	-		
22152 - A80	12/07/17	25 mm PCM	-	L	-		
-		-	-	-	-		
22152 - M79	12/07/17	UW MCE in PPI	923.59	L	-		
22152 - M80	12/07/17	UW MCE in PPI	-	L	-		
22152 - T79	12/07/17	UW MCE	935.25	L	-		
22152 - T80	12/07/17	UW MCE	-	L	-		

^Galson Laboratories will subsititute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ, please indicate if the lower LOQ is required (only available for certain analytes - see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date	Time		Print Name/Signature	Date	Time
Relinquished by	Larysa Kokarovtseva	12/12/17	09:00	Received by:		12/13/17	4:49 pm
Relinquished by		12/13/17	6:00 pm	Received by:	Michelle Krause	12/14/17	11:12

Samples received after 3pm will be considered as next day's business

* Required fields, failure to complete these fields may result in a delay in your samples being processed.

SGS GALSON

1140 Sheppard Avenue West
Unit 5
North York, Ontario, Canada M3K 2A2
Tel: 888-432-5227
www.galsonlabs.ca

☐ New Client?

Client Account No.*: _____

Report To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2
Phone No.*: 416-393-6668
Cell No.:
Email Results to: Virgil.Umali@ttc.ca & oheresults@oheconsultants.com
Email address:

Invoice To*: Toronto Transit Commission
1920 Yonge Street
Suite 600
Toronto, ON M4S 3E2
Phone No.:
Email:
P.O. No.: PU240835
Credit Card ☐ Card on File ☐ Call for Credit Card Info.

☐ Samples submitted using the FreePumpLoan™ Program ☐ Samples submitted using the FreeSamplingBadges™ Program

Need Results By*:	(surcharge)
☑ Standard	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%

Check for availability an pricing for quicker turn around times.

Site Name: Project: 22152 Sampled by: OHE Consultants

Comments:

TTC Subway Air Quality

77 78 85
* IDs are I78, I79 SK 12/14/17

List description of industry or Process/interferences present in sampling area:

Province samples were collected in (ex. ON)

Please indicate which OEL this data will be used for:
☐ OSHA PEL ☐ ACGIH TLV ☐ Cal OSHA
☐ MSHA ☐ Other (specify):

Sample Identification* (Maxmium of 20 Characters. ID's longer than 20 characters will be abbreviated.)	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis Requested*	Method Reference^	Hexavalent Chromium Process (e.g., welding plating, painting, etc.)*
22152 - S79	12/07/17	PW PVC in PPI	907.83	L	Standardized List of Analyses for TTC		
22152 - S80	12/07/17	PW PVC in PPI	-	L	Subway Air Quality Study		
22152 - I79 *	12/07/17	PW PVC in IOM	935.71	L			
22152 - I80 *	12/07/17	PW PVC in IOM	-	L			
			-	-			
			-	-			
			-	-			
			-	-			

^Galson Laboratories will subsitute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: ☐ Use method(s) listed on COC

For metals analysis: if requesting an analyte with the option of a lower LOQ, please indicate if the lower LOQ is required (only available for certain analytes - see SAG):

For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*:

Chain of Custody	Print Name/Signature	Date	Time		Print Name/Signature	Date	Time
Relinquished by	Larysa Kokarovtseva	12/12/17	09:00	Received by:	Herman Lam	12/13/17	4:44 pm
Relinquished by	Herman Lam	12/13/17	6:00pm	Received by:	~~Michelle Krause~~ Michelle Krause	12/14/17	11:22

Samples received after 3pm will be considered as next day's business
* Required fields, failure to complete these fields may result in a delay in your samples being processed.

Brief and Scala Model Sample Calculations

Table 1a. Air Sampling Results with Brief and Scala Model Sample Calculations

Transit Enforcement – Special Constables

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored											
				Total Metals (mg/m^3)											
				Sb	As	Ba	Be	Cd	CaO	Cr	Co	Cu	Pb	Mn	Se
Occupational Exposure Limits				0.5	0.1	0.5	0.002	0.01	2	0.5	0.02	1	0.05	0.02	0.2
Adjusted OELs (Brief and Scala Model)				0.272	0.054	0.272	0.0011	0.005	1.087	0.272	0.011	0.543	0.027	0.011	0.109
Job Title: Special Constables															
A3, S3, I3, M3, T3	11-Aug-17	Special Constables 5:00 AM - 4:30 PM	615	<0.00073	<0.00024	0.0041	<0.00012	<0.00012	<0.086	<0.0061	<0.00037	0.00035	<0.00031	0.0007	<0.0018
			Number of Samples	1	1	1	1	1	1	1	1	1	1	1	1
			Average	0.00073	0.00024	0.0041	0.00012	0.00012	0.086	0.0061	0.00037	0.00035	0.00031	0.0007	0.0018
			Average % of OEL	0.269	0.442	1.509	11.040	2.208	7.912	2.245	3.404	0.064	1.141	6.440	1.656

