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

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.

Chief Safety Officer Safety and Environment Department 13.23 Attachments N. Milhommens D. Girodat J. LaRiviere Copy: T. Farrell F. DeFrancesca P. Donahue D. Lyon B. Stratton D. Chappell JHSC Co-chairs and members: G. Priaulx H. Werchow D. Boone S. Barreca B. Pugh D. Bandelj K. Parhar G. Jackson R. Stickle D. Tracey F. Ndesan P. Lawryshyn K. Broad P. Zomparelli A. Amm E. Signore Document ID #05104-92-748 File:

http://ceo.int.ttc.ca/dc/safetyande/corporates/environmen/ssvs/Subway%20Air%20Quality%20-

%20Non%20Maintenance%20April%2010%202018.doc

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



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 Project No.: 22152

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 (NO2)); and
- i. Carbon dioxide (CO₂).

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:
 - i. Asbestos:
 - k. Respirable dust and crystalline silica;
 - 1. 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 (NO₂)); and
 - r. Carbon dioxide (CO₂).

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 <u>Air Sampling</u>

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. <u>Air Sampling for Asbestos</u>

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. <u>Air Sampling for Respirable Dust and Crystalline Silica</u>

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. <u>Air Sampling for Respirable Metals</u>

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. <u>Air Sampling for Total Metals</u>

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. <u>Air Sampling for Carbon Monoxide (CO) and Nitrogen Dioxide (NO₂)</u>

Air sampling for CO and NO₂ 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 NO₂ 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 (CO₂)

Air sampling for CO₂ 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 CO₂, 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. <u>Transit Enforcement – Fare Inspectors</u>

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. <u>End Terminal Cleaners</u>

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. <u>Janitors</u>

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.

<u>December 5, 2017 (Wellesley Northbound)</u>

- 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 CO₂ 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. <u>Background Information on Airborne Contaminants Studied</u>

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 μ m 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

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

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. <u>Transit Enforcement – Fare Inspectors</u>

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. <u>End Terminal Cleaners</u>

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

Original Signed by: Original Signed by:

Prepared by: Reviewed by:

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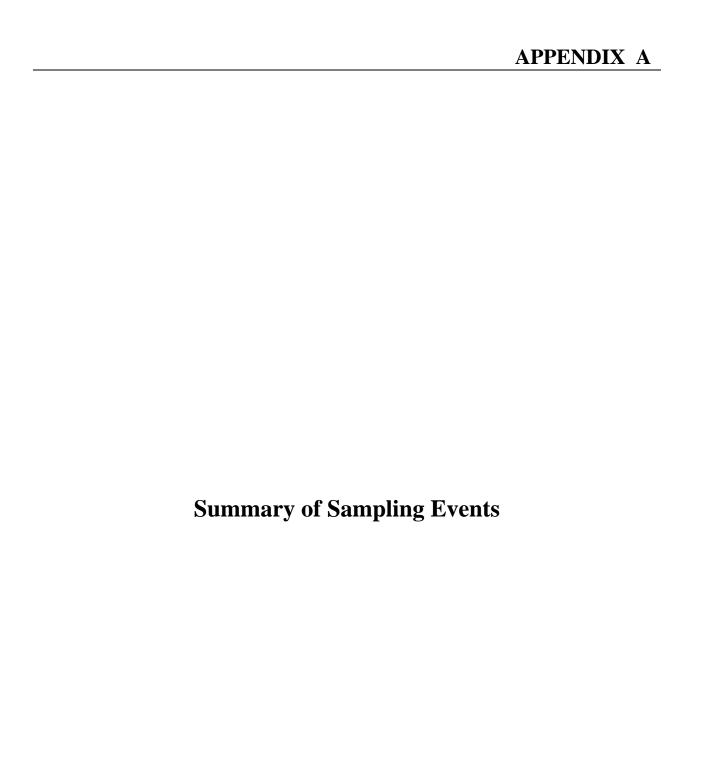


Table 1. Summary of Sampling Events

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

G 1			Sample						Agent M	lonitored					
Sample Number	Date	Location	Duration						Total Meta	als (mg/m³)					
Number			(minutes)	Sb	As	Ba	Be	Cd	CaO	Cr	Co	Cu	Pb	Mn	Se
Occupation	nal Exposure L	imits		0.5	0.1	0.5	0.002	0.01	2	0.5	0.02	1	0.05	0.02	0.2
Job Title: S	Special Constal	oles													
A1, S1, I1, M1, T1	, M1, T1 3-Aug-17 Constables 3:00 PM - 2:30 AM 8-hour TWA			<0.0007	<0.0002	0.0018	<0.0001	<0.0001	<0.083	<0.0059	<0.0004	<0.0002	<0.0003	0.0004	<0.0018
				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	A3, S3, 3, M3, 11-Aug-17 Special Constables 5:00 AM 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
		Numbe	er of Samples	2	2	2	2	2	2	2	2	2	2	2	2
	Averaş				0.000345	0.00424	0.000172	0.000172	0.1215	0.00862	0.000524	0.000424	0.000438	0.000790	0.00259
		Avera	ge % 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

 $\textbf{Notes:} \ \ \text{Grey shaded entries denote samples were below the analytical detection limit}$

Table 1b. Air Sampling Results

Transit Enforcement – Special Constables

g 1			Sample					A	gent Monitor	red				
Sample Number	Date	Location	Duration		Respira	able Metals (1	ng/m³)				Inhalable Me	etals (mg/m³)		
rumber			(minutes)	Al	Cd	FeO	Mo	ZnO	Be	MgO	Mo	Ni	Tl	V_2O_5
Occupation	al Exposure Li	imits		0.5	0.1	0.5	1	0.002	5	3	2	0.00005	10	10
Job Title: S	Special Constab	oles												
A1, S1, I1, M1, T1	M1, 3-Aug-17 Constables 3:00 PM - 2:30 AM 8-hour TWA			<0.0059	<0.00012	0.041	<0.00012	<0.0022	NA	<0.0098	<0.00012	<0.00024	<0.0012	<0.00063
							0.000172	0.003162	NA	0.014087	0.000172	0.000345	0.001725	0.000906
A3, S3, I3, M3, T3	3, S3, Special Constables Sign AM, 11-Aug-17 Sign AM S			<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 Sampl				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
		Avera	ge % of OEL	0.863	8.625	1.653	0.006	0.162	NA	0.142	0.002	0.035	8.625	1.840

 $\textbf{Notes:} \ \ \text{Grey shaded entries denote samples were below the analytical detection limit}$

Table 1c. Air Sampling Results

Transit Enforcement – Special Constables

			Sample					Ag	ent Monitore	d				
Sample	Date	Location	Duration	Resp	oirable Silica (n	ng/m³)	Resp.	Inh. Dust	PM _{2.5}	Asbest	os (f/cc)	СО	NO ₂	CO ₂
Number			(minutes)	Quartz	Cristoballite	Tridymite	Dust (mg/m³)	(mg/m ³)	Dust	PCM	TEM	(ppm)	(ppm)	(ppm)
Occupation	nal Exposure Li	mits		0.1	0.05	NA	3	10	NA	0.1	0.1	25	3	5000
Job Title: S	Special Constab	les												
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-ho	ur TWA					Void	0.1581	0.0719	0.0244	0.00647	1.437	0.1437	NA
A3, S3, I3, M3, T3	I3, M3, 11-Aug-17 Constables 5:00 AM - 615		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
		Numbe	er 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
		Avera	ge % 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

Table 2a. Air Sampling Results

Transit Enforcement – Fare Inspectors

G .			Sample						Agent M	lonitored					
Sample Number	Date	Location	Duration						Total Meta	als (mg/m³)					
Number			(minutes)	Sb	As	Ba	Be	Cd	CaO	Cr	Co	Cu	Pb	Mn	Se
Occupation	al Exposure L	imits		0.5	0.1	0.5	0.002	0.01	2	0.5	0.02	1	0.05	0.02	0.2
Job Title: F	are Inspectors	1													
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-hc	our 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	7, M7, 17-Aug-17 8:00 AM - 554		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 Sample			2	2	2	2	2	2	2	2	2	2	2	2
	Averag				0.000337	0.005687	0.000169	0.000169	0.1175	0.00843	0.000506	0.00055	0.000419	0.000919	0.0025
		Avera	ge % 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

Table 2b. Air Sampling Results

Transit Enforcement – Fare Inspectors

a .			Sample					A	gent Monitor	ed				
Sample Number	Date	Location	Duration		Respira	ıble Metals (ı	mg/m³)				Inhalable Mo	etals (mg/m³)		
Number			(minutes)	Al	Cd	FeO	Mo	ZnO	Be	MgO	Mo	Ni	Tl	V_2O_5
Occupation	nal Exposure Li	imits		0.5	0.1	0.5	1	0.002	5	3	2	0.00005	10	10
Job Title: F	are Inspectors													
A5, S5, I5, M5, T5	S5, Fare Inspector 6:30 AM - 550		550	<0.0069	<0.00014	0.11	<0.00014	<0.0026	NA	<0.011	<0.00014	<0.00027	< 0.0014	<0.00073
							0.000175	0.00325	NA	0.01375	0.000175	0.000337	0.00175	0.000912
A7, S7, I7, M7, T7	A7, S7, I7, M7, 17-Aug-17 Fare Inspector 8:00 AM - 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 Sampl				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
		Avera	ge % 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

Table 2c. Air Sampling Results

Transit Enforcement – Fare Inspectors

			Sample					Ag	ent Monitore	d				
Sample	Date	Location	Duration	Resp	oirable Silica (n	ng/m³)	Resp.	Inh. Dust	PM2.5	Asbest	os (f/cc)	СО	NO ₂	CO2
Number			(minutes)	Quartz	Cristoballite	Tridymite	Dust (mg/m³)	(mg/m ³)	Dust	PCM	TEM	(ppm)	(ppm)	(ppm)
Occupation	al Exposure L	imits		0.1	0.05	NA	3	10	NA	0.1	0.1	25	3	5000
Job Title: F	are Inspectors	1												
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	A7, S7, 7, M7, 17-Aug-17 Fare Inspector 8:00 AM - 554		554	<0.0045	<0.0045	< 0.018	0.11	0.31	0.069	0.012	<0.0051	<1	<0.1	NA
	8-hc	our TWA		0.005625	0.005625	0.0225	0.1375	0.3875	0.08625	0.015	0.006375	1.25	0.125	NA
		Numbe	er of Samples	2	2	2	2	2	2	2	1	2	2	0
	Averag				0.0056875	0.0225	0.18125	0.43125	0.116875	0.01375	0.006375	1.25	0.125	NA
		Avera	ge % 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

Table 3a. Air Sampling Results

Track Patrollers

Commle			Sample						Agent M	Ionitored					
Sample Number	Date	Location	Duration						Total Meta	als (mg/m³)					
rumber			(minutes)	Sb	As	Ba	Be	Cd	CaO	Cr	Co	Cu	Pb	Mn	Se
Occupation	al Exposure L	imits		0.5	0.1	0.5	0.002	0.01	2	0.5	0.02	1	0.05	0.02	0.2
Job Title: T	Track Patroller	S													
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	8:00 AM - 4:00 PM 3, S13, M13, M13, 513 6-Sep-17 8:00 AM - 4:00 PM Y5/Y2 - Eglinton to Union 8:00 AM - 4:00 PM			<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
		Numbe	er 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
		Averag	ge % 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

 $\label{eq:Notes: Notes: Grey shaded entries denote samples were below the analytical detection limit \\ NA = not applicable$

Table 3b. Air Sampling Results

Track Patrollers

			Sample					A	gent Monitor	red				
Sample Number	Date	Location	Duration		Respira	ble Metals (1	mg/m³)				Inhalable Me	etals (mg/m³)		
Number			(minutes)	Al	Cd	FeO	Mo	ZnO	Be	MgO	Mo	Ni	Tl	V_2O_5
Occupation	nal Exposure L	imits		0.5	0.1	0.5	1	0.002	5	3	2	0.00005	10	10
Job Title: T	Track Patroller	s												
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	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	5, S15, 15, T15 7-Sep-17		370	<0.010	<0.00020	0.11	0.00022	<0.0038	NA	<0.017*	0.00041*	<0.00040*	<0.0020*	<0.0011*
		Numbe	r 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
		Averag	ge % 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

^{*} Samples were collected and analyzed as total fraction

Table 3c. Air Sampling Results

Track Patrollers

			Comple					Ag	ent Monitore	d				
Sample	Date	Location	Sample Duration	Resp	oirable Silica (n	ng/m³)	Resp.	Inh. Dust	PM _{2.5}	Asbest	os (f/cc)	со	NO ₂	CO ₂
Number			(minutes)	Quartz	Cristoballite	Tridymite	Dust (mg/m³)	(mg/m ³)	Dust	PCM	TEM	(ppm)	(ppm)	(ppm)
Occupation	nal Exposure L	imits		0.1	0.05	NA	3	10	NA	0.1	0.1	25	3	5000
Job Title: T	Track Patroller	'S												
A9, S9, I9, M9, T9	9, 29-Aug-17 Eglinton 8:00 AM - 4:00 PM 11, B2 - Dufferin to Donlands			<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		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
		Numbe	er 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
		Averaş	ge % 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

Table 4a. Air Sampling Results

Subway Operators / Guards – Line 1

Sample			Sample						Agent M	lonitored					
Number	Date	Location	Duration						Total Meta	als (mg/m³)					
- 1,02223.0			(minutes)	Sb	As	Ba	Be	Cd	CaO	Cr	Co	Cu	Pb	Mn	Se
Occupation	al Exposure Li	imits		0.5	0.1	0.5	0.002	0.01	2	0.5	0.02	1	0.05	0.02	0.2
Job Title: S	ubway Operat	or / Guards – Lin	ie 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-ho	our 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	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-ho	our 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	9, S29, 7, M29, T29			<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-hc	our 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	8-hour TWA 81, S31, 7, M31, 15-Sep-17 Line 1 4:00 AM 566				<0.0003	0.00042	<0.0001	<0.0001	<0.092	<0.0065	<0.0004	<0.0003	<0.0001	0.00018	<0.0020
	8-hc	our 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	8-hour TWA 17, S57, 5, M57, 30-Oct-17 Closure 5:00 540			<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-hc	our 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	59, S59, 7, M59, 59, H13			<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-hc	our 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
		Numbe	er 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
		Avera	ge % 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

Table 4b. Air Sampling Results

Subway Operators / Guards – Line 1

~ .			Sample					A	gent Monitor	ed				
Sample Number	Date	Location	Duration		Respira	ble Metals (1	ng/m³)				Inhalable Me	etals (mg/m³)		
Nullibei			(minutes)	Al	Cd	FeO	Mo	ZnO	Be	MgO	Mo	Ni	Tl	V_2O_5
Occupation	al Exposure L	imits		0.5	0.1	0.5	1	0.002	5	3	2	0.00005	10	10
Job Title: S	ubway Operat	or / Guards – Lin	e 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-hc	our 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-hc	our 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	7, M29, 15-Sep-17 Line 1 4:00 566			<0.0066	<0.00013	0.024	<0.00013	< 0.0025	NA	<0.011	<0.00013	<0.00026	<0.0013	<0.00071
	8-hc	our 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-hc	our 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	8-hour TWA Line 1 Following 55, M57, 30-Oct-17 Closure 5:00 540			<0.0068	<0.00014	0.017	<0.00014	<0.0026	<0.000007	<0.011	0.00019	0.00016	<0.00068	<0.00073
	8-hc	our 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	59, S59, 7, M59, 69, H13				<0.00014	0.026	<0.00014	<0.0026	<0.000007	<0.011	<0.00007	<0.00014	<0.00068	<0.00073
	8-ho	our TWA		0.008625	0.000175	0.0325	0.000175	0.00325	0.0000085	0.01375	0.000085	0.000175	0.00085	0.000912
		Numbe	er 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
		Averag	ge % of OEL	0.854	8.542	0.629	0.006	0.160	17.000	0.142	0.002	0.029	7.042	1.825

 $\textbf{Notes:} \ \ \text{Grey shaded entries denote samples were below the analytical detection limit}$

Table 4c. Air Sampling Results

Subway Operators / Guards – Line 1

			Sample						Agent Monite	ored					
Sample	Date	Location	Duration	Resp	oirable Silica (n	ng/m³)	Resp.	Inh.	PM2.5	Asbest	os (f/cc)	со	NO ₂	CO ₂	Cr VI
Number			(minutes)	Quartz	Cristoballite	Tridymite	Dust (mg/m³)	Dust (mg/m³)	Dust	PCM	TEM	(ppm)	(ppm)	(ppm)	(mg/m^3)
Occupation	al Exposure Li	imits		0.1	0.05	NA	3	10	NA	0.1	0.1	25	3	5000	0.01
Job Title: S	ubway Operat	or / Guards – Lin	e 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-hc	our 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-hc	our 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	0.0225	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-ho	our 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-hc	our 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	7, M59, 59, H13 30-Oct-17 Closure 5:00 AM - 3:00 PM 535				<0.0046	<0.018	<0.046	<0.090	0.033	0.006	NA	<0.1	<0.1	995	<0.00003
	8-ho	our TWA		0.00575	0.00575	0.0225	0.0575	0.1125	0.04125	0.0075	NA	0.125	0.125	1243.75	0.00003
	·	Numbe	er 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
		Avera	ge % 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

Table 5a. Air Sampling Results

Subway Operators / Guards – Line 2

Sample	_	_	Sample							lonitored					
Number	Date	Location	Duration		1					als (mg/m³)			1		
			(minutes)	Sb	As	Ba	Be	Cd	CaO	Cr	Co	Cu	Pb	Mn	Se
Occupation	al Exposure Li	imits		0.5	0.1	0.5	0.002	0.01	2	0.5	0.02	1	0.05	0.02	0.2
Job Title: S	ubway Operat	or / Guards – Lin	e 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-ho	our 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-ho	our 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-ho	our 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	25, M27, 13-Sep-17 Line 2 4:00 pm 2:00 AM 560		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				0.000325	0.008375	0.000162	0.000162	0.115	0.00825	0.000487	0.00065	0.000412	0.001187	0.0025
		Numbe	r 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
		Averaş	ge % 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

Table 5b. Air Sampling Results

Subway Operators / Guards – Line 2

g .			Sample					A	gent Monitor	ed				
Sample Number	Date	Location	Duration		Respira	ble Metals (1	ng/m³)				Inhalable Me	etals (mg/m³)		
rumber			(minutes)	Al	Cd	FeO	Mo	ZnO	Be	MgO	Mo	Ni	Tl	V_2O_5
Occupationa	al Exposure Li	imits		0.5	0.1	0.5	1	0.002	5	3	2	0.00005	10	10
Job Title: St	ubway Operat	or / Guards – Lin	ie 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-ho	our 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-ho	our 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	A25, S25, 23, M25, 13-Sep-17 Line 2 4:00 PM = 2:00 AM 575				<0.00013	0.11	<0.00013	< 0.0024	NA	<0.011	<0.00013	<0.00026	<0.0013	<0.00070
	8-ho	our 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-hc	our TWA		0.008375	0.000162	0.1375	0.000162	0.003125	NA	0.01375	0.000162	0.000325	0.001625	0.000887
		Numbe	er 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
		Averaş	ge % 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

Table 5c. Air Sampling Results

Subway Operators / Guards – Line 2

			Sample						Agent Monito	ored					
Sample	Date	Location	Duration	Resp	oirable Silica (n	ng/m³)	Resp.	Inh.	PM2.5	Asbest	os (f/cc)	CO	NO ₂	CO ₂	Cr VI
Number			(minutes)	Quartz	Cristoballite	Tridymite	Dust (mg/m³)	Dust (mg/m³)	Dust	PCM	TEM	(ppm)	(ppm)	(ppm)	(mg/m^3)
Occupation	al Exposure Li	imits		0.1	0.05	NA	3	10	NA	0.1	0.1	25	3	5000	0.01
Job Title: S	ubway Operat	or / Guards – Lin	ie 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-hc	our 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-hc	our 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	23, M25, 13-Sep-17 Line 2 4:00 575		575	<0.0043	<0.0043	< 0.017	0.064	0.14	0.074	0.008	NA	0.1	<0.1	1215	NA
	8-hc	our 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-hc	our 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 Sample				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
		Averaş	ge % 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

Table 6a. Air Sampling Results

Subway Operators / Guards – Line 4

Sample			Sample						Agent M	onitored					•
Number	Date	Location	Duration						Total Meta	als (mg/m³)					
rumber			(minutes)	Sb	As	Ba	Be	Cd	CaO	Cr	Co	Cu	Pb	Mn	Se
Occupation	al Exposure Li	imits		0.5	0.1	0.5	0.002	0.01	2	0.5	0.02	1	0.05	0.02	0.2
Job Title: S	Subway Operat	or / Guards – Lin	ne 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-hc	our 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-hc	our 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
•		Numbe	er 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
		Avera	ge % 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

Table 6b. Air Sampling Results

Subway Operators / Guards – Line 4

g 1			Sample					A	gent Monitor	ed				
Sample Number	Date	Location	Duration		Respira	able Metals (1	ng/m³)				Inhalable Mo	etals (mg/m³)		
Number			(minutes)	Al	Cd	FeO	Mo	ZnO	Be	MgO	Mo	Ni	Tl	V_2O_5
Occupation	al Exposure L	imits		0.5	0.1	0.5	1	0.002	5	3	2	0.00005	10	10
Job Title: S	ubway Operat	or / Guards – Lin	ne 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-hc	our 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-hc	our TWA		0.009375	0.000187	0.03375	0.000187	0.0035	0.0000092	0.015	0.000092	0.000187	0.000925	0.000987
	_	Numbe	er 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
		Avera	ge % 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

Table 6c. Air Sampling Results

Subway Operators / Guards – Line 4

			Comple						Agent Monito	ored					
Sample	Date	Location	Sample Duration	Resp	irable Silica (n	ng/m³)	Resp.	Inh.	PM _{2.5}	Asbest	os (f/cc)	СО	NO ₂	CO2	Cr VI
Number			(minutes)	Quartz	Cristoballite	Tridymite	Dust (mg/m³)	Dust (mg/m³)	Dust	PCM	TEM	(ppm)	(ppm)	(ppm)	(mg/m^3)
Occupation	al Exposure L	imits		0.1	0.05	NA	3	10	NA	0.1	0.1	25	3	5000	0.01
Job Title: S	ubway Operat	or / Guards – Lin	ie 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-hc	our 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-hc	our TWA		0.00625	0.00625	0.025	0.0625	0.1875	0.035	0.0112	NA	0.125	0.125	851.25	NA
		Numbe	er of Samples	2	2	2	2	2	2	2	0	2	2	2	1
	Average				0.0058125	0.023125	0.05812	0.14687	0.033125	0.0087	NA	0.125	0.125	861.25	0.00003
		Averaş	ge % 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

Table 7a. Air Sampling Results

Subway Platforms

C1-			Sample						Agent M	lonitored					
Sample Number	Date	Location	Duration						Total Meta	als (mg/m³)					
rvanioei			(minutes)	Sb	As	Ba	Be	Cd	CaO	Cr	Co	Cu	Pb	Mn	Se
Occupation	al Exposure L	imits		0.5	0.1	0.5	0.002	0.01	2	0.5	0.02	1	0.05	0.02	0.2
Subway Pla	tforms														
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	139, H3 PM - 9:00 PM Coxwell A65A-C, Eastbound by Lunchroom 481		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	71A-B, 71, 169, 71, T71 Eglinton by Supervisors' Office 6:00 PM - 2:00 AM				<0.0003	0.0024	<0.0001	<0.00001	<0.11	<0.0077	<0.0005	0.00071	<0.0004	0.00085	<0.0023
		Numbe	er 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
		Avera	ge % 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

 $\begin{tabular}{ll} \textbf{Notes:} & Grey shaded entries denote samples were below the analytical detection limit \\ NA = not applicable \\ \end{tabular}$

Table 7b. Air Sampling Results

Subway Platforms

~ .			Sample					A	gent Monitor	ed				
Sample Number	Date	Location	Duration		Respira	able Metals (1	ng/m³)				Inhalable Me	etals (mg/m³)		
Number			(minutes)	Al	Cd	FeO	Mo	ZnO	Be	MgO	Mo	Ni	Tl	V_2O_5
Occupation	al Exposure L	imits		0.5	0.1	0.5	1	0.002	5	3	2	0.00005	10	10
Subway Pla	tforms													
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	480	<0.0077	<0.00015	0.096	0.00027	<0.0029	<0.000008	<0.013	0.00082	<0.00015	<0.00077	<0.00082	
		Numbe	er 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
		Avera	ge % 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

Table 7c. Air Sampling Results

Subway Platforms

			Comple						Agent Monito	ored					
Sample	Date	Location	Sample Duration	Resp	irable Silica (n	ng/m³)	Resp.	Inh.	PM2.5	Asbest	tos (f/cc)	СО	NO ₂	CO ₂	Cr VI
Number			(minutes)	Quartz	Cristoballite	Tridymite	Dust (mg/m³)	Dust (mg/m³)	Dust	PCM	TEM	(ppm)	(ppm)	(ppm)	(mg/m ³)
Occupation	al Exposure L	imits		0.1	0.05	NA	3	10	NA	0.1	0.1	25	3	5000	0.01
Subway Pla	tforms														
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	9:00 PM Eglinton by Supervisors' 7, M39, 28-Sep-17 Office 1:00 480				<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	39, H3 PM - 9:00 PM Coxwell Eastbound by 55, I63, 7-Nov-17 Lunchroom 481				<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	A-B, I69, 16-Nov-17 Eglinton by Supervisors' Office 6:00 480				<0.0051	<0.020	0.097	0.26	0.074	<0.015	<0.0118	<0.1	<0.1	920	NA
		Numbe	er 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
		Averaş	ge % of OEL	5.150	10.300	NA	11.956	5.333	NA	16.150	18.200	0.467	3.333	15.200	0.310

 $\label{eq:Notes: Notes: Grey shaded entries denote samples were below the analytical detection limit \\ NA = not applicable$

Table 8a. Air Sampling Results

End Terminal Cleaners

Sample			Sample						Agent M	lonitored					
Number	Date	Location	Duration						Total Meta	als (mg/m³)					
rumber			(minutes)	Sb	As	Ba	Be	Cd	CaO	Cr	Co	Cu	Pb	Mn	Se
Occupation	al Exposure L	imits		0.5	0.1	0.5	0.002	0.01	2	0.5	0.02	1	0.05	0.02	0.2
Job Title: E	nd 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-hc	our 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	1, M43, 43, H7 5-Oct-17 Kennedy 8:00 AM - 4:30 PM 510 8-hour TWA			<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-hc	our 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	45, S45, 3, M45, 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-hc	our 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-hc	our 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-hc	our 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	51, S51, Sheppard- 9, M51, 19-Oct-17 Yonge 6:30 455			<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-hc	our 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
		Numbe	er 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
		Avera	ge % 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

Table 8b. Air Sampling Results

End Terminal Cleaners

~ .			Sample					A	gent Monitor	ed				
Sample Number	Date	Location	Duration		Respira	able Metals (1	ng/m³)				Inhalable Me	etals (mg/m³)		
Mulliber			(minutes)	Al	Cd	FeO	Mo	ZnO	Be	MgO	Mo	Ni	Tl	V_2O_5
Occupation	al Exposure L	imits		0.5	0.1	0.5	1	0.002	5	3	2	0.00005	10	10
Job Title: E	and Terminal C	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	43, S43, 41, M43, 5-Oct-17 Kennedy 8:00 AM - 4:30 PM 510		510	<0.0073	<0.00001	0.061	<0.00007	<0.0027	<0.000007	<0.012	<0.00007	<0.00015	<0.00073	<0.00078
	8-hc	our 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-hc	our 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-hc	our 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-h	our 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 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-hc	our TWA		0.008712	0.00017	0.022312	0.00017	0.003187	0.000009	0.0138125	0.000086	0.00017	0.000861	0.000914
		Numbe	er 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
		Avera	ge % of OEL	0.838	3.471	0.740	0.004	0.156	16.717	0.136	0.001	0.019	4.179	1.785

 $\textbf{Notes:} \ \ \text{Grey shaded entries denote samples were below the analytical detection limit}$

Table 8c. Air Sampling Results

End Terminal Cleaners

			Sample						Agent Monito	ored					
Sample Number	Date	Location	Duration	Resp	oirable Silica (n	ng/m³)	Resp.	Inh.	PM _{2.5}	Asbest	os (f/cc)	СО	NO ₂	CO ₂	Cr VI
Number			(minutes)	Quartz	Cristoballite	Tridymite	Dust (mg/m³)	Dust (mg/m³)	Dust	PCM	TEM	(ppm)	(ppm)	(ppm)	(mg/m³)
Occupationa	al Exposure Li	imits		0.1	0.05	NA	3	10	NA	0.1	0.1	25	3	5000	0.01
Job Title: E	nd 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-ho	our 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-hc	our 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-hc	our 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	9, M51, 19-Oct-17 Yonge 6:30 455 T51 PM - 3:00 AM				<0.0054	<0.022	< 0.054	<0.11	0.027	0.007	NA	<0.1	<0.1	526	NA
	8-hc	our TWA		0.005737	0.0057375	0.023375	0.05737	0.11687	0.0286875	0.0074	NA	0.1062	0.1062	558.875	NA
		Numbe	er 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
		Averag	ge % 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

Table 9a. Air Sampling Results

Janitors

Sample	Date	Location	Sample Duration	Agent Monitored Total Metals (mg/m³)													
Number	Date	Location	(minutes)	Sb	As	Ba	Be	Cd	CaO	Cr	Со	Cu	Pb	Mn	Se		
Occupation	al Exposure L	 imits	(mmarco)	0.5	0.1	0.5	0.002	0.01	2	0.5	0.02	1 1	0.05	0.02	0.2		
Job Title: J	_	iiiits		0.3	0.1	0.5	0.002	0.01	2	0.5	0.02	1	0.03	0.02	0.2		
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		
	•	Numbe	er 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		
		Averag	ge % 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		

 $\begin{tabular}{ll} \textbf{Notes:} & Grey shaded entries denote samples were below the analytical detection limit \\ NA = not applicable \\ \end{tabular}$

Table 9b. Air Sampling Results

Janitors

			Sample					A	gent Monitor	ed				
Sample Number	Date	Location	Duration		Respira	ble Metals (1	mg/m³)				Inhalable Mo	etals (mg/m³)		
Nullibei			(minutes)	Al	Cd	FeO	Mo	ZnO	Be	MgO	Mo	Ni	Tl	V ₂ O ₅
Occupation	al Exposure L	imits		0.5	0.1	0.5	1	0.002	5	3	2	0.00005	10	10
Job Title: J	anitors													
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
	•	Numbe	er 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
		Avera	ge % of OEL	1.040	10.500	2.385	0.007	0.198	20.800	0.175	0.002	0.022	5.200	2.250

 $\textbf{Notes:} \ \ \text{Grey shaded entries denote samples were below the analytical detection limit}$

Table 9c. Air Sampling Results

Janitors

			Comple						Agent Monit	ored					
Sample	Date	Location	Sample Duration	Resp	pirable Silica (n	ng/m³)	Resp.	Inh.	PM2.5	Asbest	tos (f/cc)	СО	NO ₂	CO ₂	Cr VI
Number			(minutes)	Quartz	Cristoballite	Tridymite	Dust (mg/m³)	Dust (mg/m³)	Dust	PCM	TEM	(ppm)	(ppm)	(ppm)	(mg/m^3)
Occupation	al Exposure L	imits		0.1	0.05	NA	3	10	NA	0.1	0.1	25	3	5000	0.01
Job Title: Ja	anitors														
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
•		Numbe	er 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
		Avera	ge % of OEL	7.050	14.100	NA	5.725	4.000	NA	18.567	12.350	4.000	3.333	NA	NA

 $\label{eq:Notes: Notes: Grey shaded entries denote samples were below the analytical detection limit \\ NA = not applicable$

Table 10a. Air Sampling Results

Traffic Checkers

Sample	Date	Location	Sample Duration	Agent Monitored Total Metals (mg/m³)													
Number	Date	Location	(minutes)	Sb	As	Ba	Be	Cd	CaO	Cr	Со	Cu	Pb	Mn	Se		
Occupation	al Exposure L	imits	I	0.5	0.1	0.5	0.002	0.01	2	0.5	0.02	1	0.05	0.02	0.2		
Job Title: T	raffic Checker	rs		•			•			•	•		•	•			
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		
		Numbe	er 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		
		Avera	ge % 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

Table 10b. Air Sampling Results

Traffic Checkers

a .			Sample					A	gent Monitor	ed				
Sample Number	Date	Location	Duration		Respira	able Metals (1	ng/m³)				Inhalable Mo	etals (mg/m³)		
Number			(minutes)	Al	Cd	FeO	Mo	ZnO	Be	MgO	Mo	Ni	Tl	V_2O_5
Occupation	al Exposure L	imits		0.5	0.1	0.5	1	0.002	5	3	2	0.00005	10	10
Job Title: T	Traffic Checke	rs												
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, 177, M79, T79 T79 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
		Numbe	er 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
		Avera	ge % of OEL	0.808	8.250	3.735	0.006	0.151	16.250	0.135	0.003	0.027	4.063	1.735

 $\begin{tabular}{ll} \textbf{Notes:} & Grey shaded entries denote samples were below the analytical detection limit \\ NA = not applicable \\ \end{tabular}$

Table 10c. Air Sampling Results

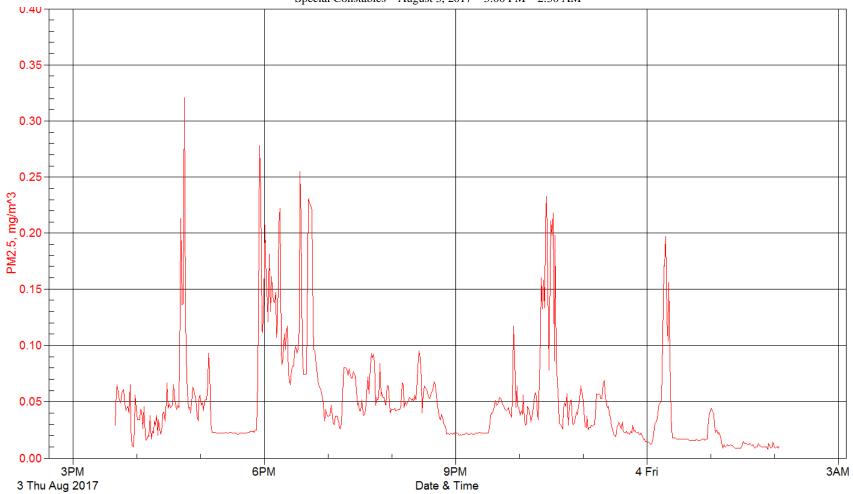
Traffic Checkers

			Sample						Agent Monite	ored					
Sample	Date	Location	Duration	Resp	pirable Silica (n	ng/m³)	Resp.	Inh.	PM2.5	Asbest	tos (f/cc)	СО	NO ₂	CO ₂	Cr VI
Number			(minutes)	Quartz	Cristoballite	Tridymite	Dust (mg/m³)	Dust (mg/m³)	Dust	PCM	TEM	(ppm)	(ppm)	(ppm)	(mg/m ³)
Occupation	al Exposure L	imits		0.1	0.05	NA	3	10	NA	0.1	0.1	25	3	5000	0.01
Job Title: T	raffic Checker	rs													
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
		Numbe	er 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
		Avera	ge % of OEL	5.425	10.850	NA	7.875	5.775	NA	25.750	24.825	4.000	3.333	NA	0.330

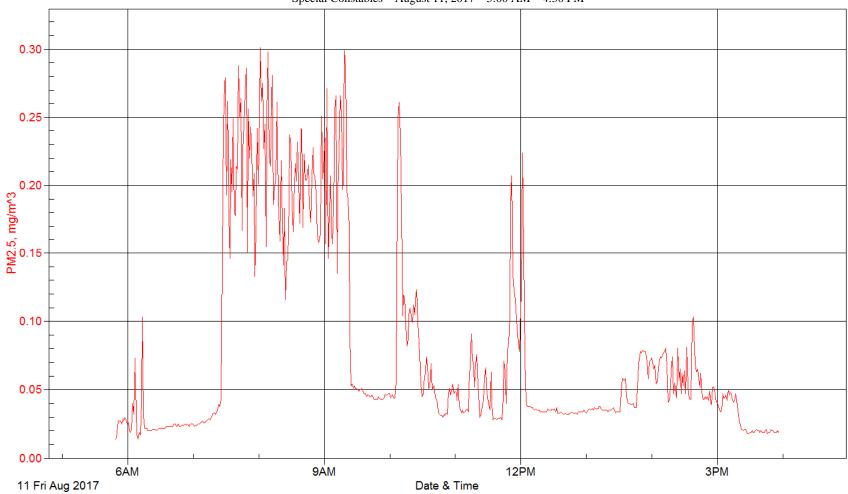
Notes: Grey shaded entries denote samples were below the analytical detection limit $NA= {\rm not\ applicable}$

PM_{2.5} Graphs

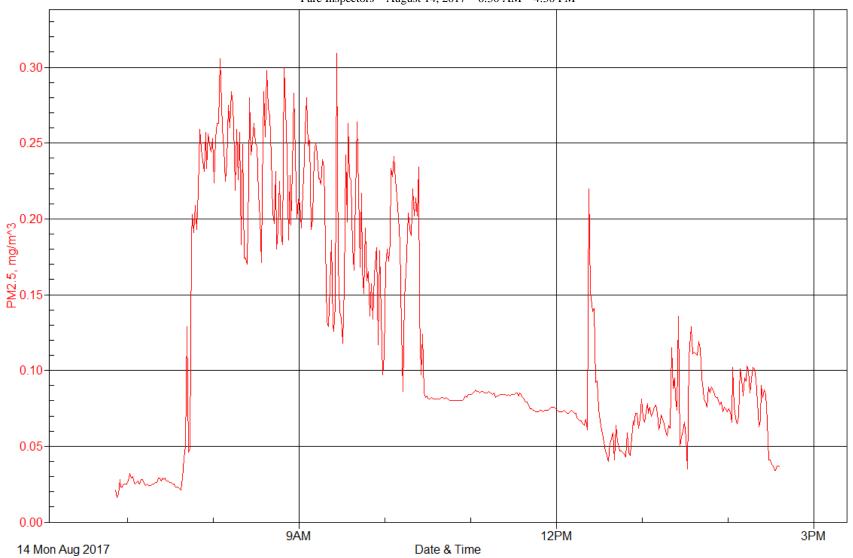




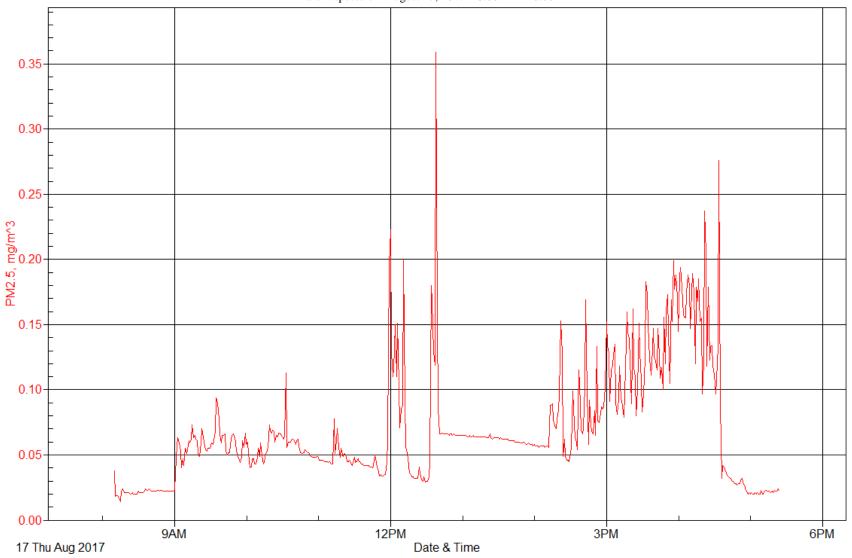
 $\label{eq:PM2.5} PM_{2.5}~Graph$ Special Constables – August 11, 2017 – 5:00 AM – 4:30 PM



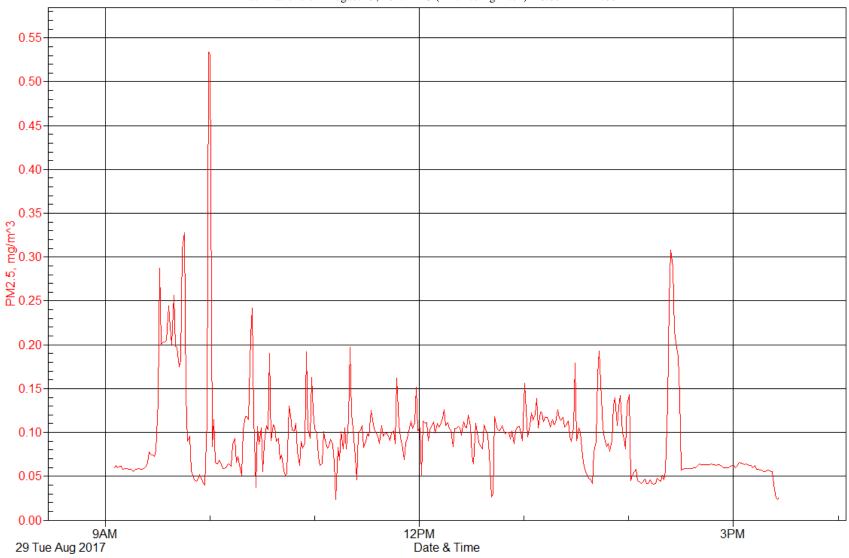
PM_{2.5} GraphFare Inspectors – August 14, 2017 – 6:30 AM – 4:30 PM



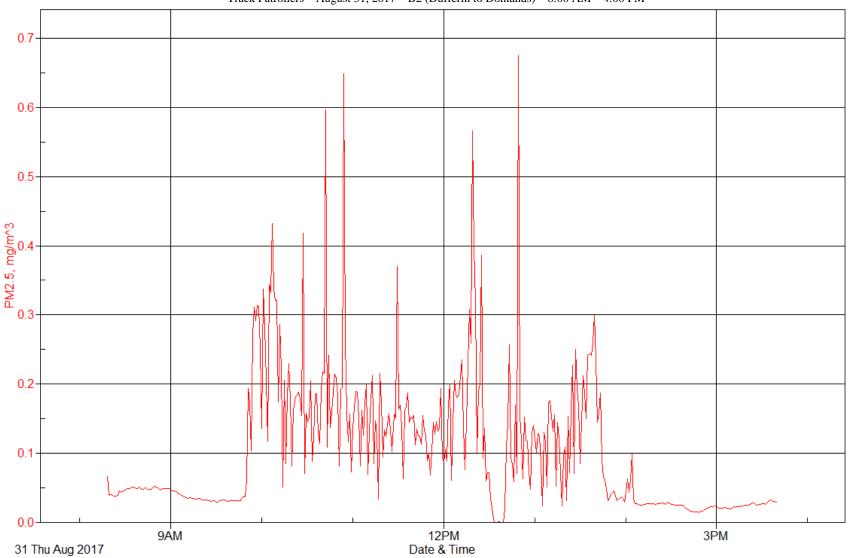
 $\label{eq:mass_problem} PM_{2.5}~Graph$ Fare Inspectors – August 17, 2017 – 8:00 AM – 6:00 PM



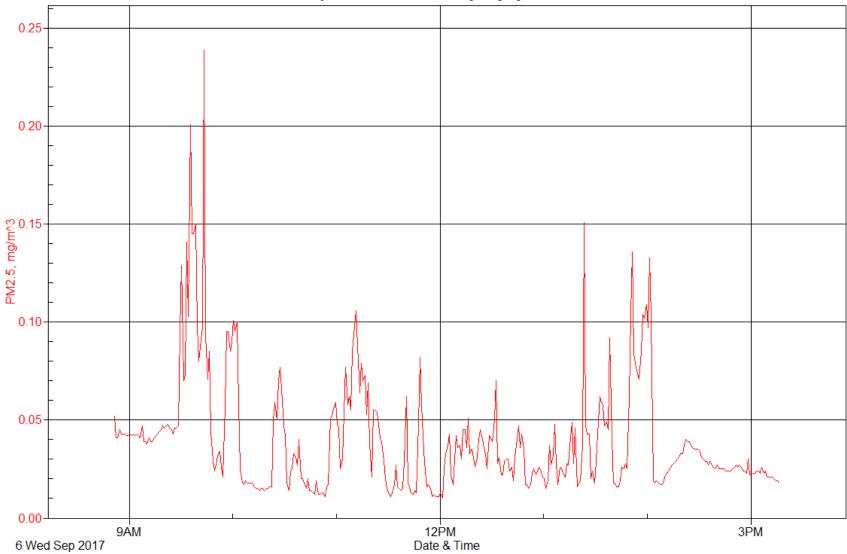
PM_{2.5} GraphTrack Patrollers – August 29, 2017 – Y3 (Finch to Eglinton) – 8:00 AM – 4:00 PM



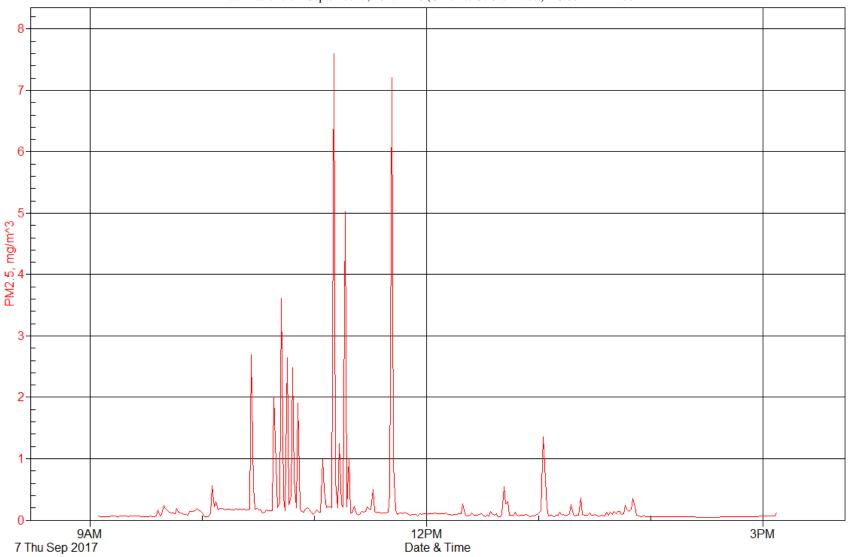
 $\label{eq:pm2.5} PM_{2.5}~Graph$ Track Patrollers – August 31, 2017 – B2 (Dufferin to Donlands) – 8:00 AM – 4:00 PM



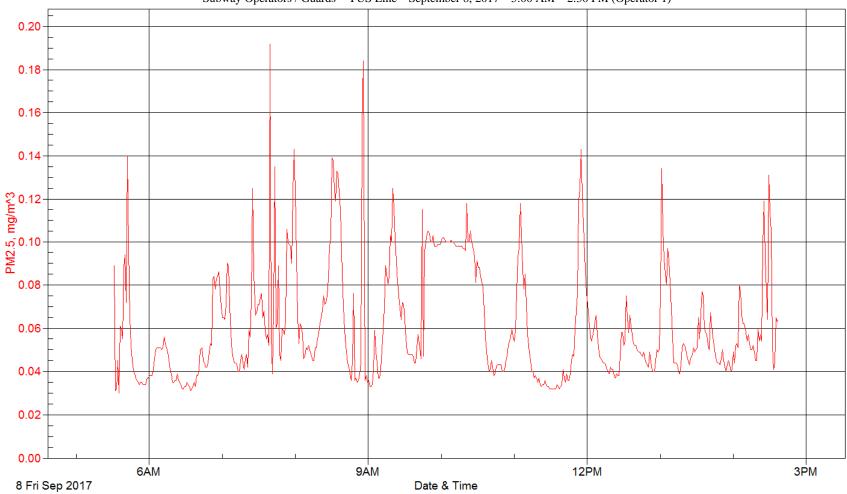
 $PM_{2.5}\ Graph$ Track Patrollers – September 6, 2017 – Y5/Y2 (King to Eglington) – 8:00 AM to 4:00 PM



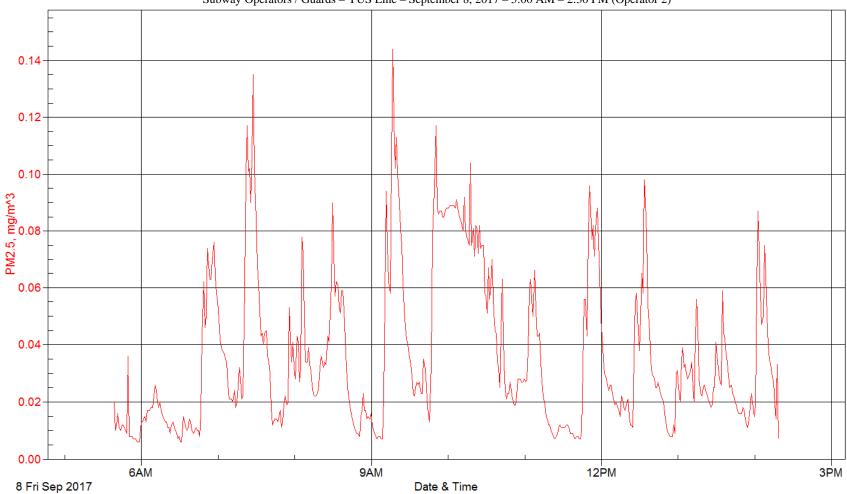
 $PM_{2.5}\ Graph$ Track Patrollers – September 7, 2017 – Y6 (Union to St Clair West) – $8:00\ AM-4:00\ PM$



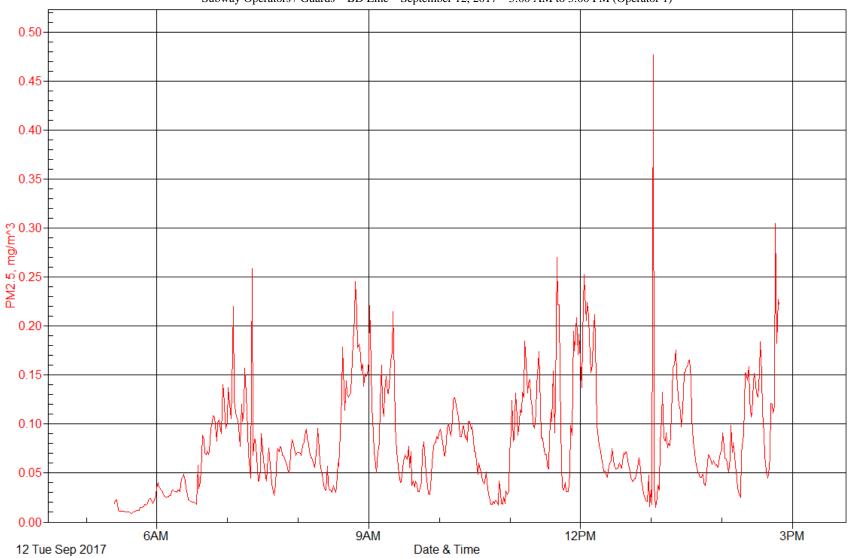
 $PM_{2.5}\ Graph$ Subway Operators / Guards – YUS Line – September 8, 2017 – 5:00 AM – 2:30 PM (Operator 1)



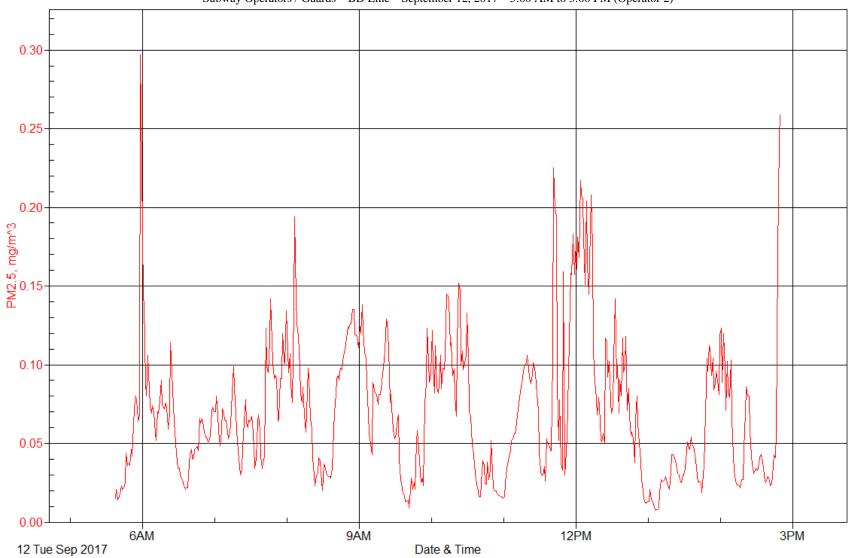
 $PM_{2.5} \ Graph$ Subway Operators / Guards – YUS Line – September 8, 2017 – 5:00 AM – 2:30 PM (Operator 2)



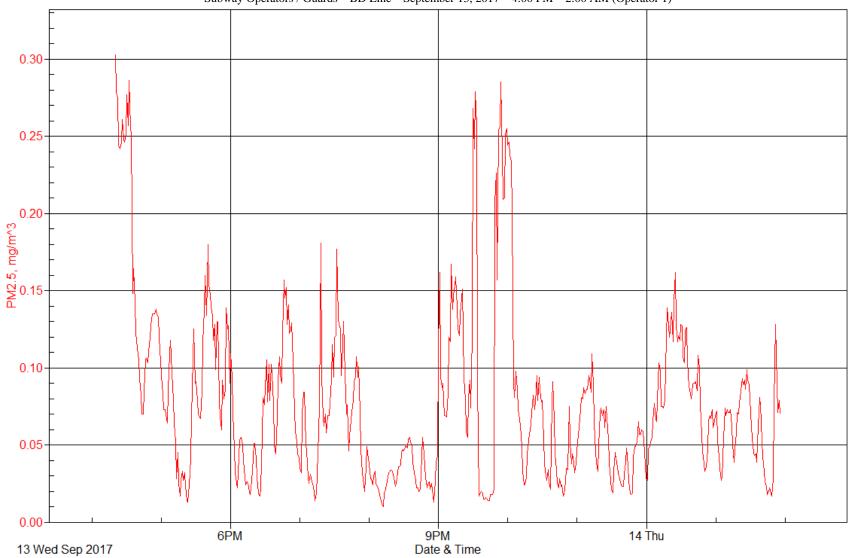
 $PM_{2.5}\ Graph$ Subway Operators / Guards – BD Line – September 12, 2017 – 5:00 AM to 3:00 PM (Operator 1)



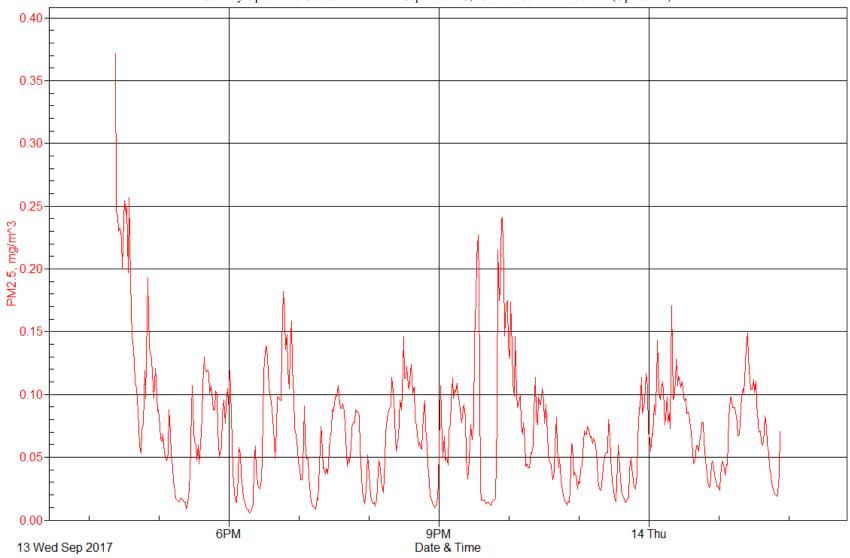
 $PM_{2.5}\ Graph$ Subway Operators / Guards – BD Line – September 12, 2017 – 5:00 AM to 3:00 PM (Operator 2)



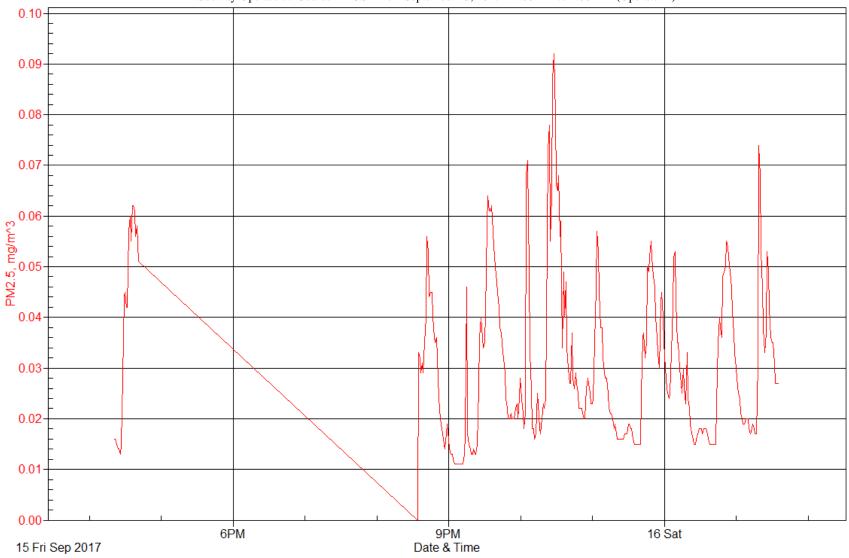
 $PM_{2.5}\ Graph$ Subway Operators / Guards – BD Line – September 13, 2017 – 4:00 PM – 2:00 AM (Operator 1)



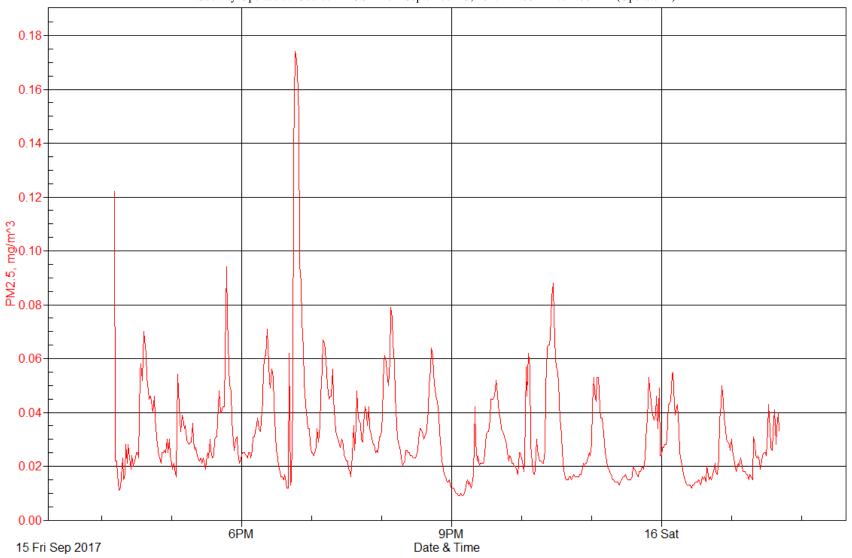
 $PM_{2.5}\ Graph$ Subway Operators / Guards – BD Line – September 13, 2017 – 4:00 PM – 2:00 AM (Operator 2)



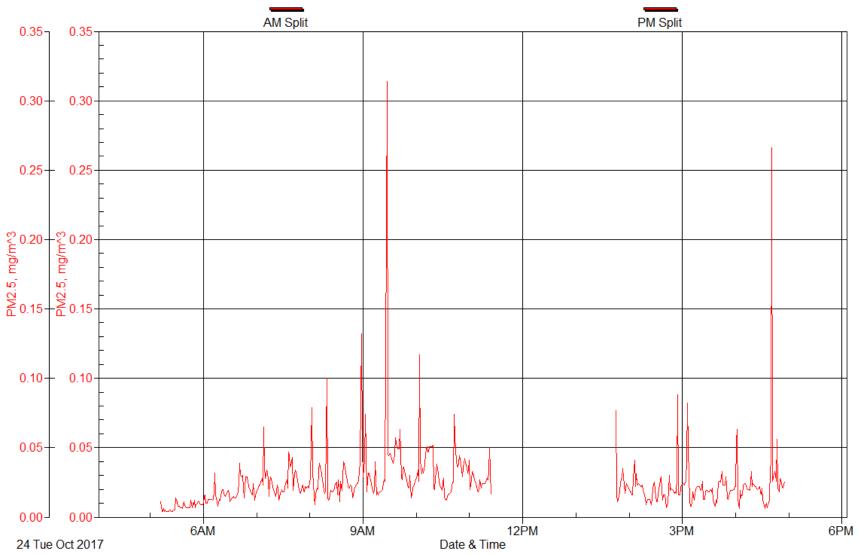
 $PM_{2.5}\ Graph$ Subway Operators / Guards – YUS Line – September 15, 2017 – 4:00 PM to 2:00 AM (Operator 1)



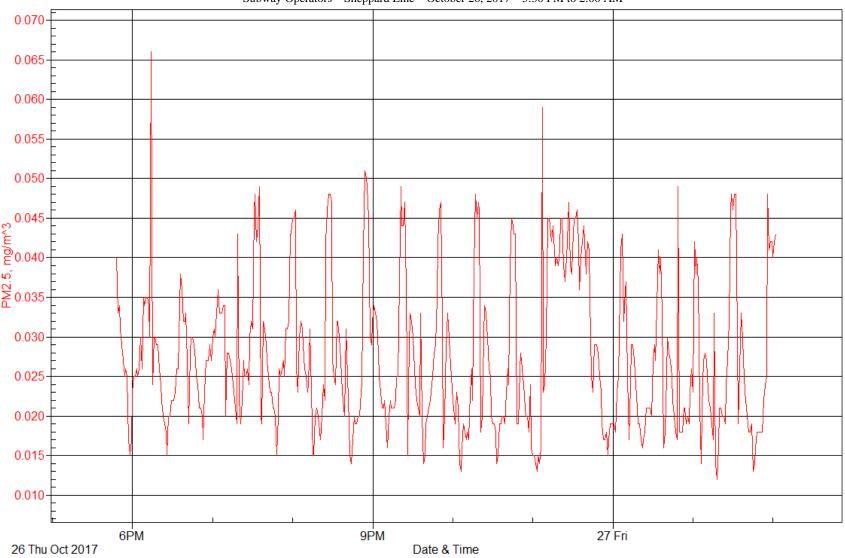
 $PM_{2.5}\ Graph$ Subway Operators / Guards – YUS Line – September 15, 2017 – 4:00 PM to 2:00 AM (Operator 2)



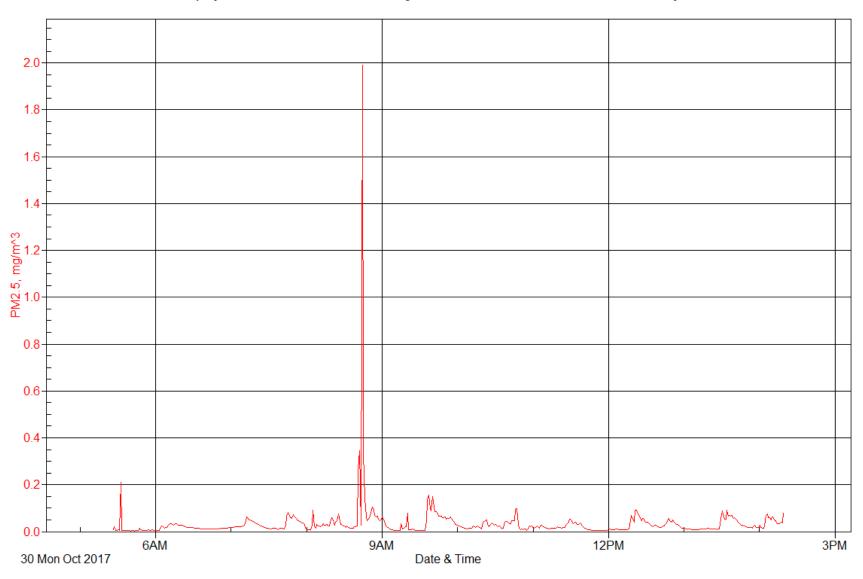
PM_{2.5} GraphSubway Operators – Sheppard Line – October 24, 2017 – 5:00 AM – 11:30 AM & 1:30 PM – 5:00 PM



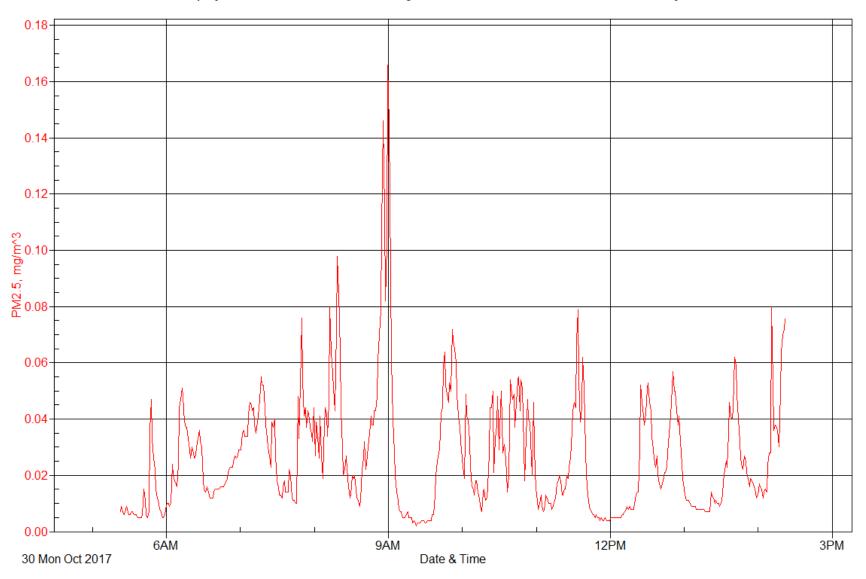
PM_{2.5} GraphSubway Operators – Sheppard Line – October 26, 2017 – 5:30 PM to 2:00 AM



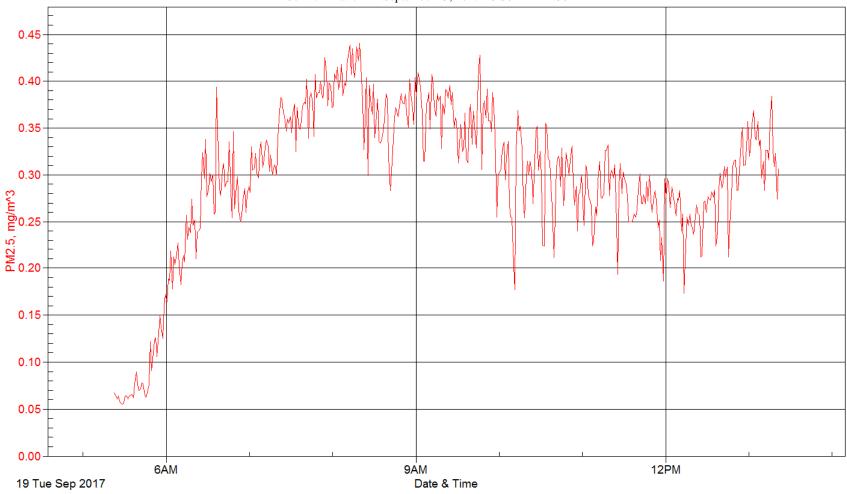
PM_{2.5} Graph
Subway Operators / Guards – YUS Line (following closure) – October 30, 2017 – 5:00 AM – 3:00 PM (Operator 1)



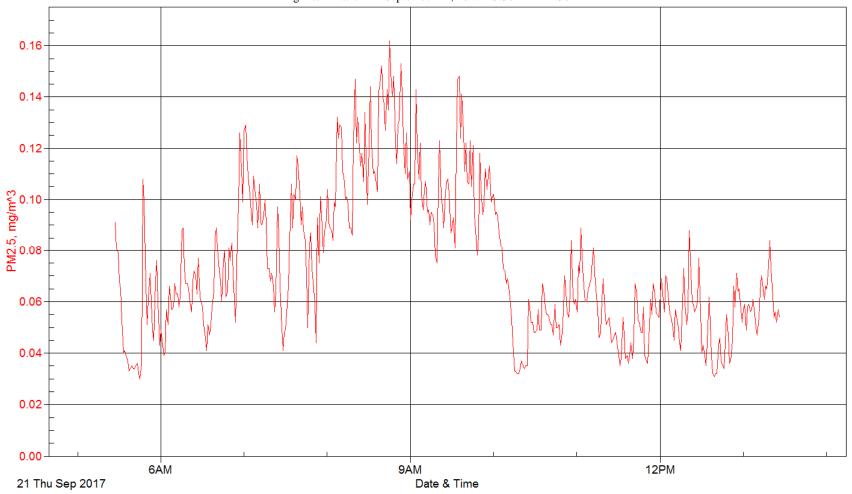
PM_{2.5} Graph
Subway Operators / Guards – YUS Line (following closure) – October 30, 2017 – 5:00 AM – 3:00 PM (Operator 2)



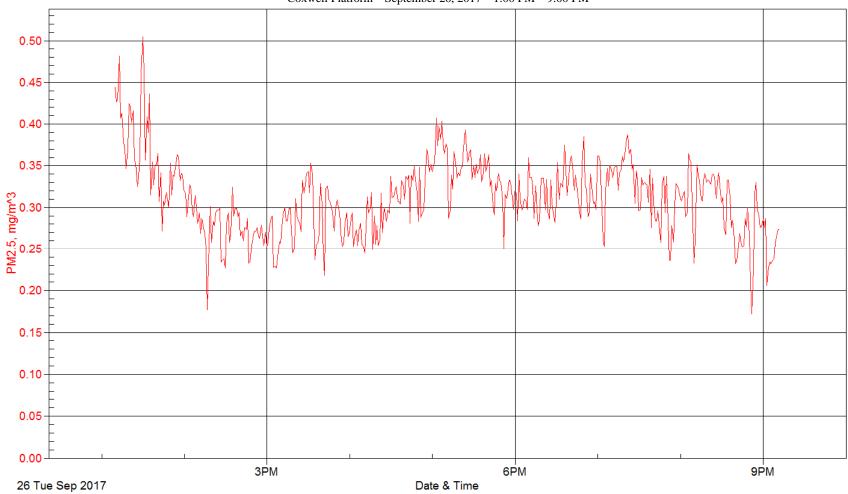
PM_{2.5} Graph
Coxwell Platform – September 19, 2017 – 5:30 AM – 1:30 PM



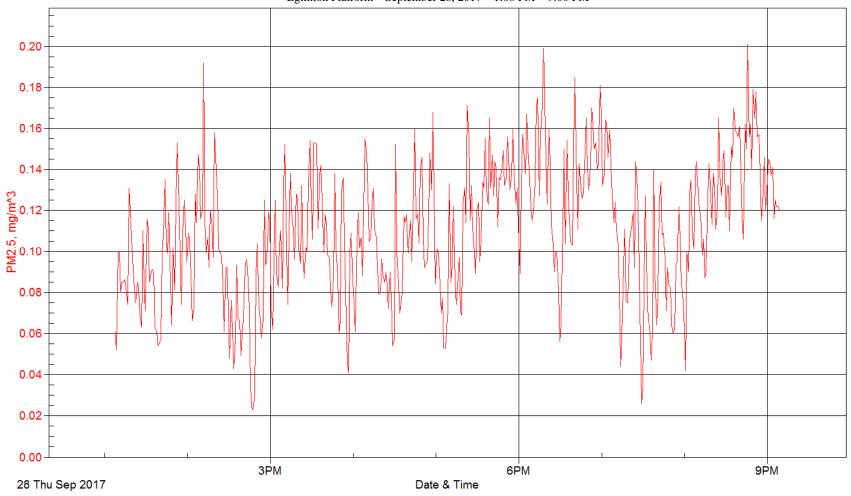
PM_{2.5} GraphEglinton Platform – September 21, 2017 – 5:30 AM – 1:30 PM



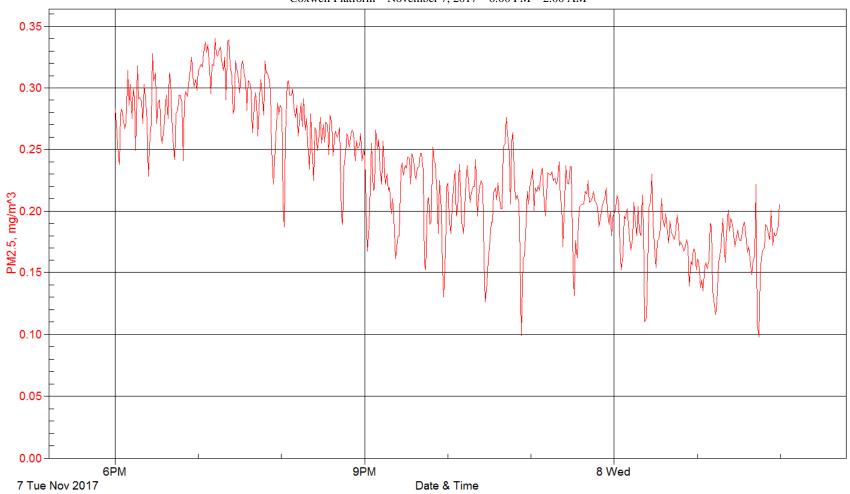
 $\label{eq:mass_problem} PM_{2.5}\,Graph$ Coxwell Platform – September 26, 2017 – 1:00 PM – 9:00 PM



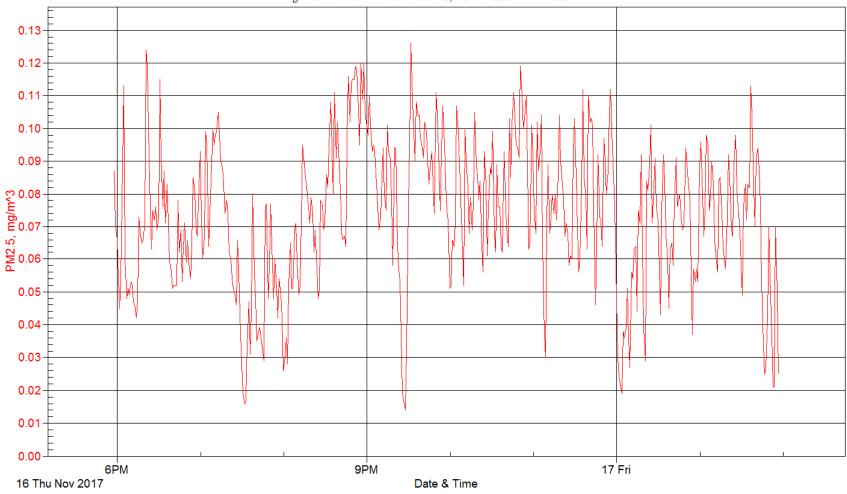
 $\label{eq:PM2.5} {\bf Graph}$ Eglinton Platform – September 28, 2017 – 1:00 PM – 9:00 PM



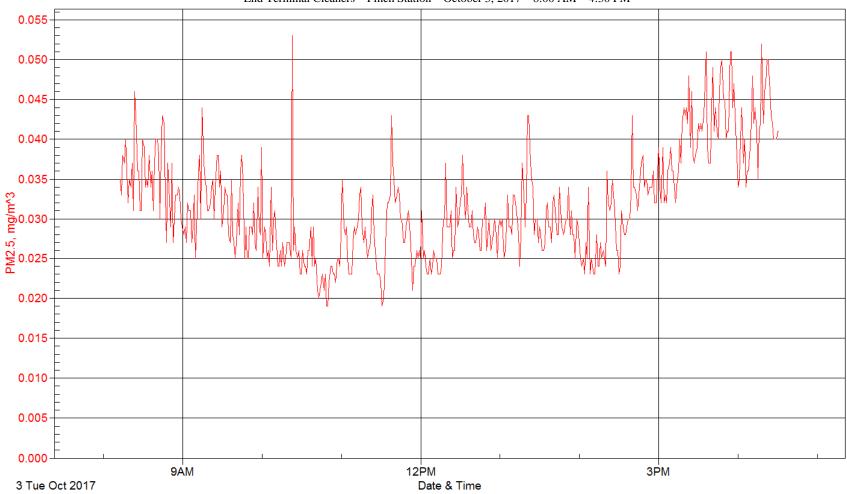
PM_{2.5} GraphCoxwell Platform – November 7, 2017 – 6:00 PM – 2:00 AM



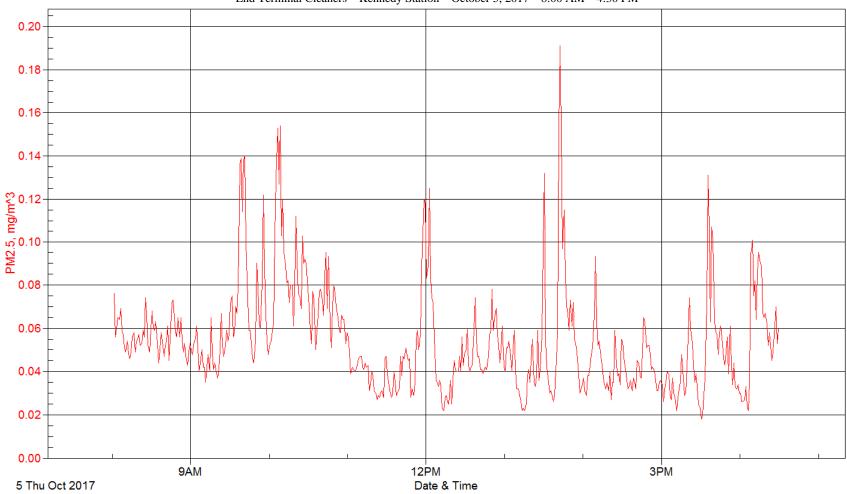
PM_{2.5} Graph
Eglinton Platform – November 16, 2017 – 6:00 PM – 2:00 AM



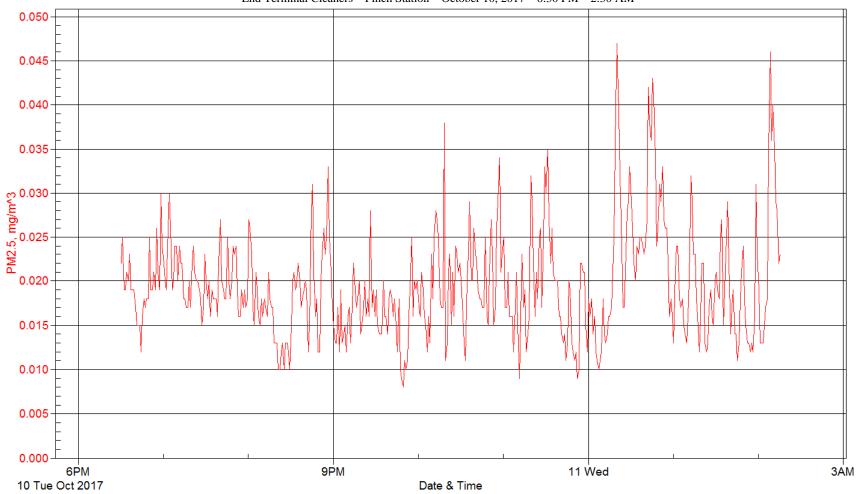
 $PM_{2.5} \ Graph$ End Terminal Cleaners – Finch Station – October 3, 2017 – 8:00 AM – 4:30 PM



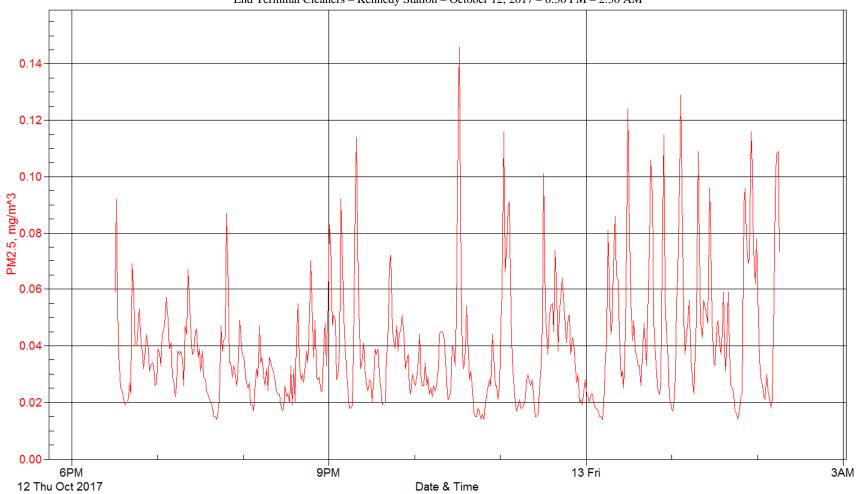
 $\label{eq:PM2.5} PM_{2.5} \ Graph$ End Terminal Cleaners – Kennedy Station – October 5, 2017 – 8:00 AM – 4:30 PM



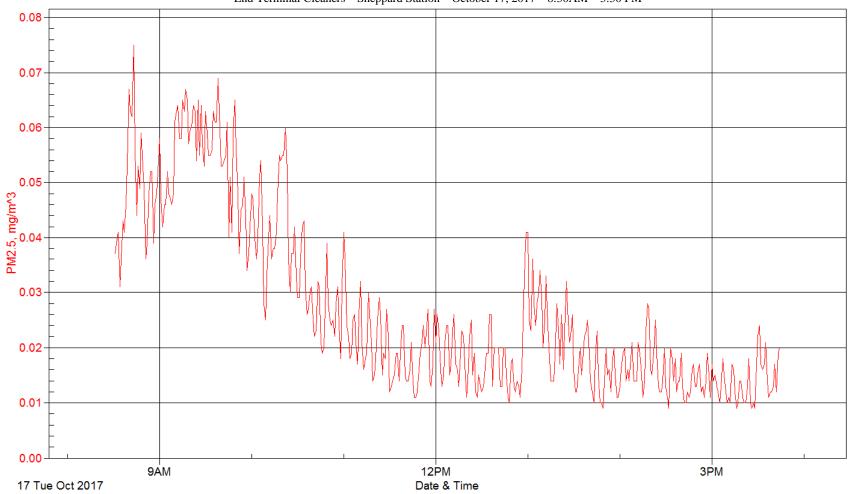
 $\label{eq:PM2.5} PM_{2.5}~Graph$ End Terminal Cleaners – Finch Station – October 10, 2017 – 6:30 PM – 2:30 AM



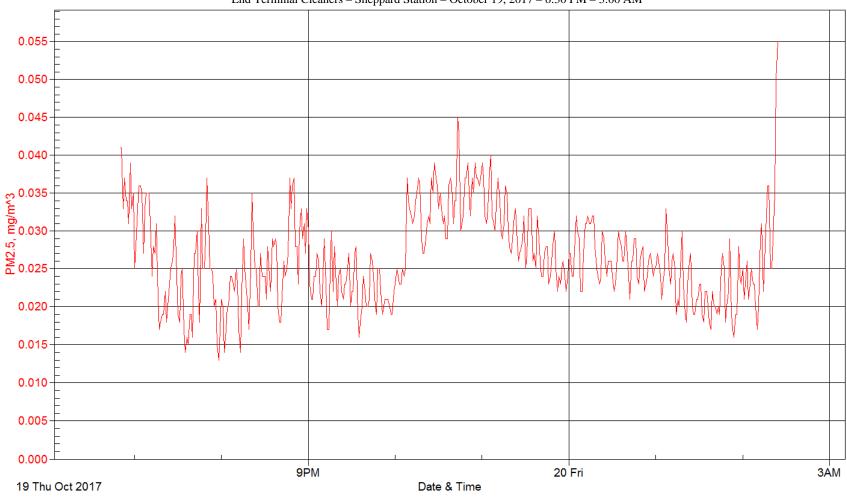
 $PM_{2.5} \ Graph$ End Terminal Cleaners – Kennedy Station – October 12, 2017 – 6:30 PM – 2:30 AM



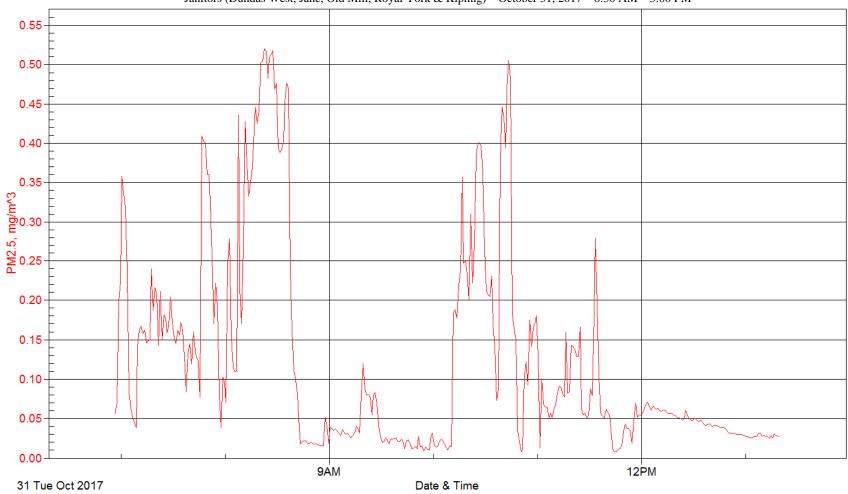
 $\label{eq:PM2.5} PM_{2.5}~Graph$ End Terminal Cleaners – Sheppard Station – October 17, 2017 – 8:30AM – 3:30 PM



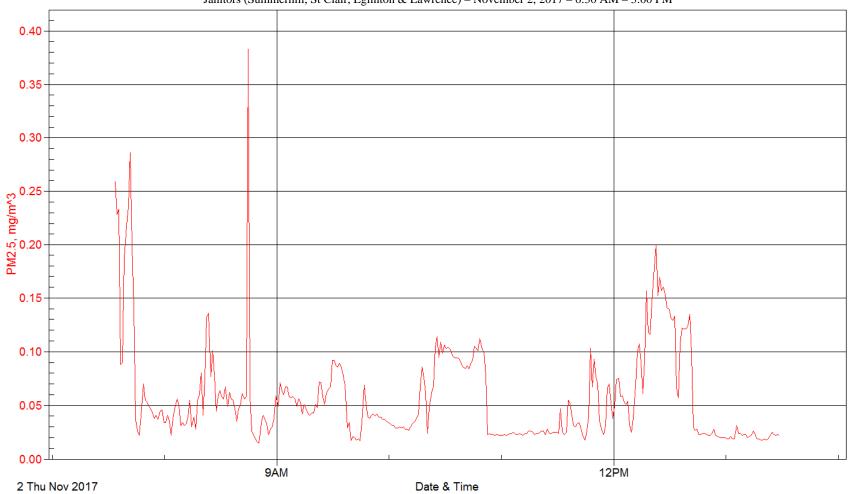
PM_{2.5} Graph
End Terminal Cleaners – Sheppard Station – October 19, 2017 – 6:30 PM – 3:00 AM



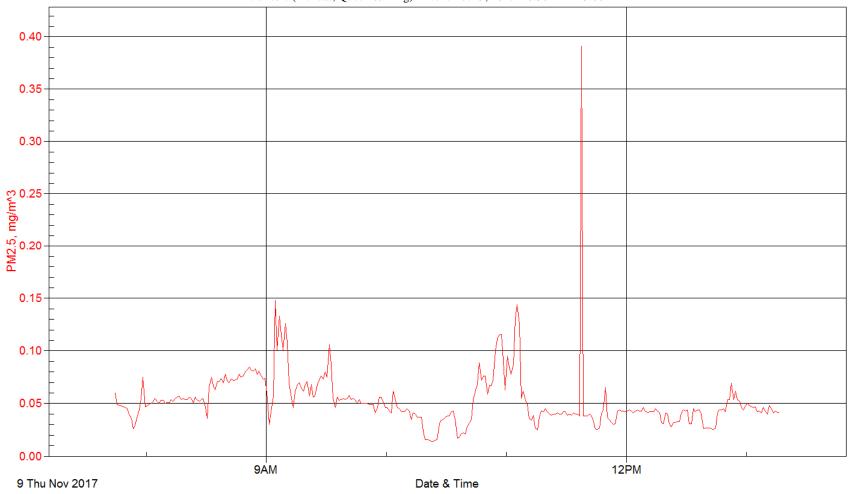
PM_{2.5} Graph
Janitors (Dundas West, Jane, Old Mill, Royal York & Kipling) – October 31, 2017 – 6:30 AM – 3:00 PM



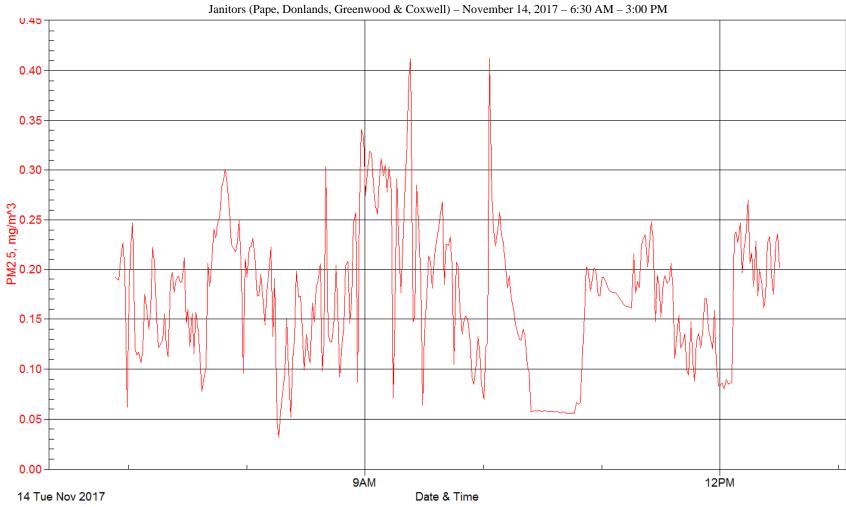
 $\label{eq:PM2.5} PM_{2.5}~Graph$ Janitors (Summerhill, St Clair, Eglinton & Lawrence) – November 2, 2017 – 6:30 AM – 3:00 PM



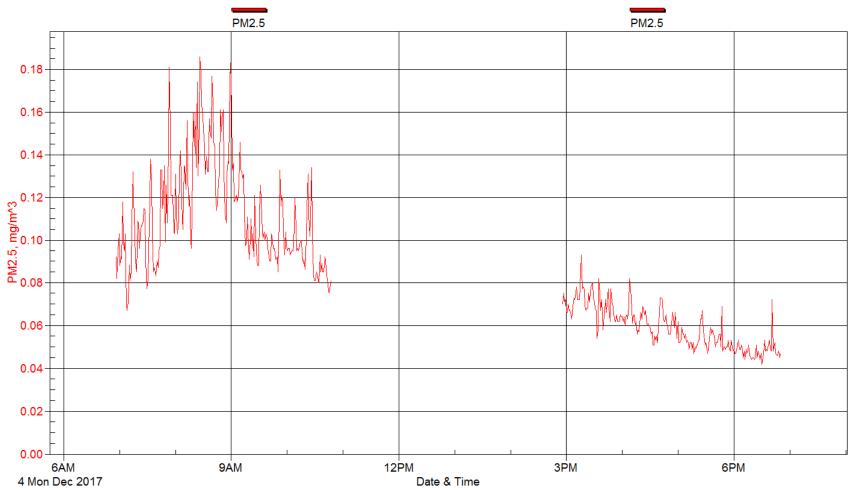
 $\label{eq:PM2.5} PM_{2.5}~Graph$ Janitors (Dundas, Queen & King) – November 9, 2017 – 6:30 AM – 3:00 PM



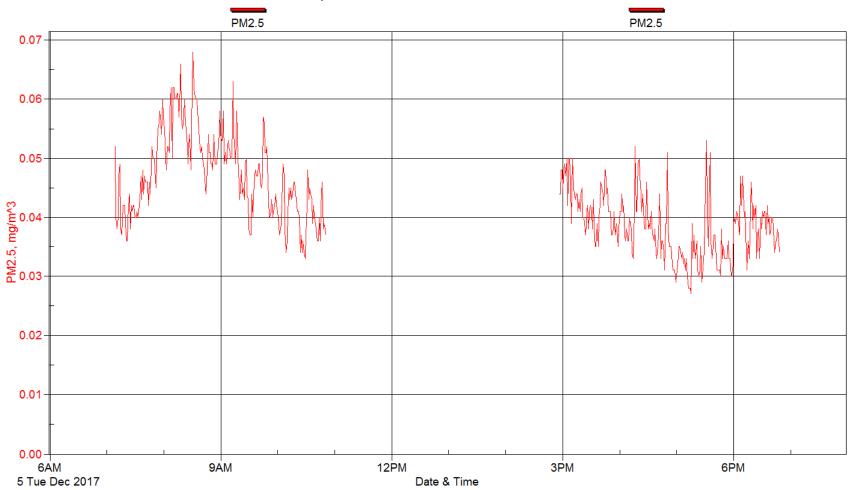
PM_{2.5} Graph



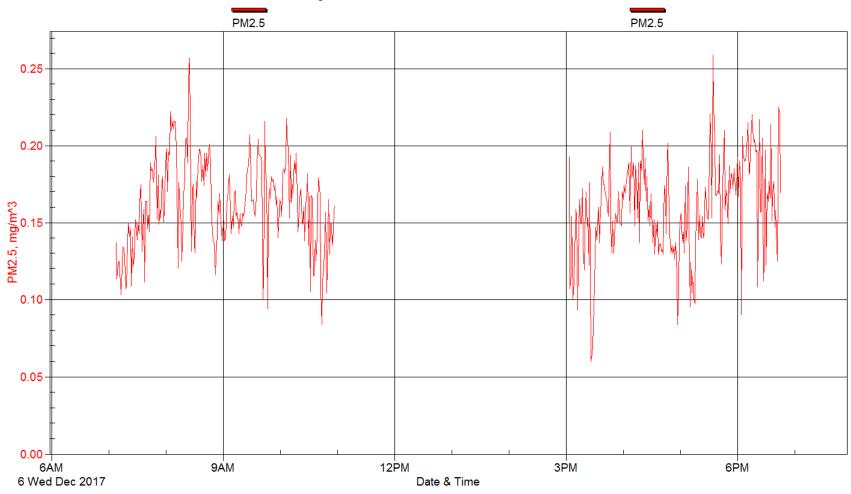
 $\label{eq:PM2.5} PM_{2.5}~Graph$ Traffic Checkers – Bloor Station – December 4, 2017 – 7:00 AM – 11:00 PM & 3:00 PM – 7:00 PM



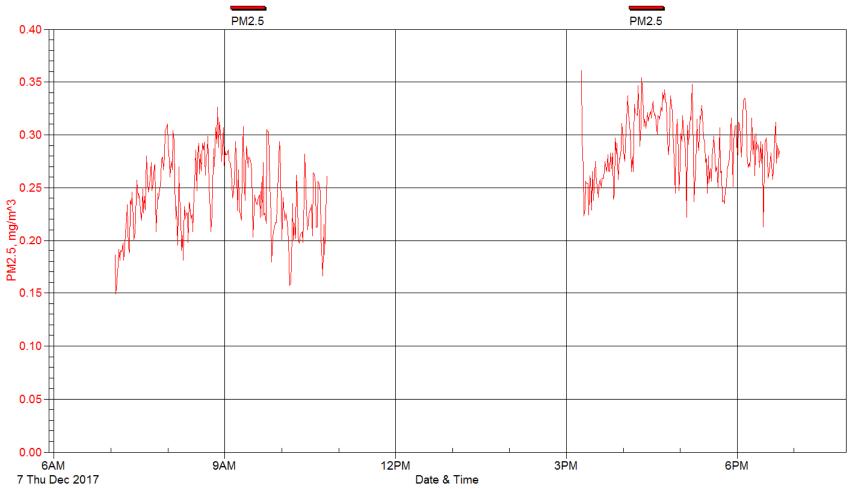
 $\label{eq:PM2.5} PM_{2.5}~Graph$ Traffic Checkers – Wellesley Station – December 5, 2017 – 7:00 AM – 11:00 PM & 3:00 PM – 7:00 PM



PM_{2.5} Graph
Traffic Checkers – St. George Station – December 6, 2017 – 7:00 AM – 11:00 PM & 3:00 PM – 7:00 PM

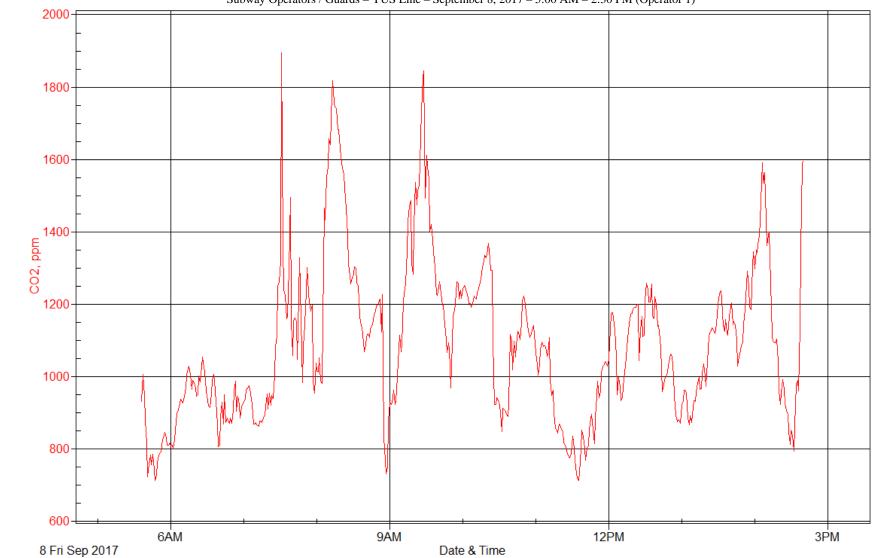


 $\label{eq:PM2.5} PM_{2.5} \ Graph$ Traffic Checkers – Spadina & Sherbourne Stations – December 7, 2017 – 7:00 AM – 11:00 PM & 3:00 PM – 7:00 PM

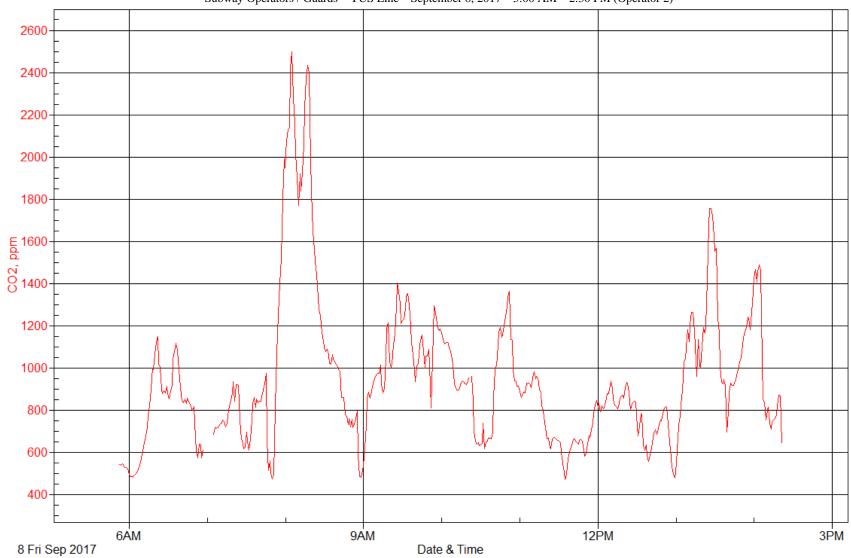


CO₂ Graphs

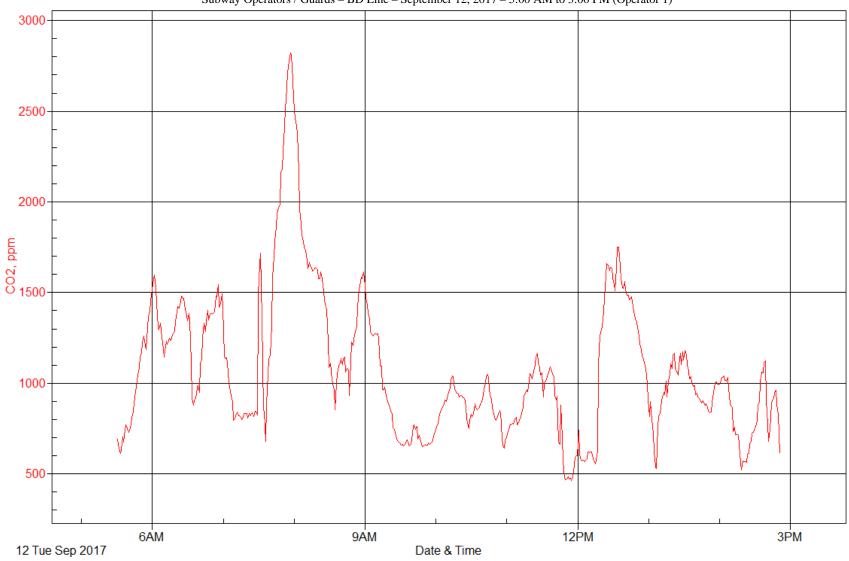
CO₂ Graph
Subway Operators / Guards – YUS Line – September 8, 2017 – 5:00 AM – 2:30 PM (Operator 1)



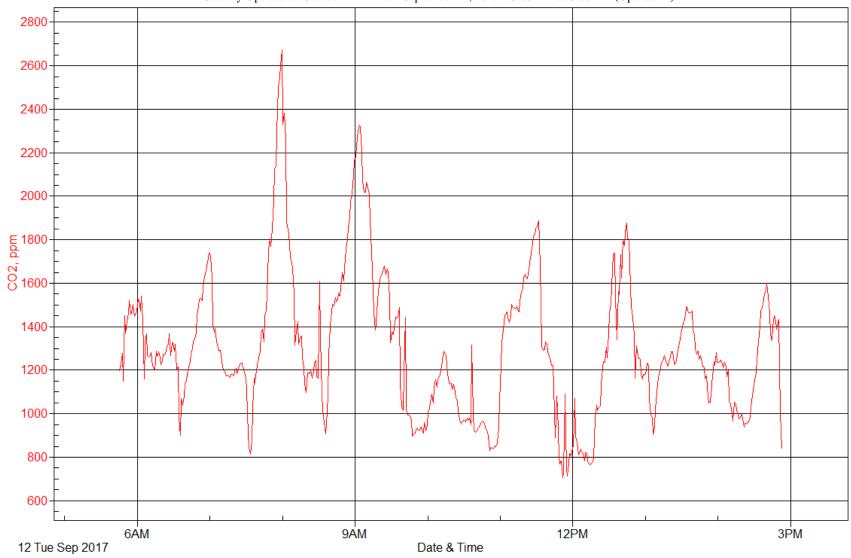
CO₂ Graph
Subway Operators / Guards – YUS Line – September 8, 2017 – 5:00 AM – 2:30 PM (Operator 2)



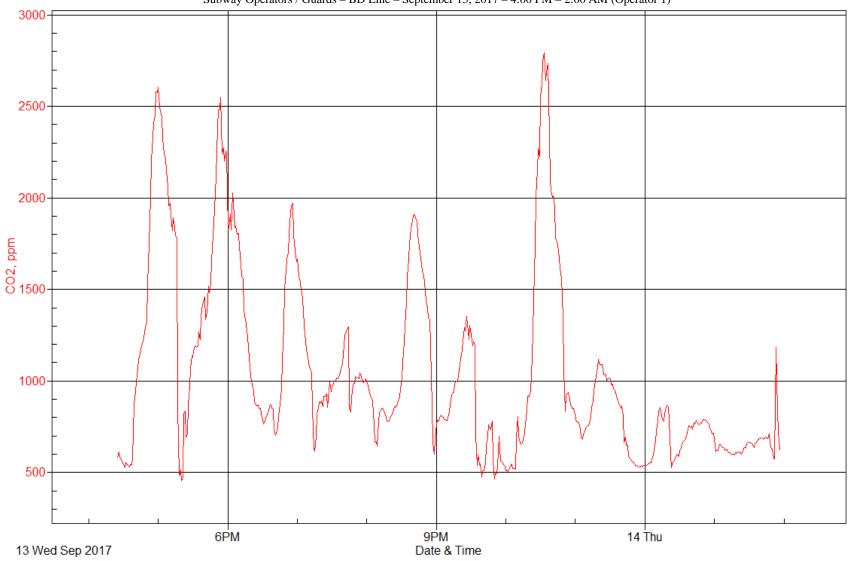
 ${\bf CO_2\,Graph}$ Subway Operators / Guards – BD Line – September 12, 2017 – 5:00 AM to 3:00 PM (Operator 1)



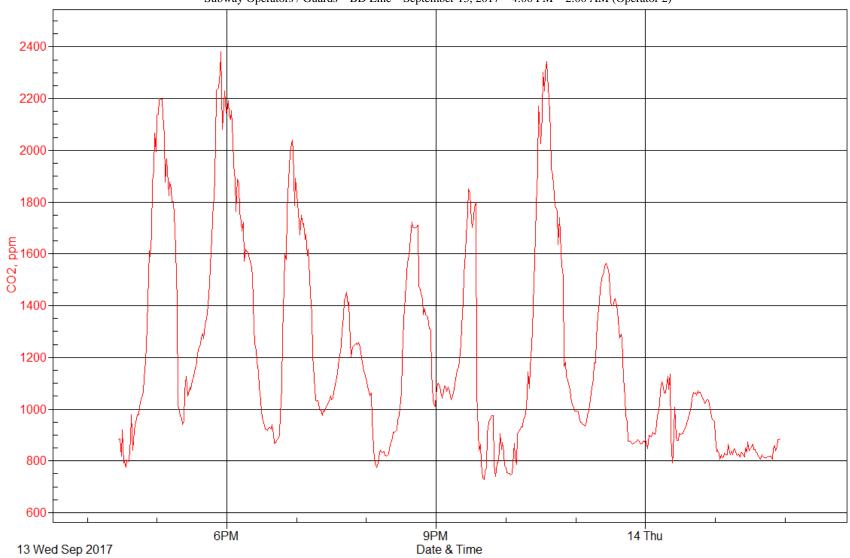
 ${\bf CO_2\,Graph}$ Subway Operators / Guards – BD Line – September 12, 2017 – 5:00 AM to 3:00 PM (Operator 2)



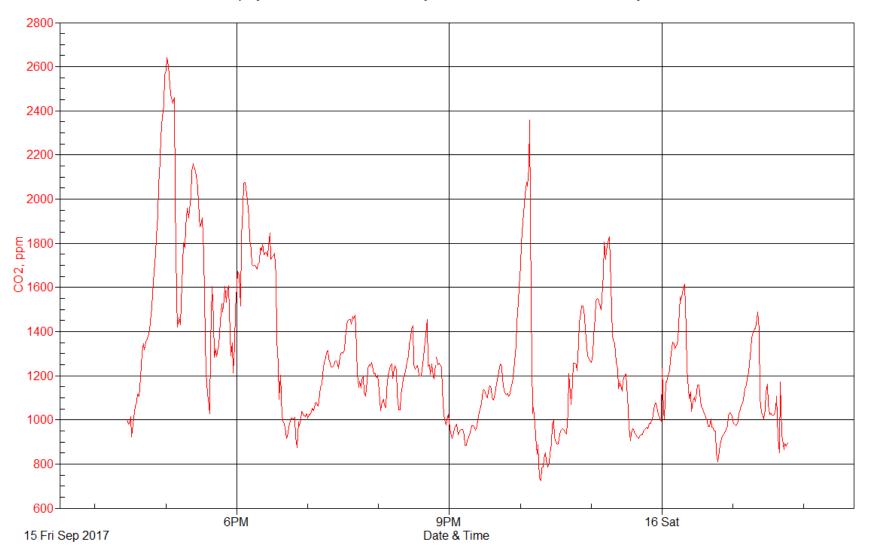
 ${\bf CO_2\,Graph}$ Subway Operators / Guards – BD Line – September 13, 2017 – 4:00 PM – 2:00 AM (Operator 1)



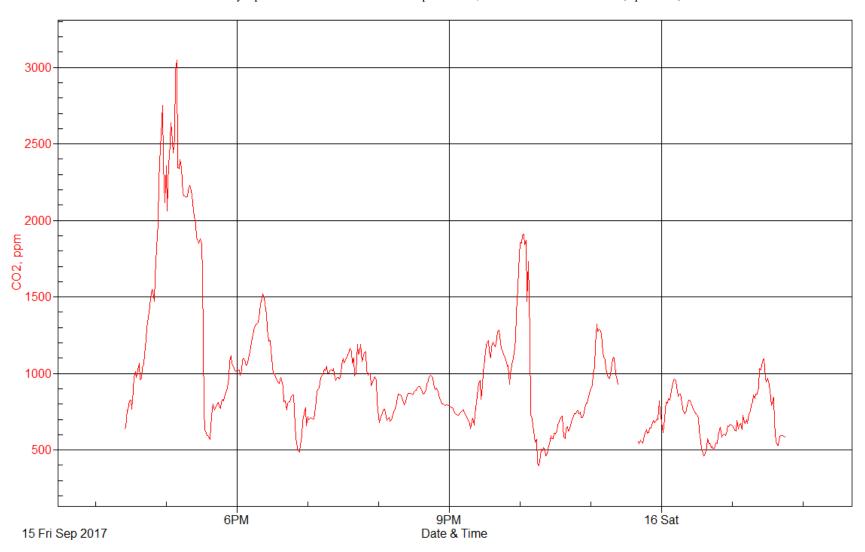
 ${\bf CO_2\,Graph}$ Subway Operators / Guards – BD Line – September 13, 2017 – 4:00 PM – 2:00 AM (Operator 2)



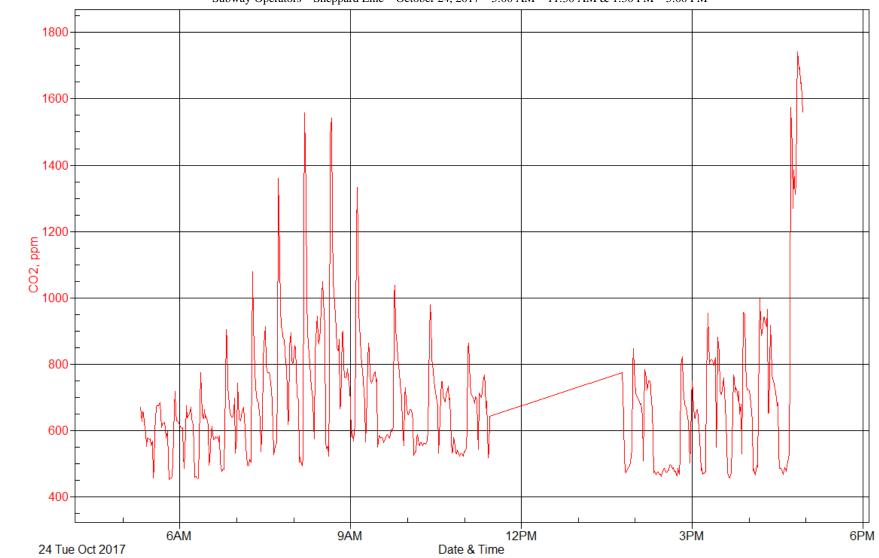
CO₂ Graph
Subway Operators / Guards – YUS Line – September 15, 2017 – 4:00 PM to 2:00 AM (Operator 1)



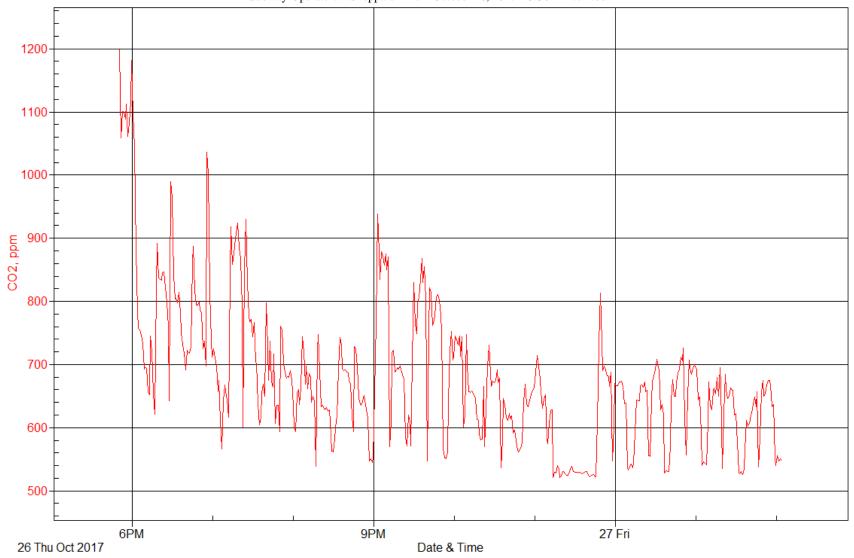
 ${\bf CO_2\,Graph}$ Subway Operators / Guards – YUS Line – September 15, 2017 – 4:00 PM to 2:00 AM (Operator 2)



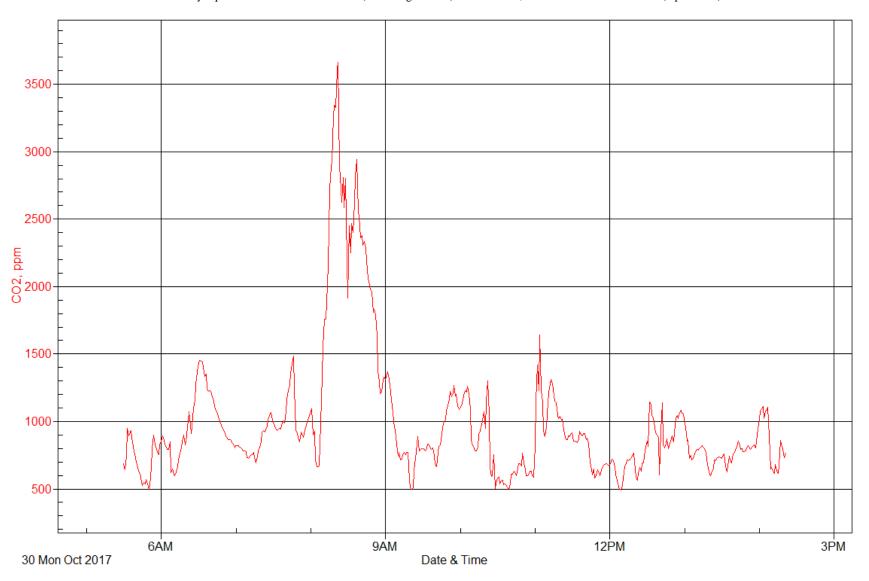
CO₂ GraphSubway Operators – Sheppard Line – October 24, 2017 – 5:00 AM – 11:30 AM & 1:30 PM – 5:00 PM



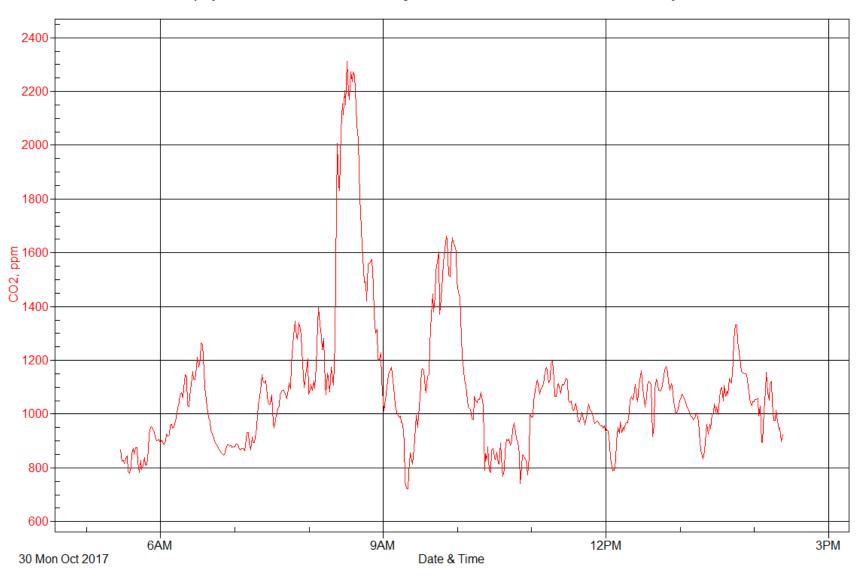
CO₂ Graph
Subway Operators – Sheppard Line – October 26, 2017 – 5:30 PM to 2:00 AM



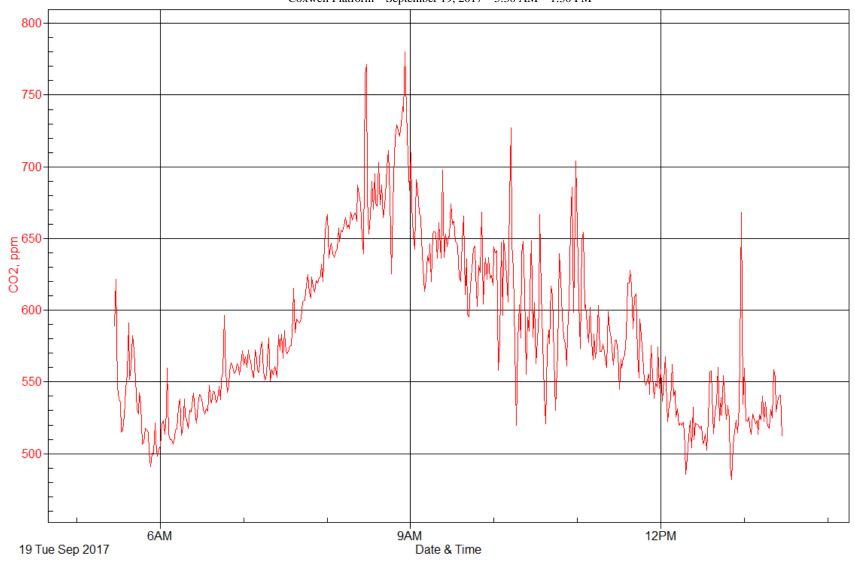
CO₂ Graph
Subway Operators / Guards – YUS Line (following closure) – October 30, 2017 – 5:00 AM – 3:00 PM (Operator 1)

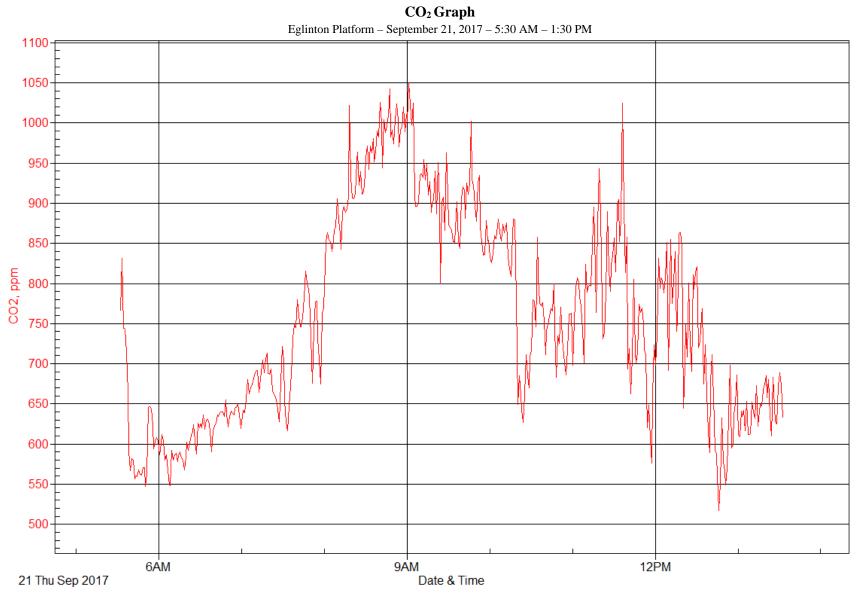


CO₂ Graph
Subway Operators / Guards – YUS Line (following closure) – October 30, 2017 – 5:00 AM – 3:00 PM (Operator 2)