Notes: Grey shaded entries denote samples were below the analytical detection limit

NA = not applicable

Adjusted OELs were calculated following Brief and Scala Model: Adjusted OEL = 8-hour OEL x Daily Reduction Factor. Daily Reduction Factor was calculated using the following formula:

Daily Reduction Factor = $\left\{\frac{8}{h} \times \left(\frac{24-h}{16}\right)\right\}$, where h = hours worked per day.

Example for Sb:

Adjusted OEL = $0.5 \times \left\{\frac{8}{11.5} \times \left(\frac{24-11.5}{16}\right)\right\} = 0.272$

Table 1b. Air Sampling Results with Brief and Scala Model Sample Calculations

Transit Enforcement – Special Constables

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored										
				Respirable Metals (mg/m^3)					Inhalable Metals (mg/m^3)					
				Al	Cd	FeO	Mo	ZnO	Be	MgO	Mo	Ni	Tl	V_2O_5
Occupational Exposure Limits				0.5	0.1	0.5	1	0.002	5	3	2	0.00005	10	10
Adjusted OELs (Brief and Scala Model)				0.543	0.0011	2.717	1.630	1.087	0.000027	5.435	5.435	0.543	0.011	0.027
Job Title: Special Constables														
A3, S3, I3, M3, T3	11-Aug-17	Special Constables 5:00 AM - 4:30 PM	615	<0.0061	<0.00012	0.074	<0.00012	<0.0023	NA	<0.010	<0.00012	<0.00024	<0.0012	<0.00065
			Number of Samples	1	1	1	1	1	0	1	1	1	1	1
			Average	0.0061	0.00012	0.074	0.00012	0.0023	NA	0.01	0.00012	0.00024	0.0012	0.00065
			Average % of OEL	1.122	11.040	2.723	0.007	0.212	NA	0.184	0.002	0.044	11.040	2.392

Notes: Grey shaded entries denote samples were below the analytical detection limit
NA = not applicable
Adjusted OELs were calculated following Brief and Scala Model: Adjusted OEL = 8-hour OEL x Daily Reduction Factor. Daily Reduction Factor was calculated using the following formula:
Daily Reduction Factor = $\left\{\frac{8}{h} \times \left(\frac{24-h}{16}\right)\right\}$, where h = hours worked per day.

Table 1c. Air Sampling Results with Brief and Scala Model Sample Calculations

Transit Enforcement – Special Constables

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored										
				Respirable Silica (mg/m^3)			Resp. Dust (mg/m^3)	Inh. Dust (mg/m^3)	$PM_{2.5}$ Dust	Asbestos (f/cc)		CO (ppm)	NO_2 (ppm)	CO_2 (ppm)
				Quartz	Cristoballite	Tridymite				PCM	TEM			
Occupational Exposure Limits				0.1	0.05	NA	3	10	NA	0.1	0.1	25	3	5000
Adjusted OELs (Brief and Scala Model)				0.054	0.027	NA	1.630	5.435	NA	0.054	0.054	13.587	1.630	2717.4
Job Title: Special Constables														
A3, S3, I3, M3, T3	11-Aug-17	Special Constables 5:00 AM - 4:30 PM	615	<0.0041	<0.0041	<0.016	0.11	0.18	0.078	0.009	NA	<1	<0.1	NA
			Number of Samples	1	1	1	1	1	1	1	0	1	1	0
			Average	0.0041	0.0041	0.016	0.11	0.18	0.078	0.009	NA	1	0.1	NA
			Average % of OEL	7.544	15.088	NA	6.747	3.312	NA	16.560	NA	7.360	6.133	NA

Notes: Grey shaded entries denote samples were below the analytical detection limit

NA = not applicable

Adjusted OELs were calculated following Brief and Scala Model: Adjusted OEL = 8-hour OEL x Daily Reduction Factor. Daily Reduction Factor was calculated using the following formula: Daily Reduction Factor = $\left\{\frac{8}{h} \times \left(\frac{24-h}{16}\right)\right\}$, where h = hours worked per day.