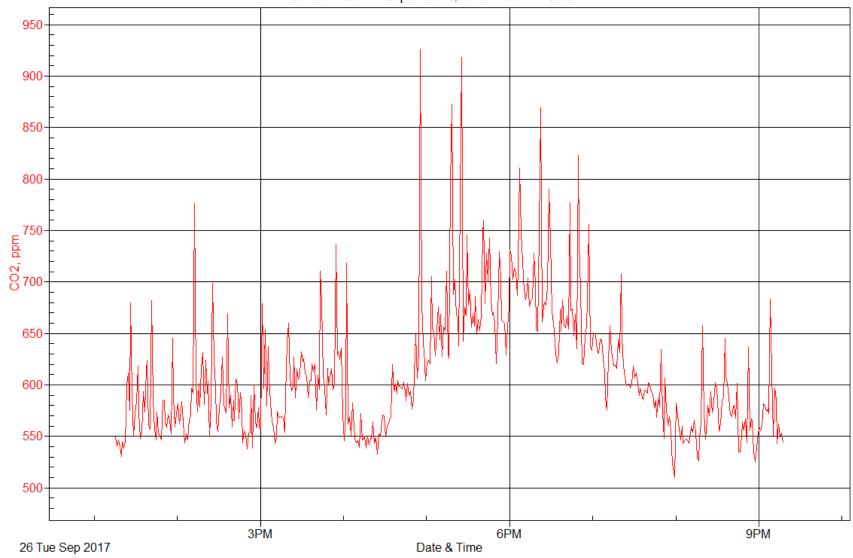


CO₂ Graph
Coxwell Platform – September 19, 2017 – 5:30 AM – 1:30 PM

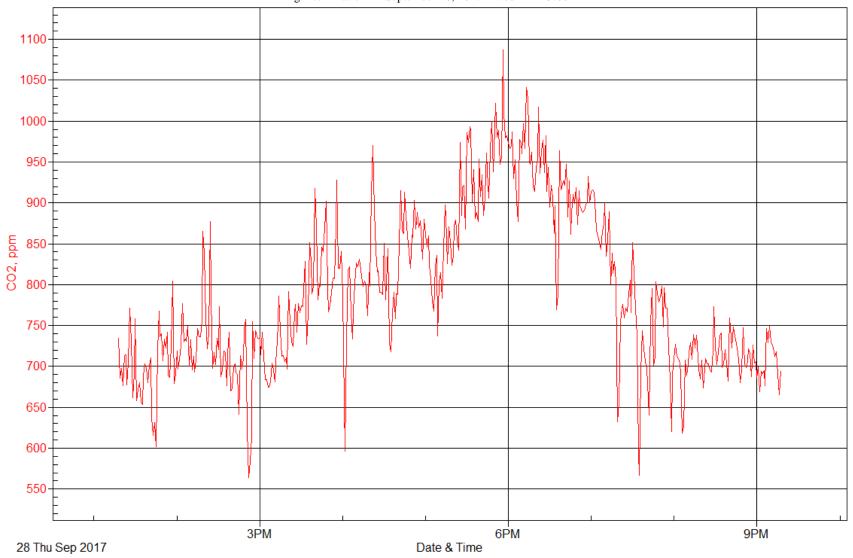




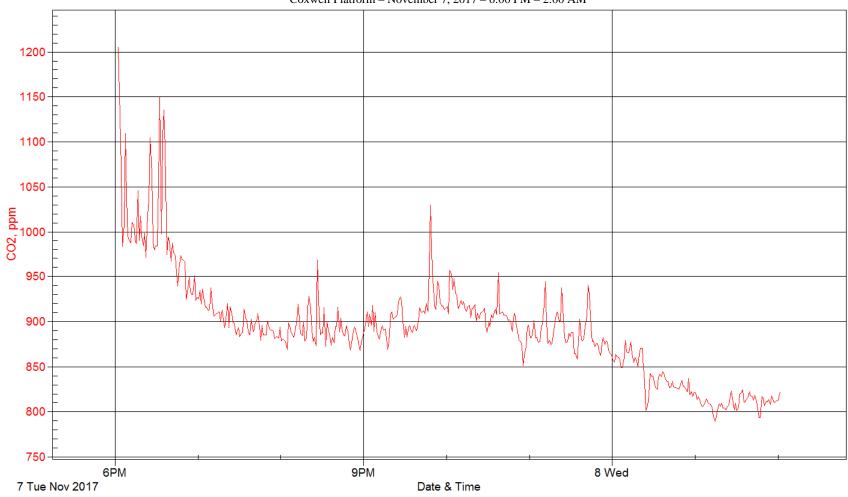
CO₂ Graph
Coxwell Platform – September 26, 2017 – 1:00 PM – 9:00 PM



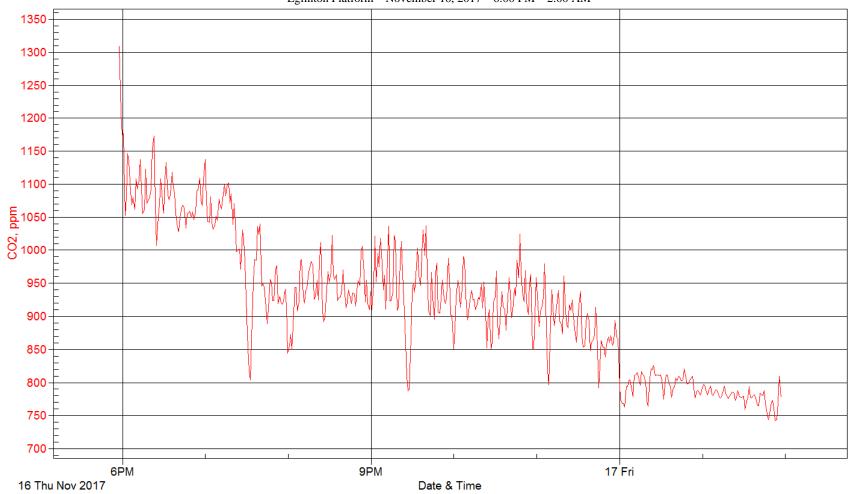
 ${\bf CO_2\,Graph}$ Eglinton Platform – September 28, 2017 – 1:00 PM – 9:00 PM



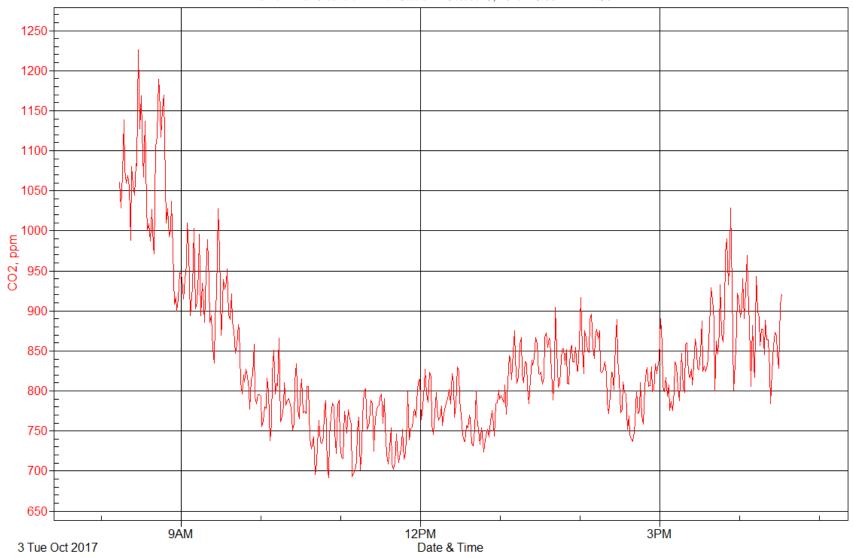
CO₂ Graph
Coxwell Platform – November 7, 2017 – 6:00 PM – 2:00 AM



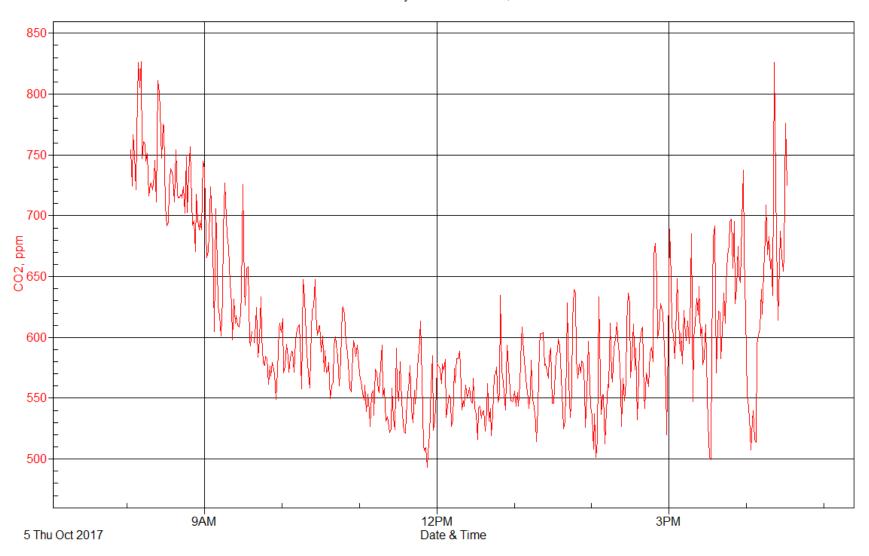
CO₂ Graph
Eglinton Platform – November 16, 2017 – 6:00 PM – 2:00 AM



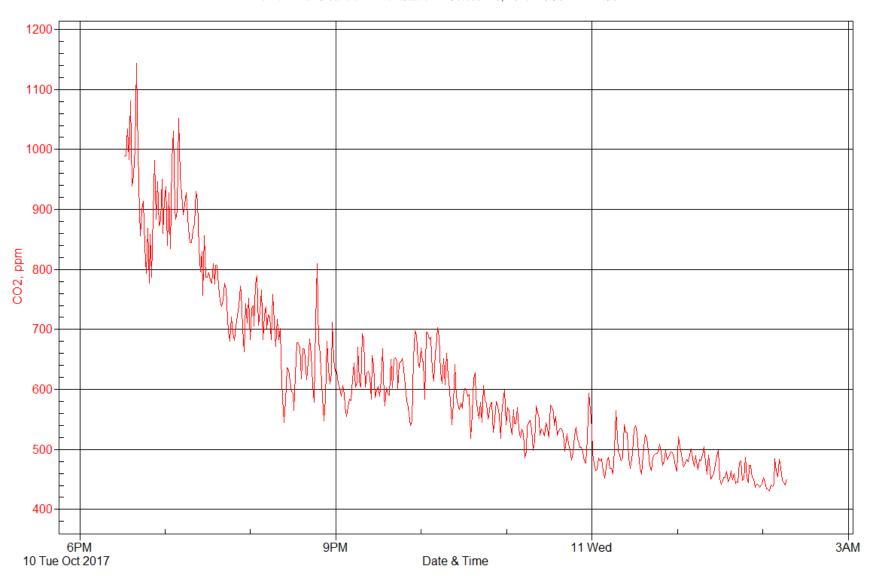
CO₂ GraphEnd Terminal Cleaners – Finch Station – October 3, 2017 – 8:00 AM – 4:30 PM



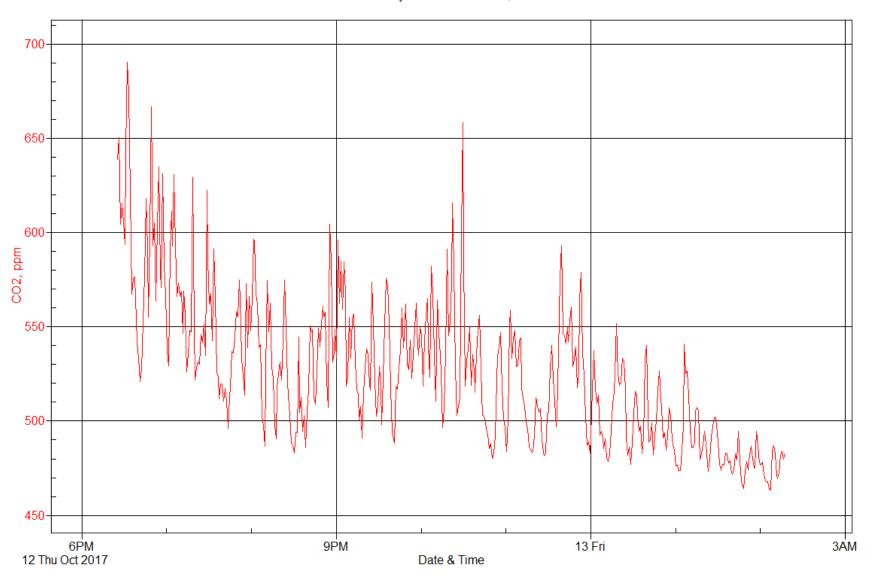
CO₂ Graph
End Terminal Cleaners – Kennedy Station – October 5, 2017 – 8:00 AM – 4:30 PM



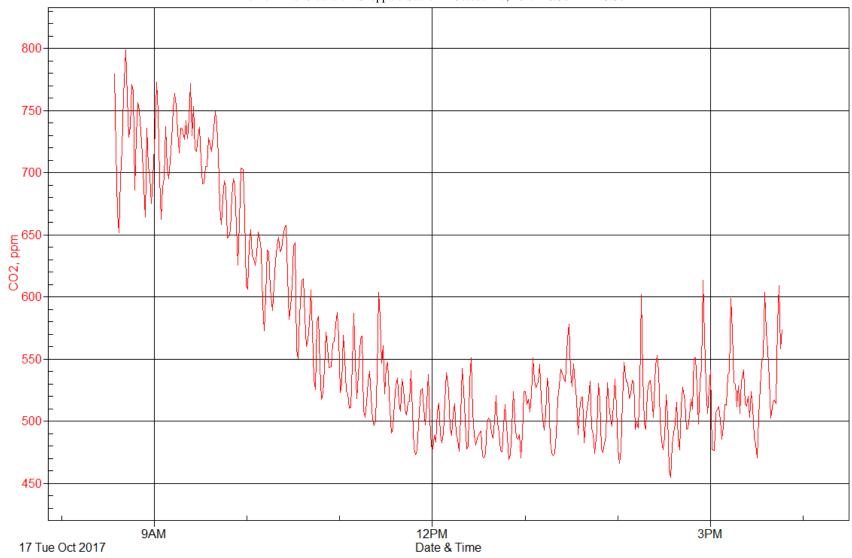
 $\label{eq:co2} \textbf{CO}_2\,\textbf{Graph}$ End Terminal Cleaners – Finch Station – October 10, 2017 – 6:30 PM – 2:30 AM



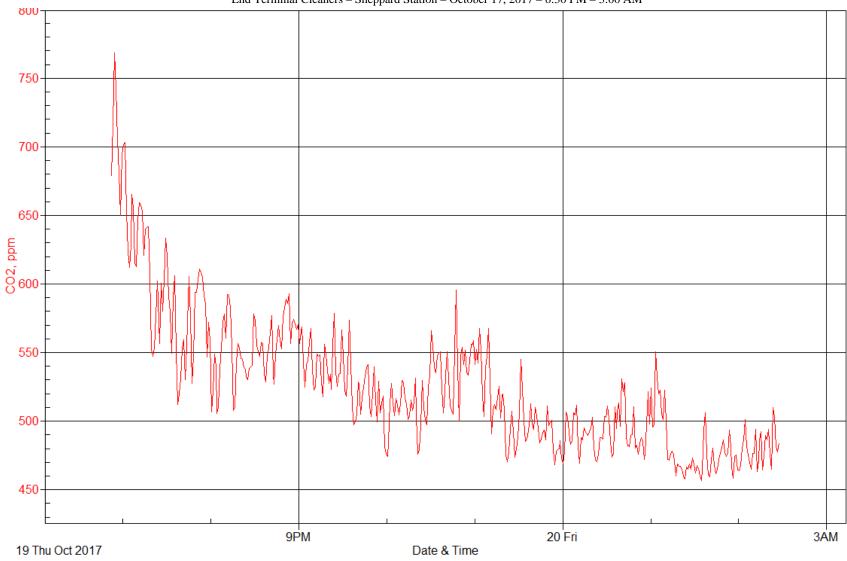
CO₂ Graph
End Terminal Cleaners – Kennedy Station – October 12, 2017 – 6:30 PM – 2:30 AM



CO₂ Graph
End Terminal Cleaners – Sheppard Station – October 17, 2017 – 8:30 AM – 3:30 PM



CO₂ 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.



LABORATORY ANALYSIS REPORT

GALSON

6601 Kirkville Road

East Syracuse, NY 13057

(315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L414980

Project No. : 22152

Date Sampled : 03-AUG-17 Date Analyzed : 14-AUG-17 - 15-AUG-17

Date Received : 09-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

<u>Parameter</u>	LOQ <u>uq</u>	Total uq	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

Collection Media: Date :	MCE UW 37mm 15-AUG-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: MLN
<pre></pre>	mg -Milligrams	m3 1	-Cubic Meters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOO-Limit of Ouantitation



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LABORATORY ANALYSIS REPORT

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East Syracuse, NY 13057

East Syracuse, NY 13057 (315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L414980

Project No. : 22152

Date Sampled : 03-AUG-17 Date Analyzed : 14-AUG-17 - 15-AUG-17

Date Received : 09-AUG-17 Report ID : 1012859

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		<u> </u>
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

Collection Media:	MCE UW 37mm 15-AUG-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: MLN
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1	- 1	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L414980

Project No. : 22152

Date Sampled : 03-AUG-17 Date Analyzed : 14-AUG-17 - 15-AUG-17

Date Received : 09-AUG-17 Report ID : 1012859

Date Sampled: 08/03/17 Date Analyzed: 08/15/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	uq	ug		
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

Collection Media	: MCE UW 37mm : 15-AUG-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG Q0	C by: MLN
<pre></pre>	mg -Milligrams ug -Micrograms	m3 1		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



6601 Kirkville Road

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LABORATORY ANALYSIS REPORT

GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L414980

East Syracuse, NY 13057 Project No. : 22152

Date Sampled : 03-AUG-17 Date Analyzed : 14-AUG-17 - 15-AUG-17

FAX: (315) 437-0571 Date Received : 09-AUG-17 Report ID : 1012859

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	uq		
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

	llection Media: te :	MCE UW 37mm 15-AUG-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG Q0	C by: MLN
<	-Less Than	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
>	-Greater Than	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



LABORATORY ANALYSIS REPORT

6601 Kirkville Road East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-0571

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site Login No. : L414980

Project No. : 22152

Date Sampled : 03-AUG-17 Date Analyzed : 14-AUG-17 - 15-AUG-17

Date Received : 09-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

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	IOM 25mm PVC 15-AUG-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: MLN
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L414980 Project No. : 22152

Date Sampled : 03-AUG-17 Date Analyzed : 14-AUG-17 - 15-AUG-17

Date Received : 09-AUG-17 Report ID : 1012858

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	IOM 25mm PVC 15-AUG-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: MLN
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



LABORATORY ANALYSIS REPORT

6601 Kirkville Road
East Syracuse, NY 13057

(315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L414980

Project No. : 22152

Date Sampled : 03-AUG-17 Date Received : 09-AUG-17 Report ID : 1012639

Asbestos Fiber Count (A Rules)

			Fibers/	Fibers/	Fibers/	Air	Fibers/
	Sample ID	<u>Lab ID</u>	<u> Fields</u>	mm2	Filter	Volume (cc)	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 Ouantitation: 5.5 Fibers/ 100 Fields

Microscope field area: 0.00785 mm2 Filter collection area: 385 mm2 Approved by : BDB
Date : 14-AUG-17
OC by: MLN

Submitted by : BTM

Supervisor: BDB

< -Less Than

> -Greater Than

ND -Not Detected

NA -Not Applicable

cc -Cubic Centimeters

NS -Not Specified



LABORATORY ANALYSIS REPORT

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East Syracuse, NY 13057 (315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L414980

Project No. : 22152

Date Sampled : 03-AUG-17 Date Received : 09-AUG-17 Report ID : 1012940

Inhalable Dust

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

 $\underline{\mathtt{COMMENTS:}}$ 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 : KRK

OSHA PEL : NA Date : 15-AUG-17 NYS DOH # : 11626

Collection Media : IOM 25mm PVC 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 FOOTNOTE REPORT

GALSON

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

This document is issued by the Company under its General Conditions of Service accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained herein reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

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 preceding 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.

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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)

 ${\tt Reported \ Magnesium \ Oxide(MgO) \ results \ assume \ that \ all \ detected \ Magnesium \ is \ present \ as \ Magnesium \ Oxide.}$

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



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):

6601 Kirkville Road

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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.

PEL

Parameter	Accuracy	Mean Recovery
		1000
Magnesium Oxide	+/-9.1%	102%
Molybdenum	+/-10.3%	99.4%
Nickel	+/-10%	103%
Thallium	+/-6.6%	99.5%
Vanadium Pentoxide	+/-9.1%	102%

Method

Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I 15 mg/m3 (Total Part.)TW
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):

Parameter

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 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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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	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable





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Date Sampled: 03-AUG-17 Account No.: 90734
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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	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable



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LABORATORY FOOTNOTE REPORT

GALSON

Client Name : Toronto Transit Commission Ltd.

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 -Greater Than mg -Milligrams

ug -Micrograms

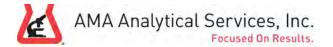
m3 -Cubic Meters -Liters

kg -Kilograms NS -Not Specified

ppm -Parts per Million

ND -Not Detected

NA -Not Applicable



CERTIFICATE OF ANALYSIS

Date Submitted: 09/11/2017

Date Analyzed: 09/18/2017

08/03/2017

Report Date: 09/18/2017

Person Submitting: Zach King

Date Sampled:

Lab Code 101143-0

NY ELAP

Lab ID 10920

Chain of Custody: 284173

Address:

Client: Galson Laboratories

East Syracuse, NY 13057-9672

6601 Kirkville Road

Attention: Pam Weaver

ver

Summary of Transmission Electron Microscopy

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

Not Provided

Job Location: Not Provided

Job Number: L414980

P.O. Number: 90734

Job Name:

AMA Sample Number	Client Sample Number	Volume (L)	Area Analyzed (mm²)	Analytical Sensitivity f/cc	Asbestos Type Amount	# Non Asbestos Structures	Conce	entration Frac	tion 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.

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

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a mutual protection to clients, the public, and these Laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from us. Sample types, locations, and collection protocols are based upon the information provided by the persons submitting them and, unless collected by personnel of these Laboratories, we expressly disclaim any knowledge and liability for the accuracy and completeness of this information. Residual sample material will be discarded in accordance with the appropriate regulatory guidelines, unless otherwise requested by the client. This report must not be used to claim, and does not imply product certification, approval, or endorsement by NY ELAP or any agency of the Federal Government. All rights reserved. AMA Analytical Services, Inc.

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

AMA Analytical Services, Inc.

Focused on Results www.amalab.com AIHA-LAP (#100470) NVLAP (#101143-0) NY ELAP (10920)

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires)

284173

4475 Forbes Blvd. • Lanham, MD 20706 (301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643 Mailing/Billing Information: Galson **Submittal Information:** 1. Client Name: ____ 1. Job Name: 2. Job Location: 2. Address 1: 5. Phone #: ______ 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. NORMAL BUSINESS HOURS REPORT TO: AFTER HOURS (must be pre-scheduled) 4 Hours 3 Day 5 Day + 9 18 17 4 Hours Results Required By Noon ☐ Email: ☐ Same Day ☐ Immediate Date Due: _____ ☐ Next Day ☐ Email 2: ☐ 24 Hours Time Due: 2 Day ☐ Verbals: Comments:___ Asbestos Analysis Metals Analysis TEM Bulk *PCM Air - Please Indicate Filter Type: _ ☐ Pb Paint Chip _____(QTY) ☐ ELAP 198.4/Chatfield _____(QTY) □ NIOSH 7400 (OTY) □ *Pb Dust Wipe (wipe type_____)___(QTY) ☐ NY State PLM/TEM _____(QTY) ☐ Fiberglass _____(QTY) □ *Pb Air (OTY) Residual Ash (OTY) TEM Air* - Please Indicate Filter Type: ☐ Pb Soil/Solid _____(QTY) TEM Dust* AHERA (QTY) ☐ Pb TCLP _(OTY) Qual. (pres/abs) Vacuum/Dust____(QTY) NIOSH 7402 (QTY) \square Drinking Water \square Pb____(QTY) \square Cu___(QTY) \square As___(QTY) ☐ Quan. (s/area) Vacuum D5755-95_____(QTY) Other (specify_____ (OTY) \square Waste Water \square Pb____(QTY) \square Cu___(QTY) \square As___(QTY) ☐ Quan. (s/area)Dust D6480-99____(QTY) PLM Bulk ☐ Pb Furnace (Media ______) _____(QTY) TEM Water _ (QTY) D Pos Stop ☐ EPA 600 – Visual Estimate **Fungal Analysis** ☐ Qual. (pres/abs)______(QTY) ☐ ELAP 198.2/EPA 100.2_____(QTY) ☐ EPA Point Count _____(OTY) Collection Apparatus for Spore Traps/Air Samples: ☐ NY State Friable 198.1 (OTY) □ EPA 100.1_____(OTY) Collection Media_____ ☐ Grav. Reduction ELAP 198.6 _____(QTY) □ *Spore-Trap____(QTY) □ Surface Vacuum Dust (OTY) Other (specify_____)___ All samples received in good condition unless otherwise noted. □ *Surface Swab____(QTY) □ Culturable ID Genus (Media____)__(QTY) MISC (TEM Water samples_____°C) □ *Surface Tape_____(QTY) □ Culturable ID Species (Media____) (QTY) ☐ Vermiculite Other (Specify____)___(QTY ☐ Asbestos Soil PLM_(Qual) PLM_(Quan) PLM/TEM_(Qual) PLM/TEM_(Quan) 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 CONTACT SAMPLE INFORMATION DATE/ VOL (L)/ CLIENT ID# SAMPLE LOCATION/ ID TIME Wipe Area (LABORATORY STAFF ONLY) Date/Time: Contact:By: Date/Time: Contact:By: Date/Time: Contact:By:

Print Name Signature Time **Shipping Information** LUPS ☐ In-Person Relinquished by: Page 17 of 20 Report Reference: 2 Generated: 19-SEP-17 13:01 FedEx Drop Box Received by: USPS ☐ Courrier Relinquished by: Airbill/Tracking No: Received for Lab by:

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LABORAT	ORIES	New Client ? yes			6601 Kirkv		J	6601 Kirkv	
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888-432-LABS(5227) Fax: 315-437-0571)						Fax No.	315-43	7-0571
www.galsonlabs.com		Site Name :				Project :	L414980	Sampled By :	Client
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Received by LAB:									

											
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Need Results By*:	(surcharge)	1	Sampl	es submitted using th	e FreePumpLoa	reePumpLoan™ Program.					
Standard	0%	Site Nar	ne :			Project :	22152		Sampled By : OHE Co	nsultants	
4 Business Days	35%	Comme									
3 Business Days	50%	Tion !	for Metal Analysis, please see attached document regarding metals to be analyzed for each fraction.								
2 Business Days	75%										
Next Day by 6pm	100%	_1	•	of industry or pro	cess/interfer	ences	State samples were collected in (ex. NY):		ate which OEL this data		
Next Day by Noon	150%	present	ın samp	iling area:			Concord in (cx. 141).	OSHA PEL	<u> </u>	Cal OSHA	
Same Day Sample Identi	200%	+		<u> </u>	Sample Volume,	Sample Units*:		MSHA	Other (spedfy):	Hexavalent Chromium	
(Maximum of 20 characters, i characters will be ab	ID's longer than 20	1	ampled* dd/yy)	Collection Medium	or Sample Time.)	(L)ml, min., in2, cm2, ft2	Analysis Requ	ested*	Method Reference [^]	Process (ex. wetting, plating, painting, etc.)*	
Examp			1/11	2pc UW PVC	(Min) 960	L	Hexavalent Chrom	nium (Cr6)	mod. OSHA ID-215	Welding	
22152 - A1		08/0	3/17	 	637	636.5	Asbestos		NIOSH 7400 +71	102 dient	
22152 - A2				25mm PCM	Ø	Ø	Asbestes		OOPF HOOZU	ZK 9/8/17	
22152 - 51				PW PVC in PPI	639	1281.5	Crystalline Silico	(allforms)	H OOZE HZOIN	NEOSH 0600	
22152 - S2				PAU PUC IN PEI	Ø	ø	Crystalline silica	•	NIOSH 7500 +	NIOSH 0600	
22 52 - II				PW PVC in IOM	633	1270.9.	Metals (Inhal		N707H 4300 +	Inhalable Pust NIOSH 0500	
22152 - I2				PW PVC in IOM	Ø	Ø	Metals (Inhale	able)	NIOSH 7300 +	Inhalable Dust NIOSH OSOO	
22/52 - MI				UW MCE in PPI	422	1261.7	Metals (Respi	rable)	NIOSH 7300		
22152 - M2	· · · -			UW MCE INPPI		ø	Metals (Respir	able)	NIOSH 7300		
22152 - TI				UW MCE	639	1262.5	Metals (Tota	()	NIOSH 7300		
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							listed on the COC un			thod(s) listed on COC	
							s required (only available	for certain ana	lytes see SAG):		
For crystalline silica: f							mite)*:			1 5	
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Relinquished by:	Yunny Pe	siana L	<u>ee</u>		Aug E/17			ma-can	-/ // Y	9817 4:0p	
Relinquished by:	Huma	بكادين	1/2/1	2==(1) =		Goffe.	Received by: M-	Y (ou >	Microsis	8/9/17 0953	
*Requir	Samp ed fields, failui	ies receiv e to comi	rea arter plete the	3pm will be consi Page 19 of 20 se fields may resu	Report Refe	rence:2 Ge in your samp	ness. nerated:19-SEP-17.1 nes being processed.1	3:01	Page 1	of <u>1</u>	

* Inhalable - MgO, Mo, NI, TL, V205

Resp- Al, Cd, Fe20, Ho, 2n0

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

per dient &



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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GALSON

LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd Account No.: 90734

6601 Kirkville Road Site : NS Login No. : L416116 East Syracuse, NY 13057 Project No. : 22152

(315) 432-5227 Date Sampled : 11-AUG-17 Date Analyzed : 24-AUG-17 FAX: (315) 437-0571 Date Received : 19-AUG-17 Report ID : 1014950

LOQ Total Conc Units Parameter uq Aluminum 7.5 <7.5 <0.0061 mq/m3Cadmium 0.15 <0.15 <0.00012 mg/m3

 Cadmium
 0.15
 <0.15</td>
 <0.00012</td>
 mg/m3

 Iron Oxide
 11.
 91
 0.074
 mg/m3

 Molybdenum
 0.15
 <0.15</td>
 <0.00012</td>
 mg/m3

 Zinc Oxide
 2.8
 <2.8</td>
 <0.0023</td>
 mg/m3

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

Collection Media: MCE UW 37mm Submitted by: SJW Approved by: JJL : 25-AUG-17 NYS DOH # : 11626 Supervisor: KEG Date QC by: NDC < -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected ug -Micrograms -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation > -Greater Than



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Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L416116

Project No. : 22152

Date Sampled : 11-AUG-17 Date Received : 19-AUG-17 Report ID : 1014950

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>	-	
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

Collection Media: Date :	MCE UW 37mm 25-AUG-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: NDC
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1	- 1	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L416116

Project No. : 22152

Date Sampled : 11-AUG-17 Date Received : 19-AUG-17 Report ID : 1014950

LOO Total Conc Units <u>Parameter</u> uq uq Antimony 0.90 <0.90 <0.00073 mq/m30.30 <0.30 Arsenic <0.00024 mq/m3Barium 0.15 5.0 0.0041 mg/m3<0.15 Bervllium 0.15 <0.00012 mq/m3Cadmium 0.15 <0.15 <0.00012 mq/m3Calcium Oxide 100. <100 <0.086 mq/m3Chromium 7.5 <0.0061 <7.5 mq/m3Cobalt 0.45 <0.45 < 0.00037 mq/m30.30 0.43 Copper 0.00035 mq/m3Lead 0.38 <0.38 < 0.00031 mq/m3Manganese 0.15 0.85 0.00070 mq/m3Selenium 2.3 < 2.3 <0.0018 mq/m3

Collection Media	MCE UW 37mm 25-AUG-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: NDC
<pre>Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



Client : Toronto Transit Commission Ltd Account No.: 90734 6601 Kirkville Road Site

Login No. : L416116

East Syracuse, NY 13057 Project No. : 22152 (315) 432-5227

Date Sampled : 11-AUG-17 Date Analyzed : 24-AUG-17 Date Received : 19-AUG-17 Report ID : 1014950

FAX: (315) 437-0571 www.galsonlabs.com

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

	LOQ	Total	Conc	Units
<u>Parameter</u>	uq	uq	·	
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

Collection Med:	a: MCE UW 37mm : 25-AUG-17	Submitted by NYS DOH #		Approved by: JJL Supervisor: KEG QC	C by: NDC
<pre></pre>	mg -Milligrams nn ug -Micrograms		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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0.80

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Vanadium Pentoxide

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<0.00065

mq/m3

Project No. : 22152

Date Sampled : 11-AUG-17 Date Received : 19-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

LOO Total Conc Units <u>Parameter</u> ug ug Magnesium Oxide 12. <12 <0.010 mq/m3Molybdenum 0.15 <0.15 <0.00012 mq/m3Nickel 0.30 <0.30 <0.00024 mg/m3Thallium <1.5 1.5 <0.0012 mg/m3

<0.80

Collection Media	: IOM 25mm PVC : 25-AUG-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: NDC
<pre></pre>	mg -Milligrams ug -Micrograms	m3 1		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L416116

Site : NS
Project No. : 22152

Date Sampled : 11-AUG-17 Date Analyzed : 24-AUG-17

Date Received : 19-AUG-17 Report ID : 1014949

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	IOM 25mm PVC 25-AUG-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: NDC
<pre>-Less Than > -Greater Than</pre>	5	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Login No. : L416116 Site

Project No. : 22152

Date Sampled : 11-AUG-17 Date Analyzed : 23-AUG-17

Date Received : 19-AUG-17 Report ID : 1014432

Asbestos Fiber Count (A Rules)

			Fibers/	Fibers/	Fibers/	Air	Fibers/
	<u>Sample ID</u>	<u>Lab ID</u>	Fields	mm2	Filter	Volume (cc)	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 Ouantitation : 5.5 Fibers/ 100 Fields

Microscope field area : 0.00785 mm2 Filter collection area: 385 mm2

Approved by : BDB Date: 25-AUG-17

Submitted by : BTM

OC by: NDC Supervisor: BDB

< -Less Than

> -Greater Than

ND -Not Detected

NA -Not Applicable

cc -Cubic Centimeters

NS -Not Specified



LABORATORY ANALYSIS REPORT

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Project No. : 22152

Date Sampled : 11-AUG-17 Date Received : 19-AUG-17 Report ID : 1013988

Inhalable Dust

Sample ID	Lab ID _	Air Vol <u>liter</u>	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 Submitted by: NRH

Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV Approved by : KRK

OSHA PEL : NA Date : 22-AUG-17 NYS DOH # : 11626

Collection Media : IOM 25mm PVC 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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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L416116

Project No. : 22152

Date Sampled : 11-AUG-17 Date Received : 19-AUG-17 Report ID : 1013989

Respirable Dust

Sample ID	<u>Lab ID</u>	Air Vol liter	Total mq	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 Approved by : KRK

OSHA PEL : PNOR 5 mg/m3 (TWA) Date : 23-AUG-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected

Submitted by: HVN

> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million



LABORATORY ANALYSIS REPORT

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(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L416116

Project No. : 22152

Date Sampled : 11-AUG-17 Date Analyzed : 22-AUG-17 - 24-AUG-17

Date Received : 19-AUG-17 Report ID : 1014742

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

			Air Vol		
Sample ID	<u>Lab ID</u>	<u>Analyte</u>	1	uq	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

Submitted: CMR

Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD Approved: KRK

OSHA PEL : 50 ug/m3 RCS Date : 25-AUG-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: NDC

NA -Not Applicable ND -Not Detected l -Liters mppcf -Million Particles per Cubic Foot



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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

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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 preceding 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/m3i Molybdenum and insoluble

compounds, as Mo (total dust) = 15 mg/m3.

Reported Vanadium Pentoxide (V205) 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 > -Greater Than mg -Milligrams ug -Micrograms

m3 -Cubic Meters 1 -Liters kg -Kilograms NS -Not Specified ppm -Parts per Million ND -Not Detected

NA -Not Applicable



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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.

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.

DET

Parameter	Accuracy	Mean Recovery
Manusarium Ossida	. / 0 28	99.2%
Magnesium Oxide	+/-9.2%	
Molybdenum	+/-7.6%	100%
Nickel	+/-8%	101%
Thallium	+/-7.9%	101%
Vanadium Pentoxide	+/-6.5%	100%

Mothod

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):

Damamatan

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
_	-Creater Than	ua -Miaroarama	1	-Titora	MC -Not Croaified	ND -Not Dotogtod

NA -Not Applicable ug -Micrograms NS -Not Specified



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LABORATORY FOOTNOTE REPORT

GALSON

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
                 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 LOO 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.
```

> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable
--



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LABORATORY FOOTNOTE REPORT

GALSON

Client Name : Toronto Transit Commission Ltd.

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 NIOCH 7200	/mod. OSHA ID-125G; ICF	/T 1E ma/m2 /mua)	
Antimony		/mod. OSHA ID-125G; ICF		
Antimony Arsenic		/mod. OSHA ID-125G; ICF /mod. OSHA ID-125G; ICF		
Barium		/mod. OSHA ID-125G; ICF		\ (TILIA \
Beryllium		/mod. OSHA ID-125G; ICF) (IWA)
Cadmium		/mod. OSHA ID-125G; ICF		
Calcium Oxide		/mod. OSHA ID-125G; ICF /mod. OSHA ID-125G; ICF		
Calcium Oxide	mod. NIOSH /300	/ MOG. USHA ID-125G/ ICE	/1 5 mg/ms (TWA)	
		13		
mg -Milligrams nan ug -Micrograms	m3 -Cubic Meters kg l -Liters NS	-Kilograms ppm	-Parts per Million	



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LABORATORY FOOTNOTE REPORT

GALSON

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
	1	5000/			
Chromium				- ,	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)
t ID: 1014432):					
			_		
The sample results may have a negat	ive bias; the filt	ter surfac	e was covered	by	
fine particulate that may have obsc	ured fibers.				

+L416116-1 (Report ID: 1014432)

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

ollows:

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



FAX: (315) 437-0571

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East Syracuse, NY 13057 (315) 432-5227

LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.

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

000		□New	Client?	Report To*:	Toronto	Transit G	mmission	[nvoice To* :	Ton	onto Transit	Commission
	CVICUM			•	1920 Y	once Street	-				o Yonge Stree	
1Z5X626A6948184439 Date:08/19/17	ì	Client /	Account	No.*:	Suite 60	b				Sut	2 600	
Shipper:UPS	1			_	Toronto,	24M 40	3E2_	*	()	Toron		ક 3€2
Initials:CEM	10 10 11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	`		Phone No.*:	46-393	3-6668			Phone No. :			
iii	(MOON STAN 1 MM			Cell No. :		·			Email:			
•	1	Em	nail Resu	its To : <u>Virgal . Ur</u>	nali Ottc.	ca 2 oheres	rutts@ohecone	rultants a	n Purchas	e Order	No.: PU 24	0835
	<u> </u>		mail Add			·					•	all for Credit Card Info
Need Results By*:	(surcharge)		Samp	les submitted using th	e FreePumpLoa	an [™] Program.			Samples submit	ted using	the FreeSamplingBa	idges™ Program.
Standard	0%	Site Nar	ne :			Project :	22152			Sample	d By: OHE	Consultants
4 Business Days	35%	Comme	ents:									3/1/4
3 Business Days	50%											
2 Business Days	75%	<u> </u>					T					
Next Day by 6pm	100%		_	of industry or pro pling area:	cess/interfer	ences	State samples collected in (ex				h OEL this data	
Next Day by Noon	150%	present	iii saiii	ning area.			Conected in (ex		OSHA PEL		ACGIH TLV	Cal OSHA
Same Day Sample Identi	200% ication*	+			Sample Volume,	Sample Units*:	-		MSHA	_	Other (specify):	Hexavalent Chromium
(Maximum of 20 characters, i characters will be abl	D's longar than 20		ampled* dd/yy)	Collection Medium	Sample Time or Sample Area	L)mi, min., in2, cm2, ft2	Analysi	is Reque	sted*	Meth	od Reference^	Process (ex. welding, plating, painting, painting, etc.)*
Examp	le	01/0)1/11	2pc UW PVC	960	L	Hexavalen	t Chromi	um (Cr6)	mod.	OSHA ID-215	Welding
22152 - A3		08/11	1/17	25mm PCM	615	621.2	Asbestos			NICH	-7400	
22152 - A4			1	25mm PCM	D	Ø	Abestos		-	MOIN		
22152-53		<u>'</u>		PW PVC in PPI	615	1217.9	Crystalline	Silica (all forms)	HLOIN	7500 + Resp.	Pust 10101H 0600
22152 - 54				PW PVC in PPI	Ø	Ø	Crystalline					Pust NIOSH 0600
22/52 - I3				PWPycinIOM	617	1231.4	Metals (alable Dust	
22152 - I4				PW PVC in IOM	Ø	Ø		Inhala	_ 1			He Dust NIOH OX
22152 - M3			<u> </u>	UW MCE IN PPI	615	1225.4	Metals ((Respira	able)	NON		
22152-M4				UW MCE in PPI	Ø	Ø	Metals (Respiral	ble)			
22122 - T3				UW MCE	615	1224.6	Metals (Total)				
22152 - TY		,	<u> </u>	4W MCE	Ø	Ø	Metals (Total)		1	/	
^Galson Laboratories	will substitute	our routi	ne/prefe	rred method if it de	oes not matc	h the method	l listed on the C	COC unle	ss this box i	s checke	ed: Use met	hod(s) listed on COC
For metals analysis: if red	questing an ana	yte with th	e option (of a lower LOQ pleas	e indicate if th	e lower LOQ i	s required (only a	available fo	or certain anal	ytes see	SAG):	
For crystalline silica: for					Cristobalite,	and/or Tridy	mite)*:					
Chain of Custody		Print Nam		ture		/Time			Print Na	me/Sign	ature	Date/Time
Relinquished by:	Yunny De	iana L	ee 7	9	Aug 15/17	- 4:00 PM	Received by:					
Relinquished by :		_					Received by:	Canda	ce Mass	<u>urin (</u>	Massuri	08-19-17 11:4K
CA *Require				3 ฏageill മെ ട്ർമsi se fields may resu			nessated:25-AU(G-17 14:′	11		Page <u>1</u>	of 1

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 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.



GALSON

6601 Kirkville Road

East Syracuse, NY 13057

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FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L416114

Project No. : 22152

Date Sampled : 14-AUG-17 Date Received : 19-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

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	MCE UW 37mm 25-AUG-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG Q	C by: NDC
< -Less Than > -Greater Than	mg -Milligrams ug -Micrograms	m3 1		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L416114

East Syracuse, NY 13057 Project No. : 22152

(315) 432-5227 Date Sampled : 14-AUG-17 Date Analyzed : 24-AUG-17 FAX: (315) 437-0571 Date Received : 19-AUG-17 Report ID : 1014948

<u>Parameter</u>	LOQ uq	Total uq	Conc	Units
Aluminum	7.5	<7.5	NA	mg/m3
Cadmium	0.15	<0.15	NA 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

Collection Media: Date :	MCE UW 37mm 25-AUG-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: NDC
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1	- 1	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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(315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L416114

Project No. : 22152

Date Sampled : 14-AUG-17 Date Received : 19-AUG-17 Report ID : 1014948

	LOQ	Total	Conc	Units
<u>Parameter</u>	uq	<u>uq</u>		
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

Collection Media: Date :	MCE UW 37mm 25-AUG-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: NDC
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1	- 1	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Site

Login No. : L416114

Project No. : 22152

Date Sampled : 14-AUG-17 Date Analyzed : 24-AUG-17 Date Received : 19-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

LOQ	Total	Conc	Units
<u>uq</u>	<u>uq</u>		
0.90	<0.90	NA	mg/m3
0.30	<0.30	NA	mg/m3
0.15	<0.15	NA	mg/m3
0.15	<0.15	NA	mg/m3
0.15	<0.15	NA	mg/m3
100.	<100	NA	mg/m3
7.5	<7.5	NA	mg/m3
0.45	<0.45	NA	mg/m3
0.30	<0.30	NA	mg/m3
0.38	<0.38	NA	mg/m3
0.15	<0.15	NA	mg/m3
2.3	<2.3	NA	mg/m3
	0.90 0.30 0.15 0.15 0.15 100. 7.5 0.45 0.30 0.38 0.15	uq uq 0.90 <0.90	uq uq 0.90 <0.90

Collection Med:	a: MCE UW 37mm : 25-AUG-17	Submitted by NYS DOH #		Approved by: JJL Supervisor: KEG QC	C by: NDC
<pre></pre>	mg -Milligrams nn ug -Micrograms		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



6601 Kirkville Road East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L416114

Project No. : 22152

Date Sampled : 14-AUG-17 Date Received : 19-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

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	IOM 25mm PVC 25-AUG-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: NDC
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L416114

Project No. : 22152

Date Sampled : 14-AUG-17 Date Received : 19-AUG-17 Report ID : 1014942

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		· ·
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

Collection Media: Date :	IOM 25mm PVC 25-AUG-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: NDC
<pre>-Less Than > -Greater Than</pre>	5	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

UAL30

Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L416114

East Syracuse, NY 13057 Project No. : 22152

(315) 432-5227 Date Sampled : 14-AUG-17 Date Analyzed : 23-AUG-17 FAX: (315) 437-0571 Date Received : 19-AUG-17 Report ID : 1014431

Asbestos Fiber Count (A Rules)

			Fibers/	Fibers/	Fibers/	Alr	Fibers/
	<u>Sample ID</u>	<u>Lab ID</u>	<u> Fields</u>	mm2	Filter	Volume (cc)	CC
+	22152-A5	L416114-1	12/100	15.3	5891	562,700	0.010
	22152-A6	T.416114-2	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 Approved by: BDB Limit of Quantitation: 5.5 Fibers/ 100 Fields Date: 25-AUG-17

Microscope field area: 0.00785 mm2 QC by: NDC Filter collection area: 385 mm2 Supervisor: BDB

< -Less Than

> -Greater Than

ND -Not Detected

Submitted by : BTM

NA -Not Applicable

cc -Cubic Centimeters

NS -Not Specified

mm2 -Square millimeters



LABORATORY ANALYSIS REPORT

6601 Kirkville Road
East Syracuse, NY 13057

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FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L416114

Project No. : 22152

Date Sampled : 14-AUG-17 Date Received : 19-AUG-17 Report ID : 1013986

Inhalable Dust

Sample ID	<u>Lab ID</u>	Air Vol <u>liter</u>	Total mq	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 Submitted by: NRH

Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV Approved by : KRK

OSHA PEL : NA Date : 22-AUG-17 NYS DOH # : 11626

Collection Media : IOM 25mm PVC 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



LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L416114

Project No. : 22152

Date Sampled : 14-AUG-17 Date Received : 19-AUG-17 Report ID : 1013987

Respirable Dust

<u>Sample ID</u>	<u>Lab ID</u>	Air Vol liter	Total mq	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 Submitted by: PAH/HVN

Analytical Method : mod. NIOSH 0600; Gravimetric Approved by : KRK

OSHA PEL : PNOR 5 mg/m3 (TWA) Date : 23-AUG-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm 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



LABORATORY ANALYSIS REPORT

6601 Kirkville Road

East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L416114

Project No. : 22152

Date Sampled : 14-AUG-17 Date Analyzed : 22-AUG-17 - 25-AUG-17

Date Received : 19-AUG-17 Report ID : 1015012

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

			Air Vol		
Sample ID	<u>Lab ID</u>	<u>Analyte</u>	1	<u>uq</u>	ug/m3
22152-S5	L416114-3	Ouartz	1094.2	<5.0	<4.6
22132-33	T410114-3	Cristobalite	1094.2	<5.0 <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

Submitted: AJD

Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD Approved: KRK

OSHA PEL : 50 ug/m3 RCS Date : 25-AUG-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: NDC

NA -Not Applicable ND -Not Detected l -Liters mppcf -Million Particles per Cubic Foot



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LABORATORY FOOTNOTE REPORT

GALSON

Client Name : Toronto Transit Commission Ltd.

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

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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 (V205) 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 -Greater Than mg -Milligrams ug -Micrograms

m3 -Cubic Meters l -Liters

kg -Kilograms NS -Not Specified

ppm -Parts per Million ND -Not Detected

NA -Not Applicable



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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.

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.

PEL

Parameter	Accuracy	Mean Recovery
Manusarium Ossida	. / 0 28	00.28
Magnesium Oxide	+/-9.2%	99.2%
Molybdenum	+/-7.6%	100%
Nickel	+/-8%	101%
Thallium	+/-7.9%	101%
Vanadium Pentoxide	+/-6.5%	100%

Method

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):

Parameter

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
_	-Creater Than	ug -Migrograms	1	-Titere	NS -Not Specified	ND -Not Detected

NA -Not Applicable



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LABORATORY FOOTNOTE REPORT

GALSON

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
                 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 LOO 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 > -Great		mg -Milligrams ug -Micrograms	m3 1	-Cubic Meters -Liters	5 5	ppm -Parts per Million ND -Not Detected	NA -Not Applicable
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LABORATORY FOOTNOTE REPORT

GALSON

Client Name : Toronto Transit Commission Ltd.

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; I	P/T 15 mg/m3 (TWA)	
Antimony		mod. OSHA ID-125G; I		
Arsenic			P/I 0.01 mg/m3 (TWA)	
Barium			CP/I 0.5 mg/m3 (Soluble) (TWA)	
Beryllium			P/I 0.0002 mg/m3 (TWA)	
Cadmium			CP/I 0.005 mg/m3 (TWA)	
Calcium Oxide		mod. OSHA ID-125G; I		
	mod. Niedli 7500	12 15 18007 1	,,	
mg -Milligrams	m3 -Cubic Meters kg	-Kilograms p	om -Parts per Million	
an ug -Micrograms			O -Not Detected NA -Not Applicable	



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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.

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

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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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.

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 Tridymite	+/-10.9% +/-13%	93.4% 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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Same Day Sample Identi	200% fication*	<u> </u>			Sample Volume,	Sample Units*:			MSHA		ther (specify):	Hexavalent Chromium
(Maximum of 20 characters, I characters will be ab	ID's longer than 20	Date Sam (mm/dd	•	Collection Medium	Sample Time, or Sample Area	Oml, min., in2, cm2, ft2	Analysis	s Reque	sted*	Method R	eference^	Process (ex. welding, plating, painting, etc.)*
Examp	le	01/01/	11	2pc UW PVC	960	L	Hexavalent	Chromi	um (Cr6)	mod. OSł	HA ID-215	Welding
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22152 - 55				PW PVC in PPI	<i>5</i> 51	1094.2	Crystalline S	silica (a	all forms)	SE HIOIN	00 + Resp	PUSH NIOSH OF
22152 - 56				PW PVC IN PPI	Ø	Ø	Crystalline Si	ilica (a	II forms)	02F HIOILU	D + Resp.	PUR NIOSH 06
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22152 - 16				PW PVC IN IOM	- 4	Ø	T	nhalabl	_	NIOSH 73	00 + Inh.	DUST NIOSH OS
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For crystalline silica: f	form(s) of silica	needed mi	ust be	indicated (Quartz,	Cristobalite,	and/or Tridy	/mite)*:					
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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

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.



GALSON

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East Syracuse, NY 13057

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Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L416110

Project No. : 22152

Date Sampled : 17-AUG-17

Date Received : 19-AUG-17

Report ID : 1014940

Date Sampled: 08/17/17 Date Analyzed: 08/24/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	MCE UW 37mm 25-AUG-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG Q	C by: NDC
<pre>< -Less Than > -Greater Than</pre>	mg -Milligrams	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOO-Limit of Ouantitation



LABORATORY ANALYSIS REPORT

6601 Kirkville Road
East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L416110

Project No. : 22152

Date Sampled : 17-AUG-17 Date Received : 19-AUG-17 Report ID : 1014940

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		· -
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

Collection Media: Date :	MCE UW 37mm 25-AUG-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: NDC
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1	- 1	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L416110

Project No. : 22152

(315) 432-5227 Date Sampled : 17-AUG-17 Date Analyzed : 24-AUG-17 FAX: (315) 437-0571 Date Received : 19-AUG-17 Report ID : 1014940

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	uq		
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

Collection Media: Date :	MCE UW 37mm 25-AUG-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: NDC
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1	- 1	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Login No. : L416110

Site

Project No. : 22152

Date Sampled : 17-AUG-17 Date Analyzed : 24-AUG-17 Date Received : 19-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

	LOQ	Total	Conc	Units
<u>Parameter</u>	uq	<u>uq</u>		<u> </u>
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

Collection Med:	a: MCE UW 37mm : 25-AUG-17	Submitted by NYS DOH #		Approved by: JJL Supervisor: KEG QC	C by: NDC
<pre></pre>	mg -Milligrams nn ug -Micrograms		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L416110

Project No. : 22152

Date Sampled : 17-AUG-17 Date Received : 19-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

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	IOM 25mm PVC 25-AUG-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: NDC
<pre>-Less Than > -Greater Than</pre>	5	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L416110

Project No. : 22152

Date Sampled : 17-AUG-17 Date Received : 19-AUG-17 Report ID : 1014939

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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	mq/m3

Collection Media: Date :	IOM 25mm PVC 25-AUG-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: NDC
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Login No. : L416110

Site Project No. : 22152

Date Sampled : 17-AUG-17 Date Analyzed : 23-AUG-17 Date Received : 19-AUG-17

Report ID : 1014430

Asbestos Fiber Count (A Rules)

			Fibers/	Fibers/	Fibers/	Air	Fibers/
	<u>Sample ID</u>	<u>Lab ID</u>	Fields	mm2	<u> Filter</u>	Volume (cc)	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 Ouantitation : 5.5 Fibers/ 100 Fields

Microscope field area : 0.00785 mm2 Filter collection area: 385 mm2

OC by: NDC

Supervisor: BDB

Submitted by : BTM

Approved by : BDB

Date: 25-AUG-17

< -Less Than

> -Greater Than

ND -Not Detected NS -Not Specified

mm2 -Square millimeters

NA -Not Applicable

cc -Cubic Centimeters



LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L416110

Project No. : 22152

Date Sampled : 17-AUG-17 Date Received : 19-AUG-17 Report ID : 1013984

Inhalable Dust

Sample ID	<u>Lab ID</u>	Air Vol liter	Total mq	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 Submitted by: NRH

Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV Approved by : KRK

OSHA PEL : NA Date : 22-AUG-17 NYS DOH # : 11626

Collection Media : IOM 25mm PVC 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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Client : Toronto Transit Commission Ltd Account No.: 90734 Login No. : L416110 Site : NS

Project No. : 22152

Date Sampled : 17-AUG-17 Date Analyzed : 22-AUG-17 Date Received : 19-AUG-17 Report ID : 1013985

Submitted by: HVN

Approved by : KRK

Respirable Dust

Sample ID	<u>Lab ID</u>	Air Vol <u>liter</u>	Total mq	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

Collection Media : PVC PW 37mm Supervisor: KRK

: PNOR 5 mg/m3 (TWA) Date: 23-AUG-17 NYS DOH # : 11626 QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected

l -Liters > -Greater Than ug -Micrograms NS -Not Specified ppm -Parts per Million



LABORATORY ANALYSIS REPORT

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(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L416110

Project No. : 22152

Date Sampled : 17-AUG-17 Date Analyzed : 22-AUG-17 - 24-AUG-17

Submitted: AJD

Date Received : 19-AUG-17 Report ID : 1015020

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

			Air Vol		
Sample ID	<u>Lab ID</u>	<u>Analyte</u>	1	<u>uq</u>	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 Approved: KRK

OSHA PEL : 50 ug/m3 RCS Date : 25-AUG-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: NDC

NA -Not Applicable ND -Not Detected 1 -Liters mppcf -Million Particles per Cubic Foot



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Client Name : Toronto Transit Commission Ltd.

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

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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 (V205) 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

NA -Not Applicable



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):

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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.

PEL

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%

Method

	1 NTONY F200/ 1 00W TD 10FG, TOD/T 1F / 2 /T 1 D NTW
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):

Parameter

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
_	-Creater Than	ug -Migrograms	1	-Titers	MS -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: 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
                 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.
```



LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.

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):

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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 NIOCH 7200	/mod. OSHA ID-125G; ICP/	1	
Antimony		/mod. OSHA ID-125G; ICP/		
Arsenic		/mod. OSHA ID-125G; ICP/		
Barium		/mod. OSHA ID-125G; ICP/		(TTLIA)
Beryllium		/mod. OSHA ID-125G; ICP/		(IWA)
Cadmium		/mod. OSHA ID-125G; ICP/		
Calcium Oxide		/mod. OSHA ID-125G; ICP/		
Carcium Oxide	mod. NIOSH /300	/ MOG. OSHA ID-125G; ICP/	L 5 mg/ms (TWA)	
mg -Milligrams	m3 -Cubic Meters kg l -Liters NS	-Kilograms ppm	-Parts per Million	



mg -Milligrams

ug -Micrograms

Client Name : Toronto Transit Commission Ltd.

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

m3 -Cubic Meters

l -Liters

L416110 (Report ID: 1014940):

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< -Less Than

> -Greater Than

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	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 (Repo	The state of the s		
	The sample results may have a negative b		
	fine particulate that may have obscured	fibers.	
- 47.57.70 /			
L416110 (Report :	· · · · · · · · · · · · · · · · · · ·		
	SOPs: ia-pcm(26)	00.5/.0	
		00 f/mm2 or greater than 1300 f/mm2 have a	
	greater than optimal variability and are		
	follows:	s of variation (CVs) for the applicable fix	er ranges are as
	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)		
		ology, and SOP(s) referenced in the report	and do not take
	into account any uncertainty associated	with the sampling process.	
L416110 (Report :	TD: 1013084):		
narotto (Keboic	SOPs: GRAV-SOP-8(17)		
		ampling media is -0.001 +/- 0.021 mg (avera	ore hlank
	Gravimeeric analytical accuracy of the s	ampring meara is 0.001 +/- 0.021 mg (avera	ge Diank

ppm -Parts per Million

NA -Not Applicable

ND -Not Detected

LABORATORY FOOTNOTE REPORT

kg -Kilograms

NS -Not Specified



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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.

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)

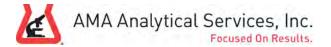
L416110 (Report ID: 1015020):

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



CERTIFICATE OF ANALYSIS

Date Submitted: 09/11/2017

Date Analyzed: 09/18/2017

08/17/2017

Report Date: 09/18/2017

Person Submitting: Zach King

Date Sampled:



Lab ID 10920

Chain of Custody:

284174

Galson Laboratories

Address:

Client:

6601 Kirkville Road

East Syracuse, NY 13057-9672

Pam Weaver Attention:

Summary of Transmission Electron Microscopy

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

Not Provided

Job Location: Not Provided

Job Number: L416110

P.O. Number: 90734

Job Name:

AMA Sample Number	Client Sample Number	Volume (L)	Area Analyzed (mm²)		Asbestos Type Amount	# Non Asbestos Structures	Concentration		Fraction Sample Type		Comments
				f/cc			f/mm ²	f/cc			
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.

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

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

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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 Infor	mation: Galson			Submitt	al Inf	ormation	n:						
	MISOM			1. Job									
				2. Job	Locati	on:	11.0					0	07211
				3. Job	#:_ L	MIG	5110	,	1		_	P.O. #: <u>\</u>	0734
4. Address 3:				4. Con	tact Pe	erson: 1	an	7 4	Jec	we	1	Cell:	
	Fax #			Coll	ected l	by:						Cell:	
Reporting 1	Info (Results provided as soon	as technically feasib					ided, A	AMA w	ill assi	ign de	fault		
AFTER HOURS (must be pre-scheduled) 4 Hours Immediate Date Due: 24 Hours Time Due: 22 Hours Time Due: 2 Date Due: 2 Date Due:						JRS Results	Require	d By No	on	□ Er	nail 2	777	
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Received for Lab by:	1/1/MAX		HW				9	11/1	1	10	JUZ	Airbill/Trackin	ng No:

		AMA		Report To :	Shelly K	rausa	Invoice To:	Jeanne G	lieson
		Check if change		report to .	SGS Galson			SGS Galson	
GALS	ORIES	of address			6601 Kirkv			6601 Kirkv	
6601 Kirkville Rd	New Client? yes			East Syracuse			East Syracuse		
East Syracuse, NY 13057	-9672	no		Phone No :	888-432		Phone No. :		
Tel: 315-437-5227 888-432-LABS(5227)				Thomas it.		0227	Fax No.	315-437	
Fax: 315-437-0571							Tax III.	- 010 101	-0071
www.galsonlabs.com		Site Name	:			Project:	L416110	Sampled By :	Client
Turnaround Time	Due D	Date Verbal Aut	horiz	ation :					
Standard	09/18	3/17			90734				
4 Business Days		Credit	Card	No. :		Card Holder Na	ame :		Exp.:
3 Business Days						-			- · · · · · · · · · · · · · · · · · · ·
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Next Day by Noon					Syracuse.Subcontracting				
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Sample				Collection	*Air Volume (liters)/	7			Specific DL
22152-A7 22152-A8		Date Sam	Date Sampled Me		Passive Monitors (Min)	Analysis	Requested	Method Reference	Needed
		8/17/20	8/17/2017 25mm MCE P		569.9	Transmission E	lectron Microscopy	NIOSH 7402; TEM	7
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					laboratory's current AIHA				
01 1 10 11					ement in accordance with	VHA LQAP policy Signature			D
Chain of Custody		Print N	lame	Page 20 of 22	Report/Reference:2 Ge		Date/Time		
Relinquished by :		Zach	King	Page 20 of 22	Report Reference: 2 Ge	nerated. 19-SEF	-17 10.39	9/	8/2017 13:46
Received by LAB:									

					.						
CCC		New	Client?	Report To*:			Commission	Invoice To*:			
,	UNTEUM.	1920 Yonge street							1920 Yonge Street		
125X626A6948184439 Date:08/19/17	Client A	Account	No.* :	Suite 6			 ₽5\	Suite 600			
Shipper:UPS Initlals:CEM	ì		•	-		on Mys			Toronto, ON M4	S 3€2	
				Phone No.*:		<u>3 - 6668</u>		Phone No. :			
Prep:UNKNOWN				Cell No. :				Email :			
	j	Em	ail Resu	lts To : <u>Virgil. Um</u>	ali @ttc.	<u>oa Rohere</u>	rutte@ohecons		e Order No. : PU 24		
`[-	nail Add			<u> </u>			Credit Card on File Ca	-	
Need Results By*:	(surcharge)	<u> </u>	Sampl	es submitted using th	e FreePumpLoa	n™ Program.		Samples submit	ted using the FreeSamplingBa	dges™ Program.	
Standard	0%	Site Nar				Project :	22152		Sampled By : OHE G	onsultants	
4 Business Days	. 35%	Comme	ents:			•					
3 Business Days	50%	Pleas	e see	the attached	d docume	ent for th	ne list of m	netals to be a	analuzed.		
2 Business Days	75%	↓					State samples w	<u>, </u>		711.1	
Next Day by 6pm	100%	1		of industry or pro ling area:	cessimenen	ences	collected in (ex.		ate which OEL this data v	Will be used for:	
Next Day by Noon Same Day	150% 200%	-		g			<u>'</u>	MSHA □	Other (specify):		
Sample Identi		Data S		Collection	Sample Volume,	Sample Units*:		<u></u>	,	Hexavalent Chromium	
(Maximum of 20 characters, 1 characters will be abl			ampled* dd/yy)	Medium	Sample Time. or Sample Area	(L.)nl, min., in2, cm2, ft2	Analysis	Requested*	Method Reference^	Process (ex. welding, plating, painting, painting, etc.)*	
Examp	le	01/0	1/11	2pc UW PVC	960	L	Hexavalent Chromium (Cr6)		mod. OSHA ID-215	Welding	
22152-A7		08/1	7/17	25mm PCM	<i>5</i> 54	569.9	Askestos		4N+ OOFF HZOIN	102 client	
22152 - A8				25mm PCM	ø	Ø	Ablestos		OOPF HZOIU	¥ 2× 9/8/17	
22152 - S.7				PW PVC in PPI	551	1113.5	Crystalline S	ilica (all forms)	NIOSH 7500+ Resp.	DUST NIOTH OF	
22122 - 28				PWPVC in PPI	Ø	Ø	Crystalline S	ilica (all forms)	NIOSH 7500+ Resp.	DUST NIOSH 060	
22152 - I7				PW PVC in IOM	554	1114.7	Metals (I	nhalable)	NIOSH 7300+ Inh.	DUST NIOSH OSS	
22127 - I.8]		PW PVC in IOM	Ø	Ø	Metals (Ir	ihalable) .	NIOSH 7300 + Inh.	PUST NIOSH 05	
22152 - M7	•			UW MCE in PPI	554	1120.1	Metals (R	espitable)	OBEF HOOEU		
22152 - M8	•			uw McE in PPI	Ø	Ø	Metals (Re	espirable)			
122152 - T7	•	<u>.</u>		uw Mc€	554	1124.1	Metals (T	otal)			
22152 - T8	•	ļ	₩	UW MOE	Ø	Ø	Metals (1	Total)	. ↓		
^Galson Laboratories	will substitute	our routi	ne/prefe		oes not matc	h the method			s checked: Use met	hod(s) listed on COC	
For metals analysis: if re-	questing an analy	yte with th	e option	of a lower LOQ pleas	se indicate if th	e lower LOQ i	s required (only av	ailable for certain anal	ytes see SAG):		
For crystalline silica: f	orm(s) of silica	needed	must be	indicated (Quartz,	Cristobalite,	and/or Tridy	mite)*:		•	Date/Time	
Chain of Custody		Print Nam	- 1	2 17 7		/Time	 	Print Na	Print Name/Signature		
Relinquished by:	Yunny Pesi	ana U	<u>ee 7</u>	report.	Aug 18/17	1:00 PM	Received by:		\sim		
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-Requir				3pm will be consi sea@elds1n0afy2n2esu				?séa. 18:39	Page 1	of <u>1</u>	

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 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-Lwab

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.



GALSON

6601 Kirkville Road

East Syracuse, NY 13057

(315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L417486

Project No. : 22152

Date Sampled : 29-AUG-17 Date Received : 02-SEP-17 Report ID : 1017257

Date Sampled: 08/29/17 Date Analyzed: 09/07/17

<u>Parameter</u>	LOQ uq	Total uq	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

Collection Media:	MCE UW 37mm 08-SEP-17		Submitted by: NYS DOH # :		Approved by: SJW Supervisor: KEG Q	C by: CRD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOO-Limit of Ouantitation



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Project No. : 22152

Date Sampled : 29-AUG-17 Date Received : 02-SEP-17 Report ID : 1017257

LOO Total Conc Units <u>Parameter</u> ug ug Aluminum 7.5 <7.5 NA mq/m3Cadmium 0.15 <0.15 NA mq/m3

 Iron Oxide
 11.
 <11</td>
 NA
 mg/m3

 Molybdenum
 0.15
 <0.15</td>
 NA
 mg/m3

 Zinc Oxide
 2.8
 <2.8</td>
 NA
 mg/m3

Collection Media:	MCE UW 37mm 08-SEP-17		Submitted by: NYS DOH # :		Approved by: SJW Supervisor: KEG QC	by: CRD
<pre>-Less Than > -Greater Than</pre>	5	m3 1		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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East Syracuse, NY 13057

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FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L417486

Project No. : 22152

Date Sampled : 29-AUG-17 Date Received : 02-SEP-17 Report ID : 1017257

	LOQ	Total	Conc	Units
<u>Parameter</u>	uq	<u>uq</u>		-
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	mq/m3

Collection Media	: MCE UW 37mm : 08-SEP-17	Submitted by: NYS DOH # :		Approved by: SJW Supervisor: KEG QC	by: CRD
<pre></pre>	mg -Milligrams ug -Micrograms	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L417486

East Syracuse, NY 13057 Project No. : 22152

(315) 432-5227 Date Sampled : 29-AUG-17 Date Analyzed : 07-SEP-17 FAX: (315) 437-0571 Date Received : 02-SEP-17 Report ID : 1017257

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	uq		
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

Collection Media:	MCE UW 37mm 08-SEP-17		Submitted by: NYS DOH # :		Approved by: SJW Supervisor: KEG QC	by: CRD
<pre>-Less Than > -Greater Than</pre>	5	m3 1		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Login No. : L417486

Site

Project No. : 22152

Date Sampled : 29-AUG-17 Date Analyzed : 07-SEP-17

Date Received : 02-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

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	uq		
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

Collection Media: Date :	IOM 25mm PW PVC 08-SEP-17	Submitted by: NYS DOH # :		Approved by: KEG Supervisor: KEG QC	by: CRD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



LABORATORY ANALYSIS REPORT

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Project No. : 22152

Date Sampled : 29-AUG-17 Date Received : 02-SEP-17 Report ID : 1017203

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		<u> </u>
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

Collection Media: Date :	IOM 25mm PW PVC 08-SEP-17		Submitted by: NYS DOH # :		Approved by: KEG Supervisor: KEG QC	by: CRD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734

Login No. : L417486 Site

Project No. : 22152

Date Sampled : 29-AUG-17 Date Analyzed : 08-SEP-17

Date Received : 02-SEP-17 Report ID : 1017304

Asbestos Fiber Count (A Rules)

		Fibers/	Fibers/	Fibers/	Air	Fibers/
<u>Sample ID</u>	<u>Lab ID</u>	Fields	mm2	Filter	Volume (cc)	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 Ouantitation: 5.5 Fibers/ 100 Fields

Microscope field area : 0.00785 mm2 Filter collection area: 385 mm2

Approved by : BDB Date : 11-SEP-17

Submitted by : BTM

OC by: CRD Supervisor: BDB

< -Less Than

> -Greater Than

ND -Not Detected NS -Not Specified

NA -Not Applicable

cc -Cubic Centimeters

mm2 -Square millimeters



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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L417486

Project No. : 22152

Date Sampled : 29-AUG-17 Date Received : 02-SEP-17 Report ID : 1016675

Inhalable Dust

Sample ID	<u>Lab ID</u>	Air Vol liter	Total mq	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 Approved by : SPR

OSHA PEL : NA

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

Submitted by: NRH

Date: 06-SEP-17

NYS DOH # : 11626



LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L417486

Project No. : 22152

Date Sampled : 29-AUG-17 Date Received : 02-SEP-17 Report ID : 1016676

Respirable Dust

<u>Sample ID</u>	<u>Lab ID</u>	Air Vol liter	Total mq	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 Submitted by: PAH/HVN

Analytical Method : mod. NIOSH 0600; Gravimetric Approved by : SPR

OSHA PEL : PNOR 5 mg/m3 (TWA) Date : 06-SEP-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm 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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Client : Toronto Transit Commission Ltd Account No.: 90734 Login No. : L417486

Site

: 22152

Date Sampled : 29-AUG-17 Date Analyzed : 06-SEP-17 - 09-SEP-17

Date Received : 02-SEP-17 Report ID : 1017333

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

Project No.

			Air Vol		
Sample ID	<u>Lab ID</u>	<u>Analyte</u>	1	uq	ug/m3
00150 00	T 415406 2		000 7	.F. 0	.6.0
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 Submitted: CMR

Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD Approved: KRK

OSHA PEL : 50 ug/m3 RCS Date : 11-SEP-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: CRD

-Parts per Million < -Less Than mg -Milligrams kg -Kilograms ppm > -Greater Than ug -Micrograms m3 -Cubic Meters -Not Specified

NA -Not Applicable ND -Not Detected -Liters mppcf -Million Particles per Cubic Foot



FAX: (315) 437-0571

www.galsonlabs.com

East Syracuse, NY 13057 (315) 432-5227

LABORATORY FOOTNOTE REPORT

GALSON

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

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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 preceding 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 $\frac{1}{2}$

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 (V205) 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



LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.

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):

6601 Kirkville Road

FAX: (315) 437-0571

www.galsonlabs.com

East Syracuse, NY 13057 (315) 432-5227

> 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.

> > PEL

Parameter	Accuracy	Mean Recovery
		1000
Magnesium Oxide	+/-9.1%	102%
Molybdenum	+/-10.3%	99.4%
Nickel	+/-10%	103%
Thallium	+/-6.6%	99.5%
Vanadium Pentoxide	+/-9.1%	102%

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

Method

L417486 (Report ID: 1017257):

Parameter

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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GALSON

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.

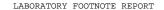
L417486 (Report ID: 1017257):

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	1	-Liters	NS -Not Specified	ND -Not Detected	NA

-Not Applicable





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(315) 432-5227

GALSON

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

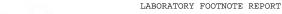
+L417486-1 (Report ID: 1017304):

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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GALSON

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

GALSON

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

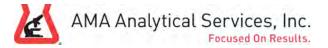
Date Analyzed: 06-SEP-17 - 09-SEP-17

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



CERTIFICATE OF ANALYSIS

NY FI AP

Lab ID 10920

Chain of Custody: 602243

Client: Galson Laboratories

Address: 6601 Kirkville Road

East Syracuse, NY 13057-9672

Pam Weaver Attention:

Filter Type:

Job Name: Not Provided

Job Location: Not Provided

Job Number: L417486

P.O. Number: 90734

Pore Size:

Date Submitted:

Date Analyzed:

Filter Size:

09/14/2017

09/21/2017

25 mm (385 mm²)

Report Date: 09/21/2017

Date Sampled: Not Provided

Person Submitting: Cameron Kennedy

Summary of Transmission Electron Microscopy

									`	,	
AMA Sample Number	Client Sample Number	Volume (L)	Area Analyzed (mm²)	•	Asbestos Type Amount	# Non Asbestos Structures	Conce	ntration	Fraction	Sample Type	Comments
				f/cc			f/mm²	f/cc			
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	

0.8 um

Analytical procedures used meet or exceed NIOSH 7402 protocols.

MCE

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

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a mutual protection to clients, the public, and these Laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from us. Sample types, locations, and collection protocols are based upon the information provided by the persons submitting them and, unless collected by personnel of these Laboratories, we expressly disclaim any knowledge and liability for the accuracy and completeness of this information. Residual sample material will be discarded in accordance with the appropriate regulatory guidelines, unless otherwise requested by the client. This report must not be used to claim, and does not imply product certification, approval, or endorsement by NY ELAP or any agency of the Federal Government. All rights reserved. AMA Analytical Services, Inc.

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



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

CHAIN OF CUSTODY (301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

(Please Refer To This Number For Inquires)



Mailing/Billing Informa	ation:								form	ation									
1. Client Name: GALS						7		Name											
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		AMA	Report To	Shelly K	rause	Invoice To:	Jeanne G	Blisson
	Che	ck if change		SGS Galson			SGS Galson	
GALSO		ddress		6601 Kirkv			6601 Kirkvi	
6601 Kirkville Rd	New	Client? yes		East Syracuse			East Syracuse	
East Syracuse, NY 13057-	9672	no 🗌	Phone No. :	888-432		Phone No. :	888-432	
Tel: 315-437-5227 888-432-LABS(5227)						Fax No.	315-437	
Fax: 315-437-0571								
www.galsonlabs.com		Site Name :			Project :	L417486	Sampled By :	Client
Turnaround Time	Due Date	Verbal Authoriz	ation:					
✓ Standard	09/21/17			90734				
4 Business Days		Credit Card	No. :		Card Holder I	Name :		Exp. :
3 Business Days								
2 Business Days								
Next Day by 6pm		Fax Result	ts To :	Email Only Plea	ise	Fax No. :	Email Only	/ Please
Next Day by Noon			ts To :	Syracuse.Subcontracting				
Same day								
Sample			Collection	*Air Volume (liters)/				Fibers/Fields
Identification	on	Date Sampled	Medium	Passive Monitors (Min)	Analys	is Requested	Method Reference	200
22152-A9		8/29/2017	25mm MCE PCM	403.6	Transmission	Electron Microscopy	NIOSH 7402; TEM	13.5/100
22152-A1		8/29/2017	25mm MCE PCM	BLANK	Transmission	Electron Microscopy	NIOSH 7402; TEM	0/100
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Comments:							State/Province of sam	pling event:
	If th	e method being rep	orted is not on you	r laboratory's current AIHA	scope of accredi	tation, please state th	at in your report.	
		Please provide	an uncertainty sta	tement in accordance with	AIHA LQAP polic	y document Section 2	A.5.4.3.	
Chain of Custody		Print Name			Signatu	ıre		Date/Time
Relinquished by :		Cameron Kenr	Page 20 of 22	Report Reference:2 Ger	erated:22-SEI	P-17 13:37	09	9/13/17 1038
Received by LAB:				- //				

		New	Client?	Report To* :	Toronto 7	Fransit	Commission	Invoice To* :	Torento Transit a	ammissian
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Need Results By':	(surcharge)	1	Sample	es submitted using the	FreePumpLoar	n Program.		Samples submit	tted using the FreeSamplingBad	lges [™] Program.
Standard	0%	Site Nar	ne:			Project :	22152	•	Sampled By: OHE G	nsultanta
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3 Business Days	50%	1								
2 Business Days	75%							,	·	
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Same Day	200%	ļ	_		(Sample Volume)	Sample Units*:	<u> </u>	□ MSnA	Other (specify):	Hexavalent Chromium
Sample Identi (Maximum of 20 characters, i characters will be ab	ID's longer then 20		ampled* /dd/yy)	Collection Medium	Sample Time, or Sample Area*	() ml, min., in2, cm2, ft2	Analysis Requ	ested*	Method Reference [^]	Process (ex. welding, plating, painting, etc.)*
Examp	ole	01/0	31/11	2pc UW PVC	960	L	Hexavalent Chron	nium (Cr6)	mod. OSHA ID-215	Welding
22152 - A3		08/2	9/17	25mm PCM	403.6	L	Asbertos + 18	M	NIOSH 7400	for cheat
22152 - A19				25mm PCM	Ø		Asbestos 1	<u></u>	NIOSH 7400	(1K 9/17/17
22152 - 59	· -			PW PVC in PPI	808.7		Crystalline Silica	(All Ferns)	NIOSH 1500 + NIOSH C	600 (Roy. Dust)
22152-510				pw pvc in pps	Ø		Crystalline Silva	(All forms)	NIOSK 7500 + NIOSH C	OD (Resp. Dust)
22152-19	·			PW PVC in som	805.7		Metals (Inhale)	ل <u>ر)</u>	NIOSH 7300 + NIOSH	
22152-110				PW PVC Wisam	Ø		Metals (Inhalch	(c)	NIOSH 7-300 + NIOSH	a soo (Inh. oust)
22152-Mg				MCG in PPI	800.8		Metals (Raspirebl	<u>م)</u>	NIOSH 73 e 0	
22152 - MIE				MCE IN PPI	P		Metals (Respireb	<i>لو</i>)	NEOSH 7300	
22152 - 19				MCE	808.1		Metals (total)		N1091 7300	
22152-110		1	5	MCE	Ø	Ð	Metab (total)	· <u></u>	N10 SH 4300	
^Galson Laboratories										nod(s) listed on COC
							is required (only available	for certain ana	lytes see SAG):	
For crystalline silica:							/mite)*:			<u> </u>
Chain of Custody		Print Nar			Date.	/Time		Print Na	me/Signature	Date/Time
Relinquished by:	ROMAN	MATH	ievez	JAO	<u>a</u>	7. 6	Received by:	t/Mm c	mi (1/1)	9/11/7 1:32
Relinquished by:	1 Home	<u>بر کک ر</u>	~ //	r 3pm will be consi	7 ////	t day's busin		hen Blandi	ng Study Bloods	9/2/17/1130
*Requi					ilt in a delay.		les being processed.	3:37	Page 1	Jof1

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 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 Luab

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.



GALSON

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East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-0571

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Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L417478

Project No. : 22152

Date Sampled : 31-AUG-17 Date Analyzed : 07-SEP-17 - 08-SEP-17

Date Received : 02-SEP-17 Report ID : 1017255

LOQ Total Conc Units Parameter ug Aluminum 7.5 <7.5 <0.0099 mg/m3Cadmium <0.15 0.15 <0.00020 mg/m30.19 Iron Oxide 11. 140 mg/m3Molybdenum 0.15 <0.15 <0.00020 mg/m3Zinc Oxide 2.8 <2.8 <0.0037 mg/m3

Collection Media: Date :	MCE UW 37mm 08-SEP-17		Submitted by: NYS DOH # :		Approved by: SJW Supervisor: KEG QC	by: CRD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L417478

Project No. : 22152

Date Sampled : 31-AUG-17 Date Analyzed : 07-SEP-17 - 08-SEP-17

Date Received : 02-SEP-17 Report ID : 1017255

Air Volume : NA Client ID : 22152-M12 Lab ID : L417478-8 Date Sampled : 08/31/17 Date Analyzed: 09/07/17

LOO Total Conc Units <u>Parameter</u> ug ug Aluminum 7.5 <7.5 NA mq/m3Cadmium 0.15 <0.15 NA mq/m3Iron Oxide 11. <11 NA mg/m3Molvbdenum 0.15 <0.15 NA mg/m3Zinc Oxide 2.8 <2.8 NA mq/m3

Collection Media:	MCE UW 37mm 08-SEP-17		Submitted by: NYS DOH # :		Approved by: SJW Supervisor: KEG QC	by: CRD
<pre>-Less Than > -Greater Than</pre>	5	m3 1		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Site Login No. : L417478

Project No. : 22152

Date Sampled : 31-AUG-17 Date Analyzed : 07-SEP-17 - 08-SEP-17

Date Received : 02-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

	LOQ	Total	Conc	Units
<u>Parameter</u>	uq	uq		
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	mq/m3

Collection Media	a: MCE UW 37mm : 08-SEP-17	Submitted by NYS DOH #		Approved by: SJW Supervisor: KEG QC	C by: CRD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams n ug -Micrograms		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Login No. : L417478

Site

Project No. : 22152 Date Sampled : 31-AUG-17 Date Analyzed : 07-SEP-17 - 08-SEP-17

Date Received : 02-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

	LOQ	Total	Conc	Units
<u>Parameter</u>	uq	uq		
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

Collection Me	dia: MCE UW 37mm : 08-SEP-17	ubmitted by: CYS DOH # : :		Approved by: SJW Supervisor: KEG	QC by: CRD
<pre>-Less Than > -Greater T</pre>	5 5		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Millic	ND -Not Detected n LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

UALOU

Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L417478

East Syracuse, NY 13057 Project No. : 22152

Date Sampled : 31-AUG-17 Date Analyzed : 07-SEP-17 - 08-SEP-17

Date Received : 02-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

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	uq		
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

Collection Media:	IOM 25mm PW PVC 08-SEP-17		Submitted by: NYS DOH # :		Approved by: KEG Supervisor: KEG QC	by: CRD
<pre>-Less Than > -Greater Than</pre>		m3 1	- 1 .	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L417478

Project No. : 22152

Date Sampled : 31-AUG-17 Date Analyzed : 07-SEP-17 - 08-SEP-17

Date Received : 02-SEP-17 Report ID : 1017199

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		-
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

Collection Media: Date :	IOM 25mm PW PVC 08-SEP-17		Submitted by: NYS DOH # :		Approved by: KEG Supervisor: KEG QC	by: CRD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



Project No.

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Client : Toronto Transit Commission Ltd Account No.: 90734 Login No. : L417478

Site

: 22152

Date Sampled : 31-AUG-17 Date Analyzed : 08-SEP-17

Date Received : 02-SEP-17 Report ID : 1017303

Asbestos Fiber Count (A Rules)

			Fibers/	Fibers/	Fibers/	Air	Fibers/
	<u>Sample ID</u>	<u>Lab ID</u>	Fields	mm2	Filter	Volume (cc)	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 Ouantitation: 5.5 Fibers/ 100 Fields

Microscope field area : 0.00785 mm2 Filter collection area: 385 mm2

OC by: CRD

Supervisor: BDB

Submitted by : BTM

Approved by : BDB

Date : 11-SEP-17

< -Less Than

> -Greater Than

ND -Not Detected

NA -Not Applicable mm2 -Square millimeters cc -Cubic Centimeters

NS -Not Specified



LABORATORY ANALYSIS REPORT

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(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L417478

Project No. : 22152

Date Sampled : 31-AUG-17 Date Received : 02-SEP-17 Report ID : 1016672

Inhalable Dust

Sample ID	<u>Lab ID</u>	Air Vol liter	Total mq	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 Submitted by: NRH

Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV Approved by : SPR

OSHA PEL : NA Date : 06-SEP-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



LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L417478

Project No. : 22152

Date Sampled : 31-AUG-17 Date Received : 02-SEP-17 Report ID : 1016673

Respirable Dust

<u>Sample ID</u>	<u>Lab ID</u>	Air Vol liter	Total mq	Conc mg/m3
22152-S11	L417478-3	758.6	0.067	0.088
22152-S12	L417478-4	NA	<0.050	NA

 $\underline{\hbox{\tt COMMENTS:}} \ \ \hbox{\tt Please see attached lab footnote report for any applicable footnotes.}$

Level of quantitation: 0.050 mg Submitted by: HVN

Analytical Method : mod. NIOSH 0600; Gravimetric Approved by : SPR

OSHA PEL : PNOR 5 mg/m3 (TWA) Date : 06-SEP-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm 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



LABORATORY ANALYSIS REPORT

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(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L417478

Project No. : 22152

Date Sampled : 31-AUG-17 Date Analyzed : 06-SEP-17 - 10-SEP-17

Submitted: AJD

Date Received : 02-SEP-17 Report ID : 1017526

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

			Air Vol		
<u>Sample ID</u>	<u>Lab ID</u>	<u>Analyte</u>	1	uq	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 Approved: KRK

OSHA PEL : 50 ug/m3 RCS Date : 11-SEP-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: CRD

NA -Not Applicable ND -Not Detected l -Liters mppcf -Million Particles per Cubic Foot



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LABORATORY FOOTNOTE REPORT

GALSON

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

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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 preceding 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 (V205) 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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GALSON

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.

PEL

LABORATORY FOOTNOTE REPORT

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%

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

Method

L417478 (Report ID: 1017255):

Parameter

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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GALSON

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	บด -Micrograms	1	-Liters	NS -Not Specified	ND -Not Detected

NA -Not Applicable





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GALSON

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

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





East Syracuse, NY 13057 (315) 432-5227

FAX: (315) 437-0571

www.galsonlabs.com

GALSON

Client Name : Toronto Transit Commission Ltd.
Site :

Project No. : 22152 6601 Kirkville Road

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 \text{ 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
```



6601 Kirkville Road East Syracuse, NY 13057

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LABORATORY FOOTNOTE REPORT

GALSON

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):

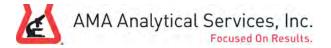
Filter received torn at the laboratory.

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%

NA -Not Applicable



Galson Laboratories

6601 Kirkville Road

602242

CERTIFICATE OF ANALYSIS

Not Provided

0.8 um

Job Location: Not Provided

Job Number: L417478

P.O. Number: 90734

Pore Size:

Job Name:

Date Submitted: 09/14/2017

09/21/2017

08/31/2017

25 mm (385 mm²)

BLK

09/21/2017

Person Submitting: N/A

<8

Date Analyzed:

Date Sampled:

Filter Size:

0

Report Date:

Lab Code 101143-0

NY ELAP

Lab ID 10920

Mantian. Dam Manuar

East Syracuse, NY 13057-9672

Attention: Pam Weaver

Filter Type:

Chain of Custody:

Client:

Address:

602242-2

Summary of Transmission Electron Microscopy

AMA Sample Number	Client Sample Number	Volume (L)	Area Analyzed (mm²)	Analytical Sensitivity f/cc	Asbestos Type Amount	# Non Asbestos Structures	Conce	entration F	Fraction Sa	ample Type	Comments
602242-1	22152-A11	380.04	0.532	0.0019	0	0	<8	<0.0076	N/	/P	

0

Analytical procedures used meet or exceed NIOSH 7402 protocols.

22152-A12

MCE

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

0.532

Analyst(s): Izabelle Mendez

Technical Director

Andreas Saldivar

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a mutual protection to clients, the public, and these Laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from us. Sample types, locations, and collection protocols are based upon the information provided by the persons submitting them and, unless collected by personnel of these Laboratories, we expressly disclaim any knowledge and liability for the accuracy and completeness of this information. Residual sample material will be discarded in accordance with the appropriate regulatory guidelines, unless otherwise requested by the client. This report must not be used to claim, and does not imply product certification, approval, or endorsement by NY ELAP or any agency of the Federal Government. All rights reserved. AMA Analytical Services, Inc.

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



AMA Analytical Services, Inc. Focused on Results www.amalab.com

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)



Mailing/Billing Information:			Submittal In						
Client Name: GALSON			1. Job Name						
2. Address 1:			2. Job Locat				00704		
3. Address 2:			3. Job #: <u>L4</u>		MEALIED		P.O. #: 90734		
4. Address 3:				erson: PAM			Cell:		
5. Phone #:			5. Collected		2 2 2 0 × 10 ×	132 C 121 A 1 To	Cell:		
	s soon as technically fea				AMA will as	ssign defaults	of 5-Day and email/fax to contacts on file.		
AFTER HOURS (must be pre-scheduled) ☐4 Hours	NORMAL □ 3 Day	BUSINESS HO		ID M		REPORT TO:			
☐Immediate Date Due:	5 Day + 9/21		Results Requi	red By Noon	and the second second second second				
24 Hours Time Due:	☐ Next Day ☐ 2 Day	Date Due: 9/21	1/1/			Email 2:			
Asbestos Analysis	_					Verbals:_ ls Analysis			
*PCM Air - Please Indicate Filter Type: NIOSH 7400	TEM D	Qual. (pres/abs) Vacu Quan. (s/area) Vacuu Quan. (s/area) Dust D ater Qual. (pres/abs) ELAP 198.2/EPA 100 EPA 100.1 All samples received EM Water samples	(QTY) num/Dust im D5755-95)6480-99 (QTY) 0.2(QTY) in good conditio°C) nitted, there is no ne	QTY) (QTY) (QTY) (QTY) (QTY) n unless otherwise	Fung.	*Pb Dust Wipe *Pb Air Pb Soil/Solid Pb TCLP Drinking Wate Waste Water Waste Water Pb Furnace (Mal Analysis Collection App Collection Mec *Spore-Trap *Surface Swah *Surface Tape Other (Specify			
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Relinquished by:	Page 19 o	Report F	Reference:2	Generated:	22-SEP-17	7 14:46	USPS Courrier		

		AMA						
(E) (P)			Report To:			Invoice To:		
GALS		Check if change		SGS Galson			SGS Galson I	
LABORATO	DRIES	of address		6601 Kirkv			6601 Kirkvi	
6601 Kirkville Rd		New Client? yes		East Syracuse			East Syracuse	
East Syracuse, NY 13057- Tel: 315-437-5227	9672	no 🗌	Phone No.:	888-432	-5227	Phone No. :		
888-432-LABS(5227)						Fax No.	315-437-	0571
Fax: 315-437-0571 www.galsonlabs.com								
		Site Name :			Project:	L417478	Sampled By :	Client
Turnaround Time	Due Da	te Verbal Authori	zation :					
✓ Standard	09/21/1	7		90734				
4 Business Days		Credit Car	d No. :		Card Holder N	lame :		Exp.:
3 Business Days							-	
2 Business Days								
Next Day by 6pm		Fax Resu	Its To :	Email Only Plea	ise	Fax No. :	Email Only	Please
Next Day by Noon				Syracuse.Subcontracting				
Same day								
Sample			Collection	*Air Volume (liters)/				Fibers/Field
Identification	on	Date Sampled	Medium	Passive Monitors (Min)	Analysis	s Requested	Method Reference	
22152-A1	1	8/31/2017	25mm MCE PCM			Electron Microscopy	NIOSH 7402; TEM	18/100
22152-A1	2	8/31/2017	25mm MCE PCM	BLANK	Transmission F	Electron Microscopy		1.5/100
22102-71		0/3/1/2017	25mm WCL F CW	DEANN	Transmission L	_iection wiicioscopy	NIOSIT7402, TEW	1.3/100
								-
			7					
					1			
					2			
Comments:							State/Province of samp	oling event:
							CATARON SALVERSANIAN	
	16	the method being ro	norted is not on your	laboratory's current AIHA	scope of agradity	ation places state the	et in your roport	
				ement in accordance with A				
Chain of Custody		Print Name		/ /	Signatur			Date/Time
Relinquished by :				Report Reference:2-Ger				/13/17 1054
Received by LAB:			Taye ZU UI ZZ	Nepuli Neielelice.z Gel	IEI AICH.ZZ-SEP	-17 14.40	00.	10/11/1004

		□New	Client?	Report To* :	TORON	ro Tran	LAX Comission	,Invoice To* :			
_SGS	CALCON					nge A			\		
1Z5X626A6947465093	GALSON	Client A	Account i	-	Suize			1256)		
Date:09/02/17 Shipper:UPS	ļ						1413E2 (
Initials:GMB	1			Phone No.* :				Phone No. :			
Prep : UNKNOWN		,		Cell No. :				Email :		A44 - 4	
1417478	- !			_			L ONEREfult QOH	-		: PW 240	
2117770	<u> </u>			ress: conful				_			ll for Credit Card Info
Need Results By:	(surcharge)		Sample	es submitted using the	e FreePumpLoa			Samples submit			
X Standard	0%	Site Na	me:	·		Project:	22152	<u>.</u>	Sampled By	: OHE GO	noulteur
4 Business Days	35%	Commi	ents:				•		•		
3 Business Days	50%	. ↓									
2 Business Days	75%	<u> </u>	 _				104-4	1=			
Next Day by 6pm	100%			of industry or pro-	cess/interfer	ences	State samples were collected in (ex. NY);	Please indicated on the property of the proper		EL this data v ACGIH TLV	will be used for: ☐ Cal OSHA
Next Day by Noon	150%	presem	i iii Sariip	ning area.				MSHA	=	Other (specify):	☐ Cai USHA
Same Day	200%	<u> </u>		1	Comple Volume	Sample Units*:		∏ M2UW	اب	Juler (specky).	Hexavalent Chromium
Sample Identi (Maximum of 20 characters. characters will be ab	tO's longer than 20		Date Sampled* Collection Confider Timp, L. ml. min., Analysis Requested* Method Reference^ Process (ex. welding							Process (ex. welding, plating, painting, etc.)*	
Examp	ole	01/0	01/11	2pc UW PVC	960	L	Hexavalent Chron	nium (Cr6)	mod. OS	HA ID-215_	Welding
22152 - A11		08/31	/17	25mm PCM	3 7 8	380.04	Asceltos +	TEM	NIOSH	7400	withert
22152-112			1	25 mm PCM	9	B	ASGETTOR	.1	•		(1K 9/17/17
22152-511				pwpvein 1PI	378	758-6	Crystelling	luce felly	my NiOS	47500+	Response
22152-512				PWPUC: U PPI	Ø	Ø	Cyysta lane p.	excelally.	m)		
22152-716				propuein Ion	378	754,7	Cygstalline A. Hetals I in had	loble1	Niora	300+]ul	0500
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22152-ML1				EW MCEIN PPI	37-8	158.5	Metels (Respi	robbel	NIOSH	300	
22152 - MIL				en MEEin PPI	Ø	0	Merces (Resp.		-		
22152-741		_		HUNCE	378	757.5	Hetels / 1070	y			
22152 - 712			<u> </u>	W- MCE	10	D	Metals (ro		· ·		
							d listed on the COC un				hod(s) listed on COC
	· <u>- </u>						is required (only available	for certain ana	lytes see SAG) :	
For crystalline silica:	form(s) of silica	needed	must be	indicated (Quartz	Cristobalite	, and/or Tridy	ymite)*:				
Chain of Custody		Print Nar	ne/Signa	ature		e/Time	 	Print Na	me/Signatu	re	Date/Time
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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 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.



6601 Kirkville Road

East Syracuse, NY 13057

(315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS

Project No. : 22152

Date Sampled : NS

Date Received : 12-SEP-17

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	

<u>Parameter</u>	LOQ uq	Total uq	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

Collection Media: Date :	MCE UW 37mm 15-SEP-17	Submitted by: NYS DOH # :	·	Approved by: JJL Supervisor: KEG QC	by: AMD
<pre></pre>	mg -Milligrams	m3 -Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	l -Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



LABORATORY ANALYSIS REPORT

GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L418175

Date Sampled : NS Date Analyzed : 14-SEP-17
Date Received : 12-SEP-17 Report ID : 1018454

FAX: (315) 437-0571 Date Receive www.galsonlabs.com

Client ID: 22152-M14 Lab ID: L418175-8 Air Volume: NA
Date Sampled: Date Analyzed: 09/14/17

LOQ Total Conc Uni

LOQ	Total	Conc	Units
<u>uq</u>	<u>uq</u>	·	<u> </u>
7.5	<7.5	NA	mg/m3
0.15	<0.15	NA	mg/m3
11.	<11	NA	mg/m3
0.15	<0.15	NA	mg/m3
2.8	<2.8	NA	mg/m3
	7.5 0.15 11. 0.15	ug ug 7.5 <7.5	ug ug 7.5 <7.5

Collection Media: Date :	MCE UW 37mm 15-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: AMD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1	- 1	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd Account No.: 90734 Site Login No. : L418175

Project No. : 22152

Date Sampled : NS Date Analyzed : 14-SEP-17 FAX: (315) 437-0571 Date Received : 12-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 uq	Total uq	Conc	Units
<u>rarameter</u>				-
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

Collection Media	: MCE UW 37mm : 15-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: AMD
<pre>Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



Client

Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L418175

Project No. : 22152

Date Sampled : NS Date Analyzed : 14-SEP-17
Date Received : 12-SEP-17 Report ID : 1018454

FAX: (315) 437-0571 www.galsonlabs.com

(315) 432-5227

6601 Kirkville Road

East Syracuse, NY 13057

Client ID: 22152-T14 Lab ID: L418175-10 Air Volume: NA
Date Sampled: Date Analyzed: 09/14/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	uq	<u>uq</u>		
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

Collection Media	: MCE UW 37mm : 15-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: AMD
<pre>Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



East Syracuse, NY 13057

LABORATORY ANALYSIS REPORT

GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L418175

Project No. : 22152

(315) 432-5227 Date Sampled : NS Date Analyzed : 14-SEP-17
FAX: (315) 437-0571 Pate Received : 12-SEP-17 Report ID : 1018451

FAX: (315) 437-0571 Date Received : 12-SEP-17 Report ID : 1018451 www.galsonlabs.com

LOQ Total Conc Units <u>Parameter</u> ug ug Magnesium Oxide 12. <12 <0.016 mq/m3Molybdenum 0.15 0.17 0.00021 mq/m3

 Nickel
 0.30
 <0.30</td>
 <0.00039</td>
 mg/m3

 Thallium
 1.5
 <1.5</td>
 <0.0019</td>
 mg/m3

 Vanadium Pentoxide
 0.80
 <0.80</td>
 <0.0010</td>
 mg/m3

Collection Media: Date :	IOM 25mm PVC 15-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: AMD
<pre>-Less Than > -Greater Than</pre>	3 3	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



(315) 432-5227

LABORATORY ANALYSIS REPORT

GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L418175

6601 Kirkville Road Site : NS Logi East Syracuse, NY 13057 Project No. : 22152

Date Sampled : NS Date Analyzed : 14-SEP-17
Date Received : 12-SEP-17 Report ID : 1018451

FAX: (315) 437-0571 Date Received : 12-SEP-17 www.galsonlabs.com

Client ID: 22152-I14 Lab ID: L418175-6 Air Volume: NA
Date Sampled: Date Analyzed: 09/14/17

LOQ Total Conc Units <u>Parameter</u> ug ug Magnesium Oxide 12. <12 NA mq/m3Molybdenum 0.15 <0.15 NA mq/m3Nickel 0.30 <0.30 NA mg/m3Thallium 1.5 <1.5 NA mg/m3Vanadium Pentoxide 0.80 <0.80 NA mq/m3

Collection Media: Date :	IOM 25mm PVC 15-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: AMD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



Client : Toronto Transit Commission Ltd Account No.: 90734 6601 Kirkville Road Site

Login No. : L418175

Project No. : 22152

Date Sampled : NS Date Analyzed : 14-SEP-17 Date Received : 12-SEP-17 Report ID : 1018274

FAX: (315) 437-0571 www.galsonlabs.com

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East Syracuse, NY 13057

Asbestos Fiber Count (A Rules)

		Fibers/	Fibers/	Fibers/	Air	Fibers/
Sample ID	<u>Lab ID</u>	Fields	mm2	<u> Filter</u>	Volume (cc)	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 Ouantitation : 5.5 Fibers/ 100 Fields

Microscope field area : 0.00785 mm2 Filter collection area: 385 mm2

Approved by : BDB Date: 18-SEP-17

Submitted by : BTM

OC by: AMD

Supervisor: BDB

< -Less Than

> -Greater Than

ND -Not Detected NS -Not Specified

NA -Not Applicable

cc -Cubic Centimeters

mm2 -Square millimeters



6601 Kirkville Road

East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com 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

<u>Sample ID</u>	<u>Lab ID</u>	Air Vol liter	Total mq	Conc mq/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

Analytical Method : mod. NIOSH 0600; Gravimetric

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 ND -Not Detected

Submitted by: PAH

Approved by : SPR

> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million



GALSON

LABORATORY ANALYSIS REPORT

6601 Kirkville Road

East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L418175

Project No. : 22152

Date Sampled : NS Date Analyzed : 13-SEP-17 - 17-SEP-17

Submitted: SPR

Date Received : 12-SEP-17 Report ID : 1018863

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

			Air Vol		
<u>Sample ID</u>	<u>Lab ID</u>	<u>Analyte</u>	1	uq	uq/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 Approved: KRK

OSHA PEL : 50 ug/m3 RCS Date : 18-SEP-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: AMD

NA -Not Applicable ND -Not Detected l -Liters mppcf -Million Particles per Cubic Foot



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LABORATORY FOOTNOTE REPORT

GALSON

Client Name : Toronto Transit Commission Ltd.

Project No. : 22152

Date Sampled : Account No.: 90734 Date Received: 12-SEP-17 Login No. : L418175

Date Analyzed: 13-SEP-17 - 17-SEP-17

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Any holder of this document is advised that information contained herein reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

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.

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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 (V205) 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 -Greater Than mg -Milligrams ug -Micrograms

m3 -Cubic Meters l -Liters

kg -Kilograms NS -Not Specified

ppm -Parts per Million ND -Not Detected

NA -Not Applicable



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LABORATORY FOOTNOTE REPORT

GALSON

Client Name : Toronto Transit Commission Ltd.

Site :

Project No. : 22152

Date Sampled: Account No.: 90734
Date Received: 12-SEP-17 Login No. : L418175

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%

Method

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):

Parameter

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	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable



LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.

Site :

Project No. : 22152

Date Sampled: Account No.: 90734
Date Received: 12-SEP-17 Login No. : L418175

Date Analyzed: 13-SEP-17 - 17-SEP-17

L418175 (Report ID: 1018454):

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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





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Client Name : Toronto Transit Commission Ltd.

Site :

Project No. : 22152

East Syracuse, NY 13057 Date Sampled: Account No.: 90734 (315) 432-5227 Date Received: 12-SEP-17 Login No.: L418175

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;	3
Arsenic	mod. NIOSH 7300/mod. OSHA ID-125G;	3
Barium	mod. NIOSH 7300/mod. OSHA ID-125G;	3
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G;	3
Cadmium	mod. NIOSH 7300/mod. OSHA ID-125G;	9, , ,
Calcium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G;	
Chromium	mod. NIOSH 7300/mod. OSHA ID-125G;	ICP/I Varies, see footnote
Cobalt	mod. NIOSH 7300/mod. OSHA ID-125G;	
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;	=
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;	=
L418175 (Report ID: 1018274):		

0.154 (5-20 fibers/100 fields)

greater than optimal variability and are probably biased.

follows:

Per NIOSH 7400, fiber counts less than 100 f/mm2 or greater than 1300 f/mm2 have a

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	1	-Liters	NS -Not Specified	ND -Not Detected

NA -Not Applicable



LABORATORY FOOTNOTE REPORT

GALSON

Client Name : Toronto Transit Commission Ltd.

Site :

Project No. : 22152

Date Sampled: Account No.: 90734
Date Received: 12-SEP-17 Login No. : L418175

Date Analyzed: 13-SEP-17 - 17-SEP-17

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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

	418/75							
	☐ New Client?	Report To*:	TORONT	o Tecupi	t Council	ارت الله Invoice To*:	:	
		1	1920 400	ugo St				
1Z5X626A6646673473 Date:09/12/17	Client Account	No.* :	Juik or	00		— KIV		
Shipper:UPS			TORONTO			<u> </u>		
Initials:ZRK	•	Phone No.* :			*	——— Phone No. :		
		Cell No. :		<u>, , , , , , , , , , , , , , , , , , , </u>	<u> </u>	Email:		
Prep:UNKNOWN	5	Cell No	<u></u>	045		Eniali .		
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						Creak Card	: Credit Card on File Ca	
Need Results By*: (surcharge)	Sampl	es submitted using th	ie FreePumpLoa			Samples submi	itted using the FreeSamplingBad	
Standard 0%	Site Name :			Project:	20152		Sampled By: OHE Co	u heltanes
4 Business Days 35%	Comments:							
3 Business Days 50%								
2 Business Days 75%	l int donovintion	-6:			Ctata camples	,,,,, I=; , ,,		
Next Day by 6pm 100%	present in samp	of industry or pro	cess/interrer	ences	State samples w collected in (ex.		ate which OEL this data v	
Next Day by Noon 150%	- present in samp	and a cu.				NY): OSHA PEL		Cal OSHA
Same Day 200% Sample Identification*		0.11 (1	Sample Volume,	Sample Units*:		□ MSDA	Other (specify):	Hexavalent Chromium
(Maximum of 20 characters, ID's longer than 20	Date Sampled* (mm/dd/yy)	Collection Medium	Sample Troo.	L, ml, min.,	Analysis	Requested*	Method Reference*	Process (ex. welding,
characters will be abbreviated.)	· · · · · · · · · · · · · · · · · · ·		 	in2, cm2, ft2				plating, painting, etc.)*
Example	01/01/11	2pc UW PVC	960		1	Chromium (Cr6)	mod. OSHA ID-215	Welding
22152 - A 13		2) mm PCM	380	392.6	Aspestos		W:0147400	
22152-114	-		10		6 000	110200		
22152-513		PWPVCIL PPI		769.2	(all	ne siloco	Nioff 7500, 060	O (Resp. Dut
22152-514		•	À				,	
22152-113		PWPUCI4 JOH	, , ,	776.02	Metall !	huses ble)	Ni084 7300 + 1	a chiosy oson
22152 I14		•	15				•	
22152 - M13		en Activ Pop	330	772.6	Metals (R)	upirobles	Ni014 7300	
22152 - M14		~	0		•		1	
22152-713		uw McE	3 80	774.8	Metals (total/		
22152-714		>	0			V	4	
^Galson Laboratories will substitute	our routine/prefer	red method if it de	oes not matc	h the method	l listed on the Co	OC unless this box	is checked: Use met	nod(s) listed on COC
For metals analysis: if requesting an ana	lyte with the option o	of a lower LOQ pleas	se indicate if th	e lower LOQ i	s required (only av	allable for certain ana	lytes see SAG):	
For crystalline silica: form(s) of silic	a needed must be	indicated (Quartz,	Cristobalite,	and/or Tridy	mite)*:			
Chain of Custody Print Name/Signature				/Time		Print Na	ime/Sjgŋature	Date/Time
Relinquished by: LRRYSA	KOKEROUTSE	YA	03/06/	17	Received by:	- Wman In	ild & Box	9/11/17 4:50
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Samı *Required fields, failu	oles received after re to complete the	•					Page	of 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 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

tand Wear

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.



GALSON

6601 Kirkville Road

East Syracuse, NY 13057 (315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L418161

Project No. : 22152

Date Sampled : 07-SEP-17 Date Received : 12-SEP-17 Report ID : 1018444

Date Sampled: 09/07/17 Date Analyzed: 09/14/17

Darramatar	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		-
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

Collection Media:	MCE UW 37mm 15-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG Q	C by: NDC
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOO-Limit of Ouantitation



GALSON

6601 Kirkville Road

East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L418161

Project No. : 22152

Date Sampled : 07-SEP-17 Date Received : 12-SEP-17 Report ID : 1018444

LOO Total Units Conc <u>Parameter</u> ug ug Aluminum 7.5 <7.5 NA mq/m3Cadmium 0.15 <0.15 NA mq/m3Iron Oxide 11. <11 NA mg/m3Molvbdenum 0.15 <0.15 NA mg/m3Zinc Oxide 2.8 <2.8 NA mq/m3

Collection Media: Date :	MCE UW 37mm 15-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: NDC
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L418161

East Syracuse, NY 13057 Project No. : 22152

Date Sampled : 07-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

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	uq		
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 Medi	a: MCE UW 37mm	Submitted by: SJW/JJL	Approved by: JJL	by: NDC
Date	: 15-SEP-17	NYS DOH # : 11626	Supervisor: KEG QC	
< -Less Than	mg -Milligrams	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

GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L418161

Project No. : 22152

Date Sampled : 07-SEP-17 Date Received : 12-SEP-17 Report ID : 1018444

Date Sampled: 09/07/17 Date Analyzed: 09/14/17

Parameter	LOQ	Total	Conc	Units
	1.5			
Thallium	1.5	<1.5	<0.0020	mg/m3
Vanadium Pentoxide	0.80	<0.80	<0.0011	mg/m3

Collection Media: Date :	MCE UW 37mm 15-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: NDC
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd Account No.: 90734 Login No. : L418161 Site

East Syracuse, NY 13057 Project No. : 22152

Date Sampled : 07-SEP-17 Date Analyzed : 14-SEP-17 FAX: (315) 437-0571 Date Received : 12-SEP-17 Report ID : 1018444

Client ID: 22152-T16 Lab ID: L418161-8 Air Volume : NA Date Sampled: Date Analyzed: 09/14/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	uq	uq		
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.

Submitted by: SJW/JJL Collection Media: MCE UW 37mm Approved by: JJL NYS DOH # Date : 15-SEP-17 : 11626 Supervisor: KEG QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected

ppm -Parts per Million LOQ-Limit of Quantitation > -Greater Than ug -Micrograms -Liters NS -Not Specified



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Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L418161

Project No. : 22152

Date Sampled : 07-SEP-17 Date Received : 12-SEP-17 Report ID : 1018444

Date Sampled: Date Analyzed: 09/14/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		·
Thallium	1.5	<1.5	NA	mg/m3
Vanadium Pentoxide	0.80	<0.80	NA	mg/m3

Collection Media: Date :	MCE UW 37mm 15-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: NDC
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Login No. : L418161

Site Project No. : 22152

Date Sampled : 07-SEP-17 Date Analyzed : 14-SEP-17 Date Received : 12-SEP-17 Report ID : 1018272

Asbestos Fiber Count (A Rules)

			Fibers/	Fibers/	Fibers/	Air	Fibers/
	<u>Sample ID</u>	<u>Lab ID</u>	<u> Fields</u>	mm2	<u> Filter</u>	Volume (cc)	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 Ouantitation : 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 OC by: NDC

Supervisor: BDB

< -Less Than

> -Greater Than

ND -Not Detected NS -Not Specified

NA -Not Applicable

cc -Cubic Centimeters

mm2 -Square millimeters



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LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L418161

Project No. : 22152

Date Sampled : 07-SEP-17 Date Received : 12-SEP-17 Report ID : 1017838

Respirable Dust

Sample ID	<u>Lab ID</u>	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 Submitted by: HVN

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: 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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Project No. : 22152

Date Sampled : 07-SEP-17

Date Received : 12-SEP-17

: Toronto Transit Commission Ltd Account No.: 90734

Login No. : L418161

Date Analyzed : 13-SEP-17 - 17-SEP-17

Report ID : 1018859

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

			Air Vol		
Sample ID	<u>Lab ID</u>	<u>Analyte</u>	1	ug	ug/m3
22152-S15	L418161-3	Ou o set =	745.2	<5.0	<6.7
22152-515	T410101-3	Quartz Cristobalite	745.2	<5.0 <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

50 ug/m3 RCS

: PVC PW 37mm Supervisor: KRK

NA -Not Applicable ND -Not Detected l -Liters mppcf -Million Particles per Cubic Foot

Submitted: NLO

Date : 18-SEP-17 NYS DOH # : 11626

QC by: NDC

Approved: CMR



LABORATORY FOOTNOTE REPORT

Site :

Project No. : 22152

Date Sampled: 07-SEP-17 Account No.: 90734
Date Received: 12-SEP-17 Login No.: L418161

Client Name : Toronto Transit Commission Ltd.

Date Analyzed: 13-SEP-17 - 17-SEP-17

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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 preceding 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 COP
```

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East Syracuse, NY 13057

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 > -Greater Than mg -Milligrams ug -Micrograms m3 -Cubic Meters 1 -Liters kg -Kilograms NS -Not Specified ppm -Parts per Million ND -Not Detected