Table 2a. Air Sampling Results with Brief and Scala Model Sample Calculations

Transit Enforcement – Fare Inspectors

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored											
				Total Metals (mg/m^3)											
				Sb	As	Ba	Be	Cd	CaO	Cr	Co	Cu	Pb	Mn	Se
Occupational Exposure Limits				0.5	0.1	0.5	0.002	0.01	2	0.5	0.02	1	0.05	0.02	0.2
Adjusted OELs (Brief and Scala Model)				0.350	0.070	0.350	0.0014	0.007	1.400	0.350	0.014	0.700	0.035	0.014	0.140
Job Title: Fare Inspectors															
A5, S5, I5, M5, T5	14-Aug-17	Fare Inspector 6:30 AM - 4:30 PM	550	<0.00082	<0.00027	0.0057	<0.00014	<0.00014	<0.095	<0.0068	<0.00041	0.00052	<0.00034	0.00088	<0.0020
			Number of Samples	1	1	1	1	1	1	1	1	1	1	1	1
			Average	0.00082	0.00027	0.0057	0.00014	0.00014	0.095	0.0068	0.00041	0.00052	0.00034	0.00088	0.002
			Average % of OEL	0.234	0.386	1.629	10.000	2.000	6.786	1.943	2.929	0.074	0.971	6.286	1.429

Notes: Grey shaded entries denote samples were below the analytical detection limit

NA = not applicable

Adjusted OELs were calculated following Brief and Scala Model: Adjusted OEL = 8-hour OEL x Daily Reduction Factor. Daily Reduction Factor was calculated using the following formula:

Daily Reduction Factor = $\left\{\frac{8}{h} \times \left(\frac{24-h}{16}\right)\right\}$, where h = hours worked per day.

Example for Sb:

Adjusted OEL = $0.5 \times \left\{\frac{8}{10} \times \left(\frac{24-10}{16}\right)\right\} = 0.350$

Table 2b. Air Sampling Results with Brief and Scala Model Sample Calculations

Transit Enforcement – Fare Inspectors

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored										
				Respirable Metals (mg/m^3)					Inhalable Metals (mg/m^3)					
				Al	Cd	FeO	Mo	ZnO	Be	MgO	Mo	Ni	Tl	V_2O_5
Occupational Exposure Limits				0.5	0.1	0.5	1	0.002	5	3	2	0.00005	10	10
Adjusted OELs (Brief and Scala Model)				0.700	0.0014	3.500	2.100	1.400	0.000035	7.000	7.000	0.700	0.014	0.035
Job Title: Fare Inspectors														
A5, S5, I5, M5, T5	14-Aug-17	Fare Inspector 6:30 AM - 4:30 PM	550	<0.0069	<0.00014	0.11	<0.00014	<0.0026	NA	<0.011	<0.00014	<0.00027	<0.0014	<0.00073
			Number of Samples	1	1	1	1	1	0	1	1	1	1	1
			Average	0.0069	0.00014	0.11	0.00014	0.0026	NA	0.011	0.00014	0.00027	0.0014	0.00073
			Average % of OEL	0.986	10.000	3.143	0.007	0.186	NA	0.157	0.002	0.039	10.000	2.086

Notes: Grey shaded entries denote samples were below the analytical detection limit
NA = not applicable
Adjusted OELs were calculated following Brief and Scala Model: Adjusted OEL = 8-hour OEL x Daily Reduction Factor. Daily Reduction Factor was calculated using the following formula:
Daily Reduction Factor = $\left\{\frac{8}{h} \times \left(\frac{24-h}{16}\right)\right\}$, where h = hours worked per day.

Table 2c. Air Sampling Results with Brief and Scala Model Sample Calculations

Transit Enforcement – Fare Inspectors

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored										
				Respirable Silica (mg/m^3)			Resp. Dust (mg/m^3)	Inh. Dust (mg/m^3)	$PM_{2.5}$ Dust	Asbestos (f/cc)		CO (ppm)	NO_2 (ppm)	CO_2 (ppm)
				Quartz	Cristoballite	Tridymite				PCM	TEM			
Occupational Exposure Limits				0.1	0.05	NA	3	10	NA	0.1	0.1	25	3	5000
Adjusted OELs (Brief and Scala Model)				0.070	0.035	NA	2.100	7.000	NA	0.070	0.070	17.500	2.100	3500.0
Job Title: Fare Inspectors														
A5, S5, I5, M5, T5	14-Aug-17	Fare Inspector 6:30 AM - 4:30 PM	550	<0.0046	<0.0046	<0.018	0.18	0.38	0.118	0.01	NA	<1	<0.1	NA
			Number of Samples	1	1	1	1	1	1	1	0	1	1	0
			Average	0.0046	0.0046	0.018	0.18	0.38	0.118	0.01	NA	1	0.1	NA
			Average % of OEL	6.571	13.143	NA	8.571	5.429	NA	14.286	NA	5.714	4.762	NA