NA -Not Applicable





GALSON

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

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```
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 (V205) 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 \text{ mg/m}3.
```

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 Antimony Arsenic Barium	+/-7.7% +/-9.8% +/-7.6% +/-6.5%	96.9% 97.3% 103% 101%

Applicable	
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GALSON

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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 1 -Liters NS -Not Specified ND -Not Detected NA -Not Applicable





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GALSON

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-	
	Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-	125G; ICP/I 5 mg/m3 (Fume) (TWA)
+L418161-1 (Rer	port ID: 1018272):		
_	The sample results may have a neg	ative bias; the filter surface was cov	ered by
	fine particulate that may have ob	scured fibers.	
L418161 (Report	: ID: 1018272):		
	SOPs: ia-pcm(26)		
	<u> </u>	than 100 f/mm2 or greater than 1300 f	/mm2 have a
	greater than optimal variability		
	The current intra-laboratory coef	ficients of variation (CVs) for the ap	plicable 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 asso	ciated with the sampling process.	
L418161 (Report	: TD: 1017838):		
(TLV for RESPIRABLE DUST: NA		
	SOPs: GRAV-SOP-5(18), GRAV-SOP-6	(17)	
		f the sampling media is 0.002 +/- 0.01	8 mg (average blank
			ainty applies to the media, technology, and
			ty associated with the sampling process.
	PNOR = Particulates Not Otherwise		-1
		-3	
< -Less Than	n mg -Milligrams m3	-Cubic Meters kg -Kilograms	ppm -Parts per Million



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LABORATORY FOOTNOTE REPORT

GALSON

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)

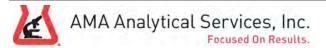
L418161 (Report ID: 1018859):

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 Tridymite	+/-10.9% +/-13.6%	93.4% 105%

<	-Less Than	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	ppm -Parts per Million
>	-Greater Than	ug -Micrograms	1	-Liters	NS -Not Specified	ND -Not Detected

NA -Not Applicable



CERTIFICATE OF ANALYSIS

NY ELAP

Lab ID 10920

Chain of Custody: 285414

Galson Laboratories

Address:

Client:

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: Date Analyzed:

Date Sampled:

09/28/2017

10/04/2017

Report Date: 10/04/2017

Person Submitting:

09/07/2017 Cameron Kennedy

Summary of Transmission Electron Microscopy

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

AMA Sample Number	Client Sample Number	Volume (L)	Area Analyzed (mm²)	Analytical Sensitivity	Asbestos Type Amount	# Non Asbestos Structures	Conce	entration	Fraction	Sample Type	Comments
				1/00			f/mm ²	f/cc			
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.

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

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a mutual protection to clients, the public, and these Laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from us. Sample types, locations, and collection protocols are based upon the information provided by the persons submitting them and, unless collected by personnel of these Laboratories, we expressly disclaim any knowledge and liability for the accuracy and completeness of this information. Residual sample material will be discarded in accordance with the appropriate regulatory guidelines, unless otherwise requested by the client. This report must not be used to claim, and does not imply product certification, approval, or endorsement by NY ELAP or any agency of the Federal Government. All rights reserved. AMA Analytical Services, Inc.

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

Received for Lab by:

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

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MISC Ciner (specify)(QTY	•)	All sa					onditio	n unles	s other	wise r	noted.						Culturable ID Genus (Media_	
□ Vermiculite			(TEM W	ater s	amples.		_°C)											Culturable ID Species (Media_	(QTY)
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		AMA	Report To :	Shelly K	Crause	Invoice To	: Jeanne G	lisson
CALC	Ch Ch	neck if change	report to .	SGS Galson			SGS Galson	
GALS	ORIES of	address		6601 Kirkv		_	6601 Kirkvi	
6601 Kirkville Rd	Ne	ew Client ? yes		East Syracuse		=	East Syracuse	
East Syracuse, NY 13057-	9672	no 🗌	Phone No. :	888-432		Phone No.	: 888-432	
Tel: 315-437-5227 888-432-LABS(5227)						Fax No.	315-437	
Fax: 315-437-0571						1,500,1101		
www.galsonlabs.com		Site Name :			Project:	L418161	Sampled By :	Client
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Standard	10/06/17			90734				
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3 Business Days					- (71.1
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Next Day by Noon				Syracuse.Subcontracting	g@sgs.com			
Same day								
Sample			Collection	*Air Volume (liters)/				Fibers/Field
Identification	on	Date Sampled	Medium	Passive Monitors (Min)	Analysis Re	quested	Method Reference	
22152-A1	5	9/7/2017	25mm MCE PCM	379.4	Transmission Elect	ron Microscopy	NIOSH 7402; TEM	14/100
22152-A1	6	9/7/2017	25mm MCE PCM	BLANK	Transmission Elect	ron Microscopy	NIOSH 7402; TEM	3/100
					12-1-12			
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Comments:							State/Province of sam	nling quanti
Comments.	I£ 41-	an mathad baing roa	and in ant an unit	laboraton 's pursont AULA	and the same distribution			pling event.
	II II	**Please provide	an uncertainty state	laboratory's current AIHA sement in accordance with	AIHA LOAP policy doc	, please state th ument Section 2	PA 5 4 3 **	
Chain of Custody		Print Name	Page 18 of 20 F	Report Reference:2 Gen	erated: 04-061-17	17:43		Date/Time
Relinquished by :		Cameron Kenn			^)			9/27/17 1630
Received by LAB:		7,002,0194101		/	/			

45 1414/61 Report To: Toronto Trens, t Commission Invoice Jo: Torento Trens, t Commission ☐ New Client? Client Account No.*: 125X626A6646673473 TORONTO, ON MUS 362 Date: 09/12/17 TORONTO, ON MUS 362 Shipper:UPS Phone No.*: 416-333-6668 Phone No.: Initials: ZRK Email: Cell No.: Prep: UNKNOUN Purchase Order No.: PU 240 835 Email Results To: Viccil, umali @ ttc.ca che consultants, can Credit Card : Credit Card on File Call for Credit Card Info Email Address: Samples submitted using the FreeSamplingBadges Program. ☐ Samples submitted using the FreePumpLoan™ Program. Need Results By: (surcharge) Project: 22152 Sampled By: OHE Consultanta Standard Site Name: 0% 4 Business Davs Comments: 35% 3 Business Davs 50% 2 Business Days 75% State samples were Please indicate which OEL this data will be used for: List description of industry or process/interferences Next Day by 6pm 100% collected in (ex. NY): Cal OSHA . OSHA PEL ACGIH TLV present in sampling area: Next Day by Noon 150% MSHA. Other (specify): Same Day 200% Hexavalent Chromium Sample Units*: Sample Identification Sample Volume Method Reference^ Collection Analysis Requested* Process (ex. welding, Date Sampled* Cml, min. Sample Time. (Maximum of 20 characters, ID's longer than 20 plating, painting, etc.)* Medium or Sample Area" in2, cm2, ft2 charecters will be abbreviated.) (mm/dd/yy)Hexavalent Chromium (Cr6) mod. OSHA ID-215 Welding 2pc UW PVC 01/01/11 960 Example NEOSH 7400 Asbestes 22152 - A15 03/07/17 25mm PCM 379.4 25MM PCM NEOSH 1600 Asbestos 12157 - A16 NEOSK 7500 + Resp. Dust NEASH 0600 745.2 Constalline Silica (all farors) PW (VC in PPI 22152-515 Ø PW PUC is PPT 22152 - 516 Sec Attached NSOSH 7300 UW MCC IN PPI Metals (Respondeble) 741.6 22152 - MIS NEOSH 7302 Cist. 22152 - MI6 UW MCE in PPI Ø 745.7 N1054 7700 See Attached Metab (Total) 12152 - 115 UW MCE Cist 22152 - T16 uw mce *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): PLEASE For crystalline silica: form(s) of silica needed must be indicated (Quartz, Cristobalite, and/or Tridymite)*: ALL rorms Date/Time Print Name/Signature Chain of Custody Print Name/Signature Date/Time ROMAIN , MATHEVET /ME Sep. 11/2017 10m Received by: Relinquished by 9/11/12 6:00/2 termination. Received by: Kris Stone Relinquished by: Samples received after 3pm will be considered as next day's business. *Required fields, failure to complete these fields may repull in and slavin አውካ የመጠሀያና ው ከባለ ምርዓ ምርዓ ምርዓ ምርዓ ምርዓ

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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East Syracuse, NY 13057

(315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L418180

Project No. : 22152

Date Sampled : 08-SEP-17 Date Received : 12-SEP-17 Report ID : 1018459

Date Sampled: 09/08/17 Date Analyzed: 09/14/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>ug</u>		
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

Collection Media: Date :	MCE UW 37mm 15-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG Q	C by: AMD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L418180

Project No. : 22152

Date Sampled : 08-SEP-17 Date Received : 12-SEP-17 Report ID : 1018459

LOO Total Conc Units <u>Parameter</u> ug ug Aluminum 7.5 <7.5 NA mq/m3Cadmium 0.15 <0.15 NA mq/m3Iron Oxide 11. <11 NA mg/m3Molvbdenum 0.15 <0.15 NA mg/m3Zinc Oxide 2.8 <2.8 NA mq/m3

Collection Media: Date :	MCE UW 37mm 15-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: AMD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1	- 1	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



6601 Kirkville Road
East Syracuse, NY 13057

East Syracuse, NY 13057 (315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L418180

Project No. : 22152

Date Sampled : 08-SEP-17 Date Received : 12-SEP-17 Report ID : 1018459

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media	: MCE UW 37mm : 15-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: AMD
<pre>Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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MOSIAS

LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L418180

East Syracuse, NY 13057 Project No. : 22152

(315) 432-5227 Date Sampled : 08-SEP-17 Date Analyzed : 14-SEP-17 FAX: (315) 437-0571 Date Received : 12-SEP-17 Report ID : 1018459

Date Sampled: 09/08/17 Date Analyzed: 09/14/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	uq	uq	·	
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

Collection Media:	MCE UW 37mm 15-SEP-17	Submitted by NYS DOH #		Approved by: JJL Supervisor: KEG QC	C by: AMD
<pre></pre>	mg -Milligrams	m3 -Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	l -Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

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East Syracuse, NY 13057

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Project No. : 22152

Date Sampled : 08-SEP-17 Date Received : 12-SEP-17 Report ID : 1018457

Date Sampled: 09/08/17 Date Analyzed: 09/14/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	IOM 25mm PVC 15-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: AMD
<pre>-Less Than > -Greater Than</pre>	3 3	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

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Project No. : 22152

Date Sampled : 08-SEP-17 Date Received : 12-SEP-17 Report ID : 1018457

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>	-	
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

Collection Media: Date :	IOM 25mm PVC 15-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: AMD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L418180

Site : NS
Project No. : 22152

Date Sampled : 08-SEP-17 Date Received : 12-SEP-17 Report ID : 1018275

Asbestos Fiber Count (A Rules)

		Fibers/	Fibers/	Fibers/	Air	Fibers/
Sample ID	<u>Lab ID</u>	<u> Fields</u>	mm2	Filter	Volume (cc)	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
OC by: AMD

Supervisor: BDB

< -Less Than

> -Greater Than

ND -Not Detected

mm2 -Square millimeters

NA -Not Applicable

cc -Cubic Centimeters NS -Not Specified



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Client : Toronto Transit Commission Ltd Account No.: 90734 Login No. : L418180 Site : NS

Project No. : 22152

Date Sampled : 08-SEP-17 Date Analyzed : 13-SEP-17 Date Received : 12-SEP-17 Report ID : 1017842

Respirable Dust

Sample ID	<u>Lab ID</u>	Air Vol <u>liter</u>	Total mq	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 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 ND -Not Detected

ug -Micrograms -Liters > -Greater Than NS -Not Specified ppm -Parts per Million



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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L418180

Project No. : 22152

Date Sampled : 08-SEP-17 Date Analyzed : 13-SEP-17 - 17-SEP-17

Date Received : 12-SEP-17 Report ID : 1018861

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

			Air Vol		
Sample ID	<u>Lab ID</u>	<u>Analyte</u>	1	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

Submitted: SPR

Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD Approved: KRK

OSHA PEL : 50 ug/m3 RCS Date : 18-SEP-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: AMD

NA -Not Applicable ND -Not Detected l -Liters mppcf -Million Particles per Cubic Foot



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LABORATORY FOOTNOTE REPORT

GALSON

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

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Any holder of this document is advised that information contained herein reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

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 preceding 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.

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L418180 (Report ID: 1018457):
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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 (V205) 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
> -Greater Than

mg -Milligrams ug -Micrograms

m3 -Cubic Meters 1 -Liters kg -Kilograms NS -Not Specified ppm -Parts per Million ND -Not Detected

NA -Not Applicable



LABORATORY FOOTNOTE REPORT

GALSON

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

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

6601 Kirkville Road

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.

PEL

Parameter	Accuracy	Mean Recovery
	. / 0 00	00.00
Magnesium Oxide	+/-9.2%	99.2%
Molybdenum	+/-7.6%	100%
Nickel	+/-8%	101%
Thallium	+/-7.9%	101%
Vanadium Pentoxide	+/-6.5%	100%
Parameter	Method	

 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</p>
> -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.

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

NA -Not Applicable -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected



SGS

Client Name : Toronto Transit Commission Ltd.

Site :

Project No. : 22152

6601 Kirkville Road
East Syracuse, NY 13057 Date Sampled: 08-SEP-17
(315) 432-5227 Date Received: 12-SEP-17

Date Received: 12-SEP-17 Login No. : L418180

FAX: (315) 437-0571 Date Analyzed: 13-SEP-17 - 17-SEP-17 www.galsonlabs.com

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
-3.	1 5000/ 1 1055	
Aluminum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 ('I'WA)
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)

Account No.: 90734

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



LABORATORY FOOTNOTE REPORT

GALSON

Client Name : Toronto Transit Commission Ltd.

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

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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

الأمما	418180	☐ New (Client?	Report To*:	Toronto	Transit	Commission	_Invoice To* :	Toronto	Transe	Commission
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(Maximum of 20 characters, i characters will be ab	ID's longer then 20	Date Sa	ampled* : dd/yy)	Collection Medium	Sample Timo or Sample Area	L, ml, min., in2, cm2, ft2	Analysis Requ	ested*	Method Re	ference^	Process (ex. welding, plating, painting, etc.)*
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22152 -A18		 		25mm PCM	Ø	Ø	Asbestos		HE HOOIL		
22/52 - 5/7		 		PW PVC in PPI		I – – – – – – – – – – – – – – – – – – –	Crystalline Silica	(all forms)	ZE HLOIN	00 + Res	Pust NIOSHOGO
22127 - 218	·	1		PW PVC in PPI	Ø	Ø					
22122 - IIS	<u> </u>			PW PVC in IOM	9+3	1074.0	Metals (Inhala	ble)	NIOSH 730	xo f Inh.	DUA NIOSHOS
22152 - IK	,			PW PVC in IOM	Ø	Ø		11			
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^Galson Laboratories		our routir	ne/prefer	rred method if it d	oes not matc	h the method	listed on the COC un	less this box i	s checked:	Use met	hod(s) listed on COC
For metals analysis: if re	questing an anal	yte with the	e option o	of a lower LOQ pleas	se indicate if th	e lower LOQ is	required (only available	for certain ana	ytes see SAG):		
For crystalline silica:	form(s) of silica	needed r	must be	indicated (Quartz,	, Cristobalite,	and/or Tridy	mite)*:				
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L nequi	ou nelus, luitui	- 10 00111	برواء د.د. د	age 16 of 17 CR	eport Kětěře	ACC GONE	rated:18-SEP-17-17				

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 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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Client : Toronto Transit Commission Ltd Account No.: 90734

Login No. : L418167 Site : NS

: 22152 Project No.

Date Sampled : NS Date Analyzed : 14-SEP-17

Date Received : 12-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

	LOQ	Total	Conc	Units	
<u>Parameter</u>	<u>uq</u>	<u>uq</u>			
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	

Collection Media:	MCE UW 37mm 15-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: NDC
<pre></pre>	mg -Milligrams	m3 1	-Cubic Meters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOO-Limit of Ouantitation



GALSON

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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

Date Sampled: Date Analyzed: 09/14/17

_	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>	-	
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

Collection Media	: MCE UW 37mm : 15-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: NDC
<pre></pre>	mg -Milligrams ug -Micrograms	m3 1		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734

ad Site : NS Login No. : L418167

6601 Kirkville Road Site : NS Login No East Syracuse, NY 13057 Project No. : 22152

(315) 432-5227 Date Sampled : NS Date Analyzed : 14-SEP-17 FAX: (315) 437-0571 Date Received : 12-SEP-17 Report ID : 1018450

Date Sampled: Date Analyzed: 09/14/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media:	MCE UW 37mm 15-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: NDC
<pre>< -Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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East Syracuse, NY 13057

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site 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-T20	Lab ID : L418167-10	Air Volume : NA
Date Sampled:	Date Analyzed: 09/14/17	

<u>Parameter</u>	LOQ uq	Total <u>uq</u>	Conc	Units
Antimony	0.90	<0.90	NΔ	mcr/m3

·	·	<u> </u>		_
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

Collection Media:	MCE UW 37mm 15-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG	QC	by: NDC
<pre></pre>	mg -Milligrams ug -Micrograms	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Milli	.on	ND -Not Detected LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734

6601 Kirkville Road Site : NS Login No. : L418167 East Syracuse, NY 13057 Project No. : 22152

(315) 432-5227 Date Sampled : NS Date Analyzed : 14-SEP-17 FAX: (315) 437-0571 Date Received : 12-SEP-17 Report ID : 1018447

Date Sampled: Date Analyzed: 09/14/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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	mq/m3

Collection Media: Date :	IOM 25mm PVC 15-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: NDC
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734

6601 Kirkville Road Site : NS Login No. : L418167

(315) 432-5227 Date Sampled : NS Date Analyzed : 14-SEP-17 FAX: (315) 437-0571 Date Received : 12-SEP-17 Report ID : 1018447

Date Sampled: Date Analyzed: 09/14/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	uq		
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

Collection Media: Date :	IOM 25mm PVC 15-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: NDC
<pre>-Less Than > -Greater Than</pre>	2	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



6601 Kirkville Road

LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd Account No.: 90734 Login No. : L418167 Site

East Syracuse, NY 13057 Project No. : 22152 (315) 432-5227

Date Sampled : NS Date Analyzed : 14-SEP-17 Date Received : 12-SEP-17 Report ID : 1018273

FAX: (315) 437-0571 www.galsonlabs.com

Asbestos Fiber Count (A Rules)

		Fibers/	Fibers/	Fibers/	Air	Fibers/
Sample ID	<u>Lab ID</u>	Fields	mm2	Filter	Volume (cc)	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 Ouantitation: 5.5 Fibers/ 100 Fields

Microscope field area : 0.00785 mm2 Filter collection area: 385 mm2

Supervisor: BDB

OC by: NDC

Submitted by : BTM

Approved by : BDB

Date: 18-SEP-17

< -Less Than

> -Greater Than

ND -Not Detected NS -Not Specified

NA -Not Applicable

cc -Cubic Centimeters

mm2 -Square millimeters



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Client : Toronto Transit Commission Ltd Account No.: 90734 Login No. : L418167 Site : NS

Project No. : 22152

Date Sampled : NS Date Analyzed : 13-SEP-17 Report ID : 1017839

Date Received : 12-SEP-17

Respirable Dust

Sample ID	<u>Lab ID</u>	Air Vol liter	Total mq	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 Submitted by: NRH/HVN

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: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected

ug -Micrograms l -Liters > -Greater Than NS -Not Specified ppm -Parts per Million



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Client Site : NS

Project No. : 22152

Date Sampled : NS

Date Received : 12-SEP-17

: Toronto Transit Commission Ltd Account No.: 90734

Login No. : L418167

Date Analyzed : 13-SEP-17 - 17-SEP-17

Report ID : 1018860

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

			Air Vol		
Sample ID	<u>Lab ID</u>	<u>Analyte</u>	1	<u>uq</u>	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

Supervisor: KRK

Submitted: SPR Approved: KRK

Date: 18-SEP-17 NYS DOH #: 11626

QC by: NDC

-Parts per Million < -Less Than mg -Milligrams kg -Kilograms ppm > -Greater Than ug -Micrograms m3 -Cubic Meters -Not Specified

NA -Not Applicable ND -Not Detected -Liters mppcf -Million Particles per Cubic Foot



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LABORATORY FOOTNOTE REPORT

GALSON

Client Name : Toronto Transit Commission Ltd.

Site :

Project No. : 22152

Date Sampled: Account No.: 90734
Date Received: 12-SEP-17 Login No.: L418167

Date Analyzed: 13-SEP-17 - 17-SEP-17

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Any holder of this document is advised that information contained herein reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

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 preceding 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.

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L418167 (Report ID: 1018447):
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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 (V205) 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 > -Greater Than mg -Milligrams ug -Micrograms

m3 -Cubic Meters

l -Liters

kg -Kilograms NS -Not Specified ppm -Parts per Million ND -Not Detected

NA -Not Applicable



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LABORATORY FOOTNOTE REPORT

GALSON

Client Name : Toronto Transit Commission Ltd.

Site :

Project No. : 22152

Date Sampled: Account No.: 90734
Date Received: 12-SEP-17 Login No. : L418167

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.

8 99.28
'% 100%
101%
% 101%
% 100%

Method

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):

Parameter

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	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable



LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.

Project No. : 22152

Account No.: 90734 Date Sampled : Date Received: 12-SEP-17 Login No. : L418167

Date Analyzed: 13-SEP-17 - 17-SEP-17

L418167 (Report ID: 1018450):

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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
_	-Creater Than	ua -Micrograms	1	-Titere	MS -Mot Specified	ND -Not Detected

NA -Not Applicable



LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.

Project No. : 22152

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Date Sampled : Account No.: 90734 Date Received: 12-SEP-17 Login No. : L418167

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)
D: 1018273):		

L418167 (Report ID: 1018273)

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

0.154 (5-20 fibers/100 fields)

<	-Less Than	mg -Milligrams	m3	-Cubic Meters	kg	-Kilograms	ppm -Parts per Million	
>	-Greater Than	ug -Micrograms	1	-Liters	NS	-Not Specified	ND -Not Detected	NA -Not Applicable



LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.

Project No. : 22152

Date Sampled : Account No.: 90734 Date Received: 12-SEP-17 Login No. : L418167

Date Analyzed: 13-SEP-17 - 17-SEP-17

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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	7	☐ New Client?	Report To*:	TOR	DO TO	TRONFO7	Commis fform	Invoice #p*:			
SGS	GALSON							1170			
1Z5X626A6646673473		Client Account			te	*		- K'			
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Initials:ZRK			Phone No.* :	416	-39	3-6668		- Phone No. :			
			Cell No. :					- Email :			
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Need Results By*:	(surcharge)	-	les submitted using th	ne Freel			_] Samples submi			
I Standard	0%	Site Name :				Project ·	22152		Sampled By	ORECO	chilony
4 Business Days	35%	Comments:			•	r rojour.			Campica D	, O P	
3 Business Days	50%	1									
2 Business Days	75%										
☐ Next Day by 6pm	100%		of industry or pro	cess/	nterfer	ences	State samples were			EL this data v	vill be used for:
Next Day by Noon	150%	present in samp	oling area:				collected in (ex. NY):	OSHA PEL	=	ACGIH TLV	Cal OSHA
Same Day	200%					L Committe Haltate		MSHA	<u> </u>	Other (specify):	
Sample Identi (Maximum of 20 characters, I characters will be ab	ID's longer than 20	Date Sampled* (mm/dd/yy)	Collection Medium	6ami	e Volume, le Time ple Area	Sample Units*: L, ml, min., in2, cm2, ft2	Analysis Requ	uested*	Method I	Reference [^]	Hexavalent Chromium Process (ex. welding, plating, painting, etc.)*
Examp	le	01/01/11	2pc UW PVC	9	60	L	Hexavalent Chror	nium (Cr6)	mod. OS	SHA ID-215	Welding
22152-A19			25 MM PCM	515 521.0 Asbestos		1 sbestos		MIOSH	7400		
22152-420	•		25mm PC M		Ø	ø	¥		V		
22/52-5/9	g		PW PVC LL PPI			1031.3	Crystallone St.	lico (alljoru	SI WiOIH	7500 4 R	esp. Dust
22152-52			i.		Ø	8	4		Niosi	10600	
22152-1	17_		<i>ewpreintom</i>			1042.2	Metals (Inhal	eble j	NEO34 3	7300 & In	h. Du so
22152 I	(8		4		0	0	4		vi084	0500	
20182 - M	19		un McBin PPI			10001	Metall (Respo	roblas	Ni OSH	7300	
22 (52 - M	20		V		0	2	4		*		
22152 - 71	19		NU MCE		<u> </u>	1034.4	Metals (Total	21			
22152 - 73	20		V		'o	D	٤		4		
^Galson Laboratories	will substitute	our routine/prefei	rred method if it de	oes n	ot matc	h the method	d listed on the COC un	less this box i	s checked:	Use meth	nod(s) listed on COC
For metals analysis: if red	questing an analy	yte with the option o	of a lower LOQ pleas	se indi	ate if th	ne lower LOQ i	s required (only available	for certain ana	lytes see SAG):	
For crystalline silica: f	orm(s) of silica	needed must be	indicated (Quartz,	Crist	balite,	and/or Tridy	/mite)*:		,		
Chain of Custody Print Name/Signature						/Time	13		me/Şignaty	re	Date/Time
Relinquished by:	LARYJA	KOKH ROYTS,	EVH	08/	08/	17		mma		P. Commercial Commerci	9/1/17 5:00
Relinquished by:	Lemma	a: ///	Hada he at 17	19/		6:00p-		is Stone	LIUS	BIDICE	9/12/17 1007
*Requir	•		•			• •	essted:18-SEP-17-17 Dies being processed.	.J3	Pag	je	of '

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.



GALSON

6601 Kirkville Road

East Syracuse, NY 13057

(315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L418917

Project No. : 22152

Date Sampled : 12-SEP-17 Date Received : 19-SEP-17 Report ID : 1019860

Date Sampled: 09/12/17 Date Analyzed: 09/21/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	MCE UW 37mm 25-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG Q	C by: NDC
<pre>Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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Project No. : 22152

Date Sampled : 12-SEP-17 Date Received : 19-SEP-17 Report ID : 1019860

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		<u> </u>
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

Collection Media: Date :	MCE UW 37mm 25-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: NDC
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Project No. : 22152

Date Sampled : 12-SEP-17 Date Received : 19-SEP-17 Report ID : 1019860

Date Sampled: 09/12/17 Date Analyzed: 09/21/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	uq	<u>uq</u>		-
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

Collection Medi Date	a: MCE UW 37mm : 25-SEP-17		ted by: JPA H # : 11626	Approved by: JJL Supervisor: KEG Q	C by: NDC
-Less Than-Greater Tha	mg -Milligrams n ug -Micrograms	m3 -Cubic l -Liters	5 5	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Selenium

Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L418917

Project No. : 22152

Date Sampled : 12-SEP-17 Date Received : 19-SEP-17 Report ID : 1019860

LOO Total Units Conc <u>Parameter</u> ug uq Antimony 0.90 <0.90 NA mq/m3Arsenic 0.30 < 0.30 NA mq/m3Barium 0.15 <0.15 mg/m3NA <0.15 Bervllium 0.15 NA mq/m3Cadmium 0.15 <0.15 NA mq/m3Calcium Oxide 100. <100 NA mq/m3Chromium 7.5 <7.5 NA mq/m3Cobalt 0.45 <0.45 NA mq/m30.30 <0.30 Copper NA mq/m3Lead 0.38 <0.38 NΑ mq/m3Manganese 0.15 <0.15 mq/m3NA

< 2.3

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

2.3

Collection Medi Date	a: MCE UW 37mm : 25-SEP-17		ted by: JPA H # : 11626	Approved by: JJL Supervisor: KEG Q	C by: NDC
-Less Than-Greater Tha	mg -Milligrams n ug -Micrograms	m3 -Cubic l -Liters	5 5	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation

NA

mq/m3



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Project No. : 22152

Date Sampled : 12-SEP-17 Date Received : 19-SEP-17 Report ID : 1019859

Date Sampled: 09/12/17 Date Analyzed: 09/21/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	IOM 25mm PW PVC 22-SEP-17	ubmitted by: YS DOH # :		Approved by: JJL Supervisor: KEG	QC	by: NDC
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Milli		ND -Not Detected LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L418917

Project No. : 22152

Date Sampled : 12-SEP-17 Date Received : 19-SEP-17 Report ID : 1019859

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	IOM 25mm PW PVC 22-SEP-17	ubmitted by: YS DOH # :		Approved by: JJL Supervisor: KEG	QC	by: NDC
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Milli		ND -Not Detected LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Login No. : L418917 Site

Project No. : 22152

Date Sampled : 12-SEP-17 Date Analyzed : 25-SEP-17 Date Received : 19-SEP-17 Report ID : 1020356

Asbestos Fiber Count (A Rules)

			Fibers/	Fibers/	Fibers/	Air	Fibers/
	<u>Sample ID</u>	<u>Lab ID</u>	Fields	mm2	Filter	Volume (cc)	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 Ouantitation: 5.5 Fibers/ 100 Fields

Microscope field area : 0.00785 mm2 Filter collection area: 385 mm2

Date : 25-SEP-17 OC by: NDC

Supervisor: BDB

Submitted by : BTM

Approved by : BDB

< -Less Than

> -Greater Than

ND -Not Detected NS -Not Specified

NA -Not Applicable

cc -Cubic Centimeters

mm2 -Square millimeters



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LABORATORY ANALYSIS REPORT

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(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L418917

Project No. : 22152

Date Sampled : 12-SEP-17 Date Received : 19-SEP-17 Report ID : 1019309

Inhalable Dust

Sample ID	<u>Lab ID</u>	Air Vol <u>liter</u>	Total mq	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 Submitted by: NRH

Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV Approved by : SPR

OSHA PEL : NA Date : 20-SEP-17 NYS DOH # : 11626

Collection Media : IOM 25mm PW PVC 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



MOSIN

LABORATORY ANALYSIS REPORT

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Project No. : 22152

Date Sampled : 12-SEP-17 Date Received : 19-SEP-17 Report ID : 1019308

Date Received : 19-SEP-17

Respirable Dust

Sample ID	<u>Lab ID</u>	Air Vol <u>liter</u>	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 Submitted by: NRH/HVN

Analytical Method : mod. NIOSH 0600; Gravimetric Approved by : SPR

OSHA PEL : PNOR 5 mg/m3 (TWA) Date : 20-SEP-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm 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

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Project No. : 22152

Date Sampled : 12-SEP-17 Date Analyzed : 20-SEP-17 - 22-SEP-17

Date Received : 19-SEP-17 Report ID : 1020012

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

			Air Vol		
Sample ID	<u>Lab ID</u>	<u>Analyte</u>	1	<u>uq</u>	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

Submitted: SPR

Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD Approved: CMR

OSHA PEL : 50 ug/m3 RCS Date : 25-SEP-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: NDC

NA -Not Applicable ND -Not Detected 1 -Liters mppcf -Million Particles per Cubic Foot



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LABORATORY FOOTNOTE REPORT

GALSON

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

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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 preceding 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.

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L418917 (Report ID: 1019859):
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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 (V205) 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 > -Greater Than mg -Milligrams ug -Micrograms

m3 -Cubic Meters 1 -Liters kg -Kilograms NS -Not Specified ppm -Parts per Million

ND -Not Detected

NA -Not Applicable



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LABORATORY FOOTNOTE REPORT

GALSON

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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	/T 15 mg/m3 (Total Dart)TWA
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP	
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	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable





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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	1	-Liters	NS -Not Specified	ND -Not Detected





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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	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable



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LABORATORY FOOTNOTE REPORT

GALSON

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
                 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	NA -Not Applicable
> -Greater Than	ug -Micrograms	1 -Liters	NS -Not Specified	ND -Not Detected	
> -Greater Inan	ug -Micrograms	i -biters	NS -NOC Specified	ND -NOL Detected	NA -NOL APPIICADIE



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LABORATORY FOOTNOTE REPORT

GALSON

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 Tridymite	+/-10.9% +/-13.6%	93.4% 105%

NA -Not Applicable

		□New	Client?	Report To*:	Torento	Trensit (anny issian	Invoice To*:	Torento Transit	Commission
SGS	CALCON			. породения	1320 yo				1320 York St	
125X626A6646A25005	GALSON	Client	Account	No.* :	_ , _	600		•	Suite 60e	
Date:09/19/17 Shipper:UPS)				TORONTO		45 362	•	TORONTE, ON	M45 3ER
Initials:MAK	1			- Phone No.* :				Phone No. :	7	
					virgil, uma			Email :		
EL ED : NIK NOMN	1	Fn	nail Resu			•	nsultants.com		e Order No. : PU Ze	49 835
L 418917	}		mail Ado		NEVESORIS	(E) OHECE	((10.10).1-3		Credit Card on File	
Need Results By*:	(surcharge)	1		les submitted using th	e FreePumpLoa	n [™] Program.		Samples submit	ted using the FreeSampling	Badges [™] Program.
X Standard	0%	Site Na	me :			Project : 2	2152		Sampled By: OHE	Consultants
4 Business Days	35%	Comm			· · · · · ·		-			
3 Business Days	50%	y e .	A WARE						da	0,06
2 Business Days	75%	X '	HILL O	vie nu. 26	.m 26	** ID	State samples were	24. SE 91"	9(1)	PIV.
Next Day by 6pm	100%	List de	scription	of industry or pro ling area:	cess/interfer	ences	State samples were collected in (ex. NY):	OSHA PEL	ate which OEL this dat	a will be used for:
Next Day by Noon Same Day	150% 200%	-	t iii ouiiip	mig a.ou.			, ,	MSHA	Other (specif	_
Sample Identi		Data S	ampled*	Collection	Sample Volume	Sample Units*:				Hexavalent Chromium
(Maximum of 20 characters, I characters will be abl			/dd/yy)	Medium	Sample Time, or Sample Area*	Uml, min., in2, cm2, ft2	Analysis Reque	ested*	Method Reference	Process (ex. welding, plating, painting, etc.)*
Examp	le	1	01/11	2pc UW PVC	960	L	Hexavalent Chrom	ium (Cr6)	mod. OSHA ID-215	Welding
22152 - A21	*	03/12	2/17	25 mm PCM	556.7	اسا	Asbestes		NIOSH 4400	
22152-A22	*	i		25mm pcm	Ø	1 .	"		"	
22152 - 521				PW PVC in PPI	1038,1		Crystelline Silver	(ell fams)	NIOSH 7500 + Res	P Dust NEOSK 0600
22157-522				PW PVC in PPI	Ø		u		n	
22152-I19				PW MCE IN LOM	1100.7		Tahalable Metals +	Inhalable	Dust NEOSH -	7300 \$ 05e0
22152-120				Phy MEE in Som	Ø		")		11	
22152- M21				PW PUC IN PPI	1110.3		Metals (Respired	Le)	NIOSH 7300	2
22152 - m22				PW PUCNEPS	Ø		11		U	
22152-121				UW MCE .	1093.4		metab (total)		e)	
22152 - T22		7	7	UN ME	Ø	b	11		1)	
		our routi	ne/prefe	rred method if it d	<u> </u>	h the method	listed on the COC union	ess this box i	s checked: Use r	method(s) listed on COC
For metals analysis: if red	questing an analy	te with th	e option o	of a lower LOQ pleas	se indicate if th	e lower LOQ is	s required (only available	for certain ana	lytes see SAG):	
For crystalline silica: f	orm(s) of silica	needed	must be	indicated (Quartz,	Cristobalite,	and/or Tridy	mite)*:			
Chain of Custody	Р		ne/Signa	30	42 4 4	/Time	ļ	Print Na	me/Signature	Date/Time
Relinquished by:	ROMAN	V M.	ATH 6	vet R	Sept. 13	1 PM	100	Man	illy	19/10/ / 5:29
Relinquished by:	1 tern		1/1	Page 18 of 19	Report Refe	rence Gen	Received by: 17/18:	your	Millin	19/17/17 070
*Requir				3pm will be consi se fields may resu			less. les being processed.		Page	of l
- 1				. ,		AB 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# 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.



GALSON

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East Syracuse, NY 13057

(315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L418946

Project No. : 22152

Date Sampled : 12-SEP-17 Date Received : 19-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

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media:	MCE UW 37mm 22-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG Q	C by: AMD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOO-Limit of Ouantitation



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East Syracuse, NY 13057

East Syracuse, NY 13057 (315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L418946

Project No. : 22152

Date Sampled : 12-SEP-17 Date Received : 19-SEP-17 Report ID : 1019866

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		<u> </u>
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

Collection Media: Date :	MCE UW 37mm 22-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: AMD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1	- 1	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L418946

Project No. : 22152

Date Sampled : 12-SEP-17 Date Received : 19-SEP-17 Report ID : 1019866

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media	: MCE UW 37mm : 22-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: AMD
<pre></pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L418946

Project No. : 22152

Date Sampled : 12-SEP-17 Date Received : 19-SEP-17 Report ID : 1019866

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	uq		
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

Collection Media: Date :	MCE UW 37mm 22-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: AMD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1	- 1	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L418946

Project No. : 22152

Date Sampled : 12-SEP-17 Date Received : 19-SEP-17 Report ID : 1019864

Date Sampled: 09/12/17 Date Analyzed: 09/21/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	uq		
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

Collection Media: Date :	IOM 25mm PW PVC 22-SEP-17	Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG	C by: AMD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L418946

East Syracuse, NY 13057 Project No. : 22152

(315) 432-5227 Date Sampled : 12-SEP-17 Date Analyzed : 21-SEP-17 FAX: (315) 437-0571 Date Received : 19-SEP-17 Report ID : 1019864

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		· ·
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

Collection Media: Date :	IOM 25mm PW PVC 22-SEP-17	Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG	C by: AMD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



Client : Toronto Transit Commission Ltd Account No.: 90734 6601 Kirkville Road

Login No. : L418946 Site

East Syracuse, NY 13057 Project No. : 22152

(315) 432-5227 Date Sampled : 12-SEP-17 Date Analyzed : 25-SEP-17 FAX: (315) 437-0571 Date Received : 19-SEP-17 Report ID : 1020360

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Asbestos Fiber Count (A Rules)

			Fibers/	Fibers/	Fibers/	Air	Fibers/
	Sample ID	<u>Lab ID</u>	<u> Fields</u>	mm2	Filter	Volume (cc)	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 Approved by : BDB Limit of Ouantitation: 5.5 Fibers/ 100 Fields Date : 25-SEP-17

Microscope field area : 0.00785 mm2 OC by: AMD Filter collection area: 385 mm2 Supervisor: BDB

< -Less Than

> -Greater Than

ND -Not Detected

Submitted by : BTM

NA -Not Applicable

cc -Cubic Centimeters

NS -Not Specified

mm2 -Square millimeters



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LABORATORY ANALYSIS REPORT

6601 Kirkville Road

East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L418946

Project No. : 22152

Date Sampled : 12-SEP-17 Date Received : 19-SEP-17 Report ID : 1019325

Inhalable Dust

<u>Sample ID</u>	<u>Lab ID</u>	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 Submitted by: NRH

Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV Approved by : SPR

OSHA PEL : NA Date : 20-SEP-17 NYS DOH # : 11626

Collection Media : IOM 25mm PW PVC 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

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L418946

Project No. : 22152

Date Sampled : 12-SEP-17 Date Received : 19-SEP-17 Report ID : 1019324

Respirable Dust

Sample ID	<u>Lab ID</u>	Air Vol liter	Total mq	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 Submitted by: NRH

Analytical Method : mod. NIOSH 0600; Gravimetric Approved by : SPR

OSHA PEL : PNOR 5 mg/m3 (TWA) Date : 20-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 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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East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L418946

Project No. : 22152

Date Sampled : 12-SEP-17 Date Analyzed : 20-SEP-17 - 22-SEP-17

Date Received : 19-SEP-17 Report ID : 1019979

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

			Air Vol		
Sample ID	<u>Lab ID</u>	<u>Analyte</u>	1	<u>uq</u>	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 Submitted: NLO

Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD Approved: CMR

OSHA PEL : 50 ug/m3 RCS Date : 23-SEP-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: AMD

NA -Not Applicable ND -Not Detected l -Liters mppcf -Million Particles per Cubic Foot



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LABORATORY FOOTNOTE REPORT

GALSON

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

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Any holder of this document is advised that information contained herein reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

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 preceding 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/m3i Molybdenum and insoluble

compounds, as Mo (total dust) = 15 mg/m3.

Reported Vanadium Pentoxide (V205) 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 > -Greater Than mg -Milligrams ug -Micrograms

m3 -Cubic Meters 1 -Liters kg -Kilograms NS -Not Specified ppm -Parts per Million ND -Not Detected

NA -Not Applicable



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LABORATORY FOOTNOTE REPORT

GALSON

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

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
	. / 0. 00	22.22
Magnesium Oxide	+/-9.2%	99.2%
Molybdenum	+/-7.6%	100%
Nickel	+/-8%	101%
Thallium	+/-7.9%	101%
Vanadium Pentoxide	+/-6.5%	100%

Method

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):

Parameter

```
TLV for COPPER: Copper dust and mist = 1 \text{ mg/m3}; Copper fume = 0.2 \text{ 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



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East Syracuse, NY 13057 (315) 432-5227

Client Name : Toronto Transit Commission Ltd.

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





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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

Copper	+/-10.3%	103%
Iron Oxide	+/-9.6%	106%
II OII OXIGE	+/-9.0%	100%
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
21 '	1 NTOCK 5200/ 1 00W TD 1050, TCD/T	15 (2 (5777)
Aluminum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	3
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	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable



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LABORATORY FOOTNOTE REPORT

GALSON

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
                 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)
```

> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable	<	-Less Than	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	ppm -Parts per Million	
	>	-Greater Than	ug -Micrograms	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable



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LABORATORY FOOTNOTE REPORT

GALSON

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%	

		□New	Client?	Report To* :	Tomato	Tizzneit	Commission	Invoice To*:	Toronto Travit	Commission
SGS	CALCON					once st.	Samma		1920 Yonge St.	
	GALSON	Client A	ccount	No.* :	suite 6	•			Suite 600	
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	1			Cell No. :		<u> </u>	.	Email :		
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L418946			nail Add	-			nruttants. com	₹	☐ Credit Card on File ☐ Ca	
Need Results By:		7 [Samp	les submitted using th	e FreePumpLoa			-	ted using the FreeSamplingBa	ľ
Standard	0%	Site Nam	ne :		·	Project :	22152	·	Sampled By : OHE	
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3 Business Days	50%								(R	119/
2 Business Days	75%						,		Ų.	
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Same Day Sample Identi	200% fication*	- 			l completetum	Sample Units*:		☐ MSHA	Other (specify):	Hexavalent Chromium
(Maximum of 20 characters, the cheracters will be ab	ID's longer than 20	Date Sa (mm/c	-	Collection Medium	Sample Volume, Sample Time or Sample Area	L, ml, min., in2, cm2, ft2	Analysis Requ	ested*	Method Reference^	Process (ex. welding, plating, painting, etc.)*
Examp	le	01/0	1/11	2pc UW PVC	960	L	Hexavalent Chron	nium (Cr6)	mod. OSHA ID-215	Welding
22152 - A23		09/12	117	25mm PCM	560	564.7	Asbestos		NIOSH 7400	
22152 - A24			ł	asimm PCM	Ø	Ø				
22152-523				PWPVC in PPI	558	1114.6	Crystalline Silica	(all forms)	WIOSH 7500 + Re	P. Pust NIOSH OF
22122-224				PW PUC in PPI	-	Ø		·		
22152-121				PW PVC IN IOM	5/00	1129.2	Metals (Inhalabl	e) t/10sH	7:300 + Inh. Dust	OCEO HIDILA
33127 - ISS	<u> </u>			PW PUC IN IOM	Ø	Ø		-11 -		
22122 - M23	<u> </u>			UW MCE in PPI	55.8	1132.9	Metals (Respi	rable)	DOSF HZOIU	
22127 - W31	4	<u> </u>		uw Mce in PPI	Ø	Ø		- 11		
22152 - T23	i S			UW MCE	560	1120.4	Metals (Tota	v	OOSF HOOIN	
22152 - T24			<u> </u>	uw McE	Ø	Ø		<u> </u>		
^Galson Laboratories	will substitute	our routin	e/prefe	rred method if it de	oes not matc	h the method	d listed on the COC unl	ess this box i	s checked: Use met	nod(s) listed on COC
For metals analysis: if re-								for certain anal	ytes see SAG):	
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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# 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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Client : Toronto Transit Commission Ltd Account No.: 90734

Login No. : L418951 Site : NS

Project No. : 22152

Date Sampled : 13-SEP-17 Date Analyzed : 21-SEP-17 - 22-SEP-17

Date Received : 19-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 uq	Total uq	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

Collection Media:	MCE UW 37mm 22-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG Q	C by: AMD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOO-Limit of Ouantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L418951

Project No. : 22152

Date Sampled : 13-SEP-17 Date Analyzed : 21-SEP-17 - 22-SEP-17

Date Received : 19-SEP-17 Report ID : 1019868

Date Sampled: 09/13/17 Date Analyzed: 09/21/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	MCE UW 37mm 22-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: AMD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1	- 1	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L418951

Project No. : 22152

Date Sampled : 13-SEP-17 Date Analyzed : 21-SEP-17 - 22-SEP-17

Date Received : 19-SEP-17 Report ID : 1019868

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	uq		
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

Collection Media	: MCE UW 37mm : 22-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: AMD
<pre></pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Site Login No. : L418951

Project No. : 22152

Date Sampled : 13-SEP-17 Date Analyzed : 21-SEP-17 - 22-SEP-17

Date Received : 19-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

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	uq		
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

Collection Medi Date	a: MCE UW 37mm : 22-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG Q0	C by: AMD
<pre></pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	n ug -Micrograms	1	-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 Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L418951

Project No. : 22152

Date Sampled : 13-SEP-17 Date Analyzed : 21-SEP-17 - 22-SEP-17

Date Received : 19-SEP-17 Report ID : 1020106

Date Sampled: 09/13/17 Date Analyzed: 09/22/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media:	IOM 25mm PW PVC 24-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: AMD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L418951

Project No. : 22152

Date Sampled : 13-SEP-17 Date Analyzed : 21-SEP-17 - 22-SEP-17

Date Received : 19-SEP-17 Report ID : 1020106

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media:	IOM 25mm PW PVC 24-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: AMD
<pre>-Less Than > -Greater Than</pre>		m3 1	- 1.	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L418951

6601 Kirkville Road Site : NS Login No.
East Syracuse, NY 13057 Project No. : 22152

(315) 432-5227 Date Sampled : 13-SEP-17 Date Analyzed : 25-SEP-17 FAX: (315) 437-0571 Date Received : 19-SEP-17 Report ID : 1020362

Asbestos Fiber Count (A Rules)

			Fibers/	Fibers/	Fibers/	Alr	Fibers/
	Sample ID	<u>Lab ID</u>	Fields	mm2	<u> Filter</u>	Volume (cc)	CC
+	22152-A25	L418951-1	9/100	11.5	4428	570,200	0.008
	22152-A26	T.418951-2	2 5/100	<7	< 2700	NΔ	NΔ

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

Sample Matrix : 25mm MCE PCM Submitted by : BTM

Analytical Method: mod. NIOSH 7400 "A" Rules Approved by: BDB Limit of Quantitation: 5.5 Fibers/ 100 Fields Date: 25-SEP-17

Microscope field area: 0.00785 mm2 QC by: AMD Filter collection area: 385 mm2 Supervisor: BDB

< -Less Than > -Greater Than ND -Not Detected

NA -Not Applicable cc -Cubic Centimeters NS -Not Specified

mm2 -Square millimeters



ALSON

LABORATORY ANALYSIS REPORT

6601 Kirkville Road

East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L418951

Project No. : 22152

Date Sampled : 13-SEP-17 Date Received : 19-SEP-17 Report ID : 1019362

Inhalable Dust

Sample ID	<u>Lab ID</u>	Air Vol <u>liter</u>	Total mq	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 Submitted by: HVN

Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV Approved by : SPR

OSHA PEL : NA Date : 20-SEP-17 NYS DOH # : 11626

Collection Media : IOM 25mm PW PVC 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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East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L418951

Project No. : 22152

Date Sampled : 13-SEP-17 Date Received : 19-SEP-17 Report ID : 1019959

Respirable Dust

<u>Sample ID</u>	<u>Lab ID</u>	Air Vol liter	Total mq	Conc mq/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 Submitted by: GMG

Analytical Method : mod. NIOSH 0600; Gravimetric Approved by : SPR

OSHA PEL : PNOR 5 mg/m3 (TWA) Date : 22-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 ND -Not Detected

> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million



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Client : Toronto Transit Commission Ltd Account No.: 90734

Site Login No. : L418951

Project No. : 22152

Date Sampled : 13-SEP-17 Date Analyzed : 22-SEP-17 - 23-SEP-17

Submitted: CMR/NLO

Approved: KRK/CMR

Date Received : 19-SEP-17 Report ID : 1020047

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

			Air Vol		
Sample ID	<u>Lab ID</u>	<u>Analyte</u>	1	uq	uq/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 Date : 25-SEP-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: AMD

-Parts per Million < -Less Than mg -Milligrams kg -Kilograms ppm > -Greater Than ug -Micrograms m3 -Cubic Meters -Not Specified

NA -Not Applicable ND -Not Detected -Liters mppcf -Million Particles per Cubic Foot



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LABORATORY FOOTNOTE REPORT

GALSON

Client Name : Toronto Transit Commission Ltd.

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

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Any holder of this document is advised that information contained herein reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

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 (V205) 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 NS -Not Specified

ppm -Parts per Million ND -Not Detected

NA -Not Applicable



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LABORATORY FOOTNOTE REPORT

GALSON

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.

PEL

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%

Method

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) (T	(AW
Vanadium Pentoxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I See footnote	

L418951 (Report ID: 1019868):

Parameter

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	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable





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Client Name : Toronto Transit Commission Ltd.

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 -Migrograme	l _Litere	NG -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

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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LABORATORY FOOTNOTE REPORT

GALSON

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
                 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 > -Greater Than	mg -Milligrams ug -Micrograms	m3 -Cubic Meters 1 -Liters	kg -Kilograms NS -Not Specified	ppm -Parts per Million ND -Not Detected	NA -Not Applicable
> -Greater Inan	ug -Micrograms	i -biters	NS -NOC Specified	ND -NOL Detected	NA -NOL APPIICADIE



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LABORATORY FOOTNOTE REPORT

GALSON

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 Ouartz	+/-10.3% +/-10.9%	102% 93.4%
Tridymite	+/-13.6%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms 1 -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

2000		☐ New (Client?	Report To*:	Polanto -	Transit C	action issued In	nvoice To* :	Tresta Transit 6	mmrssion
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Date:09/19/17 Shipper:UPS	i				TORONTO		M453E2			45362
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☐ Next Day by 6pm	100%			of industry or pro	cess/interfer	ences	State samples were		ate which OEL this data	vill be used for:
Next Day by Noon	150%	present	in samp	oling area:			collected in (ex. NY):	OSHA PEL	ACGIH TLV	Cal OSHA
Same Day	200%							☐ MSHA	Other (specify):	
Sample Identi (Maximum of 20 characters, i characters will be ab	ID's longer than 20		ampled* dd/yy)	Collection Medium	Sample Volume Sample Time, or Sample Area	Sample Units*: ml, min., in2, cm2, ft2	Analysis Reque	sted*	Method Reference [^]	Hexavalerit Chromium Process (ex. welding, plating, painting, etc.)*
Examp	le	01/0	1/11	2pc UW PVC	960	Ĺ	Hexavalent Chromi	um (Cr6)	mod. OSHA ID-215	Welding
22152 - A25	*	03/13	117	25 man PCM	570.2	L	Aspestos		NSOSH 7400	
22152-A26	*	1		. //	Ø]	"		"	
22152525	44 -		-	OW PUCILIFIE	1156.0		Crystalline Silke	(AR Frans)	NEOSH 7500 + Resp.	Oust Niosh da
22152-526				11	Ø.		1		(I	
22152-123	1 #4			PW MCE IN IOM	1148.1		Metch (soh.) + soh	. nust	MOSH 77ee + NI	osh oseo
22152 - I274.	kbt	!		1)	Ø		11		. //	
22152 - M25	ф	<u> </u>	<u> </u>	UN PUC on PPI	1156.6		Metalo (R	espireble)	NIOSH 730	<u> </u>
22152 - M26	<i>*</i>			"	Ø		"		11	
22152- T25	6 A			uw mce	1154.0		Metals (to	tel)	NIOSH 7300	
22152- T26	J. p	İ	A	"	Ø	9	"		11	
^Galson Laboratories	will substitute o	our routir	ne/prefe	rred method if it de	oes not matc	h the method	listed on the COC unle	ss this box i	s checked: Use met	nod(s) listed on COC
For metals analysis: if re	questing an analy	te with the	e option (of a lower LOQ pleas	e indicate if th	e lower LOQ i	s required (only available fo	or certain anal	ytes see SAG):	
For crystalline silica: f	<u>`</u>					-	mite)*:			
Chain of Custody	Р	rint Nam		ture	Date/	/Time	<u> </u>	Print Na	me/Signature	Date/Time
Relinquished by :	Romain	Neth	evel	-	Sept. 14	IPM	Received by:	rada	-///	9/12/12 5:3/
Relinquished by:	derma		/	40000149 =140	9101121	o'cup		ms	Muse	9191709591
*Requir							ളെളted:25-SEP-17 16:4 les being processed	+3	Page/	—of ——/——

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# 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.



GALSON

6601 Kirkville Road

East Syracuse, NY 13057

(315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L418925

Project No. : 22152

Date Sampled : 14-SEP-17 Date Analyzed : 21-SEP-17 - 22-SEP-17

Date Received : 19-SEP-17 Report ID : 1019908

Date Sampled: 09/14/17 Date Analyzed: 09/21/17

Parameter	LOQ uq	Total uq	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

Collection Media:	MCE UW 37mm 22-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: NDC
<pre></pre>	mg -Milligrams	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOO-Limit of Ouantitation



MOSIVE

LABORATORY ANALYSIS REPORT

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East Syracuse, NY 13057

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Project No. : 22152

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Date Received : 19-SEP-17 Report ID : 1019908

Date Sampled: 09/14/17 Date Analyzed: 09/21/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		<u> </u>
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

Collection Media:	MCE UW 37mm 22-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: NDC
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1	- 1	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Date Sampled: 09/14/17 Date Analyzed: 09/21/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media	: MCE UW 37mm : 22-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: NDC
<pre></pre>	mg -Milligrams ug -Micrograms	m3 1		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L418925

East Syracuse, NY 13057 Project No. : 22152

Date Sampled : 14-SEP-17 Date Analyzed : 21-SEP-17 - 22-SEP-17

Date Received : 19-SEP-17 Report ID : 1019908

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	uq		
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

Collection Media	: MCE UW 37mm : 22-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: NDC
<pre></pre>	mg -Milligrams ug -Micrograms	m3 1		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Project No. : 22152

Date Sampled : 14-SEP-17 Date Analyzed : 21-SEP-17 - 22-SEP-17

Date Received : 19-SEP-17 Report ID : 1020105

Date Sampled: 09/14/17 Date Analyzed: 09/22/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	IOM 25mm PW PVC 24-SEP-17	Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: NDC
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Project No. : 22152

Date Sampled : 14-SEP-17 Date Analyzed : 21-SEP-17 - 22-SEP-17

Date Received : 19-SEP-17 Report ID : 1020105

LOO Total Units Conc <u>Parameter</u> ug ug Magnesium Oxide 12. <12 NA mq/m30.15 Molybdenum <0.15 NA mq/m3Nickel 0.30 <0.30 NA mg/m3Thallium <1.5 1.5 NA mg/m3Vanadium Pentoxide 0.80 <0.80 NA mq/m3

Collection Media: Date :	IOM 25mm PW PVC 24-SEP-17	Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: NDC
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Login No. : L418925

Site Project No. : 22152

Date Sampled : 14-SEP-17 Date Analyzed : 25-SEP-17 Report ID : 1020357

Date Received : 19-SEP-17

Asbestos Fiber Count (A Rules)

			Fibers/	Fibers/	Fibers/	Alr	Fibers/
	Sample ID	<u>Lab ID</u>	Fields	mm2	Filter	Volume (cc)	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 Ouantitation : 5.5 Fibers/ 100 Fields

Microscope field area : 0.00785 mm2 Filter collection area: 385 mm2

Approved by : BDB Date : 25-SEP-17

Submitted by : BTM

OC 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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Project No. : 22152

Date Sampled : 14-SEP-17 Date Received : 19-SEP-17 Report ID : 1019363

Inhalable Dust

Sample ID	<u>Lab ID</u>	Air Vol liter	Total mq	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 Submitted by: HVN

Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV Approved by : SPR

OSHA PEL : NA Date : 20-SEP-17 NYS DOH # : 11626

Collection Media : IOM 25mm PW PVC 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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Project No. : 22152

Date Sampled : 14-SEP-17 Date Received : 19-SEP-17 Report ID : 1019310

Respirable Dust

Sample ID	Lab ID _	Air Vol <u>liter</u>	Total mg	Conc mg/m3
22152-S27	L418925-3	1134.6	0.18	0.16
22152-S28	L418925-4	NA	<0.050	NA

 $\underline{\mathtt{COMMENTS:}}$ Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg Submitted by: NRH/HVN

Analytical Method : mod. NIOSH 0600; Gravimetric Approved by : SPR

OSHA PEL : PNOR 5 mg/m3 (TWA) Date : 20-SEP-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm 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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Date Sampled : 14-SEP-17 Date Analyzed : 20-SEP-17 - 22-SEP-17

Date Received : 19-SEP-17 Report ID : 1020034

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

			Air Vol		
Sample ID	<u>Lab ID</u>	<u>Analyte</u>	1	<u>ug</u>	uq/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 Submitted: NLO

Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD Approved: CMR

OSHA PEL : 50 ug/m3 RCS Date : 25-SEP-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: NDC

NA -Not Applicable ND -Not Detected l -Liters mppcf -Million Particles per Cubic Foot



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LABORATORY FOOTNOTE REPORT

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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

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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 preceding 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.

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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
> -Greater Than

mg -Milligrams ug -Micrograms

m3 -Cubic Meters 1 -Liters kg -Kilograms NS -Not Specified ppm -Parts per Million

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

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%

Method

Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I 15 mg/m3 (Total Part.)TW
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):

Parameter

```
TLV for COPPER: Copper dust and mist = 1 \text{ mg/m3}; Copper fume = 0.2 \text{ 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

|--|



LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.

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Date Analyzed: 20-SEP-17 - 25-SEP-17

L418925 (Report ID: 1019908):

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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.

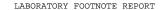
L418925 (Report ID: 1019908):

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	1	-Liters	NS	-Not Specified	ND	-Not Detected

NA -Not Applicable





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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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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
                 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)
```

> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable	< -Less Than	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	ppm -Parts per Million	
	> -Greater Than	ug -Micrograms	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable



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LABORATORY FOOTNOTE REPORT

GALSON

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 Tridymite	+/-10.9% +/-13.6%	93.4% 105%

-						•				
		☐ New 0	Client?	Report To*	Tomoba	Timorit	Commission	Invoice To*:	Tomnto Transit a	Commissi-
SGS	GALSON			Nopoli (o .		once st	AGICAMINO		1920 Youge St	-OINING TI AM
1Z5X626R6646025995	PAT201Ă	Client A	ccount	No.*: -	suite 6	•		-	Srite 600	
Date:09/19/17 Shipper:UPS				•			45 3E2	-	Toronto, ON M45	3∈2.
Initials:MAK			•	- Phone No.* :				- Phone No. :	•	17m 7
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Prep:UNKNOWN	, ,	Ema	ail Resu	its To: Virgil. Lu	nali Otto	.ca & chei	16 201 FZ @	-	se Order No. : PU 29	f0835
1418925	/		nail Add	· · · · · · · · · · · · · · · · · · ·			consultants, com		Credit Card on File Ca	
Need Results By*:	(surcharge)	7 (Sampl	les submitted using th	e FreePumpLoa			Samples submi	tted using the FreeSamplingBad	dges™ Program.
Standard	0%	Site Nam	ne :			Project :	<i>२</i> २।ऽ२		Sampled By : OH € Co	onsultants
4 Business Days	35%	Comme	nts:			•	 		, , , , , , , , , , , , , , , , , , , ,	
3 Business Days	50%									
2 Business Days	75%						1.	_		
Next Day by 6pm	100%		-	of industry or pro	cess/interfer	ences	State samples were		ate which OEL this data v	
Next Day by Noon	150%	present	ın samp	oling area:			collected in (ex. NY):	OSHA PEL		☐ Cal OSHA
Same Day	200%					Sample Units*:		☐ MSHA	Other (specify):	L Haverrale et Ches-ive
Sample Identi (Maximum of 20 characters, I characters will be ab	D's longer then 20	Date Sa (mm/c	•	Collection Medium	Sample Volume, Sample Time or Sample Area	L, ml, min., in2, cm2, ft2	Analysis Requ	iested*	Method Reference [^]	Hexavalent Chromium Process (ex. welding, plating, painting, etc.)*
Examp	le	01/0	1/11	2pc UW PVC	960	L	Hexavalent Chror	nium (Cr6)	mod. OSHA ID-215	Welding
754 - 22155		09/14	117	25mm PCM	562	574.6	Asbestos		NIOSH 7400	
22152 - A28				25 mm PCM.	Ø	Ø	11	4		
22152 - 527	_			PW PVC in PPI	595	1134.6	Crystalline Silica	a (all forms) NIOSH 7500 + Res	P. Dust NIOSHORO
22152 - 528				PW PVC in PPI	Ø	Ø				
22152 - 125				PW PVC in IOM	562	1137.2	Metals (Inhalabi	e) NIOTH	7300+ Inh. Dust	MICKH OSCO
22152 - I26				PW PVC in IOM	Ø	ø		<u> </u>		
22152 - M27	-		· .	uw MCE in PPI	<i>5</i> 55	1116.9	Metals (Respira	able)	NIOSH 7300	
22152 - M28	3			uw MCE in PPI	Ø	Ø		 		
22152 - T27	<u> </u>			uw MCE	562	1139.4	Metali (Total)	,	NIOSH 7300	•
22152 - T28	•	•	\downarrow	UW MCE	Ø	Ø		- 11		
^Galson Laboratories	will substitute	our routin	e/prefe	rred method if it de	oes not matc	h the method	listed on the COC un	less this box i	s checked: Use met	nod(s) listed on COC
For metals analysis: if red	questing an analy	yte with the	option (of a lower LOQ pleas	e indicate if th	e lower LOQ i	s required (only available	for certain ana	lytes see SAG):	
For crystalline silica: for	orm(s) of silica	needed n	nust be	indicated (Quartz,	Cristobalite,	and/or Tridy	mite)*:			-
Chain of Custody	F	Print Name	e/Signa	ture/)	Date	/Time		Print Ne	me/Signature	Date/Time
Relinquished by:	Jynny De	siana l	ee C	the		017-1:30P	Received by:	musi	m//	9/121175.200
Relinquished by :	Luna	رامن	- / /	12	9/18/12		Received by: 17	Com	Mllin	9/19/17 0959
*Requir							ersted:25-SEP-17-16 les being processed.	.50 '	Page	of J
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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# 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.



GALSON

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FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L418930

Project No. : 22152

Date Sampled : 15-SEP-17 Date Analyzed : 21-SEP-17 - 24-SEP-17

Date Received : 19-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

D	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media	: MCE UW 37mm : 22-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG Q	C by: MLN
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOO-Limit of Ouantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L418930

Project No. : 22152

Date Sampled : 15-SEP-17 Date Analyzed : 21-SEP-17 - 24-SEP-17

Date Received : 19-SEP-17 Report ID : 1019873

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	MCE UW 37mm 22-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: MLN
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1	_ •	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L418930

Project No. : 22152

Date Sampled : 15-SEP-17 Date Analyzed : 21-SEP-17 - 24-SEP-17

Date Received : 19-SEP-17 Report ID : 1019873

	LOQ	Total	Conc	Units
<u>Parameter</u>	uq	uq		
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

Collection Media	: MCE UW 37mm : 22-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG Q0	C by: MLN
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734

Site Login No. : L418930

Project No. : 22152

Date Sampled : 15-SEP-17 Date Analyzed : 21-SEP-17 - 24-SEP-17

Date Received : 19-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

	LOQ	Total	Conc	Units
<u>Parameter</u>	uq	uq	·	
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

Collection Media	: MCE UW 37mm : 22-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG Q0	C by: MLN
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-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 6601 Kirkville Road Site

Login No. : L418930

Project No. : 22152

Date Sampled : 15-SEP-17 Date Analyzed : 21-SEP-17 - 24-SEP-17

Date Received : 19-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

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	IOM 25mm PW PVC 25-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: MLN
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L418930

Project No. : 22152

Date Sampled : 15-SEP-17 Date Analyzed : 21-SEP-17 - 24-SEP-17

Date Received : 19-SEP-17 Report ID : 1020234

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	IOM 25mm PW PVC 25-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: MLN
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L418930

Project No. : 22152

Date Sampled : 15-SEP-17 Date Analyzed : 25-SEP-17

FAX: (315) 437-0571 Date Received : 19-SEP-17 Report ID : 1020358 www.qalsonlabs.com

Asbestos Fiber Count (A Rules)

		Fibers/	Fibers/	Fibers/	Air	Fibers/
Sample ID	<u>Lab ID</u>	Fields	mm2	<u> Filter</u>	Volume (cc)	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 Approved by: BDB Limit of Quantitation: 5.5 Fibers/ 100 Fields Date: 25-SEP-17

Microscope field area: 0.00785 mm2 Filter collection area: 385 mm2

lter collection area: 385 mm2 Supervisor: BDB

< -Less Than

> -Greater Than

ND -Not Detected

Submitted by : BTM

OC by: MLN

NA -Not Applicable

cc -Cubic Centimeters

NS -Not Specified

mm2 -Square millimeters



LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L418930

Project No. : 22152

Date Sampled : 15-SEP-17 Date Received : 19-SEP-17 Report ID : 1019971

Inhalable Dust

Sample ID	<u>Lab ID</u>	Air Vol <u>liter</u>	Total mq	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 Submitted by: NRH

Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV Approved by : SPR

OSHA PEL : NA Date : 22-SEP-17 NYS DOH # : 11626

Collection Media : IOM 25mm PW PVC 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



LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L418930

Project No. : 22152

Date Sampled : 15-SEP-17 Date Received : 19-SEP-17 Report ID : 1019442

Respirable Dust

<u>Sample ID</u>	<u>Lab ID</u>	Air Vol liter	Total mq	Conc mg/m3
22152-S29	L418930-3	1130	<0.050	<0.044
22152-S30	L418930-4	NA	<0.050	NA

 $\underline{\mathtt{COMMENTS:}}$ Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg Submitted by: HVN

Analytical Method : mod. NIOSH 0600; Gravimetric Approved by : SPR

OSHA PEL : PNOR 5 mg/m3 (TWA) Date : 20-SEP-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm 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



LABORATORY ANALYSIS REPORT

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East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L418930

Project No. : 22152

Date Sampled : 15-SEP-17 Date Analyzed : 20-SEP-17 - 22-SEP-17

Submitted: CMR

Date Received : 19-SEP-17 Report ID : 1020045

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

			Air Vol		
Sample ID	<u>Lab ID</u>	<u>Analyte</u>	1	uq	ug/m3
22152-S29	L418930-3	Ouartz	1130	<5.0	<4.4
	1110730 3	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 Approved: KRK

OSHA PEL : 50 ug/m3 RCS Date : 25-SEP-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: MLN

NA -Not Applicable ND -Not Detected l -Liters mppcf -Million Particles per Cubic Foot



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LABORATORY FOOTNOTE REPORT

GALSON

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

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Any holder of this document is advised that information contained herein reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

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 preceding 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.

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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/m3i Molybdenum and insoluble

compounds, as Mo (total dust) = 15 mg/m3.

Reported Vanadium Pentoxide (V205) 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
> -Greater Than

mg -Milligrams ug -Micrograms

m3 -Cubic Meters 1 -Liters kg -Kilograms NS -Not Specified ppm -Parts per Million ND -Not Detected

NA -Not Applicable



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LABORATORY FOOTNOTE REPORT

GALSON

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%

Method

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):

Parameter

```
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



LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.

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):

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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

l -Liters NS -Not Specified NA -Not Applicable -Greater Than ug -Micrograms ND -Not Detected





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GALSON

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%
II OII OXIGE	+/-9.0%	100%
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)
D: 1020358):		

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	1	-Liters	NS	-Not Specified	ND -Not Detected	NA -Not Applicable



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LABORATORY FOOTNOTE REPORT

GALSON

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)
```



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LABORATORY FOOTNOTE REPORT

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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 Tridymite	+/-10.9% +/-13.6%	93.4% 105%

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⊠ Standard	0%	Site Na				Project	: 22152		Sampled By: OHE C	nsuitants
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3 Business Days	50%	∤ ≲	es atta	eched docume	nt for m	ietal a	nelysis			
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Sample Identi (Maximum of 20 characters, i characters will be ab	fication* ID's longer than 20	4	ampled* /dd/yy)	Collection Medium	Sample Volume, Sample Time, or Sample Area*	Sample Uni L, ml, min in2, cm2, f	. Analysis Red		Method Reference^	Hexavalent Chromium Process (ex. welding, plating, painting, etc.)*
Examp	le	01/0	01/11	2pc UW PVC	960	L	Hexavalent Chro	mium (Cr6)	mod. OSHA ID-215	Welding
22152-A29		09/1	5/17	25mm PCM	561.6	L	Ashestos	, ,	MOSH Hae	
22152-A3Q				25MM PCM	Ø	1	11		11	
22152-529	-			PW PK LAPPI	1130.0		Crystalline Sil	ry (all form	1) NIOSH 7500 + Resp	Dust NIOSH
22152-530				11	Ø		_	i	11	
22157-127	-	1		PW PVC MJEM	1/33.5		Metals (sohalable)	NIOSH 77	20 + Inh. Oust 1	MOSH OSOQ
22152-128		<u> </u>		"	Ø			(1)	1)	
22152 - M29	•		\	UW MEE MIPI	1132.1		Metals (Respire	ble)	NIOSH From	
22152-M30	,			"	Ø		11		<i>u</i> .	
22152-T29			<u> </u>	UW MCE	1140.4		Tyetds (Total	<u>) </u>	13	
2215Z-T30			*	•	Ø	b	"		1)	
^Galson Laboratories	will substitute	our routi	ne/prefe	rred method if it d	oes not matc	h the meth	od listed on the COC u	nless this box	is checked: Use met	hod(s) listed on COC
		_					Q is required (only availab		lytes see SAG):	
For crystalline silica: f							dymite)*: (なしょ	ORMS		Ţ
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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# 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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Client : Toronto Transit Commission Ltd Account No.: 90734

Login No. : L418938 Site : NS

Project No. : 22152

Date Sampled : 15-SEP-17 Date Analyzed : 21-SEP-17 Date Received : 19-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 ua	Total ug	Conc	Units
<u>rarameter</u>		<u></u>		
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

Collection Media	: MCE UW 37mm : 22-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG Q	C by: AMD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L418938

Project No. : 22152

Date Sampled : 15-SEP-17 Date Received : 19-SEP-17 Report ID : 1019862

Date Sampled: 09/15/17 Date Analyzed: 09/21/17

<u>Parameter</u>	LOQ <u>uq</u>	Total uq	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

Collection Media	: MCE UW 37mm : 22-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: AMD
<pre></pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Site Login No. : L418938

Project No. : 22152

Date Sampled : 15-SEP-17 Date Analyzed : 21-SEP-17 Date Received : 19-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

LOQ	Total	Conc	Units
uq	uq		
0.90	<0.90	<0.00079	mg/m3
0.30	<0.30	<0.00026	mg/m3
0.15	0.48	0.00042	mg/m3
0.15	<0.15	<0.00013	mg/m3
0.15	<0.15	<0.00013	mg/m3
100.	<100	<0.092	mg/m3
7.5	<7.5	<0.0065	mg/m3
0.45	<0.45	<0.00039	mg/m3
0.30	<0.30	<0.00026	mg/m3
0.38	<0.38	<0.00033	mg/m3
0.15	0.21	0.00018	mg/m3
2.3	<2.3	<0.0020	mg/m3
	0.90 0.30 0.15 0.15 0.15 100. 7.5 0.45 0.30 0.38 0.15	uq uq 0.90 <0.90	uq uq 0.90 <0.90

Collection Media	: MCE UW 37mm : 22-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: AMD
<pre></pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L418938

East Syracuse, NY 13057 Project No. : 22152

(315) 432-5227 Date Sampled : 15-SEP-17 Date Analyzed : 21-SEP-17 FAX: (315) 437-0571 Date Received : 19-SEP-17 Report ID : 1019862

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	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	uq		
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

Collection Media	: MCE UW 37mm : 22-SEP-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: AMD
<pre></pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L418938

East Syracuse, NY 13057 Project No. : 22152

Date Sampled : 15-SEP-17 Date Received : 19-SEP-17 Report ID : 1019861

LOO Total Conc Units <u>Parameter</u> ug uq Magnesium Oxide 12. <12 <0.011 mq/m3Molybdenum 0.15 <0.15 <0.00013 mq/m3Nickel 0.30 <0.30 <0.00026 mg/m3Thallium <1.5 1.5 <0.0013 mg/m3Vanadium Pentoxide 0.80 <0.80 <0.00069 mq/m3

Collection Media: Date :	IOM 25mm PW PVC 22-SEP-17	Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG	C by: AMD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L418938

Project No. : 22152

Date Sampled : 15-SEP-17 Date Received : 19-SEP-17 Report ID : 1019861

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	IOM 25mm PW PVC 22-SEP-17	Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: AMD
<pre>-Less Than > -Greater Than</pre>	5	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734
Road Site : NS Login No. : L418938

6601 Kirkville Road Site : NS Login No. : L418938 East Syracuse, NY 13057 Project No. : 22152

(315) 432-5227 Date Sampled : 15-SEP-17 Date Analyzed : 25-SEP-17 FAX: (315) 437-0571 Date Received : 19-SEP-17 Report ID : 1020359

Asbestos Fiber Count (A Rules)

		Fibers/	Fibers/	Fibers/	Air	Fibers/
Sample ID	<u>Lab ID</u>	Fields	mm2	<u> Filter</u>	Volume (cc)	CC
22152-A31	L418938-1	6/100	7.6	2926	594,670	0.005
22152-A32	T ₁ 418938-2	1/100	<7	< 2700	NA	NΑ

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

Sample Matrix : 25mm MCE PCM Submitted by : BTM

Analytical Method: mod. NIOSH 7400 "A" Rules Approved by: BDB Limit of Ouantitation: 5.5 Fibers/ 100 Fields Date: 25-SEP-17

Microscope field area: 0.00785 mm2 QC by: AMD Filter collection area: 385 mm2 Supervisor: BDB

mm2 -Square millimeters



MOON

LABORATORY ANALYSIS REPORT

6601 Kirkville Road

East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L418938

Project No. : 22152

Date Sampled : 15-SEP-17 Date Received : 19-SEP-17 Report ID : 1019317

Inhalable Dust

Sample ID	<u>Lab ID</u>	Air Vol <u>liter</u>	Total mq	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 Submitted by: NRH

Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV Approved by : SPR

OSHA PEL : NA Date : 20-SEP-17 NYS DOH # : 11626

Collection Media : IOM 25mm PW PVC 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



LABORATORY ANALYSIS REPORT

6601 Kirkville Road

East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L418938

Project No. : 22152

Date Sampled : 15-SEP-17 Date Received : 19-SEP-17 Report ID : 1019316

Respirable Dust

<u>Sample ID</u>	<u>Lab ID</u>	Air Vol <u>liter</u>	Total mg	Conc mq/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 Submitted by: NRH/HVN

Analytical Method : mod. NIOSH 0600; Gravimetric Approved by : SPR

OSHA PEL : PNOR 5 mg/m3 (TWA) Date : 20-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 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 Account No.: 90734
Site : NS Login No. : L418938

6601 Kirkville Road Site : NS Login
East Syracuse, NY 13057 Project No. : 22152

(315) 432-5227 Date Sampled : 15-SEP-17 Date Analyzed : 20-SEP-17 - 22-SEP-17

FAX: (315) 437-0571 Date Received : 19-SEP-17 Report ID : 1020037

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

			Air Vol		
<u>Sample ID</u>	<u>Lab ID</u>	<u>Analyte</u>	1	<u>uq</u>	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 Submitted: NLO Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD Approved: CMR

OSHA PEL : 50 ug/m3 RCS Date : 25-SEP-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: AMD

NA -Not Applicable ND -Not Detected l -Liters mppcf -Million Particles per Cubic Foot



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LABORATORY FOOTNOTE REPORT

GALSON

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

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Any holder of this document is advised that information contained herein reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

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 preceding 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 > -Greater Than mg -Milligrams ug -Micrograms

ams 1

m3 -Cubic Meters 1 -Liters kg -Kilograms NS -Not Specified ppm -Parts per Million ND -Not Detected

NA -Not Applicable



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LABORATORY FOOTNOTE REPORT

GALSON

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
Manus adam Orda	. / 0 28	00.2%
Magnesium Oxide Molybdenum	+/-9.2% +/-7.6%	99.2% 100%
Nickel	+/-8%	101%
Thallium	+/-7.9%	101%
Vanadium Pentoxide	+/-6.5%	100%
Parameter	Method	

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 TD-125G;	TCP/T	See footnote

L418938 (Report ID: 1019862):

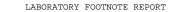
```
TLV for COPPER: Copper dust and mist = 1 mg/m3; Copper fume = 0.2 mg/m3
```

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

|--|





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Client Name : Toronto Transit Commission Ltd.

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.

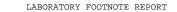
Reported Zinc Oxide (ZnO) results assume that all detected Zinc is present as Zinc Oxide.

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
	4.4			





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< -Less Than

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Client Name : Toronto Transit Commission Ltd.

Site :

Project No. : 22152

greater than optimal variability and are probably biased.

0.154 (5-20 fibers/100 fields)

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	

mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million

The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as

- Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable



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LABORATORY FOOTNOTE REPORT

GALSON

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)
```



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LABORATORY FOOTNOTE REPORT

GALSON

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 Ouartz	+/-10.3% +/-10.9%	102% 93.4%
Tridymite	+/-13.6%	105%

4					·					
		☐ New	Client?	Report To*:	Tomoto	Transit i	Commission	Invoice To*:	Toronto Transit	Commission
SGS	GALSON			·	1920 YO			•	1920 Youse St.	
1Z5X626A6646025995	GWESUM	Client A	Account	No.* :		00		-	Suite 600	
Date:09/19/17	1				Toronto.		S 3€2	=		45 3€2
Shipper: Initials:DTE				Phone No.*:	`			- Phone No. :		
	\${ \$ { \$ { \$ { \$ { \$ { \$ {\$} {\$} {\$} {\$} {\$} {\$} {\$} {\$} {\$} {\$}			Cell No. :		400		- Email :		
Prep:UNKNOUN	_	Ém	ail Resu	its To: <u>Virgal. Ur</u>		ca La	ne rerutts @	-	e Order No.: PU24	0 835
L418938	y _ /		nail Add		TIME!		nsultants. Com	-	Credit Card on File Ca	
Need Results By*:	(surcharge)	ן ן	Sampl	es submitted using th	e FreePumpLoa			Samples submit	tted using the FreeSamplingBa	dges™ Program.
Standard	0%	Site Nan	ne :			Project :	22152		Sampled By :	asultants
4 Business Days	35%	Comme					<u> </u>	_		
3 Business Days	50%]							1011	4
2 Business Days	75%						,		()	
Next Day by 6pm	100%		=	of industry or pro	cess/interfer	ences	State samples were		ate which OEL this data v	
Next Day by Noon	150%	present	ın samp	oling area:			collected in (ex. NY):	OSHA PEL		Cal OSHA
Same Day Sample Identif	200%			1	Comple Matrice	Sample Units*:	-	MSHA	Other (specify):	Hexavalent Chromium
(Maximum of 20 characters, II characters will be abt	D's longer than 20	Date Sa (mm/c	ampled* dd/yy)	Collection Medium	Sample Volume, Sample Time, or Sample Area	L, ml, min., in2, cm2, ft2	Analysis Requ	iested*	Method Reference^	Process (ex. welding, plating, painting, etc.)*
Examp	le	01/0	1/11	2pc UW PVC	960	L	Hexavalent Chror	nium (Cr6)	mod. OSHA ID-215	Welding
22152 - A31		09/15	/1 1	25mm PCM	566	594.67	Asbestos		OOPF HZOIN	
22152 - A32]	25mm PCM	Ø	Ø		(
22/52 - 531				PW PVC in PPI	5766	1122.8	Crystalline Silica	(all forms)	NIOSH 7500 + Resp.	DUST NIOTH OGOD
22152 - 532	<u> </u>			PW PVC in PPI	Ø	Ø				
22152 - I29				PW PUCIN JOM	566	1162.4	Metals (Inhalabl	e)	NIOSH 7300 + Inh.	DUST NIOSH OSOD
22152 - I30)			PW PUC IN IOM	Ø	Ø				
22/52 - M31				UW MCE in PPI	566	1143.6	Metals (Respire	able)	NIOSH 7300	
22 152 - M3	ર			UW MCEIN PPI	Ø	Ø				
22152 - T31			İ	uw McE	566	1146.3	Metals (Total)	OOSF HZOIN	
22152 - T32				uw Mc€	Ø	ø		<u>ii</u>		
^Galson Laboratories	will substitute	our routir	ne/prefe		oes not matcl	h the method	listed on the COC un	less this box i	s checked: Use met	hod(s) listed on COC
For metals analysis: if rec	questing an analy	te with the	option o	of a lower LOQ pleas	e indicate if th	e lower LOQ i	s required (only available	for certain ana	lytes see SAG):	
For crystalline silica: fo	orm(s) of silica	needed r	nust be	indicated (Quartz,	Cristobalite,	and/or Tridy	mite)*:			
Chain of Custody	Р	rint Nam	e/Signa	ture	Date/	/Time		Print Na	me/Signature	Date/Time
Relinquished by:	Yunny Desi	ang, le	2		Sep 18/17 9	7:30AM	Received by:	man I	on /1/	9/12/175 270
Relinquished by:	Jemu		_//	Dan 210 01 10		6! copr	Received by:	Long	Miling	9/19/170935
*Require				3pm will be consi se fields may resu			less. les being processed.	∠ 1	Pagel	of _

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 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.



LABORATORY ANALYSIS REPORT

GALSON

6601 Kirkville Road

East Syracuse, NY 13057

(315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L419912

Project No. : 22152

Date Sampled : 19-SEP-17 Date Analyzed : 28-SEP-17 - 03-OCT-17

Date Received : 27-SEP-17 Report ID : 1021827

Date Sampled: 09/19/17 Date Analyzed: 09/29/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	MCE UW 37mm 02-OCT-17		Submitted by: NYS DOH # :	SJW/JMR/KEG/JJL/JPA 11626		by: MLN
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L419912

Site : NS
Project No. : 22152

Date Sampled : 19-SEP-17 Date Analyzed : 28-SEP-17 - 03-OCT-17

Date Received : 27-SEP-17 Report ID : 1021827

LOO Total Units Conc <u>Parameter</u> ug ug Aluminum 7.5 <7.5 NA mq/m3Cadmium 0.15 <0.15 NA mq/m3Iron Oxide 11. <11 mg/m3NA Molvbdenum 0.15 <0.15 NA mg/m3Zinc Oxide 2.8 <2.8 NA mq/m3

Collection Media:	MCE UW 37mm 02-OCT-17		Submitted by: NYS DOH # :	SJW/JMR/KEG/JJL/JPA 11626		by: MLN
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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: Toronto Transit Commission Ltd Account No.: 90734 Client

Site Login No. : L419912

Project No. : 22152

Date Sampled : 19-SEP-17 Date Analyzed : 28-SEP-17 - 03-OCT-17

Date Received : 27-SEP-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

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media:	MCE UW 37mm 02-OCT-17		Submitted by: NYS DOH # :	SJW/JMR/KEG/JJL/JPA 11626	= = = = = = = = = = = = = = = = = = =	by: MLN
<pre></pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



MOSINS

LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L419912

Project No. : 22152

Date Sampled : 19-SEP-17 Date Analyzed : 28-SEP-17 - 03-OCT-17

Date Received : 27-SEP-17 Report ID : 1021827

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media	MCE UW 37mm 02-OCT-17		Submitted by: NYS DOH # :	SJW/JMR/KEG/JJL/JPA 11626		by: MLN
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



LABORATORY ANALYSIS REPORT

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Project No. : 22152

Date Sampled : 19-SEP-17 Date Analyzed : 28-SEP-17 - 03-OCT-17

Date Received : 27-SEP-17 Report ID : 1022031

Date Sampled: 09/19/17 Date Analyzed: 10/03/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	IOM 25mm PW PVC 03-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: MLN
<pre>-Less Than > -Greater Than</pre>	5	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



LABORATORY ANALYSIS REPORT

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Site : NS Login No. : L419912

Project No. : 22152

Date Sampled : 19-SEP-17 Date Analyzed : 28-SEP-17 - 03-OCT-17

Date Received : 27-SEP-17 Report ID : 1022031

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		<u> </u>
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

Collection Media: Date :	IOM 25mm PW PVC 03-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: MLN
<pre>-Less Than > -Greater Than</pre>	5	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L419912

Project No. : 22152

Date Sampled : 19-SEP-17 Date Received : 27-SEP-17 Report ID : 1022148

Asbestos Fiber Count (A Rules)

			Fibers/	Fibers/	Fibers/	Alr	Fibers/
	<u>Sample ID</u>	<u>Lab ID</u>	Fields	mm2	<u> Filter</u>	Volume (cc)	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 Ouantitation: 5.5 Fibers/ 100 Fields

Microscope field area: 0.00785 mm2
Filter collection area: 385 mm2

Filter collection area: 385 mm2 Supervisor: BDB

< -Less Than

> -Greater Than

ND -Not Detected

Submitted by : BTM

Approved by : RCF

Date: 03-0CT-17

OC by: MLN

NA -Not Applicable

cc -Cubic Centimeters

NS -Not Specified

mm2 -Square millimeters



MOSIAS

LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd Account No.: 90734
6601 Kirkville Road Site : NS Login No. : L419912

East Syracuse, NY 13057 Project No. : 22152

(315) 432-5227 Date Sampled : 19-SEP-17 Date Analyzed : 02-OCT-17 FAX: (315) 437-0571 Date Received : 27-SEP-17 Report ID : 1021630

Inhalable Dust

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Sample ID	<u>Lab ID</u>	Air Vol liter	Total mq	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 Submitted by: HVN Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV Approved by : KRK

OSHA PEL : NA Date : 02-OCT-17 NYS DOH # : 11626

Collection Media : IOM 25mm PW PVC 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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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L419912

Project No. : 22152

Date Sampled : 19-SEP-17 Date Received : 27-SEP-17 Report ID : 1021637

Respirable Dust

Sample ID	<u>Lab ID</u>	Air Vol liter	Total mq	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 Submitted by: HVN

Analytical Method : mod. NIOSH 0600; Gravimetric Approved by : SPR

OSHA PEL : PNOR 5 mg/m3 (TWA) Date : 02-OCT-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm 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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Client : Toronto Transit Commission Ltd Account No.: 90734 Site Login No. : L419912

Project No. : 22152

Date Sampled : 19-SEP-17 Date Analyzed : 02-OCT-17

Date Received : 27-SEP-17 Report ID : 1022048

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

			Air Vol		
Sample ID	<u>Lab ID</u>	<u>Analyte</u>	1	<u>uq</u>	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 Submitted: AJD

Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD Approved: KRK

OSHA PEL : 50 ug/m3 RCS Date : 03-OCT-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: MLN

-Parts per Million < -Less Than mg -Milligrams kg -Kilograms ppm > -Greater Than ug -Micrograms m3 -Cubic Meters -Not Specified

NA -Not Applicable ND -Not Detected -Liters mppcf -Million Particles per Cubic Foot



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LABORATORY FOOTNOTE REPORT

GALSON

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

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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 preceding 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 (V205) 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.

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.

NA -Not Applicable

Parameter	Accuracy	Mean Recovery
2 11'	. / 10 60	1020
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	1	-Titers	NS -Not Specified	ND -Not Detected





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

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```
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 \text{ 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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GALSON

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

105%
102%
103%
104%
106%
103%
103%
100%
105%
102%

Parameter	Method	PEL
Aluminum	mod. NIOSH 7300/mod. OSHA ID-125G; ICI	P/I 15 mg/m3 (TWA)
Antimony	mod. NIOSH 7300/mod. OSHA ID-125G; ICI	P/I 0.5 mg/m3 (TWA)
Arsenic	mod. NIOSH 7300/mod. OSHA ID-125G; ICI	P/I 0.01 mg/m3 (TWA)
Barium	mod. NIOSH 7300/mod. OSHA ID-125G; ICI	P/I 0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICI	P/M 0.0002 mg/m3 (TWA)
Cadmium	mod. NIOSH 7300/mod. OSHA ID-125G; ICI	P/I 0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICI	P/I 5 mg/m3 (TWA)
Chromium	mod. NIOSH 7300/mod. OSHA ID-125G; ICI	P/I Varies, see footnote
Cobalt	mod. NIOSH 7300/mod. OSHA ID-125G; ICI	P/I 0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7300/mod. OSHA ID-125G; ICI	P/I Varies, see footnote
Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICI	P/I 10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7300/mod. OSHA ID-125G; ICI	P/I 0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7300/mod. OSHA ID-125G; ICI	P/I 5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICI	P/I Varies, see footnote
Selenium	mod. NIOSH 7300/mod. OSHA ID-125G; ICI	P/I 0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICI	P/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	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable



FAX: (315) 437-0571

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LABORATORY FOOTNOTE REPORT

GALSON

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: 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

GALSON

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%

		☐ New (Client?	Report To*:	Tommto	Transit Go	Mmicrion	Invoice To*:	Toronto Transit Go	
SGS	GALSON			·	1920 You			•	1920 Yonge St.	
125X626A6646386435	GALSUN	Client A	ccount	No.* :	Sruite Go	U			Suite 600	
Date:09/27/17 Shipper:UPS					Toronto.	on Mus 3	<u> </u>		_	3E2
Initials:CEM		10	2	Phone No.* :				Phone No.:	•	
)	Cell No. :		* · · · · · · · · · · · · · · · · · · ·	<u>-</u>	Email :	<u></u>	
Prep:UNKNOWN		Em	ail Resul	ts To: Vigal. U	mali@ttc	.ca 4 ohe	results@oheconsult	ants Purchas	se Order No. : PU 24	40 l 35
L419912			nail Add	•		. 0			Credit Card on File Ca	
Need Results By*:	(surcharge)]	Sampl	es submitted using th	e FreePumpLoa			Samples submit	tted using the FreeSamplingBa	dges [™] Program.
Standard	0%	Site Nan	ne :			Project :	22152		Sampled By : OH∈ Co	onsultants
4 Business Days	35%									
3 Business Days	50%	1	11	ave see attac	hed docu	ment for h	netal list. For Be	ryllium , 1	please use ICP-M.	۲.
2 Business Days	75%									
Next Day by 6pm	100%		•	of industry or pro	cess/interfer	ences	State samples were		ate which OEL this data	:
Next Day by Noon	150%	present	in samp	ling area:			collected in (ex. NY):	OSHA PEL	=	Cal OSHA
Same Day	200%	ļ				Sample Units*:		☐ MSHA	Other (specify):	Hexavalent Chromium
Sample Identi (Maximum of 20 characters, I characters will be ab	D's longer than 20	Date Sa (mm/c	•	Collection Medium	Sample Volume, Sample Time or Sample Area	L, ml, min., in2, cm2, ft2	Analysis Requ	ested*	Method Reference^	Process (ex. welding, plating, painting, etc.)*
Examp	le	01/0	1/11	2pc UW PVC	960	L	Hexavalent Chron	nium (Cr6)	mod. OSHA ID-215	Welding
22152 - A33		09/19	/17	25 mm PCM	486	486.77	Asbestos		NIOSH7400	
22152 - A34				25 mm PCM	Ø	Ø	и		II	
22152-533				PW PVC in PPI	486	970.35	Crystalline Silica	(all forms)	NIOSH 7500 + Resp.	DUST NIOSH 060
22152 - 534				PW PVC in PPI	Ø _	Ø		—— ii ——		
22152 -I31				PW PVC in IOM	486	972.97	Metals (Inhalabl	H2OIN (a	7300 + Inhalable	DUM NIOTH 050
22152-132				PW PUC in IOM	Ø	Ø		 #		
22152 - M33				uw McEin PPI	486	964.95	Metals (Respire	able)	NIOSH 7300	
22152 - M34	· ii			uw MCE in PPI	<u> </u>	Ø				
22 52 - T33		<u> </u>		uw McE	486	973.31	Metals (Total)			
22127 - 134		,	<u> </u>	uw McE	Ø	Ø	ii	-	<u> </u>	
							d listed on the COC unl			hod(s) listed on COC
For metals analysis: if re								for certain ana	lytes see SAG):	
For crystalline silica: f				-,			mite)*:			
Chain of Custody		Print Nam	7 7	tuffe -		/Time		Print Na	me/Signature	Date/Time
Relinquished by:	Yunny Des	iana	<u>e</u> 7	Mes_	1 -1 - 7		Y	6 Man	$x = y \times y \times y = y$	9/26/17 9:35
Relinquished by:	b cm	un Ja	·/	Page 18 of 19				s Stone		1927/19 11:18
*Requir	*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) <u>Total Metals by NIOSH 7300.</u> Analyze for antimony, arsenic, barium, beryllium, cadmium, calcium oxide, chromium III, cobalt, copper, lead, manganese, and selenium.
- 2) <u>Asbestos fibre count by NiOSH 7400.</u> In addition, analyze specifically for asbestos by TEM if the fibre count result exceeds 0.01 f/cc.
- Respirable silica and respirable dust by NIOSH 7500/0600. Analyze for quartz, cristobalite, tridymite, and dust.
- 4) <u>Respirable metals by NIOSH 7300.</u> Analyze for aluminum, cadmium, iron oxide, molybdenum, and zinc oxide.
- 5) <u>Inhalable metals and inhalable dust by NIOSH 7300/0500.</u> 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.



LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd Account No.: 90734

6601 Kirkville Road Site : NS Login No. : L419904 East Syracuse, NY 13057 Project No. : 22152

(315) 432-5227 Date Sampled : 21-SEP-17 Date Analyzed : 28-SEP-17 - 02-OCT-17

FAX: (315) 437-0571 Date Received : 27-SEP-17 Report ID : 1022038 www.galsonlabs.com

Client ID: 22152-M35 Lab ID: L419904-7 Air Volume: 973.27 L

Date Sampled: 09/21/17 Date Analyzed: 10/02/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	MCE UW 37mm 03-OCT-17	Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: MLN
<pre></pre>	mg -Milligrams	m3 -Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	l -Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



LABORATORY ANALYSIS REPORT

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FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L419904

Project No. : 22152

Date Sampled : 21-SEP-17 Date Analyzed : 28-SEP-17 - 02-OCT-17

Date Received : 27-SEP-17 Report ID : 1022038

LOO Total Units Conc <u>Parameter</u> ug ug Aluminum 7.5 <7.5 NA mq/m3Cadmium 0.15 <0.15 NA mq/m3Iron Oxide 11. <11 mg/m3NA Molvbdenum 0.15 <0.15 NA mg/m3Zinc Oxide 2.8 <2.8 NA mq/m3

Collection Media	: MCE UW 37mm : 03-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG Q0	C by: MLN
<pre></pre>	mg -Milligrams ug -Micrograms	m3 1		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L419904

East Syracuse, NY 13057 Project No. : 22152

(315) 432-5227 Date Sampled : 21-SEP-17 Date Analyzed : 28-SEP-17 - 02-OCT-17

FAX: (315) 437-0571 Date Received : 27-SEP-17 Report ID : 1022038

LOQ	Total	Conc	Units
uq	uq		
0.90	<0.90	<0.00092	mg/m3
0.15	<0.15	<0.00015	mg/m3
0.15	1.7	0.0017	mg/m3
0.0075	<0.0075	<0.0000077	mg/m3
0.015	<0.015	<0.000015	mg/m3
100.	<100	<0.11	mg/m3
7.5	<7.5	<0.0077	mg/m3
0.045	<0.045	<0.000046	mg/m3
0.30	0.42	0.00043	mg/m3
0.075	<0.075	<0.000077	mg/m3
0.15	0.71	0.00073	mg/m3
2.3	<2.3	<0.0023	mg/m3
	0.90 0.15 0.15 0.0075 0.015 100. 7.5 0.045 0.30 0.075 0.15	uq uq 0.90 <0.90	uq uq 0.90 <0.90

Collection Media: Date :	MCE UW 37mm 03-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: MLN
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1	- 1	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L419904

East Syracuse, NY 13057 Project No. : 22152

(315) 432-5227 Date Sampled : 21-SEP-17 Date Analyzed : 28-SEP-17 - 02-OCT-17

FAX: (315) 437-0571 Date Received : 27-SEP-17 Report ID : 1022038

	LOQ	Total	Conc	Units
<u>Parameter</u>	uq	uq		
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

Collection Media:	MCE UW 37mm 03-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: MLN
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1	- 1	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

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East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toront Site : NS

Project No. : 22152

Date Sampled : 21-SEP-17

Date Received : 27-SEP-17

: Toronto Transit Commission Ltd Account No.: 90734

Login No. : L419904

Date Analyzed : 28-SEP-17 - 02-OCT-17

Report ID : 1022047

LOO Total Conc Units <u>Parameter</u> ug ug Beryllium 0.0075 <0.0075 <0.0000077 mq/m3Magnesium Oxide 12. <0.013 mq/m3<12 Molybdenum 0.075 0.16 0.00016 mg/m3Nickel <0.15 0.15 <0.00015 mq/m3Thallium 0.75 <0.75 <0.00077 mq/m3Vanadium Pentoxide 0.80 <0.80 <0.00083 mq/m3

Collection Media: Date :	IOM 25mm PW PVC 03-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: MLN
<pre>-Less Than > -Greater Than</pre>	3	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L419904

Project No. : 22152

Date Sampled : 21-SEP-17 Date Analyzed : 28-SEP-17 - 02-OCT-17

Date Received : 27-SEP-17 Report ID : 1022047

Date Sampled: 09/21/17 Date Analyzed: 10/02/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	IOM 25mm PW PVC 03-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: MLN
<pre>-Less Than > -Greater Than</pre>	3	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Login No. : L419904 Site

Project No. : 22152

Date Sampled : 21-SEP-17 Date Analyzed : 03-OCT-17 Date Received : 27-SEP-17 Report ID : 1022147

Asbestos Fiber Count (A Rules)

			Fibers/	Fibers/	Fibers/	Air	Fibers/
	Sample ID	<u>Lab ID</u>	Fields	mm2	Filter	Volume (cc)	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 Ouantitation : 5.5 Fibers/ 100 Fields

Microscope field area : 0.00785 mm2 Filter collection area: 385 mm2

QC by: MLN

Supervisor: BDB

Submitted by : BTM

Approved by : RCF

Date: 03-0CT-17

< -Less Than

> -Greater Than

ND -Not Detected NS -Not Specified

NA -Not Applicable

cc -Cubic Centimeters

mm2 -Square millimeters



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Client : Toronto Transit Commission Ltd Account No.: 90734

Login No. : L419904 Site

Project No. : 22152

Date Sampled : 21-SEP-17 Date Analyzed : 02-OCT-17 : 1021629

Date Received : 27-SEP-17 Report ID

Inhalable Dust

Sample ID	<u>Lab ID</u>	Air Vol liter	Total mq	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 Submitted by: HVN

Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV Approved by : KRK

OSHA PEL Date : 02-OCT-17 NYS DOH # : 11626

Collection Media : IOM 25mm PW PVC Supervisor: KRK QC by: MLN

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected

-Liters > -Greater Than ug -Micrograms NS -Not Specified ppm -Parts per Million



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LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L419904

Project No. : 22152

Date Sampled : 21-SEP-17 Date Received : 27-SEP-17 Report ID : 1021635

Respirable Dust

<u>Sample ID</u>	<u>Lab ID</u>	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 Submitted by: HVN/PAH

Analytical Method : mod. NIOSH 0600; Gravimetric Approved by : SPR

OSHA PEL : PNOR 5 mg/m3 (TWA) Date : 02-OCT-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm 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

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(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L419904

Project No. : 22152

Date Sampled : 21-SEP-17 Date Analyzed : 02-OCT-17 - 03-OCT-17

Date Received : 27-SEP-17 Report ID : 1022160

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

			Air Vol		
Sample ID	<u>Lab ID</u>	Analyte	1	<u>uq</u>	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

Submitted: AJD

Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD Approved: KRK

OSHA PEL : 50 ug/m3 RCS Date : 03-OCT-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: MLN

NA -Not Applicable ND -Not Detected l -Liters mppcf -Million Particles per Cubic Foot



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LABORATORY FOOTNOTE REPORT

GALSON

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

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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 preceding 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 (V205) 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



FAX: (315) 437-0571

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East Syracuse, NY 13057 (315) 432-5227

LABORATORY FOOTNOTE REPORT

GALSON

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.

DET.

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%

rarameter	Method	FBD
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.

Darameter

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.

Method

OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3

< -Less Th	an mg -Milligrams	m3 -Cubic Meters	s kg -Kilograms	ppm -Parts per Millio	n
> -Greater	Than ug -Micrograms	l -Liters	NS -Not Specified	d ND -Not Detected	NA -Not Applicable





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GALSON

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	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable





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Client Name : Toronto Transit Commission Ltd.

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)

< -I	Less Than	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	ppm -Parts per Million	
> -0	Greater Than	ug -Micrograms	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable



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LABORATORY FOOTNOTE REPORT

GALSON

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 \text{ 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

GALSON

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 Tridymite	+/-10.9% +/-13.6%	93.4% 105%

		☐ New 0	Client?	Report To*:	Toronto	Transi+ G	emmirsion	Invoice,To*:	Toronto 7	Transit G	mmission
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Date:09/27/1/				,		E 2PM CK		•	Toronto, O		3E2
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Standard	0%	Site Nam Comme				Project :	22152		Sampled By:	UHG Lan	surcara.
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2 Business Days	50% 75%	-	Pleas	e see attach	ied acuin	uent for u	netal list. for Bo	ayınum, pi	eare use 1	27-193	
Next Day by 6pm	100%	List des	cription	of industry or pro	cess/interfer	ences	State samples were	Please indica	ate which OFI	this data v	vill be used for:
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Same Day	200%	1						☐ MSHA	=	her (specify):	
Sample Identifi (Maximum of 20 charectors, I characters will be abl	fication* ID's longer than 20	Date Sa (mm/s	•	Collection Medium	Sample Volume Sample Time, or Sample Area	Sample Units*: L, ml, mln., in2, cm2, ft2	Analysis Requ	ested*	Method Re	eference^	Hexavalent Chromium Process (ex. welding, plating, painting, etc.)*
Examp	le	01/0	1/11	2pc UW PVC	960	L	Hexavalent Chron	nium (Cr6)	mod. OSH	A ID-215	Welding
22152 - A35		09/21/		25mm PCM	485	489.73	Asbestos	· · · · · · · · · · · · · · · · · · ·	HZOZU	7400	
22152 - A36		, ,	1	25mm PCM	Ø	Ø	H				
22152-535				PW PVC in PPI	485	968.59	Crystalline Silica	(all forms)	NIOSH 75	004 Resp	. Pust NIOSHOG
22152 - 536				PW PVC in-PPI	i	Ø					
22152 - I33				tw puc in Iom	485	972.21	Metals (Inhalak	HOOIH (sh	7300+ In	ihalable	Dust WIOSH 05
22152 - I34				PW PUC in IOM	es.	Ø					
22152 - M35				uw McE in PPI	485	973.27	Metals (Respir	abk)	NIOSH	7300	
22152 - M36	•			LIW MCE IN PPI	Ø	Ø	I			<u> </u>	
22152 - T35			_	UW MCE	485	977.11	Metals (Tota	()			
22152 - T36		- ,	l	UW MCE	Ø	Ø				/	
^Galson Laboratories	will substitute	our routir	ne/prefe	rred method if it de	oes not matc	h the method	d listed on the COC un	less this box i	s checked:	Use met	hod(s) listed on COC
For metals analysis: if re-	questing an anal	yte with the	option :	of a lower LOQ pleas	se indicate if th	e lower LOQ i	s required (only available	for certain ana	lytes see SAG):		
For crystalline silica: f	orm(s) of silica	needed r	nust be	indicated (Quartz,	Cristobalite,	and/or Tridy	/mite)*:				
Chain of Custody	F	Print Nam	e/Signa	iture	Date	/Time		Print Na	me/Signature		Date/Time
Relinquished by:	Yunny Desig	ana lee	4	gra-	Sep 25/17	8:50 AM	Received by:	man So	mail /	1)	9/26/17 9:3
Relinquished by :	Lisma	Nan	///		9/2air	6:afr.	Received by: Kris	s Stone		me	19/27/17 11:18
*Requir							ested:03-OCT-17 17 bles being processed.	:21	Page		of

The TTC file number/purchase order number is PU240835:

- 1) <u>Total Metals by NIOSH 7300.</u> Analyze for antimony, arsenic, barium, beryllium, cadmium, calcium oxide, chromium III, cobalt, copper, lead, manganese, and selenium.
- 2) <u>Asbestos fibre count by NIOSH 7400.</u> 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) <u>Inhalable metals and inhalable dust by NIOSH 7300/0500.</u> 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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Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L420331

Project No. : 22152

Date Sampled : 26-SEP-17 Date Analyzed : 03-OCT-17 - 05-OCT-17

Date Received : 30-SEP-17 Report ID : 1023025

Date Sampled: 09/26/17 Date Analyzed: 10/05/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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	ma/m3

Collection Media: Date :	IOM 25mm PW PVC 06-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	! by: CRD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L420331

Project No. : 22152

Date Sampled : 26-SEP-17 Date Analyzed : 03-OCT-17 - 05-OCT-17

Date Received : 30-SEP-17 Report ID : 1023025

	LOQ	Total	Conc	Units
<u>Parameter</u>	uq	<u>uq</u>		
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

Collection Media: Date :	IOM 25mm PW PVC 06-OCT-17	Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: CRD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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East Syracuse, NY 13057

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Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L420331

Project No. : 22152

Date Sampled : 26-SEP-17 Date Analyzed : 03-OCT-17 - 05-OCT-17

Date Received : 30-SEP-17 Report ID : 1022354

Date Sampled: 09/26/17 Date Analyzed: 10/03/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	uq		
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

Collection Media:	MCE UW 37mm 06-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: CRD
<pre>-Less Than > -Greater Than</pre>	5	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734
6601 Kirkville Road Site : NS Login No. : L420331

East Syracuse, NY 13057 Project No. : 22152

(315) 432-5227 Date Sampled : 26-SEP-17 Date Analyzed : 03-OCT-17 - 05-OCT-17

FAX: (315) 437-0571 Date Received : 30-SEP-17 Report ID : 1022354

LOO Total Conc Units <u>Parameter</u> uq uq Aluminum 7.5 <7.5 NA mq/m3Cadmium 0.15 <0.15 NA mq/m3Iron Oxide 11. mq/m3<11 NA 0.15 Molvbdenum <0.15 NA mq/m3Zinc Oxide <2.8 2.8 NA mq/m3

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

Collection Media: MCE UW 37mm Submitted by: JMR Approved by: JJL Date : 06-OCT-17 NYS DOH # : 11626 Supervisor: KEG QC by: CRD -Less Than mg -Milligrams -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected -Greater Than ug -Micrograms -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L420331

East Syracuse, NY 13057 Project No. : 22152

(315) 432-5227 Date Sampled : 26-SEP-17 Date Analyzed : 03-OCT-17 - 05-OCT-17

FAX: (315) 437-0571 Date Received : 30-SEP-17 Report ID : 1022354

	LOQ	Total	Conc	Units
<u>Parameter</u>	uq	<u>uq</u>		
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

Collection Media:	MCE UW 37mm 06-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: CRD
<pre>Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L420331

Project No. : 22152

Date Sampled : 26-SEP-17 Date Analyzed : 03-OCT-17 - 05-OCT-17

Date Received : 30-SEP-17 Report ID : 1022354

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	uq		· .
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

Collection Media:	MCE UW 37mm 06-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: CRD
<pre>Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Login No. : L420331 Site

Project No. : 22152

Date Sampled : 26-SEP-17 Date Analyzed : 05-OCT-17 Date Received : 30-SEP-17 Report ID : 1022913

Asbestos Fiber Count (A Rules)

			Fibers/	Fibers/	Fibers/	Air	Fibers/
	<u>Sample ID</u>	<u>Lab ID</u>	Fields	mm2	Filter	Volume (cc)	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 Ouantitation : 5.5 Fibers/ 100 Fields

Microscope field area : 0.00785 mm2

Filter collection area: 385 mm2

Submitted by : BTM Approved by : BDB Date: 06-0CT-17

OC by: CRD

Supervisor: BDB

< -Less Than

> -Greater Than

ND -Not Detected

NA -Not Applicable mm2 -Square millimeters cc -Cubic Centimeters

NS -Not Specified



MOSIAS

LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L420331

Project No. : 22152

Date Sampled : 26-SEP-17 Date Received : 30-SEP-17 Report ID : 1021954

Inhalable Dust

Sample ID	<u>Lab ID</u>	Air Vol liter	Total mq	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 Submitted by: NRH

Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV Approved by : SPR

OSHA PEL : NA Date : 04-OCT-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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Client : Toronto Transit Commission Ltd Account No.: 90734 Login No. : L420331 Site : NS

Project No. : 22152

Date Sampled : 26-SEP-17 Date Analyzed : 05-OCT-17 Date Received : 30-SEP-17 Report ID : 1021955

Submitted by: HVN

Approved by : SPR

NYS DOH # : 11626

Date : 05-OCT-17

Respirable Dust

Sample ID	<u>Lab ID</u>	Air Vol liter	Total 	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 Supervisor: KRK

QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected

l -Liters > -Greater Than ug -Micrograms NS -Not Specified ppm -Parts per Million



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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L420331

Project No. : 22152

Date Sampled : 26-SEP-17 Date Received : 30-SEP-17 Report ID : 1022793

Hexavalent Chromium

Sample ID	<u>Lab ID</u>	Air Vol liter	Total uq	Conc ug/m3
22152-Н1	L420331-11	952.8	<0.030	<0.031
22152-Н2	L420331-12	NA	<0.030	NA

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

Level of quantitation: 0.030 ug Submitted by: KLS

Analytical Method : mod. OSHA ID-215 (version 2); IC/UV Approved by : DNF

OSHA PEL : 5 ug/m3 (TWA) Date : 06-OCT-17 NYS DOH # : 11626

Collection Media : PVC UW 37mm Supervisor: MWJ 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

6601 Kirkville Road

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(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L420331

Project No. : 22152

Date Sampled : 26-SEP-17 Date Analyzed : 05-OCT-17 - 06-OCT-17

Submitted: AJD

Date Received : 30-SEP-17 Report ID : 1023115

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

			Air Vol		
Sample ID	<u>Lab ID</u>	Analyte	1	uq	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 Approved: CMR

OSHA PEL : 50 ug/m3 RCS Date : 06-OCT-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: CRD

NA -Not Applicable ND -Not Detected l -Liters mppcf -Million Particles per Cubic Foot



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LABORATORY FOOTNOTE REPORT

GALSON

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

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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 preceding 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 (V205) 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 1 -Liters NS -Not Specified ND -Not Detected NA -Not Applicable



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LABORATORY FOOTNOTE REPORT

GALSON

Client Name : Toronto Transit Commission Ltd.

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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
	4 40 50	
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	Mechod	PED
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

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



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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% 104% Antimony +/-8.2% < -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable -Greater Than ug -Micrograms





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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 1 -Liters NS -Not Specified ND -Not Detected NA -Not Applicab



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LABORATORY FOOTNOTE REPORT

GALSON

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

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L420331 (Report ID: 1022913):
                 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
                 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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LABORATORY FOOTNOTE REPORT

GALSON

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 1 -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

, ,	CUG	☐ New (Client?	Report To*:	Tomak	Trancia C		m ictim.	Invoice To*	Toponto Transit	Commission
SGS				report to :	1920 Yo		Offi	ΥΟΙζένει	" INVOICE TO .	1920 Yonge St.	COMMISSION
	GALSON	Client A	Account	No.*:	Suite 60				•		
1Z5X626A6948549723 Date:09/30/17		Client	·ccount	140			^	2E 2		Suite 600	C 2E2
Shipper:UPS Initials:ZRK				- Dhana Na * :		ON M4		3CZ	Dh M	Toronto, ON M4	3 362
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Prep:UNKNOWN	is an esection	_		Cell No. :			_		Email:		<u>- 025</u>
(42033)				lts To: <u>Virgil. U</u>	mali @ttc					ie Order No. : PU 29	
		•	nail Add				<u>nsu</u>	Hants.com	•	Credit Card on File Ca	
Need Results By*:	(surcharge)		_	es submitted using th	e FreePumpLoa		<u> </u>		Samples submit	tted using the FreeSamplingBa	
Standard	0%	Site Nam	-			Project :		452	-	Sampled By: OHE C	onrultants
4 Business Days	35%	Comme	ınıs: -	TTC Subi	way Air	Quality					
3 Business Days 2 Business Days	50%	-		• • •	σ	. 0					
Next Day by 6pm	75% 100%	List des	cription	of industry or pro	cess/interfer	ences	Sta	ate samples were	Please indica	ate which OEL this data	will be used for:
Next Day by Noon	150%			ling area:				llected in (ex. NY):	OSHA PEL	·	Cal OSHA
Same Day	200%	1							☐ MSHA	Other (specify):	
Sample Identi (Maximum of 20 charactors, I charactors will be abl	D's longer than 20	Date Sa (mm/c	,	Collection Medium	Sample Volume, Sample Time, or Sample Area	Sample Units*: L, ml, min., in2, cm2, fl2		Analysis Requ	ested*	Method Reference^	Hexavalent Chromium Process (ex. welding, plating, painting, etc.)*
Examp	le	01/0	1/11	2pc UW PVC	960	L		Hexavalent Chron	nium (Cr6)	mod. OSHA ID-215	Welding
22152-A37		09/20	0/17	25mm PCM	480	495.2	ח				
22152 -A38				25mm PCM	Ø	Ø	Ц				
22152 - 537				PW PVC in PPI	480	962.3					
22 52 - S38	•			PW PVC in PPI	Ø	Ø	Ц				
<u> 22152 - I35</u>	5			PW PVC in IOM	480	964.2	$oxed{oxed}$	Standardiz	ed List	of Analyses	
22152 - I36	•			PW PVC IN IOM	Ø	Ø		> for TTC	Subway	Air Quality Studi	4
22152 - M37	7			UW MCE IN PPI	420	967.2			<u> </u>	•	ľ
22152- M38	3			UW MCE IN PPI	Ø	Ø					
22152 - T37				uw Mc5	480	970.5					
22152 - T38	3	,	V	uw Mc€	Ø	Ø	ز)			
^Galson Laboratories	will substitute o	our routin	e/prefer	red method if it do	oes not matcl	h the method	llis	ted on the COC unl	ess this box i	s checked: Use met	nod(s) listed on COC
For metals analysis: if red	questing an analy	te with the	option o	of a lower LOQ pleas	e indicate if th	e lower LOQ is	s re	quired (only available	for certain anal	ytes see SAG):	
For crystalline silica: for					Cristobalite,	and/or Tridy	mit	e)*:			
Chain of Custody		rint Name	77 (-1	ture	Date/	Time	_		Print Na	me/Signature	Date/Time
Relinquished by:	Yuphy Desig	apa Le	e //	700	Sep 29/17	11:08 AM	Re	eceived by:	masa	://	9/29/17 1:370
Relinquished by :	Herma	ليمتهك	12	Page 18 of 20	9/29/12	(0[00]m	Re	ceived by:	sstone	Stone	930/17 13
*Require				3pm will be consi se fields may resu						Page	of η

		☐ New Client?	Report To* :	Tomonto	Transit	Commission	Invoice To*:	Toronto Transit	Commission
	JAOO IAO		·	1920 You			-	1920 Yonge St.	
1Z5X626A6948549723	·	Client Account	No.* :	Suite 60			-	Suite 600	
Date:09/30/17 Shipper:UPS						S 3∈2	_	Toronto, ON MY	હ ૩ ∈૨
Initials:ZRK	IA C 11		Phone No.* :				– Phone No. :		
			Cell No. :				- Email :		
Prep:UNKNOWN		Email Resul	ts To: Virgil. L		c ca & c	shere with @	_	se Order No. : PU &	14n l 35
ı	/	Email Add			consultar		_	Credit Card on File Ca	
Need Results By*:	(surcharge)	- -	es submitted using th				=	tted using the FreeSamplingBa	
Standard	0%	Site Name :		·	-	22/52	<u> </u>	Sampled By : OHE (
4 Business Days	35%	i .	TTO CIL	Δ.			- · · · · · · · · · · · · · · · · · · ·	Campica by : Ot)C	2019 WICHING
3 Business Days	50%	7	TTC Subi	way mr	Quaing	†			
2 Business Days	75%	7							
Next Day by 6pm	100%	List description	of industry or pro	cess/interfer	ences	State samples were	Please indic	ate which OEL this data	will be used for:
Next Day by Noon	150%	present in samp	ling area:			collected in (ex. NY):	OSHA PEL	☐ ACGIH TLV	Cal OSHA
Same Day	200%						☐ MSHA	Other (specify):	
Sample Identi (Maximum of 20 charactors, I characters will be ab	ID's longer than 20	Date Sampled* (mm/dd/yy)	Collection Medium	Sample Velume, Sample Time, or Sample Area	Sample Units*: L, ml, min., in2, cm2, ft2	Analysis Requ	uested*	Method Reference^	Hexavalent Chromlum Process (ex. welding, plating, painting, etc.)*
Examp	le	01/01/11	2pc UW PVC	960	L	Hexavalent Chror	mium (Cr6)	mod. OSHA ID-215	Welding
22152-H1		09/24/17	2pc UW PVC	480	952.8	Hexavalent Ch	homium	mod OSHA ID 215	
22152 - H2			2pc UWPVC		Ø				
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*Galson Laboratories For metals analysis: if re-									hod(s) listed on COC
For crystalline silica: f	<u> </u>	<u>- </u>	<u>-</u>				e ioi ceitain ana	iyles see shoj.	
Chain of Custody		Print Name/Signa	· ·		/Time		Print Na	me/Signature	Date/Time
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Relinquished by :	11	()	15/	9/2011	Cicola	Received by:		V XIn	93017 103
		oles received after		वहार्क्य वह शह	eday d basn	Agg jed:06-OCT-17 18	:35	<u> </u>) •
*Requir	ed fields, failu	re to complete the	se fields may resu	ult in a delay	in your samp	les being processed.		Page 2	of \mathcal{Q}



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.



GALSON

6601 Kirkville Road

East Syracuse, NY 13057

(315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L420327

Project No. : 22152

Date Sampled : 28-SEP-17 Date Analyzed : 03-OCT-17 - 05-OCT-17

Date Received : 30-SEP-17 Report ID : 1023021

Date Sampled: 09/28/17 Date Analyzed: 10/05/17

Darameter	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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	ma/m3

Collection Media: Date :	IOM 25mm PW PVC 06-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	! by: CRD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



FAX: (315) 437-0571

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd Account No.: 90734 6601 Kirkville Road Site

Login No. : L420327

East Syracuse, NY 13057 Project No. : 22152 (315) 432-5227

Date Sampled : 28-SEP-17 Date Analyzed : 03-OCT-17 - 05-OCT-17

Date Received : 30-SEP-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

	LOQ	Total	Conc	Units
<u>Parameter</u>	uq	<u>uq</u>		
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

Collection Media: Date :	IOM 25mm PW PVC 06-OCT-17	Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: CRD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L420327

Project No. : 22152

Date Sampled : 28-SEP-17 Date Analyzed : 03-OCT-17 - 05-OCT-17

Date Received : 30-SEP-17 Report ID : 1022364

Date Sampled: 09/28/17 Date Analyzed: 10/03/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media:	MCE UW 37mm 05-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: CRD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L420327

Project No. : 22152

Date Sampled : 28-SEP-17 Date Analyzed : 03-OCT-17 - 05-OCT-17

Date Received : 30-SEP-17 Report ID : 1022364

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		<u> </u>
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

Collection Media:	MCE UW 37mm 05-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: CRD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



East Syracuse, NY 13057

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L420327

Project No. : 22152

Date Sampled : 28-SEP-17 Date Analyzed : 03-OCT-17 - 05-OCT-17

Date Received : 30-SEP-17 Report ID : 1022364

	LOQ	Total	Conc	Units
<u>Parameter</u>	uq	uq		
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	ma/m3

Collection Media: Date :	MCE UW 37mm 05-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: CRD
<pre>-Less Than > -Greater Than</pre>	5	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L420327

Project No. : 22152

Date Sampled : 28-SEP-17 Date Analyzed : 03-OCT-17 - 05-OCT-17

Date Received : 30-SEP-17 Report ID : 1022364

Date Sampled: 09/28/17 Date Analyzed: 10/04/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	uq	<u>uq</u>		<u> </u>
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	mq/m3

Collection Media:	MCE UW 37mm 05-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: CRD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L420327

Project No. : 22152

Date Sampled : 28-SEP-17 Date Received : 30-SEP-17 Report ID : 1022911

Asbestos Fiber Count (A Rules)

		Fibers/	Fibers/	Fibers/	Air	Fibers/
<u>Sample ID</u>	<u>Lab ID</u>	<u> Fields</u>	mm2	<u> Filter</u>	Volume (cc)	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 Ouantitation: 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
OC 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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Project No. : 22152

Date Sampled : 28-SEP-17 Date Received : 30-SEP-17 Report ID : 1021956

Inhalable Dust

Sample ID	<u>Lab ID</u>	Air Vol liter	Total mq	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 Submitted by: HVN/NRH

Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV Approved by : SPR

OSHA PEL : NA Date : 04-OCT-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



LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L420327

Project No. : 22152

Date Sampled : 28-SEP-17 Date Received : 30-SEP-17 Report ID : 1021957

Respirable Dust

Sample ID	<u>Lab ID</u>	Air Vol liter	Total mq	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 Submitted by: HVN

Analytical Method : mod. NIOSH 0600; Gravimetric Approved by : SPR

OSHA PEL : PNOR 5 mg/m3 (TWA) Date : 05-OCT-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected



LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L420327

Project No. : 22152

Date Sampled : 28-SEP-17 Date Received : 30-SEP-17 Report ID : 1022792

Submitted by: KLS

Approved by : DNF

Hexavalent Chromium

Sample ID	<u>Lab ID</u>	Air Vol liter	Total uq	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) Date : 06-OCT-17 NYS DOH # : 11626

Collection Media : PVC UW 37mm Supervisor: MWJ QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected



LABORATORY ANALYSIS REPORT

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FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L420327

Project No. : 22152

Date Sampled : 28-SEP-17 Date Analyzed : 05-OCT-17 - 06-OCT-17

Submitted: AJD

Date Received : 30-SEP-17 Report ID : 1023113

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

			Air Vol		
Sample ID	<u>Lab ID</u>	<u>Analyte</u>	1	uq	uq/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 Approved: CMR

OSHA PEL : 50 ug/m3 RCS Date : 06-OCT-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: CRD

NA -Not Applicable ND -Not Detected l -Liters mppcf -Million Particles per Cubic Foot



FAX: (315) 437-0571

East Syracuse, NY 13057 (315) 432-5227

LABORATORY FOOTNOTE REPORT

GALSON

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

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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 preceding 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 (V205) 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 (315) 432-5227

LABORATORY FOOTNOTE REPORT

GALSON

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%

rarameter	Method	FBD
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.

Darameter

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.

Method

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

DET.



LABORATORY FOOTNOTE REPORT

GALSON

Client Name : Toronto Transit Commission Ltd.

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):

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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
22	. / 10 60	1040
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	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable





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Client Name : Toronto Transit Commission Ltd.

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

+/-11.3%	100%
+/-9.1%	102%
+/-10.2%	103%
+/-9.3%	104%
+/-10%	102%
+/-8.1%	103%
+/-8.9%	103%
+/-10.3%	99.4%
+/-11.4%	105%
+/-9.9%	106%
	+/-9.1% +/-10.2% +/-9.3% +/-10% +/-8.1% +/-8.9% +/-10.3% +/-11.4%

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)

< -I	Less Than	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	ppm -Parts per Million	
> -0	Greater Than	ug -Micrograms	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable



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LABORATORY FOOTNOTE REPORT

GALSON

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

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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 \text{ 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	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable



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LABORATORY FOOTNOTE REPORT

GALSON

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%

|--|

		New	Client?	Report To*:	Toronto	Transit C	ent	– miction	- V	Invoice To*:	Toronto Transit	Commission -
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Same Day	200%						<u> </u>			MSHA	Other (specify):	
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For metals analysis: if red	questing an analy	te with the	option o	of a lower LOQ pleas	e indicate if th	e lower LOQ is	s rec	quired (only	available	for certain anal	ytes see SAG):	
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CCC			Report 10 .			Diffire 3 for	IIIVOICE TO		ŀ
<u> </u>	GALSON			1920 70	•			1920 Yonge St.	
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888-432-5227			Cell No. :						
Fax: 315-437-0571 www.galsonlabs.com		Email Result	ts To: Virgil. U	Imali@tb	c.09 &	oheresulta e	Purcha	se Order No. : PU 24	o & 35
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*Requir	Samples received after 3pm with 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								



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.



GALSON

6601 Kirkville Road

East Syracuse, NY 13057

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FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L421598

Project No. : 22152

Date Sampled : 03-OCT-17 Date Received : 11-OCT-17 Report ID : 1024784

Date Sampled: 10/03/17 Date Analyzed: 10/14/17

Parameter	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media	: MCE UW 37mm : 16-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG Q	C by: TJB
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOO-Limit of Ouantitation



Clic 6601 Kirkville Road Site

East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L421598

Project No. : 22152

Date Sampled : 03-OCT-17 Date Received : 11-OCT-17 Report ID : 1024784

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		· ·
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

Collection Media: Date :	MCE UW 37mm 16-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: TJB
<pre>-Less Than > -Greater Than</pre>	5	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



(315) 432-5227

LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd Account No.: 90734

Login No. : L421598

East Syracuse, NY 13057 Project No. : 22152

Date Sampled : 03-OCT-17 Date Received : 11-OCT-17 Report ID : 1024784

FAX: (315) 437-0571 Date Received : 11-OCT-17 www.galsonlabs.com

Site

	LOQ	Total	Conc	Units
<u>Parameter</u>	uq	ug		
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

Collection Media: Date :	MCE UW 37mm 16-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: TJB
<pre>-Less Than > -Greater Than</pre>	5	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734
6601 Kirkville Road Site : NS Login No. : L421598

East Syracuse, NY 13057 Project No. : 22152

(315) 432-5227 Date Sampled : 03-OCT-17 Date Analyzed : 14-OCT-17 FAX: (315) 437-0571 Date Received : 11-OCT-17 Report ID : 1024784

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media:	MCE UW 37mm 16-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: TJB
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



6601 Kirkville Road East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L421598

Project No. : 22152

Date Sampled : 03-OCT-17 Date Received : 11-OCT-17 Report ID : 1024781

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	IOM 25mm PW PVC 16-OCT-17	Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: TJB
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734
6601 Kirkville Road Site : NS Login No. : L421598

East Syracuse, NY 13057 Project No. : 22152

(315) 432-5227 Date Sampled : 03-OCT-17 Date Analyzed : 14-OCT-17 FAX: (315) 437-0571 Date Received : 11-OCT-17 Report ID : 1024781

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		<u> </u>
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

Collection Media: Date :	IOM 25mm PW PVC 16-OCT-17	Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	С by: тјв
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734

6601 Kirkville Road Site : NS Login No. : L421598

East Syracuse, NY 13057 Project No. : 22152

(315) 432-5227 Date Sampled : 03-OCT-17 Date Analyzed : 16-OCT-17

FAX: (315) 437-0571 Date Received : 11-OCT-17 Report ID : 1024816 www.qalsonlabs.com

Asbestos Fiber Count (A Rules)

		Fibers/	Fibers/	Fibers/	Air	Fibers/
Sample ID	<u>Lab ID</u>	Fields	mm2	<u> Filter</u>	Volume (cc)	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 Submitted by : BTM

Analytical Method: mod. NIOSH 7400 "A" Rules Approved by: BDB Limit of Quantitation: 5.5 Fibers/ 100 Fields Date: 17-OCT-17

 $\begin{array}{lll} \mbox{Microscope field area: 0.00785 mm2} & \mbox{QC by: TJB} \\ \mbox{Filter collection area: 385 mm2} & \mbox{Supervisor: BDB} \end{array}$

< -Less Than > -Greater Than ND -Not Detected

NA -Not Applicable cc -Cubic Centimeters NS -Not Specified

mm2 -Square millimeters



LABORATORY ANALYSIS REPORT

6601 Kirkville Road

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L421598

Project No. : 22152

Date Sampled : 03-OCT-17 Date Received : 11-OCT-17 Report ID : 1023998

Inhalable Dust

<u>Sample ID</u>	Lab ID	liter	mq	mg/m3
	L421598-5 10:			<0.098 NA

 $\underline{\mathtt{COMMENTS:}}$ 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 : KRK

OSHA PEL : NA Date : 17-OCT-17 NYS DOH # : 11626

Collection Media : IOM 25mm PW PVC Supervisor: KRK QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected



LABORATORY ANALYSIS REPORT

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FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L421598

Project No. : 22152

Date Sampled : 03-OCT-17 Date Received : 11-OCT-17 Report ID : 1023999

Respirable Dust

Sample ID	<u>Lab ID</u>	Air Vol liter	Total mq	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 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

Submitted by: HVN

Approved by : SPR

NYS DOH # : 11626

Date : 16-OCT-17



MOSIA

LABORATORY ANALYSIS REPORT

6601 Kirkville Road

East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L421598

Project No. : 22152

Date Sampled : 03-OCT-17 Date Received : 11-OCT-17 Report ID : 1024461

Hexavalent Chromium

Sample ID	<u>Lab ID</u>	Air Vol liter	Total uq	Conc ug/m3
22152-Н5	L421598-11	1002.5	<0.030	<0.030
22152-н6	L421598-12	NA	<0.030	NA

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

Level of quantitation: 0.030 ug Submitted by: MCM

Analytical Method : mod. OSHA ID-215 (version 2); IC/UV Approved by : MWJ

OSHA PEL : 5 ug/m3 (TWA) Date : 16-OCT-17 NYS DOH # : 11626

Collection Media : PVC UW 37mm Supervisor: MWJ QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected



LABORATORY ANALYSIS REPORT

6601 Kirkville Road

East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L421598

Project No. : 22152

Date Sampled : 03-OCT-17 Date Analyzed : 16-OCT-17 - 17-OCT-17

Date Received : 11-OCT-17 Report ID : 1025157

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

			Air Vol		
<u>Sample ID</u>	<u>Lab ID</u>	Analyte	1	uq	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 Submitted: AJD

Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD Approved: KRK

OSHA PEL : 50 ug/m3 RCS Date : 17-OCT-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: TJB

NA -Not Applicable ND -Not Detected l -Liters mppcf -Million Particles per Cubic Foot



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LABORATORY FOOTNOTE REPORT

GALSON

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

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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 preceding 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 (V205) 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 1 -Liters NS -Not Specified ND -Not Detected NA -Not Applicable



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LABORATORY FOOTNOTE REPORT

GALSON

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.