Notes: Grey shaded entries denote samples were below the analytical detection limit
NA = not applicable
Adjusted OELs were calculated following Brief and Scala Model: Adjusted OEL = 8-hour OEL x Daily Reduction Factor. Daily Reduction Factor was calculated using the following formula:
Daily Reduction Factor = $\left\{\frac{8}{h} \times \left(\frac{24-h}{16}\right)\right\}$, where h = hours worked per day.

Table 3a. Air Sampling Results with Brief and Scala Model Sample Calculations

Subway Operators / Guards

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored											
				Total Metals (mg/m^3)											
				Sb	As	Ba	Be	Cd	CaO	Cr	Co	Cu	Pb	Mn	Se
Occupational Exposure Limits				0.5	0.1	0.5	0.002	0.01	2	0.5	0.02	1	0.05	0.02	0.2
Adjusted OELs (Brief and Scala Model)				0.350	0.070	0.350	0.0014	0.007	1.400	0.350	0.014	0.700	0.035	0.014	0.140
Job Title: Subway Operator / Guards – Line 1															
A21, S21, I19, M21, T21	12-Sep-17	Line 2 5:00 AM - 3:00 PM	551	<0.00082	<0.00027	0.0054	<0.00014	<0.00014	<0.095	<0.0068	<0.00041	0.00044	<0.00034	0.00078	<0.0020
A55, S55, I53, M55, T55	26-Oct-17	Line 4 5:30 PM - 2:00 AM	495	<0.00090	<0.00030	0.0006	<0.00015	<0.00015	<0.11	<0.0075	<0.00045	<0.00030	<0.00038	0.00024	<0.0023
A57, S57, I55, M57, T57, H11	30-Oct-17	Line 1 Following Closure 5:00 AM - 2:30 PM	540	<0.00082	<0.00027	0.00063	<0.00014	<0.00014	<0.095	<0.0068	<0.00041	<0.00027	<0.00034	0.00021	<0.0020
		Number of Samples		3	3	3	3	3	3	3	3	3	3	3	3
		Average		0.000847	0.00028	0.00221	0.000143	0.000143	0.1	0.007033	0.000423	0.000337	0.000353	0.00041	0.0021
		Average % of OEL		0.242	0.400	0.631	10.238	2.048	7.143	2.010	3.024	0.048	1.010	2.929	1.500

Notes: Grey shaded entries denote samples were below the analytical detection limit

NA = not applicable

Adjusted OELs were calculated following Brief and Scala Model: Adjusted OEL = 8-hour OEL x Daily Reduction Factor. Daily Reduction Factor was calculated using the following formula:

Daily Reduction Factor = $\left\{\frac{8}{h} \times \left(\frac{24-h}{16}\right)\right\}$, where h = hours worked per day.

Example for Sb:

Adjusted OEL = $0.5 \times \left\{\frac{8}{10} \times \left(\frac{24-10}{16}\right)\right\} = 0.350$

Table 3b. Air Sampling Results with Brief and Scala Model Sample Calculations

Subway Operators / Guards

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored										
				Respirable Metals (mg/m^3)					Inhalable Metals (mg/m^3)					
				Al	Cd	FeO	Mo	ZnO	Be	MgO	Mo	Ni	Tl	V_2O_5
Occupational Exposure Limits				0.5	0.1	0.5	1	0.002	5	3	2	0.00005	10	10
Adjusted OELs (Brief and Scala Model)				0.700	0.0014	3.500	2.100	1.400	0.000035	7.000	7.000	0.700	0.014	0.035
Job Title: Subway Operator / Guards – Line 1														
A21, S21, I19, M21, T21	12-Sep-17	Line 2 5:00 AM - 3:00 PM	551	<0.0068	<0.00014	0.098	<0.00014	<0.0025	NA	<0.011	<0.00014	<0.00027	<0.0014	<0.00073
A55, S55, I53, M55, T55	26-Oct-17	Line 4 5:30 PM - 2:00 AM	495	<0.0075	<0.00015	0.027	<0.00015	<0.0028	<0.0000074	<0.012	<0.000074	<0.00015	<0.00074	<0.00079
A57, S57, I55, M57, T57, H11	30-Oct-17	Line 1 Following Closure 5:00 AM - 2:30 PM	540	<0.0068	<0.00014	0.017	<0.00014	<0.0026	<0.0000068	<0.011	0.00019	0.00016	<0.00068	<0.00073
		Number of Samples		3	3	3	3	3	2	3	3	3	3	3
		Average		0.007033	0.000143	0.047333	0.000143	0.002633	0.0000071	0.0113333	0.000135	0.000193	0.00094	0.00075
		Average % of OEL		1.005	10.238	1.352	0.007	0.188	20.286	0.162	0.002	0.028	6.714	2.143

Notes: Grey shaded entries denote samples were below the analytical detection limit
NA = not applicable
Adjusted OELs were calculated following Brief and Scala Model: Adjusted OEL = 8-hour OEL x Daily Reduction Factor. Daily Reduction Factor was calculated using the following formula:
Daily Reduction Factor = $\left\{\frac{8}{h} \times \left(\frac{24-h}{16}\right)\right\}$, where h = hours worked per day.

Table 3c. Air Sampling Results with Brief and Scala Model Sample Calculations

Subway Operators / Guards

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored											
				Respirable Silica (mg/m^3)			Resp. Dust (mg/m^3)	Inh. Dust (mg/m^3)	$PM_{2.5}$ Dust	Asbestos (f/cc)		CO (ppm)	NO_2 (ppm)	CO_2 (ppm)	Cr VI (mg/m^3)
				Quartz	Cristoballite	Tridymite				PCM	TEM				
Occupational Exposure Limits				0.1	0.05	NA	3	10	NA	0.1	0.1	25	3	5000	0.01
Adjusted OELs (Brief and Scala Model)				0.070	0.035	NA	2.100	7.000	NA	0.070	0.070	17.500	2.100	3500.0	0.007
Job Title: Subway Operator / Guards – Line 1															
A17, S17, I15, M17, T17	8-Sep-17	Line 1 5:00 AM - 2:30 PM	543	<0.0046	<0.0046	<0.018	0.15	0.22	0.07	<0.005	NA	0.3	<0.1	1308	NA
A19, S19, I17, M19, T19	8-Sep-17	Line 1 5:00 AM - 2:30 PM	515	<0.0050	<0.0050	<0.020	<0.050	0.15	0.028	0.009	NA	<0.1	<0.1	681	NA
A29, S29, I27, M29, T29	15-Sep-17	Line 1 4:00 PM - 2:00 AM	566	<0.0046	<0.0046	<0.018	<0.046	0.18	0.027	0.007	NA	<0.1	<0.1	1091	<0.000028
		Number of Samples		3	3	3	3	3	3	3	0	3	3	3	1
		Average		0.004733	0.0047333	0.0186667	0.082	0.18333	0.0416667	0.007	NA	0.1667	0.1	1026.67	0.000028
		Average % of OEL		6.762	13.524	NA	3.905	2.619	NA	10.000	NA	0.952	4.762	29.333	0.400

Notes: Grey shaded entries denote samples were below the analytical detection limit
NA = not applicable
Adjusted OELs were calculated following Brief and Scala Model: Adjusted OEL = 8-hour OEL x Daily Reduction Factor. Daily Reduction Factor was calculated using the following formula:
Daily Reduction Factor = $\left\{\frac{8}{h} \times \left(\frac{24-h}{16}\right)\right\}$, where h = hours worked per day.

Table 4a. Air Sampling Results with Brief and Scala Model Sample Calculations

End Terminal Cleaners

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored											
				Total Metals (mg/m^3)											
				Sb	As	Ba	Be	Cd	CaO	Cr	Co	Cu	Pb	Mn	Se
Occupational Exposure Limits				0.5	0.1	0.5	0.002	0.01	2	0.5	0.02	1	0.05	0.02	0.2
Adjusted OELs (Brief and Scala Model)				0.456	0.091	0.456	0.0018	0.009	1.824	0.456	0.018	0.912	0.046	0.018	0.182
Job Title: End Terminal Cleaners															
A43, S43, I41, M43, T43, H7	5-Oct-17	Kennedy 8:00 AM - 4:30 PM	510	<0.00088	<0.00015	0.0041	<0.000007	<0.000015	<0.10	<0.0073	<0.000044	0.00046	<0.000073	0.00083	<0.0022
			Number of Samples	1	1	1	1	1	1	1	1	1	1	1	1
			Average	0.00088	0.00015	0.0041	0.000007	0.000015	0.1	0.0073	0.000044	0.00046	0.000073	0.00083	0.0022
			Average % of OEL	0.193	0.165	0.899	0.400	0.165	5.484	1.601	0.241	0.050	0.160	4.552	1.206