DET.

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%

rarameter	I-IC CII	ou					FBD
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

blased low.

Darameter

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(Fe203) 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.

Method

OSHA PEL: Chromium II and III = 0.5 mg/m3; Chromium metal (as Cr) = 1 mg/m3

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



LABORATORY FOOTNOTE REPORT

6601 Kirkville Road

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East Syracuse, NY 13057 (315) 432-5227

Client Name : Toronto Transit Commission Ltd.

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

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L421598 (Report ID: 1024784):
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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	1	-Liters	NS -Not Specified	ND -Not Detected

NA -Not Applicable



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Client Name : Toronto Transit Commission Ltd.

Project No. : 22152

East Syracuse, NY 13057 Date Sampled : 03-OCT-17 Account No.: 90734 Date Received: 11-OCT-17 Login No. : L421598

Date Analyzed: 13-OCT-17 - 17-OCT-17

+/-0 1%	103%
,	
+/-12.6%	103%
+/-9%	105%
+/-11.3%	100%
+/-9.1%	102%
+/-10.2%	103%
+/-9.3%	104%
+/-10%	102%
+/-8.1%	103%
+/-8.9%	103%
+/-10.3%	99.4%
+/-11.4%	105%
+/-9.9%	106%
	+/-11.3% +/-9.1% +/-10.2% +/-9.3% +/-10% +/-8.1% +/-8.9% +/-10.3% +/-11.4%

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	0.5 mg/m3 (TWA)
		3, - , - ,
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	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable

LABORATORY FOOTNOTE REPORT



FAX: (315) 437-0571

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< -Less Than

-Greater Than

mg -Milligrams

ug -Micrograms

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LABORATORY FOOTNOTE REPORT

GALSON

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

m3 -Cubic Meters

l -Liters

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.

ppm -Parts per Million

NA -Not Applicable

ND -Not Detected

kg -Kilograms

NS -Not Specified



FAX: (315) 437-0571

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East Syracuse, NY 13057 (315) 432-5227

LABORATORY FOOTNOTE REPORT

GALSON

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: 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%

g -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million g -Micrograms 1 -Liters NS -Not Specified ND -Not Detected NA -Not Applicab
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	GUG	0.1.001			20 Yonge Str				nge Street	001011
		CAI SON	Client Account No.		uite 600			Suite 600		
	6A6646795458 0/11/17				pronto, ON M4	S 3E2			ON M4S 3E2	
	r:UPS		1	Phone No.* : 41	6-393-6668		Pł	none No. :		
	ls:KMS Millimanatum uu	DIRA DE ILEGE BIL	2A2	Cell No. :				Email :		
		BYON OF WELL BY		Email Results to : Vir	gil.Umali@ttc.ca &	oheresults@oheconsi	ultants.com	P.O. No.: PU240835		
p : ur	NKNOWN		1	Email address :	_			edit Card 🔲 Card on Fil	e 🔲 Call for Cred	lit Card Info.
ı			J						P 1	74.6
1	Need Results By*:	(surcharge)				sing the FreePumpLoan™	Program Sai	nples submitted using the		s ^{rm} Program
7	Standard	0%	Site Name :		F	Project: 22152		Sampled by: OHE C	Consultants	
	4 Business Days	35%	Comments:							
	3 Business Days	50%	TTC Sub	oway Air	Quality					
<u> </u>	2 Business Days	75%							that one are described	II be a see of feet
Ш	Next Day by 6pm	100%	List description of indu	istry or Process/interfe	rences present in sam	pling area:	Province samples we collected in (ex. ON)	l <u>—</u>	which OEL this data wil	Cal OSHA
	Check for availability ar quicker turn around							MSHA	Other (specify):	
	Sample Identifica (Maxmlum of 20 Characters than 20 characters will be a	s. ID's longer	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.)*
221	52 - A41		10/03/17	25 mm PCM	516.5	L	Standardized Lis	t of Analysis for TTC		
221	52 - A42		10/03/17	25 mm PCM	-	-	-			
221	52 - S41		10/03/17	PW PVC in PPI	1008.5	L	-			
221	52 - S42		10/03/17	PW PVC in PPI	-	-	-			
221	52 - 139		10/03/17	PW PVC in IOM	1019.0	L	-			
221	52 - 140		10/03/17	PW PVC in IOM	-	-				
221	52 - M41		10/03/17	UW MCE in PPI	1007.3	L	-			
221	52 - M42		10/03/17	UW MCE in PPI		-				
221	52 - T41		10/03/17	UW MCE	1005.8	L	-			
221	52 - T 42		10/03/17	UW MCE			-			
^Gi	alson Laboratories wi	ll subsititute ou	r routine/preferred meth	nod if it does not match	the method listed o	n the COC unless this box	is checked: Use m	ethod(s) listed on COC		
For	metals analysis: if red	questing an anal	yte with the option of a	lower LOQ, please indi	cate if the lower LOQ	is required (only available	e for certain analytes - s	ee SAG) :		
For	crystalline silica: forn	n(s) of silica need	ded must be indicated ((Quartz, Cristobalite, and	d/or Tridymite)* :					
	ain of Custody		int Name/Signature		Date Time		Prir	t Name/Signature	Da	
Rel	linquished by Ror	nain Mathevet		10.	/10/17 11:30	_	Luman	Sanz fel	10/10/	
Rel	linquished by	eman.	Jun / //	10/1	017 Gap		MI Cani	Meny	U VAUIC	7 1554
			(* Re			n will be considered as fields may result in a d		: heing processed		Page 1 of _2

Page 19 of 20 Report Reference:1 Generated:19-OCT-17 13:19

Unit 5	GALSON rd Avenue West	New Client? Client Account No.*	19 S:	oronto Transit C 020 Yonge Stree uite 600 oronto, ON M4S 6-393-6668	et .	Phone N	1920 Yo Suite 60 Toronto,	Transit Commi nge Street 0 ON M4S 3E2	
www.galso		E		gil.Umali@ttc.ca & o	heresults@oheconsu	_	o.: <u>PU240835</u>		
			Email address :			Credit Ca	ard 🔲 Card on Fi	le Call for Cred	lit Card Info.
Need Results By*:	(surcharge)			Samples submitted usir	ng the FreePumpLoan™	Program Samples s	ubmitted using th	e FreeSamplingBadge	s™ Program
✓ Standard	0%	Site Name :		Pro	oject: 22152	Samp	oled by: OHE (Consultants	
4 Business Days	35%	Comments:							
3 Business Days	50%	TTO COL	NIA Air	Ougliby					
2 Business Days	75%	TTC Sub	way Air	Quality					
Next Day by 6pm	100%	List description of indu	stry or Process/interfe	rences present in samp	ing area :	Province samples were		vhich OEL this data wil	l be used for:
Check for availability ar	pricing for				<u>.</u> ·	collected in (ex. ON)	OSHA PEL	ACGIH TLV	Cal OSHA
quicker turn around							MSHA	Other (specify):	
Sample Identifica (Maxmlum of 20 Characters than 20 characters will be al	i. ID's longer	Date Sampled Collection Medium Sample Volume Sample Units*: Collection Medium Sample Time Sample Area* L, ml,min,in2,cm2,ft7				Analysis Requested* Method Reference^ Process (e.g., welding plating, painting, etc.)*			
22152 - H5		10/03/17	2pc UW PVC	1002.5	L	Hexavalent Chromium	1	mod.OSHA 215	Other
22152 - H6		10/03/17	2pc UW PVC	-	-	-		-	-
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				1					
		<u> </u>			required (Only available	e for certain analytes - see SAG			
For crystalline silica: form				- 1	1	Print Mam	e/Signature	Da	te Time
Chain of Custody		int Name/Signature		Date Time //10/17 11:30	Received by :		·	10/10/	12 3:04
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		/ *Re				lelay in your samples being	processed.	f	Page 2 of _2
						19-OCT-17 13:19			



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.



GALSON

6601 Kirkville Road

East Syracuse, NY 13057

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FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L421594

Project No. : 22152

Date Sampled : 05-OCT-17 Date Received : 11-OCT-17 Report ID : 1024758

Date Sampled: 10/05/17 Date Analyzed: 10/14/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	MCE UW 37mm 16-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: AMD
<pre></pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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East Syracuse, NY 13057 (315) 432-5227

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L421594

Project No. : 22152

Date Sampled : 05-OCT-17 Date Received : 11-OCT-17 Report ID : 1024758

LOO Total Units Conc <u>Parameter</u> ug ug Aluminum 7.5 <7.5 NA mq/m3Cadmium 0.015 <0.015 NA mq/m3Iron Oxide 11. <11 mg/m3NA Molvbdenum <0.075 0.075 NA mg/m3Zinc Oxide 2.8 <2.8 NA mq/m3

Collection Media: Date :	MCE UW 37mm 16-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: AMD
<pre>-Less Than > -Greater Than</pre>	5	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



East Syracuse, NY 13057

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LABORATORY ANALYSIS REPORT

GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734 6601 Kirkville Road Site

Login No. : L421594 : NS

Project No. : 22152

Date Sampled : 05-OCT-17 Date Analyzed : 14-OCT-17 Date Received : 11-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

LOO Total Conc Units <u>Parameter</u> uq uq Antimony 0.90 <0.90 <0.00088 mq/m3Arsenic 0.15 <0.15 <0.00015 mq/m3Barium 0.15 4.2 0.0041 mq/m3Bervllium 0.0075 <0.0075 < 0.0000073 mq/m3Cadmium 0.015 <0.015 <0.000015 mq/m3Calcium Oxide 100. <100 < 0.10 mq/m3Chromium <0.0073 7.5 <7.5 mq/m3Cobalt <0.045 <0.000044 0.045 mq/m30.30 0.47 0.00046 Copper mq/m3Lead 0.075 <0.075 < 0.000073 mq/m3Manganese 0.15 0.85 0.00083 mq/m3Selenium 2.3 < 2.3 <0.0022 mq/m3

Collection Media: Date :	MCE UW 37mm 16-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: AMD
<pre>-Less Than -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Login No. : L421594 : NS

Project No. : 22152

Date Sampled : 05-OCT-17 Date Received : 11-OCT-17 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

Site

LOO Total Conc Units <u>Parameter</u> uq uq Antimony 0.90 <0.90 NA mq/m3Arsenic 0.15 <0.15 NA mq/m3Barium 0.15 <0.15 NA mq/m3Bervllium <0.0075 0.0075 NA mq/m3Cadmium <0.015 0.015 NA mq/m3Calcium Oxide 100. <100 NA ma/m3Chromium 7.5 <7.5 NΑ mq/m3Cobalt < 0.045 0.045 NΑ mq/m3<0.30 Copper 0.30 NA mq/m3Lead 0.075 <0.075 NΑ ma/m30.15 <0.15 Manganese NA mq/m3Selenium 2.3 < 2.3 NΑ mq/m3

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

Collection Media: MCE UW 37mm Submitted by: JMR Approved by: JJL Date : 16-OCT-17 NYS DOH # : 11626 Supervisor: KEG QC by: AMD -Less Than mg -Milligrams -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected -Greater Than uq -Micrograms -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 Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L421594

Project No. : 22152

Date Sampled: 10/05/17 Date Analyzed: 10/14/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	IOM 25mm PW PVC 16-OCT-17	Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: AMD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

Clier

Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L421594

East Syracuse, NY 13057 Project No. : 22152

(315) 432-5227 Date Sampled : 05-OCT-17 Date Analyzed : 14-OCT-17 FAX: (315) 437-0571 Date Received : 11-OCT-17 Report ID : 1024756

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		<u> </u>
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

Collection Media: Date :	IOM 25mm PW PVC 16-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: AMD
<pre>-Less Than > -Greater Than</pre>		m3 1	- 1 .	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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East Syracuse, NY 13057 (315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734 Login No. : L421594 Site

Project No. : 22152

Date Sampled : 05-OCT-17 Date Analyzed : 16-OCT-17 Date Received : 11-OCT-17 Report ID : 1024815

Asbestos Fiber Count (A Rules)

			Fibers/	Fibers/	Fibers/	Air	Fibers/
	<u>Sample ID</u>	<u>Lab ID</u>	<u> Fields</u>	<u>mm2</u>	<u> Filter</u>	Volume (cc)	CC
왕	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 Ouantitation : 5.5 Fibers/ 100 Fields

Microscope field area : 0.00785 mm2

Filter collection area: 385 mm2

Supervisor: BDB

OC by: AMD

Submitted by : BTM

Approved by : BDB

Date: 17-0CT-17

< -Less Than

> -Greater Than

ND -Not Detected NS -Not Specified

NA -Not Applicable

cc -Cubic Centimeters

mm2 -Square millimeters



LABORATORY ANALYSIS REPORT

6601 Kirkville Road

East Syracuse, NY 13057

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L421594

Project No. : 22152

Date Sampled : 05-OCT-17 Date Analyzed : 13-OCT-17

Date Received : 11-OCT-17 Report ID : 1023995

Inhalable Dust

Sample ID	<u>Lab ID</u>	Air Vol liter	Total mq	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 Submitted by: GMG

Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV Approved by : KRK

OSHA PEL : NA Date : 17-OCT-17 NYS DOH # : 11626

Collection Media : IOM 25mm PW PVC 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



LABORATORY ANALYSIS REPORT

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(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L421594

Project No. : 22152

Date Sampled : 05-OCT-17 Date Received : 11-OCT-17 Report ID : 1023996

Respirable Dust

Sample ID	<u>Lab ID</u>	Air Vol liter	Total mq	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 Submitted by: HVN

Analytical Method : mod. NIOSH 0600; Gravimetric Approved by : SPR

OSHA PEL : PNOR 5 mg/m3 (TWA) Date : 16-OCT-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 ND -Not Detected

> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million



LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L421594

Project No. : 22152

Date Sampled : 05-OCT-17 Date Received : 11-OCT-17 Report ID : 1024460

Submitted by: MCM

Approved by : MWJ

NYS DOH # : 11626

Date : 16-OCT-17

Hexavalent Chromium

<u>Sample ID</u>	<u>Lab ID</u>	Air Vol liter	Total uq	Conc ug/m3
22152-н7	L421594-11	1010.3	<0.030	<0.030
22152-H8	L421594-12	NA	<0.030	NA

 $\underline{\mathtt{COMMENTS:}}$ 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 Supervisor: MWJ 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



LABORATORY ANALYSIS REPORT

6601 Kirkville Road
Fast Syracuse NV 13057

East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L421594

Project No. : 22152

Date Sampled : 05-OCT-17 Date Analyzed : 16-OCT-17 - 18-OCT-17

Submitted: NLO

Approved: KRK

Date Received : 11-OCT-17 Report ID : 1025394

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

			Air Vol		
Sample ID	<u>Lab ID</u>	<u>Analyte</u>	1	<u>uq</u>	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 Date : 18-OCT-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: AMD

NA -Not Applicable ND -Not Detected 1 -Liters mppcf -Million Particles per Cubic Foot



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East Syracuse, NY 13057 (315) 432-5227

LABORATORY FOOTNOTE REPORT

GALSON

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

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Any holder of this document is advised that information contained herein reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

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 preceding 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 (V205) 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</p>

> -Greater Than ug -Micrograms 1 -Liters NS -Not Specified ND -Not Detected NA -Not Applicable



FAX: (315) 437-0571

www.galsonlabs.com

East Syracuse, NY 13057 (315) 432-5227

LABORATORY FOOTNOTE REPORT

GALSON

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	Mechod	PED
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

blased 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	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable





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East Syracuse, NY 13057 (315) 432-5227

GALSON

Client Name : Toronto Transit Commission Ltd.

Site :

Project No. : 22152

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 ARSENIC: U.UI 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	1	-Liters	NS -Not Specified	ND -Not Detected

NA -Not Applicable



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

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):

6601 Kirkville Road East Syracuse, NY 13057

FAX: (315) 437-0571

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(315) 432-5227

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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LABORATORY FOOTNOTE REPORT

GALSON

Client Name : Toronto Transit Commission Ltd.

Site :

Project No. : 22152

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

GALSON

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	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable

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Relinquished by

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Check for availability ar quicker turn aroun								•	MSHA	Other (specify):	Carosina
Sample Identifica (Maxmlum of 20 Characters than 20 characters will be a	s. ID's longer	Date Sampled	Collection Medium	n Samp	e Volume ble Time le Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Ana	lysis Reques	ted*	Method Reference^	Hexavalent Chromiu Process (e.g., welding plating, painting, etc.
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22152 - I41		10/05/17	PW PVC in IC	OM 1026.6		L	-				
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22152 - M44		10/05/17	UW MCE in PI	PI -		-	-				
22152 - T43		10/05/17	UW MCE	1022.8		L	-				
22152 - T44		10/05/17	UW MCE	-		-	-				
^Galson Laboratories wi	ill subsititute ou	r routine/preferred met	hod if it does not m	atch the metho	od listed on t	he COC unless this box	is checked: Us	e method(s) listed on COC	-	•
For metals analysis: if red	questing an anal	lyte with the option of a	lower LOQ, please i	indicate if the lo	ower LOQ is I	equired (only available	for certain analyte	s - see SAG):		
For crystalline silica: form	n(s) of silica nee	ded must be indicated (Quartz, Cristobalite,	, and/or Tridym	ite)*:						
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Samples received after 8pm 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 19 of 20 Report Reference:1 Generated:18-OCT-17 17:47

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Page 1 of 2

CCC		New Client?			t Commission	Invoice 1		Transit Comm	ission
<u> </u>	GALSON	- 0		920 Yonge St	reet			nge Street	
		Client Account No		uite 600	140.050	-	Suite 60		
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Need Results By*:	(surcharge)			Samples submittee					
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Check for availability ar quicker turn around					• •	conected in (ex. ON)	OSHA PEL MSHA	Other (specify):	Cal OSHA
Sample Identifica (Maxmlum of 20 Characters than 20 characters will be a	s. ID's longer	Date Sampled	Collection Medium	Sample Volume 5ample Time Sample Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis Reque	sted*	Method Reference^	Hexavalent Chromium Process (e.g., welding plating, painting, etc.)*
22152 - H7		10/05/17	2pc UW PVC	1010.3	L	Hexavalent Chromiun	n	mod OSHA 215	Other
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		·				e for certain analytes - see SAG		-	
For crystalline silica: form	<u> </u>	·					·	 .	
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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 20 of 20 Report Reference: 1 Generated: 18-OCT-17 17:47

Page_2_ of _2_



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.



LABORATORY ANALYSIS REPORT

Client 6601 Kirkville Road Site

Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L422140

East Syracuse, NY 13057 Project No. : 22152

(315) 432-5227 Date Sampled : 10-OCT-17 Date Analyzed : 19-OCT-17 - 20-OCT-17

FAX: (315) 437-0571 Date Received : 17-OCT-17 Report ID : 1025792 www.galsonlabs.com

Date Sampled: 10/10/17 Date Analyzed: 10/19/17

Darramatar	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	MCE UW 37mm 19-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG (QC by: TJB
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



6601 Kirkville Road
East Syracuse, NY 13057

East Syracuse, NY 13057 (315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L422140

Project No. : 22152

Date Sampled : 10-OCT-17 Date Analyzed : 19-OCT-17 - 20-OCT-17

Date Received : 17-OCT-17 Report ID : 1025792

Date Sampled: 10/10/17 Date Analyzed: 10/19/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		<u> </u>
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

Collection Media: Date :	MCE UW 37mm 19-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: TJB
<pre>-Less Than > -Greater Than</pre>	5	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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East Syracuse, NY 13057

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site Login No. : L422140

Project No. : 22152

Date Sampled : 10-OCT-17 Date Analyzed : 19-OCT-17 - 20-OCT-17

Date Received : 17-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

LOQ	Total	Conc	Units
uq	uq		
0.90	<0.90	<0.00096	mg/m3
0.15	<0.15	<0.00016	mg/m3
0.15	0.52	0.00056	mg/m3
0.0075	<0.0075	<0.0000080	mg/m3
0.015	<0.015	<0.000016	mg/m3
100.	<100	<0.11	mg/m3
7.5	<7.5	<0.0080	mg/m3
0.045	<0.045	<0.000048	mg/m3
0.30	<0.30	<0.00032	mg/m3
0.075	<0.075	<0.000080	mg/m3
0.15	0.19	0.00021	mg/m3
2.3	<2.3	<0.0024	mg/m3
	uq 0.90 0.15 0.15 0.0075 0.015 100. 7.5 0.045 0.30 0.075 0.15	uq uq 0.90 <0.90	uq uq 0.90 <0.90

Collection Media: Date :	MCE UW 37mm 19-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: TJB
<pre>-Less Than > -Greater Than</pre>	5	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L422140

Project No. : 22152

Date Sampled : 10-OCT-17 Date Analyzed : 19-OCT-17 - 20-OCT-17

Date Received : 17-OCT-17 Report ID : 1025792

Date Sampled: 10/10/17 Date Analyzed: 10/19/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	MCE UW 37mm 19-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: TJB
<pre>-Less Than > -Greater Than</pre>	5	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L422140

Project No. : 22152

Date Sampled : 10-OCT-17 Date Analyzed : 19-OCT-17 - 20-OCT-17

Date Received : 17-OCT-17 Report ID : 1026386

Date Sampled: 10/10/17 Date Analyzed: 10/20/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	IOM 25mm PW PVC 23-OCT-17	Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: тјв
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L422140

Project No. : 22152

Date Sampled : 10-OCT-17 Date Analyzed : 19-OCT-17 - 20-OCT-17

Date Received : 17-OCT-17 Report ID : 1026386

Date Sampled: 10/10/17 Date Analyzed: 10/20/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		<u> </u>
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

Collection Media: Date :	IOM 25mm PW PVC 23-OCT-17	Submitted l	-	Approved by: JJL Supervisor: KEG QC	С by: тјв
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 -Cubic Mete:	rs kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L422140

Project No. : 22152

Date Sampled : 10-OCT-17 Date Received : 17-OCT-17 Report ID : 1025904

Asbestos Fiber Count (A Rules)

		Fibers/	Fibers/	Fibers/	Air	Fibers/
Sample ID	<u>Lab ID</u>	Fields	mm2	Filter	Volume (cc)	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 Ouantitation: 5.5 Fibers/ 100 Fields

Microscope field area: 0.00785 mm2 Filter collection area: 385 mm2 Approved by : CDT Date : 20-OCT-17

Submitted by : BTM

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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Client : Toronto Transit Commission Ltd Account No.: 90734 Login No. : L422140 Site

Project No. : 22152

Date Sampled : 10-OCT-17 Date Analyzed : 20-OCT-17

Date Received : 17-OCT-17 Report ID : 1025250

Inhalable Dust

Sample ID	<u>Lab ID</u>	Air Vol liter	Total mq	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 Submitted by: NRH/HVN

Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV Approved by : SPR

OSHA PEL Date : 20-OCT-17 NYS DOH # : 11626

Collection Media : IOM 25mm PW PVC Supervisor: KRK QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected

-Liters > -Greater Than ug -Micrograms NS -Not Specified ppm -Parts per Million



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Client : Toronto Transit Commission Ltd Account No.: 90734

Login No. : L422140 Site

Project No. : 22152

Date Sampled : 10-OCT-17 Date Analyzed : 20-OCT-17

Date Received : 17-OCT-17 Report ID : 1025251

Respirable Dust

Sample ID	<u>Lab ID</u>	Air Vol liter	Total mq	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 Approved by : SPR

OSHA PEL : PNOR 5 mg/m3 (TWA) Date : 20-OCT-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected

Submitted by: HVN

l -Liters > -Greater Than ug -Micrograms NS -Not Specified ppm -Parts per Million



LABORATORY ANALYSIS REPORT

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(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L422140

Project No. : 22152

Date Sampled : 10-OCT-17 Date Analyzed : 20-OCT-17 - 23-OCT-17

Date Received : 17-OCT-17 Report ID : 1026466

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

			Air Vol		
Sample ID	<u>Lab ID</u>	<u>Analyte</u>	1	<u>uq</u>	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

Submitted: AJD

Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD Approved: KRK

OSHA PEL : 50 ug/m3 RCS Date : 23-OCT-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: TJB

NA -Not Applicable ND -Not Detected l -Liters mppcf -Million Particles per Cubic Foot



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LABORATORY FOOTNOTE REPORT

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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

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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 preceding 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 (V205) 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.

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
	4.00.50	1000
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	Meth	od					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
_	-Creater Than	ug -Migrograms	1	_T.itere	NG -Not Specified	ND -Not Detected

NA -Not Applicable





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Client Name : Toronto Transit Commission Ltd.

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.

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%

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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

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. NIO	SH 7300/mod.	OSHA ID-1250	; ICP/I	15 mg/m3 (TWA)
Antimony	mod. NIO	SH 7300/mod.	OSHA ID-1250	; ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. NIO	SH 7300/mod.	OSHA ID-1250	; ICP/I	0.01 mg/m3 (TWA)
Barium	mod. NIO	SH 7300/mod.	OSHA ID-1250	; ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. NIO	SH 7300/mod.	OSHA ID-1250	; ICP/M	0.0002 mg/m3 (TWA)
Cadmium	mod. NIO	SH 7300/mod.	OSHA ID-1250	; ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. NIO	SH 7300/mod.	OSHA ID-1250	; ICP/I	5 mg/m3 (TWA)
Chromium	mod. NIO	SH 7300/mod.	OSHA ID-1250	; ICP/I	Varies, see footnote
Cobalt	mod. NIO	SH 7300/mod.	OSHA ID-1250	; ICP/I	0.1 mg/m3 (TWA)
Copper	mod. NIO	SH 7300/mod.	OSHA ID-1250	; ICP/I	Varies, see footnote
Iron Oxide	mod. NIO	SH 7300/mod.	OSHA ID-1250	; ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. NIO	SH 7300/mod.	OSHA ID-1250	; ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. NIO	SH 7300/mod.	OSHA ID-1250	; ICP/I	5 mg/m3 CEIL
Molybdenum	mod. NIO	SH 7300/mod.	OSHA ID-1250	; ICP/I	Varies, see footnote
Selenium	mod. NIO	SH 7300/mod.	OSHA ID-1250	; ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIO	SH 7300/mod.	OSHA ID-1250	; 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	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable



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LABORATORY FOOTNOTE REPORT

GALSON

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 \text{ 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)
```

> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable
--



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LABORATORY FOOTNOTE REPORT

GALSON

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 Quartz	+/-13.8% +/-10.9%	101% 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

L422	14
SGS 46648547794	.CI

Report To*: Toronto Transit Commission Invoice To*: Toronto Transit Commission New Client? 1920 Yonge Street 1920 Yonge Street MODIA Suite 600 Suite 600 Client Account No.*: 175X626 Toronto, ON M4S 3E2 Toronto, ON M4S 3E2 Date: 10 Shipper:UPS Phone No.*: 416-393-6668 Phone No.: Initials:MAK < 2A2 Email: Cell No.: P.O. No.: PU240835 Email Results to : Virgil.Umali@ttc.ca & oheresults@oheconsultants.com Prep: UNKNOWN Credit Card Card on File Email address: Call for Credit Card Info. Samples submitted using the FreePumpLoan™ Program Samples submitted using the FreeSamplingBadges™ Program Need Results By*: (surcharge) Project: 22152 Sampled by: OHE Consultants 0% Site Name: Standard 4 Business Days 35% Comments: 3 Business Days 50% TTC Subway Air Quality 2 Business Days 75% Please indicate which OEL this data will be used for: Province samples were List description of industry or Process/interferences present in sampling area: Next Day by 6pm 100% collected in (ex. ON) OSHA PEL ACGIH TLV Cal OSHA Check for availability an pricing for ☐ MSHA Other (specify): quicker turn around times. Hexavalent Chromium Sample Volume Sample Identification* Sample Units*: Date Sampled Collection Medium Sample Time Analysis Requested* Method Reference^ Process (e.g., welding (Maxmium of 20 Characters. ID's longer L, ml,min,in2,cm2,ft2 Sample Area* than 20 characters will be abbreviated.) plating, painting, etc.)* 10/10/17 25 mm PCM 469.7 Standardized List of Analysis for TTC 22152 - A45 Subway Air Quality Study 22152 - A46 10/10/17 25 mm PCM PW PVC in PPI 939.8 22152 - S45 10/10/17 22152 - S46 10/10/17 PW PVC in PPI PW PVC in IOM 933.7 22152 - 143 10/10/17 PW PVC in IOM 22152 - 144 10/10/17 22152 - M45 10/10/17 UW MCE in PPI 931.9 10/10/17 **UW MCE in PPI** 22152 - M46 UW MCE 500 22152 - T45 10/10/17 935.6 UW MCE 22152 - T46 10/10/17 Use method(s) listed on COC AGalson Laboratories will substitute our routine/preferred method if it does not match the method listed on the COC unless this box is checked: 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 TOU D 10/13/17 15:09 Relinguished by Yunny Desiana Received by: Relinguished by Received by: 6:UDe Samples received after 3pm will be considered as next day's business Page_1 of 1 * Required fields, failure to complete these fields may result in a delay in your samples being processed.

Page 18 of 18 Report Reference: 1 Generated: 23-OCT-17-17:26



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 improve the presentation of data and allow for the transition to the new logo.



GALSON

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East Syracuse, NY 13057

(315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L422141

Project No. : 22152

Date Received : 17-OCT-17 Report ID : 1025797

Date Sampled: 10/12/17 Date Analyzed: 10/19/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media	: MCE UW 37mm : 19-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: AMD
<pre></pre>	5	m3 1	-Cubic Meters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOO-Limit of Ouantitation



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(315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734 Site Login No. : L422141

Project No. : 22152

Date Sampled : 12-OCT-17 Date Analyzed : 19-OCT-17 - 20-OCT-17

Date Received : 17-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

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		· ·
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

Collection Media: Date :	MCE UW 37mm 19-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: AMD
<pre>-Less Than > -Greater Than</pre>	5	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L422141

Project No. : 22152

Date Sampled : 12-OCT-17 Date Analyzed : 19-OCT-17 - 20-OCT-17

Date Received : 17-OCT-17 Report ID : 1025797

Date Sampled: 10/12/17 Date Analyzed: 10/19/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	uq		
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

Collection Media:	MCE UW 37mm 19-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: AMD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-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 Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L422141

Project No. : 22152

Date Sampled : 12-OCT-17 Date Analyzed : 19-OCT-17 - 20-OCT-17

Date Received : 17-OCT-17 Report ID : 1025797

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	uq		
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

Collection Media: Date :	MCE UW 37mm 19-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: AMD
<pre>-Less Than > -Greater Than</pre>	5	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



LABORATORY ANALYSIS REPORT

6601 Kirkville Road
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FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L422141

Project No. : 22152

Date Sampled : 12-OCT-17 Date Analyzed : 19-OCT-17 - 20-OCT-17

Date Received : 17-OCT-17 Report ID : 1026392

Date Sampled: 10/12/17 Date Analyzed: 10/20/17

<u>Parameter</u>	LOQ uq	Total uq	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

Collection Media: Date :	IOM 25mm PW PVC 23-OCT-17	Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: AMD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L422141

East Syracuse, NY 13057 Project No. : 22152

(315) 432-5227 Date Sampled : 12-OCT-17 Date Analyzed : 19-OCT-17 - 20-OCT-17

FAX: (315) 437-0571 Date Received : 17-OCT-17 Report ID : 1026392

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		<u> </u>
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

Collection Media: Date :	IOM 25mm PW PVC 23-OCT-17	Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: AMD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L422141

Project No. : 22152

Date Sampled : 12-OCT-17 Date Received : 17-OCT-17 Report ID : 1025905

Asbestos Fiber Count (A Rules)

		Fibers/	Fibers/	Fibers/	Air	Fibers/
Sample ID	<u>Lab ID</u>	Fields	mm2	Filter	Volume (cc)	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 Ouantitation: 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

mm2 -Square millimeters

NA -Not Applicable

cc -Cubic Centimeters NS -Not Specified



LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L422141

Project No. : 22152

Date Sampled : 12-OCT-17 Date Received : 17-OCT-17 Report ID : 1025248

Inhalable Dust

Sample ID	<u>Lab ID</u>	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 Submitted by: HVN

Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV Approved by : SPR

OSHA PEL : NA Date : 20-OCT-17 NYS DOH # : 11626

Collection Media : IOM 25mm PW PVC 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



LABORATORY ANALYSIS REPORT

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Project No. : 22152

Date Sampled : 12-OCT-17 Date Received : 17-OCT-17 Report ID : 1025249

Submitted by: HVN

Approved by : SPR

NYS DOH # : 11626

QC by: AMD

Date : 20-OCT-17

Supervisor: KRK

Respirable Dust

<u>Sample ID</u>	<u>Lab ID</u>	Air Vol liter	Total mq	Conc mq/m3
22152-S47	L422141-3	960.7	0.071	0.074
22152-S48	L422141-4	NA	<0.050	NA

 $\underline{\mathtt{COMMENTS:}}$ 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

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected</pre>

> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million



LABORATORY ANALYSIS REPORT

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East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L422141

Project No. : 22152

Date Sampled : 12-OCT-17 Date Analyzed : 20-OCT-17 - 22-OCT-17

Submitted: AJD

Approved: KRK

Date Received : 17-OCT-17 Report ID : 1026445

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

			Air Vol		
Sample ID	<u>Lab ID</u>	<u>Analyte</u>	1	<u>uq</u>	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 Date : 23-OCT-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: AMD

NA -Not Applicable ND -Not Detected l -Liters mppcf -Million Particles per Cubic Foot



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LABORATORY FOOTNOTE REPORT

GALSON

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

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Any holder of this document is advised that information contained herein reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

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 preceding 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 (V205) 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 1 -Liters NS -Not Specified ND -Not Detected NA -Not Applicable



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LABORATORY FOOTNOTE REPORT

GALSON

Client Name : Toronto Transit Commission Ltd.

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
	4 10 50	1000
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 l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable ug -Micrograms



Client Name : Toronto Transit Commission Ltd.

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

www.galsonlabs.com L422141 (Report ID: 1025797):

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FAX: (315) 437-0571

East Syracuse, NY 13057 (315) 432-5227

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):

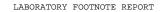
The method blank prepared with the sample contained 0.36 ug Copper.

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.

LABORATORY FOOTNOTE REPORT

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	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable





6601 Kirkville Road East Syracuse, NY 13057

FAX: (315) 437-0571

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GALSON

Client Name : Toronto Transit Commission Ltd.

Site :

Project No. : 22152

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

GALSON

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 \text{ 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)
```

> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable	<	-Less Than	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	ppm -Parts per Million	
	>	-Greater Than	ug -Micrograms	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable



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LABORATORY FOOTNOTE REPORT

GALSON

Client Name : Toronto Transit Commission Ltd.

Site :

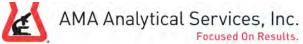
Project No. : 22152

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%



CERTIFICATE OF ANALYSIS

Chain of Custody: 285005

Client: Galson Laboratories

Address: 6601 Kirkville Road

East Syracuse, NY 13057-9672

Pam Weaver Attention:

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

NY ELAP

Lab ID 10920

Summary of Transmission Electron Microscopy

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

AMA Sample Number	Client Sample Number	Volume (L)	Area Analyzed (mm²)	Analytical Sensitivity	Asbestos Type Amount	# Non Asbestos Structures	Conce	ntration Fraction	Sample Type	Comments
				f/cc			f/mm²	f/cc		
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.

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

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a mutual protection to clients, the public, and these Laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from us. Sample types, locations, and collection protocols are based upon the information provided by the persons submitting them and, unless collected by personnel of these Laboratories, we expressly disclaim any knowledge and liability for the accuracy and completeness of this information. Residual sample material will be discarded in accordance with the appropriate regulatory guidelines, unless otherwise requested by the client. This report must not be used to claim, and does not imply product certification, approval, or endorsement by NY ELAP or any agency of the Federal Government. All rights reserved. AMA Analytical Services, Inc.

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

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: Client Name:					Submittal Information: 1. Job Name:											
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3		AMA	Report To :	Shelly K	rause	Invoice To	Jeanne	Glisson
	Chu	eck if change	report to .	SGS Galson			SGS Galsor	
GALSO	UIN of a	address		6601 Kirkv			6601 Kirk	
6601 Kirkville Rd	7.00 * - 7	w Client ? yes		East Syracuse			East Syracus	
East Syracuse, NY 13057-		no 🗌	Phone No :	888-432		Phone No.	888-43	
Tel: 315-437-5227 888-432-LABS(5227)			Thomas inc.	000 102		Fax No.	315-43	
Fax: 315-437-0571						, ax mo.		
www.galsonlabs.com		Site Name :			Project:	L422141	Sampled By :	Client
Turnaround Time	Due Date	Verbal Authoriz	ation :					
√ Standard	10/31/17			90734				
4 Business Days		Credit Card	d No. :		Card Holder	Name :		Exp.:
3 Business Days								
2 Business Days								
Next Day by 6pm		Fax Result	ts To :	Email Only Plea	ise	Fax No.	: Email On	ly Please
Next Day by Noon				Syracuse. Subcontracting				
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Sample			Collection	*Air Volume (liters)/				
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		New Client?	Report To* : To	ronto Transit C	ommission	Invoice T	o*: Toronto	Transit Comm	ission
SGS	GALSON	_	_19	20 Yonge Stree	et .		<u>1920 Yo</u>	nge Street	
	GALSUN	Client Account No.	_	ite 600		<u> </u>	Suite 60		
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Next Day by 6pm	100%	List description of indu	ustry or Process/interfe	ences present in sampl	ing area :	Province samples were		vhich OEL this data wil	ll be used for :
Check for availability an	pricing for					collected in (ex. ON)		ACGIH TLV	Cal OSHA
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5ample Identifica (Maxmlum of 20 Characters		Date Sampled	Collection Medium	Sample Volume Sample Time	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis Reques	ted*	Method Reference^	Hexavalent Chromium Process (e.g., welding
than 20 characters will be at 22152 - A47	obrevlated.)	10/12/17	25 mm PCM	Sample Area* 485.9	1	Standardized List of Ar	nalveis for TTC	<u> </u>	plating, painting, etc.)*
				400.0	<u>-</u>				
22152 - A48		10/12/17	25 mm PCM	-	-	Subway Air Quality St	uay		
22152 - S47		10/12/17	PW PVC in PPI	960.7	L	-			
22152 - S48		10/12/17	PW PVC in PPI	-	-	-			
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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	-	-	-			
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22152 - T48	_	10/12/17	n∧ wce 4	-	-	-			
			STIDIZIT						
^Galson Laboratories wi	ll subsititute ou	r routine/preferred meth	nod if it does not match	the method listed on t	he COC unless this box	is checked: Use method(s	i) listed on COC		
For metals analysis: if rec	uesting an anal	yte with the option of a	lower LOQ, please indi	cate if the lower LOQ is a	required (only available	for certain analytes - see SAG):		
For crystalline silica: form	n(s) of silica need	ded must be indicated (0	Quartz, Cristobalite, and	l/or Tridymite)* :			<u> </u>		
Chain of Custody	Pr	int Name/Signature	[Date Time		Print Nam	e/Signature	, Da	te Time
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			Page 21 of 2	1 Report Refere	ence:1 Generated	d:01-NOV-17 17:51	p.occisco.		



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.



GALSON

6601 Kirkville Road

East Syracuse, NY 13057

(315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L423091

Project No. : 22152

Date Sampled : 17-OCT-17 Date Analyzed : 26-OCT-17 - 28-OCT-17

Date Received : 25-OCT-17 Report ID : 1027517

Date Sampled: 10/17/17 Date Analyzed: 10/26/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>ug</u>		
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

Collection Media: Date :	MCE UW 37mm 27-OCT-17	Submitted b NYS DOH #	-	Approved by: JJL Supervisor: KEG Q0	C by: TJB
<pre>-Less Than > -Greater Than</pre>		m3 -Cubic Meter l -Liters	s kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



6601 Kirkville Road

East Syracuse, NY 13057 (315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Molvbdenum

Zinc Oxide

Client : Toronto Transit Commission Ltd Account No.: 90734

NA

NA

Site : NS Login No. : L423091

Project No. : 22152

Date Sampled : 17-OCT-17 Date Analyzed : 26-OCT-17 - 28-OCT-17

mq/m3

mq/m3

Date Received : 25-OCT-17 Report ID : 1027517

0.15

2.8

LOO Total Conc Units <u>Parameter</u> uq uq Aluminum 7.5 <7.5 NA mq/m3Cadmium 0.15 <0.15 NA mq/m3Iron Oxide 11. mq/m3<11 NA

<0.15

<2.8

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

Collection Media: MCE UW 37mm Submitted by: SJW Approved by: JJL Date : 27-OCT-17 NYS DOH # : 11626 Supervisor: KEG QC by: TJB -Less Than mg -Milligrams -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected -Greater Than ug -Micrograms -Liters NS -Not Specified ppm -Parts per Million LOQ-Limit of Quantitation



6601 Kirkville Road S

East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L423091

Project No. : 22152

Date Sampled : 17-OCT-17 Date Analyzed : 26-OCT-17 - 28-OCT-17

Date Received : 25-OCT-17 Report ID : 1027517

Date Sampled: 10/17/17 Date Analyzed: 10/26/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	uq	ug		
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

Collection Media:	MCE UW 37mm 27-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: TJB
<pre>-Less Than > -Greater Than</pre>	2	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



6601 Kirkville Road

East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734 Site Login No. : L423091

Project No. : 22152

Date Sampled : 17-OCT-17 Date Analyzed : 26-OCT-17 - 28-OCT-17

Date Received : 25-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

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	uq		
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

Collection Media:	MCE UW 37mm 27-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: TJB
<pre>-Less Than > -Greater Than</pre>	2	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



Clic 6601 Kirkville Road Site

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L423091

Project No. : 22152

Date Sampled : 17-OCT-17 Date Analyzed : 26-OCT-17 - 28-OCT-17

Date Received : 25-OCT-17 Report ID : 1027991

Date Sampled: 10/17/17 Date Analyzed: 10/28/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	IOM 25mm PW PVC 30-OCT-17	Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG Q	C by: TJB
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	Cubic Meters Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



Cli 6601 Kirkville Road Sit

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Vanadium Pentoxide

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Project No. : 22152

Date Sampled : 17-OCT-17 Date Analyzed : 26-OCT-17 - 28-OCT-17

mq/m3

Date Received : 25-OCT-17 Report ID : 1027991

LOO Total Units Conc <u>Parameter</u> ug ug Beryllium 0.0075 <0.0075 NA mq/m3Magnesium Oxide 12. NA mq/m3<12 Molybdenum 0.075 <0.075 mg/m3NA Nickel 0.15 0.68 NA mq/m3Thallium 0.75 <0.75 NA mq/m3

<0.80

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

0.80

Collection Media: Date :	IOM 25mm PW PVC 30-OCT-17		nitted by: 3 DOH # : 1		Approved by: JJL Supervisor: KEG	QC	by: TJB
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 -Cubi l -Lite		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Mill:	ion	ND -Not Detected LOQ-Limit of Quantitation

NA



GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734

6601 Kirkville Road Site : NS Login No. : L423091 East Syracuse, NY 13057 Project No. : 22152

(315) 432-5227 Date Sampled : 17-OCT-17 Date Analyzed : 30-OCT-17

FAX: (315) 437-0571 Date Received : 25-OCT-17 Report ID : 1027940 www.galsonlabs.com

Asbestos Fiber Count (A Rules)

		Fibers/	Fibers/	Fibers/	Air	Fibers/
Sample ID	<u>Lab ID</u>	Fields	mm2	<u> Filter</u>	Volume (cc)	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 Submitted by : BDB

Analytical Method: mod. NIOSH 7400 "A" Rules Approved by: RCF Limit of Ouantitation: 5.5 Fibers/ 100 Fields Date: 30-OCT-17

Microscope field area: 0.00785 mm2 QC by: TJB Filter collection area: 385 mm2 Supervisor: BDB

mm2 -Square millimeters



Client

LABORATORY ANALYSIS REPORT

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East Syracuse, NY 13057

Site Project No. : 22152 Date Sampled : 17-OCT-17

Date Received : 25-OCT-17

: Toronto Transit Commission Ltd Account No.: 90734 Login No. : L423091

> Date Analyzed : 26-OCT-17 Report ID : 1027109

Inhalable Dust

Sample ID	<u>Lab ID</u>	Air Vol liter	Total mq	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

Collection Media : IOM 25mm PW PVC

Submitted by: GMG Approved by : SPR

> Date : 26-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

-Liters > -Greater Than ug -Micrograms NS -Not Specified ppm -Parts per Million



LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L423091

Project No. : 22152

Date Sampled : 17-OCT-17 Date Received : 25-OCT-17 Report ID : 1027110

Respirable Dust

<u>Sample ID</u>	<u>Lab ID</u>	Air Vol liter	Total mg	Conc mq/m3
22152-S49	L423091-3	892	<0.050	<0.056
22152-S50	L423091-4	NA	<0.050	NA

 $\underline{\mathtt{COMMENTS:}}$ 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) Date : 27-OCT-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected

Submitted by: HVN

Approved by : SPR



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Client Site

Project No. : 22152

Date Sampled : 17-OCT-17

Date Received : 25-OCT-17

: Toronto Transit Commission Ltd Account No.: 90734

Login No. : L423091

Date Analyzed : 26-OCT-17 - 02-NOV-17

Report ID : 1028866

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

			Air Vol		
Sample ID	<u>Lab ID</u>	<u>Analyte</u>	1	uq	uq/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 Supervisor: KRK QC by: TJB

-Parts per Million < -Less Than mg -Milligrams kg -Kilograms ppm > -Greater Than ug -Micrograms m3 -Cubic Meters -Not Specified

NA -Not Applicable ND -Not Detected -Liters mppcf -Million Particles per Cubic Foot

Submitted: SPR

Date : 02-NOV-17 NYS DOH # : 11626

Approved: KRK





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Client Name : Toronto Transit Commission Ltd.

Site :

Project No. : 22152

Date Analyzed: 26-OCT-17 - 02-NOV-17

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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 preceding 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.

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L423091 (Report ID: 1027991):
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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 (V205) 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.



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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.

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.

NA -Not Applicable

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 (T	'WA'
Magnesium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I 15 mg/m3 (Total	
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I Varies, see foo	tnote
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 (Solu	ble) (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 l -Liters NS -Not Specified ND -Not Detected -Greater Than ug -Micrograms



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):

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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	1	-Liters	NS -Not Specified	ND -Not Detected

NA -Not Applicable



LABORATORY FOOTNOTE REPORT

DET

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

Mothod

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%

langanese	+/-8.3%	99.89
Molybdenum	+/-7.6%	100%
Selenium	+/-11.6%	105%
inc 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):

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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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LABORATORY FOOTNOTE REPORT

GALSON

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):
                 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)
```



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LABORATORY FOOTNOTE REPORT

GALSON

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 Ouartz	+/-13.8% +/-10.9%	101%
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

120	05

SGS	GALSON	New Client? Report To*: Toronto Transit Commission Invoice To*: Toronto Transit Commission 1920 Yonge Street 1920 Yonge Street 1920 Yonge Street Suite 600 Suite 600 Toronto, ON M4S 3E2							
Unit 5			Phone No.* : 416 Cell No. : mail Results to : Viro Email address :	il.Umali@ttc.ca & of	neresuits@oheconsu	P.O. N Credit C	No.: ail: lo.: <u>PU240835</u> ard	5 le	dit Card Info.
Need Results By*:	(surcharge)		∐ s	amples submitted usin	g the FreePumpLoan™	Program Samples:	submitted using the	e FreeSamplingBadge	es™Program
Z Standard	0%	Site Name :		Pro	ject: 22152	Sam	pled by: OHE C	Consultants	
4 Business Days	35%	Comments:							
3 Business Days	50%	TTC Suk	oway Air	Quality					
2 Business Days	75%				•	Dravin se samulas viero	Diseas indicate w	vhich OEL this data wi	II ha waa difaar
Next Day by 6pm	100%	List description of indu	istry or Process/interfer	ences present in sampl	ing area :	Province samples were collected in (ex. ON)	OSHA PEL		Cal OSHA
Check for availability an guicker turn around							☐ MSHA	Other (specify):	
Sample Identifica (Maxmlum of 20 Characters than 20 characters will be ab	tion* . ID's longer	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis Requested* Method Reference^ Process (e.g., w			Hexavalent Chromium Process (e.g., welding plating, painting, etc.)*
22152 - A49		10/17/17	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 St	tudy		
22152 - S49		10/17/17	PW PVC in PPI	892.0	L	- Besp Silica			
22152 - S50		10/17/17	PW PVC in PPI	-	-	- 11			
22152 - I47		10/17/17	PW PVC in IOM	888.3	L	- Inhelable 1	1et		
22152 - 148		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		-	- 1/			
22152 - T49		10/17/17	UW MCE	899.6	L	- Total Met			
22152 - T50		10/17/17	UW MCE			- "	/-		
						- "	<u> </u>		
^Galson Laboratories w	ill subsititute o	ur routine/preferred met	hod if it does not matc	h the method listed on t	he COC unless this box	is checked: Use method(s) listed on COC		
For metals analysis: if re	questing an ana	alyte with the option of a	lower LOQ, please indi	cate if the lower LOQ is	required (only available	for certain analytes - see SAC):		
For crystalline silica: for									
Chain of Custody	Р	rint Name/Signature		Date Time		- 	ie/Signature	Da	
Relinquished by Ro	main Matheve	et O		/18/17 15:20	Received by :	Hamman	<u> </u>	10/	23/17 2:09
Relinquished by	Lesmo	n Sue/16		23/17 6:40		n out day's business		0 (0-)	25/17 1014
		* R	equired fields, failure	s received after 3pm verto complete these find 19 Report Ref	elds may result in a d	next day's business lelay in your samples being ated:02-NOV-17-17:2	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.



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 www.galsonlabs.com

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 - 31-OCT-17

Date Received : 25-OCT-17 Report ID : 1027442

LOQ Total Conc Units Parameter ug Aluminum 7.5 <7.5 <0.0082 mg/m3Cadmium 0.15 <0.15 <0.00016 mg/m3Iron Oxide 11. 19 0.021 mg/m3Molybdenum 0.15 <0.15 <0.00016 mg/m3Zinc Oxide 2.8 <2.8 <0.0030 mg/m3

Collection Media: Date :	MCE UW 37mm 27-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG	QC by: TJB
<pre></pre>	mg -Milligrams ug -Micrograms	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Project No. : 22152

Date Sampled : 19-OCT-17 Date Analyzed : 26-OCT-17 - 31-OCT-17

Date Received : 25-OCT-17 Report ID : 1027442

Date Sampled: 10/19/17 Date Analyzed: 10/26/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		· ————
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

Collection Media:	MCE UW 37mm 27-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	! by: TJB
<pre>< -Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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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 - 31-OCT-17

Date Received : 25-OCT-17 Report ID : 1027442

Date Sampled: 10/19/17 Date Analyzed: 10/26/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	uq	uq		-
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

Collection Media	: MCE UW 37mm : 27-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: TJB
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-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 Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L423110

Site : NS
Project No. : 22152

Date Sampled : 19-OCT-17 Date Analyzed : 26-OCT-17 - 31-OCT-17

Date Received : 25-OCT-17 Report ID : 1027442

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	uq		
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

Collection Media:	MCE UW 37mm 27-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: TJB
<pre>-Less Than > -Greater Than</pre>	2	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L423110

Project No. : 22152

Date Received : 25-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

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media:	IOM 25mm PW PVC 31-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: TJB
<pre>-Less Than > -Greater Than</pre>		m3 1	- 1 .	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

GALSON

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 - 31-OCT-17

Date Received : 25-OCT-17 Report ID : 1028149

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		<u> </u>
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

Collection Media: Date :	IOM 25mm MCE 31-OCT-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: TJB
<pre>-Less Than > -Greater Than</pre>	5	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Login No. : L423110 Site

Project No. : 22152

Date Sampled : 19-OCT-17 Date Analyzed : 30-OCT-17

Date Received : 25-OCT-17 Report ID : 1027942

Asbestos Fiber Count (A Rules)

		Fibers/	Fibers/	Fibers/	Air	Fibers/
Sample ID	<u>Lab ID</u>	Fields	mm2	<u> Filter</u>	Volume (cc)	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 Ouantitation : 5.5 Fibers/ 100 Fields

Microscope field area : 0.00785 mm2

Filter collection area: 385 mm2

Supervisor: BDB

OC by: TJB

Submitted by : BDB

Approved by : RCF

Date: 30-0CT-17

< -Less Than

> -Greater Than

ND -Not Detected NS -Not Specified

NA -Not Applicable

cc -Cubic Centimeters

mm2 -Square millimeters



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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L423110

Project No. : 22152

Date Sampled : 19-OCT-17 Date Received : 25-OCT-17 Report ID : 1027113

Inhalable Dust

		Air Vol	Total	Conc
Sample ID	<u>Lab ID</u>	liter	<u>mg</u>	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 Submitted by: PAH

Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV Approved by : SPR

OSHA PEL : NA Date : 27-OCT-17 NYS DOH # : 11626

Collection Media : IOM 25mm PW PVC Supervisor: KRK QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected



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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L423110

Project No. : 22152

Date Sampled : 19-OCT-17
Date Received : 25-OCT-17
Report ID : 1027644

Inhalable Dust

		Air Vol	Total	Conc
Sample ID	<u>Lab ID</u>	liter	mg	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 Supervisor: KRK QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected

Submitted by: HVN

Approved by : SPR

NYS DOH # : 11626

Date : 27-OCT-17



LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L423110

Project No. : 22152

Date Sampled : 19-OCT-17 Date Received : 25-OCT-17 Report ID : 1027114

Respirable Dust

Sample ID	<u>Lab ID</u>	Air Vol liter	Total mq	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 Submitted by: HVN

Analytical Method : mod. NIOSH 0600; Gravimetric Approved by : SPR

OSHA PEL : PNOR 5 mg/m3 (TWA) Date : 27-OCT-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected



LABORATORY ANALYSIS REPORT

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(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com 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 - 02-NOV-17

Submitted: SPR

Date Received : 25-OCT-17 Report ID : 1028867

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

			Air Vol		
Sample ID	<u>Lab ID</u>	<u>Analyte</u>	1	uq	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 Approved: KRK

OSHA PEL : 50 ug/m3 RCS Date : 02-NOV-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: TJB

NA -Not Applicable ND -Not Detected l -Liters mppcf -Million Particles per Cubic Foot



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LABORATORY FOOTNOTE REPORT

GALSON

Client Name : Toronto Transit Commission Ltd.

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

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Any holder of this document is advised that information contained herein reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

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

Reported Vanadium Pentoxide (V205) 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 -Greater Than
- mg -Milligrams ug -Micrograms
- m3 -Cubic Meters l -Liters
- kg -Kilograms NS -Not Specified
- ppm -Parts per Million ND -Not Detected
- NA -Not Applicable



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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.

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 730	00/mod. OSHA ID-125G;	ICP/M 0.0002 mg/	m3 (TWA)
Magnesium Oxide	mod. NIOSH 730	00/mod. OSHA ID-125G;	ICP/I 15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 730	00/mod. OSHA ID-125G;	ICP/I Varies, se	e footnote
Nickel	mod. NIOSH 730	00/mod. OSHA ID-125G;	ICP/I 1 mg/m3 (T	WA)
Thallium	mod. NIOSH 730	00/mod. OSHA ID-125G;	ICP/I = 0.1 mg/m3	(Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 730	00/mod. OSHA ID-125G;	ICP/I See footno	te

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	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable



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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.

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

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%

Paralleter	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
_	-Creater Than	ug -Migrograms	1	-Titere	NS -Not Specified	ND -Not Detected

NA -Not Applicable



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> -Greater Than

ug -Micrograms

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LABORATORY FOOTNOTE REPORT

GALSON

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

l -Liters

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
423110 (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 (Inhala	ble)	
	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 analy		
	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 d		
		me that all detected Calcium is present as	Calcium Oxide.
	OSHA PEL: Chromium II and III = 0.5 mg/m		
	OSHA PEL: Copper dust and mist = 1 mg/m3		
		e that all detected Iron is present as Iron	1 UX1GE.
	OSHA PEL: Molypaenum soluble compounds,	as Mo = 5 mg/m3; Molybdenum and insoluble	

NS -Not Specified

ND -Not Detected

NA -Not Applicable



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LABORATORY FOOTNOTE REPORT

GALSON

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%



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LABORATORY FOOTNOTE REPORT

GALSON

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
	Parameter Aluminum Antimony Arsenic Barium Beryllium Cadmium Calcium Oxide Chromium Cobalt	Method mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	15 mg/m3 (TWA) 0.5 mg/m3 (TWA) 0.01 mg/m3 (TWA) 0.5 mg/m3 (Soluble) (TWA) 0.0002 mg/m3 (TWA) 0.0005 mg/m3 (TWA) 5 mg/m3 (TWA) Varies, see footnote
	Copper	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	
	Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	
	Lead	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	
	Manganese	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	
	Molybdenum Selenium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	
	Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	
L423110 (Report I			
212010 (102010 1	SOPs: ia-pcm(26) Per NIOSH 7400, fiber counts less than 10 greater than optimal variability and are The current intra-laboratory coefficients 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)	of variation (CVs) for the applicable fib	
L423110 (Report I	D: 1027644): SOPs: GRAV-SOP-8(17)		
< -Less Than > -Greater Tha	mg -Milligrams m3 -Cubic n ug -Micrograms l -Liters	3 3 11	arts per Million t Detected NA -Not Applicable



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L423110 (Report ID: 1027644):

LABORATORY FOOTNOTE REPORT

GALSON

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

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

Parameter	Accuracy	Mean Recovery
Cristobalite	+/-13.8%	101%
Quartz	+/-10.9%	93.4%

data is available to provide statistical accuracy and mean recovery values for the associated analyte.



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LABORATORY FOOTNOTE REPORT

GALSON

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 > -Greater Than

an mg -Milligrams Than ug -Micrograms

Milligrams m3 -Cubic Meters
Micrograms l -Liters

kg -Kilograms NS -Not Specified ppm -Parts per Million ND -Not Detected

NA -Not Applicable

	1010									
		New Client?	Report To* : To	ronto Transit C	ommission	Invoice To	o*: <u>Toronto</u>]		<u>ımission</u>	
SGS	O A L COM		19	20 Yonge Street	et		1920 Yonge Street			
000	GALSON	Client Account No	<u></u>	Suite 600						
			_ <u>To</u>	ronto, ON M4S	3E2		Toronto,	ON M4S 31	<u>=2</u>	
, ,	rd Avenue West		Phone No.* : 410	6-393-6668		Phone N	o.:	<u> </u>		
Unit 5 North York, O	ntario, Canada M	13K 2A2	Cell No.:			<u> </u>	.1 .			
Tel: 888-432			Email Results to : Virg	ail.Umali@ttc.ca & o	– heresults@oheconsu	iltants,com P.O. No	o.: <u>PU240835</u>	<u> </u>		
www.galson	niads.ca		Email address :			Credit Ca	ırd 🔲 Card on Fil	e 🔲 Call for	Credit Card In	ifo.
	<u> </u>	_		Samples submitted usit	- ng the FreePumpLoan™	Program Samples si	ubmitted using the	e FreeSamplingBa	ıdges™ Progra	am
Need Results By*:	(surcharge)			·						
✓ Standard	0%	Site Name :		Pro	oject: 22152	Samp	oled by: OHE C	onsultants		
4 Business Days	35%	Comments:								
3 Business Days	50%	TTC Sul	bway Air	Quality						
2 Business Days	75%							List OF Also dea		1600.
Next Day by 6pm	100%	List description of ind	ustry or Process/interfe	rences present in samp	ling area :	Province samples were collected in (ex. ON)	Please indicate w		a will be used Cal (
Check for availability an						,		Other (specif		
quicker turn around	d times.		т	CI-Makima				<u> </u>		ent Chromium
Sample Identifica (Maxmium of 20 Characters than 20 characters will be al	s. ID's longer	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	5ample Units*: L, ml,min,in2,cm2,ft2	Analysis Reques	ted*	Method Referen		(e.g., welding painting, etc.)*
22152 - A51		10/19/17	25 mm PCM	468.7	L	Standardized List of An	alyses for TTC			
22152 - A52	<u> </u>	10/19/17	25 mm PCM	-	-	Subway Air Quality St	udy			
22152 - S51		10/19/17	PW PVC in PPI	918.2	L	-				
22152 - S52		10/19/17	PW PVC in PPI		<u> </u>	-				
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	<u></u>	-	-				
·						<u>_</u>				
^Galson Laboratories w	ill subsititute ou	ur routine/preferred me	thod if it does not matcl	n the method listed on	the COC unless this box	is checked: Use method(s) listed on COC			
For metals analysis: if re-	questing an ana	lyte with the option of a	a lower LOQ, please indi	cate if the lower LOQ is	required (only available	e for certain analytes - see SAG	5):			
For crystalline silica: for	m(s) of silica nee	eded must be indicated	(Quartz, Cristobalite, an	d/or Tridymite)* :						
Chain of Custody	P	rint Naprie/Signature	2	Date Time		Print Nam	ne/Signature		Date	Time
Relinquished by Yur	nny Desiana L	ee	<u> </u>	/20/17 13:50		Herman Ja	<u>~// /</u>	7-19	125/17	2:67
Relinquished by	tema	Shall V		3/17 (05cer)		I am m		/ (8	-4311	11019
	Samples received after 3pm will be considered as next day's business * Page 1 of 1									

* Required fields, failure to complete these fields may result in a delay in your samples b — Page 21 of 22 — Report Reference:1 Generated:02-NOV-17 17:32

The TTC file number/purchase order number is PU240835:

- 1) <u>Total Metals by NIOSH 7300.</u> 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.
- Respirable metals by NIOSH 7300. Analyze for aluminum, cadmium, iron oxide, molybdenum, and zinc oxide.
- 5) <u>Inhalable metals and inhalable dust by NIOSH 7300/0500</u>. 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 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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Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L423757

Project No. : 22152

Date Sampled : 24-OCT-17 Date Analyzed : 02-NOV-17 - 05-NOV-17

Date Received : 31-OCT-17 Report ID : 1029030

Date Sampled: 10/24/17 Date Analyzed: 11/02/17

Darameter	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		-
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

Collection Media: Date :	MCE UW 37mm 03-NOV-17	Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: TJB
<pre></pre>	mg -Milligrams	m3 -Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	l -Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L423757

Project No. : 22152

Date Sampled : 24-OCT-17 Date Analyzed : 02-NOV-17 - 05-NOV-17

Date Received : 31-OCT-17 Report ID : 1029030

Date Sampled: 10/24/17 Date Analyzed: 11/02/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	MCE UW 37mm 03-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: тјв
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L423757

East Syracuse, NY 13057 Project No. : 22152

Date Sampled : 24-OCT-17 Date Analyzed : 02-NOV-17 - 05-NOV-17

Date Received : 31-OCT-17 Report ID : 1029030

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Med:	a: MCE UW 37mm : 03-NOV-17	Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG Q	C by: TJB
<pre></pre>	mg -Milligrams n ug -Micrograms	Cubic Meters Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L423757

Project No. : 22152

Date Sampled : 24-OCT-17 Date Analyzed : 02-NOV-17 - 05-NOV-17

Date Received : 31-OCT-17 Report ID : 1029030

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	uq		
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

Collection Medi Date	a: MCE UW 37mm : 03-NOV-17		itted by: SJW DOH # : 11626	Approved by: JJL Supervisor: KEG	QC	by: TJB
-Less Than-Greater Tha	mg -Milligrams n ug -Micrograms	m3 -Cubi 1 -Lite	c Meters kg -Kilogr rs NS -Not Sp			ND -Not Detected LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L423757

East Syracuse, NY 13057 Project No. : 22152

Date Sampled : 24-OCT-17 Date Analyzed : 02-NOV-17 - 05-NOV-17

Date Received : 31-OCT-17 Report ID : 1029241

Date Sampled: 10/24/17 Date Analyzed: 11/05/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	IOM 25mm MCE 06-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: TJB
<pre>-Less Than > -Greater Than</pre>	5	m3 1		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



Client

6601 Kirkville Road

East Syracuse, NY 13057

(315) 432-5227

Site

0.0075

: Toronto Transit Commission Ltd Account No.: 90734 : NS

Login No. : L423757

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<u>Parameter</u>

Beryllium

Project No. : 22152

Date Sampled : 24-OCT-17 Date Received : 31-OCT-17

Date Analyzed : 02-NOV-17 - 05-NOV-17

Report ID : 1029241

Client ID : 22152 - I52 Date Sampled : 10/24/17

Lab ID : L423757-6

Air Volume : NA

NA

Units

mq/m3

Date Analyzed: 11/05/17

LOO Total Conc ug ug

<0.0075

Magnesium Oxide 12. NA mq/m3<12 Molybdenum 0.075 <0.075 mg/m3NA Nickel <0.15 0.15 NA mq/m3Thallium 0.75 <0.75 NA mq/m3Vanadium Pentoxide 0.80 <0.80 NA mq/m3

Collection Media:	IOM 25mm MCE 06-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG Q	C by: TJB
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3 1	-Cubic Meters	kg -Kilograms NS -Not Specified	NA -Not Applicable	ND -Not Detected LOO-Limit of Ouantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Login No. : L423757 Site

Project No. : 22152

Date Sampled : 24-OCT-17 Date Analyzed : 06-NOV-17

Date Received : 31-OCT-17 Report ID : 1029384

Asbestos Fiber Count (A Rules)

		Fibers/	Fibers/	Fibers/	Air	Fibers/
Sample ID	<u>Lab ID</u>	Fields	mm2	Filter	Volume (cc)	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 Ouantitation : 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

OC by: TJB

Supervisor: BDB

< -Less Than

> -Greater Than

ND -Not Detected NS -Not Specified

NA -Not Applicable

cc -Cubic Centimeters

mm2 -Square millimeters



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Client : Toronto Transit Commission Ltd Account No.: 90734 Login No. : L423757 Site

Project No. : 22152

Date Sampled : 24-OCT-17 Date Analyzed : 01-NOV-17 Date Received : 31-OCT-17 Report ID : 1028392

Inhalable Dust

<u>Sample ID</u>	<u>Lab ID</u>	Air Vol <u>liter</u>	Total mq	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 Submitted by: PAH

Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV Approved by : SPR OSHA PEL : NA Date: 01-NOV-17

Collection Media : IOM 25mm MCE Supervisor: KRK QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected

-Liters > -Greater Than ug -Micrograms NS -Not Specified ppm -Parts per Million

NYS DOH # : 11626



LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L423757

Project No. : 22152

Date Sampled : 24-OCT-17 Date Received : 31-OCT-17 Report ID : 1028393

Respirable Dust

Sample ID	Lab ID _	Air Vol <u>liter</u>	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 Submitted by: HVN

Analytical Method : mod. NIOSH 0600; Gravimetric Approved by : SPR

OSHA PEL : PNOR 5 mg/m3 (TWA) Date : 01-NOV-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm 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



LABORATORY ANALYSIS REPORT

6601 Kirkville Road

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(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L423757

Project No. : 22152

Date Sampled : 24-OCT-17 Date Received : 31-OCT-17 Report ID : 1028923

Hexavalent Chromium

Sample ID	<u>Lab ID</u>	Air Vol liter	Total uq	Conc ug/m3
22152 - Н9	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 Submitted by: TMK

Analytical Method : mod. OSHA ID-215 (version 2); IC/UV Approved by : NKP

OSHA PEL : 5 ug/m3 (TWA) Date : 03-NOV-17 NYS DOH # : 11626

Collection Media : PVC UW 37mm Supervisor: MWJ 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



LABORATORY ANALYSIS REPORT

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(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L423757

Project No. : 22152

Date Sampled : 24-OCT-17 Date Analyzed : 01-NOV-17 - 07-NOV-17

Date Received : 31-OCT-17 Report ID : 1030031

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

			Air Vol		
Sample ID	<u>Lab ID</u>	Analyte	1	uq	uq/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 Submitted: AJD

Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD Approved: CMR

OSHA PEL : 50 ug/m3 RCS Date : 08-NOV-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: TJB

NA -Not Applicable ND -Not Detected 1 -Liters mppcf -Million Particles per Cubic Foot



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LABORATORY FOOTNOTE REPORT

GALSON

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

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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 preceding 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 (V205) 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.

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 -Migrograme	l _Litere	NG -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

TLV for BERYLLIUM: 0.00005 mg/m3 (Inhalable)

Date Sampled: 24-OCT-17 Account No.: 90734
Date Received: 31-OCT-17 Login No.: L423757

Date Analyzed: 01-NOV-17 - 07-NOV-17

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L423757 (Report ID: 1029030):