Notes: Grey shaded entries denote samples were below the analytical detection limit

NA = not applicable

Adjusted OELs were calculated following Brief and Scala Model: Adjusted OEL = 8-hour OEL x Daily Reduction Factor. Daily Reduction Factor was calculated using the following formula:

Daily Reduction Factor = $\left\{\frac{8}{h} \times \left(\frac{24-h}{16}\right)\right\}$, where h = hours worked per day.

Example for Sb:

Adjusted OEL = $0.5 \times \left\{\frac{8}{8.5} \times \left(\frac{24-8.5}{16}\right)\right\} = 0.456$

Table 4b. Air Sampling Results with Brief and Scala Model Sample Calculations

End Terminal Cleaners

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored										
				Respirable Metals (mg/m^3)					Inhalable Metals (mg/m^3)					
				Al	Cd	FeO	Mo	ZnO	Be	MgO	Mo	Ni	Tl	V_2O_5
Occupational Exposure Limits				0.5	0.1	0.5	1	0.002	5	3	2	0.00005	10	10
Adjusted OELs (Brief and Scala Model)				0.912	0.0018	4.559	2.735	1.824	0.000046	9.118	9.118	0.912	0.018	0.046
Job Title: End Terminal Cleaners														
A43, S43, I41, M43, T43, H7	5-Oct-17	Kennedy 8:00 AM - 4:30 PM	510	<0.0073	<0.000015	0.061	<0.00007	<0.0027	<0.000007	<0.012	<0.00007	<0.00015	<0.00073	<0.00078
			Number of Samples	1	1	1	1	1	1	1	1	1	1	1
			Average	0.0073	0.000015	0.061	0.000073	0.0027	0.000007	0.012	0.00007	0.00015	0.00073	0.00078
			Average % of OEL	0.801	0.823	1.338	0.003	0.148	16.013	0.132	0.001	0.016	4.003	1.711

Notes: Grey shaded entries denote samples were below the analytical detection limit
NA = not applicable
Adjusted OELs were calculated following Brief and Scala Model: Adjusted OEL = 8-hour OEL x Daily Reduction Factor. Daily Reduction Factor was calculated using the following formula:
Daily Reduction Factor = $\left\{\frac{8}{h} \times \left(\frac{24-h}{16}\right)\right\}$, where h = hours worked per day.

Table 4c. Air Sampling Results with Brief and Scala Model Sample Calculations

End Terminal Cleaners

Sample Number	Date	Location	Sample Duration (minutes)	Agent Monitored											
				Respirable Silica (mg/m^3)			Resp. Dust (mg/m^3)	Inh. Dust (mg/m^3)	$PM_{2.5}$ Dust	Asbestos (f/cc)		CO (ppm)	NO_2 (ppm)	CO_2 (ppm)	Cr VI (mg/m^3)
				Quartz	Cristoballite	Tridymite				PCM	TEM				
Occupational Exposure Limits				0.1	0.05	NA	3	10	NA	0.1	0.1	25	3	5000	0.01
Adjusted OELs (Brief and Scala Model)				0.091	0.046	NA	2.735	9.118	NA	0.091	0.091	22.794	2.735	4558.82	0.009
Job Title: End Terminal Cleaners															
A43, S43, I41, M43, T43, H7	5-Oct-17	Kennedy 8:00 AM - 4:30 PM	510	<0.0048	<0.0048	<0.019	0.11	0.32	0.055	0.007	NA	<0.1	<0.1	605	<0.00003
Number of Samples				1	1	1	1	1	1	1	0	1	1	1	1
Average				0.0048	0.0048	0.019	0.11	0.32	0.055	0.007	NA	0.1	0.1	605	0.00003
Average % of OEL				5.265	10.529	NA	4.022	3.510	NA	7.677	NA	0.439	3.656	13.271	0.329

Notes: Grey shaded entries denote samples were below the analytical detection limit

NA = not applicable

Adjusted OELs were calculated following Brief and Scala Model: Adjusted OEL = 8-hour OEL x Daily Reduction Factor. Daily Reduction Factor was calculated using the following formula: Daily Reduction Factor = $\left\{\frac{8}{h} \times \left(\frac{24-h}{16}\right)\right\}$, where h = hours worked per day.