```
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 \text{ 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%
                                                             +/-7.6%
                                                                                  103%
                   Arsenic
  < -Less Than
                          mg -Milligrams
                                                m3 -Cubic Meters
                                                                        kg -Kilograms
                                                                                               ppm -Parts per Million
                                                l -Liters
                                                                        NS -Not Specified
                                                                                               ND -Not Detected
                                                                                                                          NA -Not Applicable
    -Greater Than
                          ug -Micrograms
```





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GALSON

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. N	IOSH	7300/mod.	OSHA	ID-125G;	ICP/I	15 mg/m3 (TWA)
Antimony	mod. N	IOSH	7300/mod.	OSHA	ID-125G;	ICP/I	0.5 mg/m3 (TWA)
Arsenic	mod. N	IOSH	7300/mod.	OSHA	ID-125G;	ICP/I	0.01 mg/m3 (TWA)
Barium	mod. N	IOSH	7300/mod.	OSHA	ID-125G;	ICP/I	0.5 mg/m3 (Soluble) (TWA)
Beryllium	mod. N	IOSH	7300/mod.	OSHA	ID-125G;	ICP/I	0.0002 mg/m3 (TWA)
Cadmium	mod. N	IOSH	7300/mod.	OSHA	ID-125G;	ICP/I	0.005 mg/m3 (TWA)
Calcium Oxide	mod. N	IOSH	7300/mod.	OSHA	ID-125G;	ICP/I	5 mg/m3 (TWA)
Chromium	mod. N	IOSH	7300/mod.	OSHA	ID-125G;	ICP/I	Varies, see footnote
Cobalt	mod. N	IOSH	7300/mod.	OSHA	ID-125G;	ICP/I	0.1 mg/m3 (TWA)
Copper	mod. N	IOSH	7300/mod.	OSHA	ID-125G;	ICP/I	Varies, see footnote
Iron Oxide	mod. N	IOSH	7300/mod.	OSHA	ID-125G;	ICP/I	10 mg/m3 (Fume) (TWA)
Lead	mod. N	IOSH	7300/mod.	OSHA	ID-125G;	ICP/I	0.05 mg/m3 (TWA)
Manganese	mod. N	IOSH	7300/mod.	OSHA	ID-125G;	ICP/I	5 mg/m3 CEIL
Molybdenum	mod. N	IOSH	7300/mod.	OSHA	ID-125G;	ICP/I	Varies, see footnote
Selenium	mod. N	IOSH	7300/mod.	OSHA	ID-125G;	ICP/I	0.2 mg/m3 (TWA)
Zinc Oxide	mod. N	IOSH	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	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable



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< -Less Than

-Greater Than

mg -Milligrams

ug -Micrograms

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LABORATORY FOOTNOTE REPORT

GALSON

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

m3 -Cubic Meters

l -Liters

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.

ppm -Parts per Million

NA -Not Applicable

ND -Not Detected

kg -Kilograms

NS -Not Specified



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LABORATORY FOOTNOTE REPORT

GALSON

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%

g -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million g -Micrograms 1 -Liters NS -Not Specified ND -Not Detected NA -Not Applicab
--

		New Client?	Report To* : To	oronto Transit C	ommission	Invoice T	o*: Toronto	Transit Commi	ssion				
SGS	CALCON	—		20 Yonge Stree			1920 Yonge Street						
	GALSON	Client Account No.		uite 600			Suite 600						
			. <u>T</u> c	ronto, ON M4S	3E2		Toronto,	ON M4S 3E2					
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	ntario, Canada M	13K 2A2	Cell No. :			Ema	il :						
rei: 888-432 www.galsor			Email Results to : Vir	gil.Umali@ttc.ca & o	heresults@oheconsu	ultants.com P.O. N	o.: <u>PU240835</u>						
_			Email address <u>:</u>			Credit Ca	ard 🔲 Card on Fil	e Call for Cred	dit Card Info.				
.,		-		Samples submitted usin	a the FreePumpl cap™	Program Samples s	ubmitted using the	e FreeSamplingBadge	s™ Program				
Need Results By*:	(surcharge)												
✓ Standard	0%	Site Name :		Pro	oject: 22152	Samp	oled by: OHE C	Consultants					
4 Business Days	35%	Comments:											
3 Business Days	50%	TTC Sul	oway Air	Quality									
2 Business Days	75%			-	Ita - a vaa	Described coronless was	Dlanca in dianta ::	vhich OEL this data wi	Liboured for				
Next Day by 6pm	100%	List description of indu	ustry or Process/interfe	rences present in sampl	ling area :	Province samples were collected in (ex. ON)	OSHA PEL		Cal OSHA				
Check for availability an quicker turn around			_				I <u>—</u>	Other (specify):					
Sample Identifica (Maxmium of 20 Characters than 20 characters will be al	s. 1D's longer	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis Reques	ted*	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 An	alyses for TTC						
22152 - A54		10/24/17	25 mm PCM	-	-	Subway Air Quality St	udy						
22152 - S53		10/24/17	PW PVC in PPI	1168.0	L			<u> </u>					
22152 - S54		10/24/17	PW PVC in PPI	-	-	_							
22152 - I51		10/24/17	PW-PYC in IOM	1175.7	L	-							
22152 - I52		10/24/17	PW RYC 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 wi	ill subsititute ou	ur routine/preferred meth	nod if it does not match	the method listed on t	the COC unless this box	is checked: Use method(s) listed on COC						
						e for certain analytes - see SAG							
For crystalline silica: forn	n(s) of silica nee	ded must be indicated ((Quartz, Cristobalite, and	d/or Tridymite)* :									
Chain of Custody	Pr	rint Name/Signature		Date Time		Print/Nam	e/Signature	Dā	ate Time				
Relinquished by Yun	nny Desiana L	ee parlo	10	25/17 14:50	Received by :	esmonda	-//	10/3	JE230				
Relinquished by	Lumm	1./17	7/16/	36/17 Gray	Received by :	, ,	2	10134	71024				
		Je l'	Relinquished by										

000		New Client?		oronto Transit (Invoice 1		Transit Commi	ssion
SGS	GALSON			920 Yonge Stre	eet	<u></u>		onge Street	
	GALJUN	Client Account No.		uit <u>e 600</u>			Suite 60		
			. <u>T</u>	oronto, ON M4	S 3E2		Toronto	, ON M4S 3E2	
1140 Sheppard Unit 5	d Avenue West		Phone No.* : 4	16-393-6668		Phone I	No.:		
North York, Or	ntario, Canada M	3K 2A2	Cell No. :	<u></u> .		 Em			
Tel: 888-432-				roil Umali@ttc.ca.&.e	oheresults@ohecons	ultants.com P.O. N	lo.: PU24083	•	
www.galson	ildus.ca		Email address :				ard Card on F		dit Card Info.
Need Results By*:	(surcharge)]		Samples submitted us	ing the FreePumpLoan™	Program Samples	submitted using t	he FreeSamplingBadge	s™ Program
✓ Standard	0%	Site Name :			roject : 22152	 Sam	pled by: OHE	Consultants	
4 Business Days	35%	Comments:							
3 Business Days	50%		Λ i.e.	Ouglity					
2 Business Days	75%	TTC Sul	oway Air	Quality					
Next Day by 6pm	100%	List description of ind	ustry or Process/interfo	erences present in sam	pling area :	Province samples were	Please indicate	which OEL this data wi	II be used for :
Check for availability an quicker turn around		·				collected in (ex. ON)	OSHA PEL MSHA	ACGIH TLV Other (specify):	Cal OSHA
Sample Identificat (Maxmium of 20 Characters. than 20 characters will be ab	ID's longer	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis Requested* Method Reference^ Process (e.g			Hexavalent Chromium Process (e.g., welding plating, painting, etc.)
22152 - H9	· .	10/24/17	2pc UW PVC	1164.3	L	Hexavalent Chromium mod.		mod.OSHA 215	Other
		10/24/17	2pc UW PVC	-	-	-		-	-
						-			
 	<u>~_</u>					-	-		
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	<u></u>					_			
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				<u> </u>		-		- 	
					<u> </u>				<u></u>
						k is checked: Use method			
·					is required (only available	e for certain analytes - see SAG	ā): 	·	
For crystalline silica: form			Quartz, Cristobalite, a	nd/or Tridymite)* :	- 1			 	
Chain of Custody	Pr	int Name/Signature		Date Time		Print Nar	ne/Signature		ate Time
Relinquished by Yun	ny Desiana L	ee Juft	1(0/25/17 14:50	Received by :	Lamondan	11/	_ 10/20	1/7 3:32
Relinquished by	esma	12/1/	/6/	30/17 65cp	Received by:	Unny		(0-31-14	(024)
	, 5 0 (0)	/ 0			n will be considered as fieldsen åv Gesuleira åg	s next day's business ^{''} ædl a)∂irly⊙\/ sār n¢l l6 s 0 @in	g processed.	-	Page 2 of 2

90134

The TTC file number/purchase order number is PUZ40835:

- 1) Total Metals by NIOSH 7300. Analyze for antimony, arsenic, barium, beryllium, cadmium, calcium oxide, chromium III, cobalt, copper, lead, manganese, and selenium.
- 2) <u>Asbestos fibre count by NIOSH 7400.</u> In addition, analyze specifically for asbestos by PCM TEM if the fibre count result exceeds 0.01 f/cc.
- 3) Respirable silica and respirable dust by NIOSH 7500/0600. Analyze for quartz, PFI PW PVC cristobalite, tridymite, and dust.
- 4) Respirable metals by NIOSH 7300. Analyze for aluminum, cadmium, iron oxide, PPI WWMCE 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 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.



GALSON

6601 Kirkville Road

East Syracuse, NY 13057

(315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L423780

Project No. : 22152

Date Sampled : 26-OCT-17 Date Analyzed : 02-NOV-17 - 05-NOV-17

Date Received : 31-OCT-17 Report ID : 1029044

LOQ Total Conc Units Parameter ug Aluminum 7.5 <7.5 <0.0075 mg/m3Cadmium 0.15 <0.15 <0.00015 mg/m3Iron Oxide 11. 27 0.027 mg/m3Molybdenum 0.15 <0.15 <0.00015 mg/m3Zinc Oxide 2.8 <2.8 <0.0028 mg/m3

Collection Media: Date :	MCE UW 37mm 03-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: TJB
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



(315) 432-5227

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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd Account No.: 90734 6601 Kirkville Road

Site Login No. : L423780

East Syracuse, NY 13057 Project No. : 22152

Date Sampled : 26-OCT-17 Date Analyzed : 02-NOV-17 - 05-NOV-17

Date Received : 31-OCT-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

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>	-	
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

Collection Media: Date :	MCE UW 37mm 03-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: TJB
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1	- 1	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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East Syracuse, NY 13057

East Syracuse, NY 13057 (315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L423780

Project No. : 22152

Date Sampled : 26-OCT-17 Date Analyzed : 02-NOV-17 - 05-NOV-17

Date Received : 31-OCT-17 Report ID : 1029044

Date Sampled: 10/26/17 Date Analyzed: 11/02/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	uq	ug		
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

Collection Media: Date :	MCE UW 37mm 03-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: TJB
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1	- 1	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L423780

6601 Kirkville Road Site : NS Login No. : East Syracuse, NY 13057 Project No. : 22152

(315) 432-5227 Date Sampled : 26-OCT-17 Date Analyzed : 02-NOV-17 - 05-NOV-17

FAX: (315) 437-0571 Date Received : 31-OCT-17 Report ID : 1029044

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	uq		
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

Collection Medi Date	a: MCE UW 37mm : 03-NOV-17		itted by: SJW DOH # : 11626	Approved by: JJL Supervisor: KEG	QC	by: TJB
-Less Than-Greater Tha	mg -Milligrams n ug -Micrograms	m3 -Cubi 1 -Lite	c Meters kg -Kilogr rs NS -Not Sp			ND -Not Detected LOQ-Limit of Quantitation



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CVICON

LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd Account No.: 90734
6601 Kirkville Road Site : NS Login No. : L423780

East Syracuse, NY 13057 Project No. : 22152

(315) 432-5227 Date Sampled : 26-OCT-17 Date Analyzed : 02-NOV-17 - 05-NOV-17

FAX: (315) 437-0571 Date Received : 31-OCT-17 Report ID : 1029242

Date Sampled: 10/26/17 Date Analyzed: 11/05/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		-
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

Collection Media: Date :	IOM 25mm MCE 06-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: TJB
<pre>-Less Than > -Greater Than</pre>	5	m3 1		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L423780

Project No. : 22152

Date Sampled : 26-OCT-17 Date Analyzed : 02-NOV-17 - 05-NOV-17

Date Received : 31-OCT-17 Report ID : 1029242

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		<u> </u>
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

Collection Media: Date :	IOM 25mm MCE 06-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	! by: TJB
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Login No. : L423780 Site

Project No. : 22152

Date Sampled : 26-OCT-17 Date Analyzed : 06-NOV-17

Date Received : 31-OCT-17 Report ID : 1029385

Asbestos Fiber Count (A Rules)

		Fibers/	Fibers/	Fibers/	Air	Fibers/
Sample ID	<u>Lab ID</u>	Fields	mm2	Filter	Volume (cc)	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 Ouantitation : 5.5 Fibers/ 100 Fields

Microscope field area : 0.00785 mm2

Supervisor: BDB

Submitted by : BTM

Approved by : BDB

Date: 06-NOV-17

OC by: TJB Filter collection area: 385 mm2

< -Less Than

> -Greater Than

ND -Not Detected

NA -Not Applicable

cc -Cubic Centimeters

NS -Not Specified



LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L423780

Project No. : 22152

Date Sampled : 26-OCT-17 Date Received : 31-OCT-17 Report ID : 1028380

Inhalable Dust

Sample ID	<u>Lab ID</u>	Air Vol <u>liter</u>	Total mq	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 Submitted by: PAH

Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV Approved by : SPR

OSHA PEL : NA Date : 02-NOV-17 NYS DOH # : 11626

Collection Media : IOM 25mm MCE 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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Client : Toronto Transit Commission Ltd Account No.: 90734 Login No. : L423780 Site : NS

Project No. : 22152

Date Sampled : 26-OCT-17 Date Analyzed : 01-NOV-17 Date Received : 31-OCT-17 Report ID : 1028381

Respirable Dust

<u>Sample ID</u>	<u>Lab ID</u>	Air Vol liter	Total mq	Conc mq/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

Collection Media : PVC PW 37mm Supervisor: KRK

: PNOR 5 mg/m3 (TWA) Date: 01-NOV-17 NYS DOH # : 11626 QC by: TJB

Submitted by: HVN

Approved by : SPR

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected

l -Liters > -Greater Than ug -Micrograms NS -Not Specified ppm -Parts per Million



LABORATORY ANALYSIS REPORT

6601 Kirkville Road

East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L423780

Project No. : 22152

Date Sampled : 26-OCT-17 Date Analyzed : 01-NOV-17 - 08-NOV-17

Submitted: AJD

Approved: KRK

Date Received : 31-OCT-17 Report ID : 1030115

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

			Air Vol		
Sample ID	<u>Lab ID</u>	Analyte	1	uq	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

: 50 ug/m3 RCS Date : 08-NOV-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: TJB

NA -Not Applicable ND -Not Detected l -Liters mppcf -Million Particles per Cubic Foot



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LABORATORY FOOTNOTE REPORT

GALSON

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

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Any holder of this document is advised that information contained herein reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

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 preceding 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 (V205) 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</p>

> -Greater Than ug -Micrograms 1 -Liters NS -Not Specified ND -Not Detected NA -Not Applicable



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East Syracuse, NY 13057 (315) 432-5227

LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.

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.

PEL

Parameter	Accuracy	Mean Recovery
	4 10 50	1000
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%

Method

Beryllium	mod. NIOSH 7300/mod	d. OSHA ID-125G; ICP/M	0.0002 mg/m3 (TWA)
Magnesium Oxide	mod. NIOSH 7300/mod	d. OSHA ID-125G; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 7300/mod	d. OSHA ID-125G; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 7300/mod	d. OSHA ID-125G; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 7300/mod	d. OSHA ID-125G; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 7300/mod	d. OSHA ID-125G; ICP/I	See footnote

L423780 (Report ID: 1029044):

Parameter

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
_	-Creater Than	ug -Migrograms	1	-Titers	MS -Not Specified	ND -Not Detected

NA -Not Applicable



SGS

6601 Kirkville Road

FAX: (315) 437-0571

www.galsonlabs.com

East Syracuse, NY 13057 (315) 432-5227

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 $Mo = 5 \text{ mg/m3}; Molybdenum and insoluble}$ 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.

LABORATORY FOOTNOTE REPORT

Parameter	Accuracy	Mean Recovery
Aluminum	+/-7.7%	96.9%
Antimony	+/-9.8%	97.3%
Arsenic	+/-7.6%	103%

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

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

	4 5 50	
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	
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)



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LABORATORY FOOTNOTE REPORT

GALSON

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 \text{ 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 \text{ 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)
```

> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable	<	-Less Than	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	ppm -Parts per Million	
	>	-Greater Than	ug -Micrograms	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable



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LABORATORY FOOTNOTE REPORT

GALSON

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 Quartz	+/-13.8% +/-10.9%	101% 93.4%
Tridymite	+/-13.6%	105%

 L423780

	-								
		New Client?	Report To* : T	oronto Transit C	ommission	Invoice T	o*: Toronto	Transit Comm	ission
SGS	GALSON			920 Yonge Stre				nge Street	
_000	GALOUN	Client Account No.		uite 600			Suite 60		
			_ T (oronto, ON M4S	3E2		Toronto,	ON M4S 3E2	
1140 Sheppa Unit 5	ard Avenue West		Phone No.* : 41	16-393-6668		Phone N	o. :		<u>~</u>
•	Ontario, Canada M	13K 2A2	Cell No. :			 Ema	il:		
Tel: 888-432 www.galso			Email Results to : Vir	rgil.Umali@ttc.ca & o	heresults@ohecons	ultants.com P.O. N	p.: PU240835	5	
Ť			Email address :				ırd 🔲 Card on Fi	le 🔲 Call for Cre	dit Card Info.
		_		Samples submitted usir			to and the sale of the sale	. E. Comotto Ball	TH D
Need Results By*:	(surcharge)			•		Program Samples s	ubmitted using th	e FreeSamplingBadge	is'm Program
■ Standard	0%	Site Name :		Pro	oject: 22152	Samp	led by: OHE (Consultants	
4 Business Days	35%	Comments:							
3 Business Days	50%	TTC Sul	bway Air	Quality					,
2 Business Days	75%						61		
Next Day by 6pm	100%	List description of indu	istry or Process/interne	erences present in sampl	ing area :	Province samples were collected in (ex. ON)	OSHA PEL	which OEL this data wi	Cal OSHA
Check for availability ar quicker turn aroun								Other (specify):	
Sample Identification* (Maxmium of 20 Characters. ID's longer Date Sampled 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 An	alyses for TTC		
22152 - A56		10/26/17	25 mm PCM	-	-	Subway Air Quality St	udy		
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 - 154		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 wi	ill subsititute ou	r routine/preferred meth	nod if it does not matc	h the method listed on t	he COC unless this box	is checked: Use method(s) listed on COC	1	
						e for certain analytes - see SAG			
For crystalline silica: forn	n(s) of silica need	ded must be indicated (C	Quartz, Cristobalite, an	d/or Tridymite)* :					
Chain of Custody	Pr	int Name/Signature		Date Time		Print\Nam	e/Signature	Da	ate Time
Relinquished by Lan	ysa Kokarovts	eva) ,	10	/26/17 14:50	Received by :	trongan Jan	1/2	10/20	117 3:40
Relinquished by	Luma	nden/2		Ja11 6:00	Received by :	my	<u>/ </u>	- 10-31-F	7 1037 1
		/ * D.		s received after 36m v				I	Page 1 of 1
I		* Re	quited neigs, failure	to complete these his	eius may result in a d	elay in your samples being	processea.	ı	-a or

The TTC file number/purchase order number is PU240835:

- 1) <u>Total Metals by NIOSH 7300.</u> Analyze for antimony, arsenic, barium, beryllium, cadmium, calcium oxide, chromium III, cobalt, copper, lead, manganese, and selenium.
- 2) <u>Asbestos fibre count by NIOSH 7400.</u> 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, cadmlum, 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 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 the presentation of data and allow for the transition to the new logo.



GALSON

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East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L424375

13057 Project No. : 22152

Date Sampled : 30-OCT-17 Date Analyzed : 07-NOV-17 - 08-NOV-17

Date Received : 04-NOV-17 Report ID : 1029992

Date Sampled: 10/30/17 Date Analyzed: 11/07/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	MCE UW 37mm 08-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: TJB
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L424375

Site : NS
Project No. : 22152

Date Sampled : 30-OCT-17 Date Analyzed : 07-NOV-17 - 08-NOV-17

Date Received : 04-NOV-17 Report ID : 1029992

Date Sampled: 10/30/17 Date Analyzed: 11/07/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	MCE UW 37mm 08-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: TJB
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1	- 1	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



MICON

LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L424375

Project No. : 22152

Date Sampled : 30-OCT-17 Date Analyzed : 07-NOV-17 - 08-NOV-17

Date Received : 04-NOV-17 Report ID : 1029992

Date Sampled: 10/30/17 Date Analyzed: 11/07/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media	: MCE UW 37mm : 08-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: TJB
<pre></pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L424375

Project No. : 22152

Date Sampled : 30-OCT-17 Date Analyzed : 07-NOV-17 - 08-NOV-17

Date Received : 04-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

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	uq		
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

Collection Media	: MCE UW 37mm : 08-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: TJB
<pre></pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L424375

Project No. : 22152

Date Sampled : 30-OCT-17 Date Analyzed : 07-NOV-17 - 08-NOV-17

Date Received : 04-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

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	IOM 25mm MCE 08-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	! by: TJB
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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East Syracuse, NY 13057

East Syracuse, NY 13057 (315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L424375

Project No. : 22152

Date Sampled : 30-OCT-17 Date Analyzed : 07-NOV-17 - 08-NOV-17

Date Received : 04-NOV-17 Report ID : 1030143

Date Sampled: 10/30/17 Date Analyzed: 11/07/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		<u> </u>
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

Collection Media	IOM 25mm MCE 08-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: TJB
<pre>Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Login No. : L424375 Site

Project No. : 22152

Date Sampled : 30-OCT-17 Date Analyzed : 09-NOV-17 Date Received : 04-NOV-17 Report ID : 1030332

Asbestos Fiber Count (A Rules)

		Fibers/	Fibers/	Fibers/	Air	Fibers/
Sample ID	<u>Lab ID</u>	Fields	mm2	<u> Filter</u>	Volume (cc)	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 Ouantitation : 5.5 Fibers/ 100 Fields

Microscope field area : 0.00785 mm2 Filter collection area: 385 mm2

OC by: TJB

Supervisor: BDB

Submitted by : BTM

Approved by : BDB

Date: 09-NOV-17

< -Less Than

> -Greater Than

cc -Cubic Centimeters

ND -Not Detected

mm2 -Square millimeters

NA -Not Applicable

NS -Not Specified



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LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L424375

Project No. : 22152

Date Sampled : 30-OCT-17 Date Received : 04-NOV-17 Report ID : 1029719

Inhalable Dust

Sample ID	<u>Lab ID</u>	Air Vol liter	Total mq	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 Submitted by: PAH

Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV Approved by : SPR

OSHA PEL : NA Date : 07-NOV-17 NYS DOH # : 11626

Collection Media : IOM 25mm MCE 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

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L424375

Project No. : 22152

Date Sampled : 30-OCT-17 Date Received : 04-NOV-17 Report ID : 1029720

Respirable Dust

Sample ID	<u>Lab ID</u>	Air Vol liter	Total mq	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 Submitted by: HVN

Analytical Method : mod. NIOSH 0600; Gravimetric Approved by : SPR

OSHA PEL : PNOR 5 mg/m3 (TWA) Date : 07-NOV-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm 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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FAX: (315) 437-0571

Client : Toronto Transit Commission Ltd Account No.: 90734 Login No. : L424375 Site

Project No. : 22152

Date Sampled : 30-OCT-17 Date Analyzed : 09-NOV-17 Date Received : 04-NOV-17

Submitted by: KLS

Report ID : 1030346

Hexavalent Chromium

Sample ID	<u>Lab ID</u>	Air Vol liter	Total uq	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 Approved by : DNF

OSHA PEL : 5 ug/m3 (TWA) Date: 10-NOV-17 NYS DOH # : 11626

Collection Media : PVC UW 37mm Supervisor: MWJ QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected

ug -Micrograms l -Liters > -Greater Than NS -Not Specified ppm -Parts per Million



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LABORATORY ANALYSIS REPORT

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(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L424375

Project No. : 22152

Date Sampled : 30-OCT-17 Date Analyzed : 07-NOV-17 - 12-NOV-17

Date Received : 04-NOV-17 Report ID : 1031150

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

			Air Vol		
<u>Sample ID</u>	<u>Lab ID</u>	<u>Analyte</u>	1	<u>uq</u>	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 Submitted: NLO

Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD Approved: CMR

OSHA PEL : 50 ug/m3 RCS Date : 13-NOV-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: TJB

NA -Not Applicable ND -Not Detected l -Liters mppcf -Million Particles per Cubic Foot



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

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Any holder of this document is advised that information contained herein reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

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.

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L424375 (Report ID: 1030143):
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> 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.

mg -Milligrams < -Less Than 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

GALSON

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.

PEL

NA -Not Applicable

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%

Method

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):

Parameter

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





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Client Name : Toronto Transit Commission Ltd.

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 Antimony Arsenic Barium	+/-7.7% +/-9.8% +/-7.6% +/-6.5%	96.9% 97.3% 103% 101%

Applicable	
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LABORATORY FOOTNOTE REPORT

NA -Not Applicable

Client Name : Toronto Transit Commission Ltd.

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 -Migrograms	1	-Titers	NS -Not Specified	ND -Not Detected



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< -Less Than

-Greater Than

mg -Milligrams

ug -Micrograms

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LABORATORY FOOTNOTE REPORT

GALSON

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

m3 -Cubic Meters

l -Liters

```
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 \text{ 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.
```

ppm -Parts per Million

NA -Not Applicable

ND -Not Detected

kg -Kilograms

NS -Not Specified



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LABORATORY FOOTNOTE REPORT

GALSON

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%

g -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million g -Micrograms 1 -Liters NS -Not Specified ND -Not Detected NA -Not Applicab
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000	New Client?	Report To* : To	oronto Transit C	Commission	Invoice	To*: Toronto	Transit Commi	ssion
MUSINO	 	19	920 Yonge Stre	et		1920 Yor	nge Street	
62666948791800	; Client Account N		uite 600			Suite 600		
:11/04/17 per:UPS			oronto, ON M45	S 3E2		Toronto,	ON M4S 3E2	<u>.</u>
ials:KMS		Phone No.* <u>: 41</u>	6-393-6668		Phone	No.:		·
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424375		Email address <u>:</u>			Credit C	ard 🔲 Card on File	le Call for Cred	dit Card Info.
Need Results By*: (surcharge)	1		Samples submitted usi	ng the FreePumpLoan™	Program Samples	submitted using the	e FreeSamplingBadge	s™ Program
✓ Standard 0%	Site Name :		Pre	oject: 22152	Sam	pled by: OHE C	Consultants	
4 Business Days 35%	Comments:			•				
3 Business Days 50%	TTC C	huay Air	Ouglity,					
2 Business Days 75%	TILC Su	bway Air	Quality					
Next Day by 6pm 100%	List description of inc	lustry or Process/interfe	rences present in samp	ling area :	Province samples were	l	vhich OEL this data wil	I be used for :
Check for availability an pricing for					collected in (ex. ON)		ACGIH TLV	Cal OSHA
quicker turn around times.						☐ MSHA	Other (specify):	r
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 Reque	ested*	Method Reference^	Hexavalent Chron Process (e.g., weld plating, painting,
22152 - A57	10/30/17	25 mm PCM	550.8	L	Standardized List of A	nalyses for TTC		
22152 - A58	10/30/17	25 mm PCM	-	_	Subway Air Quality S	Study		
	40/20/47	PW PVC in PPI	1084.6	L	-			
22152 - S57	10/30/17	1						
22152 - S57 22152 - S58	10/30/17	PW PVC in PPI	-	-	-			
			1098.4	L	-			
22152 - S58	10/30/17	PW PVC in PPI	† · · · · · · · · · · · · · · · · · · ·	- L -	-			
22152 - S58 22152 - I55	10/30/17 10/30/17	PW PVC in PPI PW PVC in IOM	† · · · · · · · · · · · · · · · · · · ·	- L - L	-			
22152 - \$58 22152 - 155 22152 - 156	10/30/17 10/30/17 10/30/17	PW PVC in PPI PW PVC in IOM PW PVC in IOM	-	- L - L	- - -			
22152 - S58 22152 - I55 22152 - I56 22152 - M57	10/30/17 10/30/17 10/30/17 10/30/17	PW PVC in PPI PW PVC in IOM PW PVC in IOM UW MCE in PPI	-	- L - L -				
22152 - S58 22152 - I55 22152 - I56 22152 - M57 22152 - M58	10/30/17 10/30/17 10/30/17 10/30/17 10/30/17	PW PVC in PPI PW PVC in IOM PW PVC in IOM UW MCE in PPI UW MCE in PPI	1095.9	- L	- - - - -			
22152 - S58 22152 - I55 22152 - I56 22152 - M57 22152 - M58 22152 - T57	10/30/17 10/30/17 10/30/17 10/30/17 10/30/17 10/30/17	PW PVC in PPI PW PVC in IOM PW PVC in IOM UW MCE in PPI UW MCE in PPI UW MCE	1095.9	- L	- - - -			
22152 - S58 22152 - I55 22152 - I56 22152 - M57 22152 - M58 22152 - T57 22152 - T58	10/30/17 10/30/17 10/30/17 10/30/17 10/30/17 10/30/17	PW PVC in PPI PW PVC in IOM PW PVC in IOM UW MCE in PPI UW MCE in PPI UW MCE UW MCE	- 1095.9 - 1099.7 -	- L - L	- - - - -			
22152 - S58 22152 - I55 22152 - I56 22152 - M57 22152 - M58 22152 - T57 22152 - T58 ^Galson Laboratories will substitute ou	10/30/17 10/30/17 10/30/17 10/30/17 10/30/17 10/30/17	PW PVC in PPI PW PVC in IOM PW PVC in IOM UW MCE in PPI UW MCE in PPI UW MCE UW MCE	- 1095.9 - 1099.7 - the method listed on the method	L L the COC unless this box		l(s) listed on COC		
22152 - S58 22152 - I55 22152 - I56 22152 - M57 22152 - M58 22152 - T57 22152 - T58	10/30/17 10/30/17 10/30/17 10/30/17 10/30/17 10/30/17	PW PVC in PPI PW PVC in IOM PW PVC in IOM UW MCE in PPI UW MCE in PPI UW MCE UW MCE	- 1095.9 - 1099.7 - the method listed on the method	L L the COC unless this box				
22152 - S58 22152 - I55 22152 - I56 22152 - M57 22152 - M58 22152 - T57 22152 - T58 ^Galson Laboratories will substitute ou	10/30/17 10/30/17 10/30/17 10/30/17 10/30/17 10/30/17	PW PVC in PPI PW PVC in IOM PW PVC in IOM UW MCE in PPI UW MCE in PPI UW MCE UW MCE	- 1095.9 - 1099.7 - the method listed on scate if the lower LOQ is	L L the COC unless this box				
22152 - S58 22152 - I55 22152 - I56 22152 - M57 22152 - M58 22152 - T57 22152 - T58 AGalson Laboratories will substitute ou For metals analysis: if requesting an anal For crystalline silica: form(s) of silica need Chain of Custody Pr	10/30/17 10/30/17 10/30/17 10/30/17 10/30/17 10/30/17 10/30/17 rroutine/preferred merelyte with the option of add must be indicated with Name/Signature	PW PVC in PPI PW PVC in IOM PW PVC in IOM UW MCE in PPI UW MCE in PPI UW MCE UW MCE thod if it does not match lower LOQ, please indic	- 1095.9 - 1099.7 - the method listed on scate if the lower LOQ is	L L the COC unless this box	e for certain analytes - see SAC		Da	te Tir
22152 - S58 22152 - I55 22152 - I56 22152 - M57 22152 - M58 22152 - T57 22152 - T58 AGalson Laboratories will substitute ou For metals analysis: if requesting an anal For crystalline silica: form(s) of silica need	10/30/17 10/30/17 10/30/17 10/30/17 10/30/17 10/30/17 10/30/17 rroutine/preferred merelyte with the option of add must be indicated with Name/Signature	PW PVC in PPI PW PVC in IOM PW PVC in IOM UW MCE in PPI UW MCE in PPI UW MCE UW MCE	1095.9 1099.7 - the method listed on the cate if the lower LOQ is d/or Tridymite)*:	L L the COC unless this box	e for certain analytes - see SAC	G):	Da	te Tin

- · · ·	- -, I		New Client?	Report To* · To	oronto Transit C	`ommission	Invoice T	o*· Toronto	Transit Commi	ieeion
	SGS		☐ New Client:		920 Yonge Stre				nge Street	1331011
	<u>JUJ</u>	GALSON	Client Account No.		uite 600	Ct		Suite 60		
					pronto, ON M4S	\$ 3F2			ON M4S 3E2	
ŀ		rd Avenue West		 Phone No. * : 41		, o	Phone N		01111110022	<u>-</u>
	Unit 5 North York, O	ntario, Canada M	3K 2A2	Cell No. :	0-030-0000		Ema	SI.		
	Tel: 888-432				rdi I lmali@ttc.ca.&.c	heresults@oheconst		o.: <u>PU24083</u> 5		
	www.galsoi	njaos.ca		Email address :	gii.Omaii@i.c.ca & c	<u>neresuns@oneconst</u>		ard Card on Fi		dit Card Info
										are care in ito.
Ne	eed Results By*:	(surcharge)			Samples submitted usi	ng the FreePumpLoan™	Program Samples s	ubmitted using th	e FreeSamplingBadge	s™Program
7	Standard	0%	Site Name :		Pro	oject: 22152	Samp	oled by: OHE (Consultants	·
	4 Business Days	35%	Comments:		_					
	3 Business Days	50%	TTC C	over Air	Ouglity					
	2 Business Days	75%	IIC Sui	oway Air	Quality					
	Next Day by 6pm	100%	List description of indu	stry or Process/interfe	rences present in samp	ling area :	Province samples were	Please indicate v	which OEL this data wil	ll be used for :
C	heck for availability an	pricing for					collected in (ex. ON)	OSHA PEL	ACGIH TLV	☐ Cal OSHA
	quicker turn around	d times.						☐ MSHA	Other (specify):	
	Sample Identification* (Maxmium of 2D Characters. ID's longer than 20 characters will be abbreviated.) Sample Volume Sample Units*: L, ml,min,in2,cm2,ft2 Analysis Requested*			ted*	Method Reference^	Hexavalent Chromium Process (e.g., welding plating, painting, etc.)*				
2215	52 - H11		10/30/17	2pc UW PVC	1085.9	L	Hexavalent Chromium		mod.OSHA 215	Other
2215	52 - H12		10/30/17	2pc UW PVC	-	-	-	•	_	-
							-			
	.						-		 	
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	•									
^Gals	son Laboratories wil	Il subsititute ou	routine/preferred meth	nod if it does not match	h the method listed on	the COC unless this box	is checked: Use method(s) listed on COC		
	•				·	·	for certain analytes - see SAG			-
For c	rystalline silica: form	n(s) of silica need	led must be indicated (0	Quartz, Cristobalite, and	d/or Tridymite)* :					
Chai	in of Custody	Pri	int Name/Signature		Date Time		, Print Nam	e/Signature	Da	te Time
	nquished by Yun			10.	/31/17 _ 15:30	Received by :	1 1	~1/C/	11/2/	17 2:1500
Relin	nquished by	Mana	111	11/7	117 6501	Received by :	Kris Stone	Vine (11/4/1	7 12:10
	• ()			Samples	received after 3pm	will be considered as	next day's business		WYCC.	2000 2000
			* Re	apiged fields failure	tokeport Referen	elds may result in a d ice: 1 Generated:	next day's business elax in your samples being 14-100-15-14-25	processed.		Page 2 of 2

90134

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) <u>Asbestos fibre count by NIOSH 7400.</u> 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, PPI PW PVC cristobalite, tridymite, and dust.
- 4) Respirable metals by NIOSH 7300. Analyze for aluminum, cadmium, iron oxide, PPT WWMCE 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 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 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

Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L424064

Project No. : 22152

Date Sampled : 30-OCT-17 Date Analyzed : 03-NOV-17 - 07-NOV-17

Date Received : 02-NOV-17 Report ID : 1029429

Date Sampled: 10/30/17 Date Analyzed: 11/03/17

Parameter	LOQ ua	Total ug	Conc	Units
<u>rarameter</u>	<u></u>	<u></u>		
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

Collection Media: Date :	MCE UW 37mm 07-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: TJB
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L424064

Project No. : 22152

Date Sampled : 30-OCT-17 Date Analyzed : 03-NOV-17 - 07-NOV-17

Date Received : 02-NOV-17 Report ID : 1029429

Date Sampled: 10/30/17 Date Analyzed: 11/03/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	MCE UW 37mm 07-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: TJB
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1	- 1	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L424064

Project No. : 22152

Date Sampled : 30-OCT-17 Date Analyzed : 03-NOV-17 - 07-NOV-17

Date Received : 02-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

	LOQ	Total	Conc	Units
<u>Parameter</u>	uq	uq		-
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

Collection Media: Date :	MCE UW 37mm 07-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: TJB
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1	- 1	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L424064

6601 Kirkville Road Site : NS Log East Syracuse, NY 13057 Project No. : 22152

Date Sampled : 30-OCT-17 Date Analyzed : 03-NOV-17 - 07-NOV-17

Date Received : 02-NOV-17 Report ID : 1029429

LOO Total Units Conc <u>Parameter</u> uq uq Antimony 0.90 <0.90 NA mq/m3Arsenic 0.30 < 0.30 NA mq/m3Barium 0.15 <0.15 mq/m3NA <0.15 Bervllium 0.15 NA mq/m3Cadmium 0.15 <0.15 NA mq/m3Calcium Oxide 100. <100 NA mq/m3Chromium 7.5 <7.5 NA mq/m3Cobalt 0.45 <0.45 NA mq/m30.30 <0.30 Copper NA mq/m3Lead 0.38 <0.38 NΑ mq/m3Manganese 0.15 <0.15 mq/m3NA Selenium 2.3 < 2.3 NA mq/m3

Collection Media	: MCE UW 37mm : 07-NOV-17	Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG Q	C by: TJB
<pre>Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L424064

Site : NS
Project No. : 22152

Date Sampled : 30-OCT-17 Date Analyzed : 03-NOV-17 - 07-NOV-17

Date Received : 02-NOV-17 Report ID : 1029769

Date Sampled: 10/30/17 Date Analyzed: 11/07/17

	LOQ	Total	Conc	Units	
<u>Parameter</u>	<u>uq</u>	<u>uq</u>			
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	

Collection Media	: IOM 25mm MCE : 07-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: TJB
<pre></pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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Project No. : 22152

Date Sampled : 30-OCT-17 Date Analyzed : 03-NOV-17 - 07-NOV-17

Date Received : 02-NOV-17 Report ID : 1029769

Date Sampled: 10/30/17 Date Analyzed: 11/07/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	IOM 25mm MCE 07-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: TJB
<pre>-Less Than > -Greater Than</pre>	5	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Login No. : L424064 Site

Project No. : 22152

Date Sampled : 30-OCT-17 Date Analyzed : 06-NOV-17 Report ID : 1029606

Date Received : 02-NOV-17

Asbestos Fiber Count (A Rules)

		Fibers/	Fibers/	Fibers/	Air	Fibers/
Sample ID	<u>Lab ID</u>	Fields	mm2	Filter	Volume (cc)	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 Ouantitation : 5.5 Fibers/ 100 Fields

Microscope field area : 0.00785 mm2 Filter collection area: 385 mm2

Approved by : BDB Date: 07-NOV-17OC by: TJB

Submitted by : MJS

Supervisor: BDB

< -Less Than

> -Greater Than

cc -Cubic Centimeters

ND -Not Detected

NA -Not Applicable mm2 -Square millimeters NS -Not Specified



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LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L424064

Project No. : 22152

Date Sampled : 30-OCT-17 Date Received : 02-NOV-17 Report ID : 1029116

Inhalable Dust

Sample ID	<u>Lab ID</u>	Air Vol liter	Total mq	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 Submitted by: PAH

Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV Approved by : SPR

OSHA PEL : NA Date : 03-NOV-17 NYS DOH # : 11626

Collection Media : IOM 25mm MCE 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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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L424064

Project No. : 22152

Respirable Dust

Sample ID	<u>Lab ID</u>	Air Vol liter	Total mq	Conc mg/m3
22152 - S59	L424064-3	1091.9	<0.050	<0.046
22152 - S60	L424064-4	NA	<0.050	NA

 $\underline{\mathtt{COMMENTS:}}$ Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg Submitted by: HVN

Analytical Method : mod. NIOSH 0600; Gravimetric Approved by : SPR

OSHA PEL : PNOR 5 mg/m3 (TWA) Date : 07-NOV-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm 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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Client : Toronto Transit Commission Ltd Account No.: 90734 Login No. : L424064 Site

Project No. : 22152

Date Sampled : 30-OCT-17 Date Analyzed : 07-NOV-17 Date Received : 02-NOV-17 Report ID : 1029834

Hexavalent Chromium

Sample ID	<u>Lab ID</u>	Air Vol liter	Total uq	Conc ug/m3
22152 - н13	L424064-11	1098.6	<0.030	<0.027
22152 - н14	L424064-12	NA	<0.030	NA

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

Level of quantitation: 0.030 ug Submitted by: KLS

Analytical Method : mod. OSHA ID-215 (version 2); IC/UV Approved by : DNF

OSHA PEL : 5 ug/m3 (TWA) Date: 08-NOV-17 NYS DOH # : 11626

Collection Media : PVC UW 37mm Supervisor: MWJ QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected

ug -Micrograms l -Liters > -Greater Than NS -Not Specified ppm -Parts per Million



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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L424064

Project No. : 22152

Date Sampled : 26-OCT-17 - 30-OCT-17 Date Analyzed : 07-NOV-17 - 11-NOV-17

Date Received : 02-NOV-17 Report ID : 1030759

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

			Air Vol		
<u>Sample ID</u>	<u>Lab ID</u>	<u>Analyte</u>	1	<u>ug</u>	uq/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 Submitted: SPR
Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD Approved: CMR

OSHA PEL : 50 ug/m3 RCS Date : 13-NOV-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: TJB

NA -Not Applicable ND -Not Detected l -Liters mppcf -Million Particles per Cubic Foot



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LABORATORY FOOTNOTE REPORT

GALSON

Client Name : Toronto Transit Commission Ltd.

Site :

Project No. : 22152

Date Analyzed: 03-NOV-17 - 11-NOV-17

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Any holder of this document is advised that information contained herein reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

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 preceding 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 (V205) 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</p>

> -Greater Than ug -Micrograms 1 -Liters NS -Not Specified ND -Not Detected NA -Not Applicable



FAX: (315) 437-0571

www.galsonlabs.com

East Syracuse, NY 13057 (315) 432-5227

LABORATORY FOOTNOTE REPORT

GALSON

Client Name : Toronto Transit Commission Ltd.

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	Meth	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 l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable ug -Micrograms





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GALSON

Client Name : Toronto Transit Commission Ltd.

Site :

Project No. : 22152

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

 ${\tt biased \ low.}$

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):

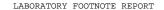
Reported results represent Respirable metals.

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	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable





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(315) 432-5227

GALSON

Client Name : Toronto Transit Commission Ltd.

Site :

Project No. : 22152

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	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable



LABORATORY FOOTNOTE REPORT

GALSON

Project No. : 22152

6601 Kirkville Road East Syracuse, NY 13057

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(315) 432-5227 FAX: (315) 437-0571 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

Client Name : Toronto Transit Commission Ltd.

```
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 \text{ 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	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable



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East Syracuse, NY 13057 (315) 432-5227

LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.

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%

g -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million g -Micrograms 1 -Liters NS -Not Specified ND -Not Detected NA -Not Applicab
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SGS 5x626A6648971629 te:11/02/17 hipper:UPS hitials:MAK WHITE WAR WAR WAR WAR WAR WAR WAR WAR WAR WAR	(surcharge)	Site Name :	*: St To Phone No.*: 411 Cell No.: Email Results to:Vire Email address:	gil.Umali@ttc.ca & Samples submitted us	eet	Phone N Ema Ultants.com P.O. N Credit Ca Program Samples s	1920 Yor Suite 600 Toronto, lo.: ail: O:: PU240835 ard Card on File	e Call for Cre	RIVS dit Card Info.
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Next Day by 6pm Check for availability an quicker turn around			istry or Process/interfei			Province samples were collected in (ex. ON)	T	hich OEL this data wi	ll be used for : Cal OSHA
Sample Identifica (Maxmium of 20 Characters than 20 characters will be al	. ID's longer	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis Reques	ted*	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 An	alyses for TTC		
22152 - A60		10/30/17	25 mm PCM	-	_	Subway Air Quality St	udy		
22152 - S59		10/26/17	PW PVC in PPI	1091.9	L	-			
22152 - S60		10/30/17	PW PVC in PPI	-	-	-			
22152 - 157		10/30/17	PW PVC in IOM	1105.3	L	-			
22152 - 158		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	-	-	-			
	questing an analy	yte with the option of a	lower LOQ, please indi	cate if the lower LOQ i		is checked: use method(: for certain analytes - see SAG			
For crystalline silica: forn						2.	·		
Chain of Custody Relinquished by Lan Relinquished by		# .		Date Time 31/17 14:30	Received by :	Print Nam Michelle Kraus	e/Signature	0/1/11	ite Time 17 12\52 17 0945
	CHAIN WAY			received after 3pm	will be considered as	_		' 	Page 1 of 1

		New Client?	Report To* : T (oronto Transit C	Commission	Invoice T	o*: Toronto	Transit Commi	ssion
SGS	GALSON	_	19	20 Yonge Stre	et		1920 Yo	nge Street	
-000	GAL2011	Client Account No.		uite 600			Suite 60		
				oronto, ON M45	S 3E2		Toronto,	ON M4S 3E2	
1140 Sheppar Unit 5	rd Avenue West		Phone No.* : 41	6-393-6668		Phone N	o. :		
North York, O	Intario, Canada M	13K 2A2	Cell No. :			 Ema	il:		
Tel: 888-432 www.galsoi			 Email Results to : _{Vir}	rail Umali@ttc.ca.&.c	heresults@ohecons	ultants.com P.O. N	o.:_ <u>PU24083</u>		
vvvv.gai30i	illabs.ca		Email address :		- TO TO THE TO T		ord Card on F		dit Card Info.
				-					
Need Results By*:	(surcharge)			Samples submitted usi	ng the FreePumpLoan™	Program Samples s	ubmitted using th	ne FreeSamplingBadge.	[™] Program
✓ Standard	0%	Site Name :		Pr	oject: 22152	Samp	led by: OHE	Consultants	
4 Business Days	35%	Comments:							
3 Business Days	50%	TTO 0	Λ: ₋	O 1:4					
2 Business Days	75%	I I C Sui	oway Air	Quality					
Next Day by 6pm	100%	List description of indu	ustry or Process/interfe	rences present in samp	ling area :	Province samples were	Please indicate	which OEL this data wil	l be used for :
Check for availability an	pricing for					collected in (ex. ON)	OSHA PEL	ACGIH TLV	Cal OSHA
quicker turn around							MSHA	Other (specify):	
Sample Identifica (Maxmlum of 20 Characters than 20 characters will be at	. ID's longer	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml,min,in2,cm2,ft2	2 Analysis Requested* Method Reference^ Hexavalent (Process (e.g. plating, pain			
22152 - H13		10/30/17	2pc UW PVC	1098.6	L				<u> </u>
22152 - H14		10/30/17	2pc UW PVC	-	_			1-	-
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^Galson Laboratories wil	ll subsititute ou	r routine/preferred meth	nod if it does not matc	h the method listed on	the COC unless this box	is checked: Use method(s) listed on COC		
For metals analysis: if rec	questing an anal	yte with the option of a	lower LOQ, please ind	icate if the lower LOQ is	required (only available	e for certain analytes - see SAG):		
For crystalline silica: form	n(s) of silica need	ded must be indicated ((Quartz, Cristobalite, an	d/or Tridymite)* :					
Chain of Custody	Pr	int Name/Signature		Date Time	·· [Print Nam	e/Signature	Da	te Time
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		· · · · · · · · · · · · · · · · · · ·			will be considered as			, , , , , , , , , , , , , , , , , , ,),,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
		* Re	equired fields, failure Page 20 of 21	to complete these f Report Referen	elds may result in a c ce:1 Generated:	lelay in your samples being	processed.	!	Page 2 of 2

90134

The TTC file number/purchase order number is PU240835:

- 1) Total Metals by NIOSH 7300. Analyze for antimony, arsenic, barlum, beryllium, calcium oxide, chromium III, cobalt, copper, lead, manganese, and selenium.
- 2) Asbestos fibre count by NIOSH 7400. In addition, analyze specifically for asbestos by PLIM if the fibre count result exceeds 0.01 f/cc.
- 3) Respirable silica and respirable dust by NIOSH 7500/0600. Analyze for quartz, PPI PW PVC cristobalite, tridymite, and dust.
- 4) Respirable metals by NIOSH 7300. Analyze for aluminum, cadmium, iron oxide, PT WWMCE molybdenum, and zinc oxide.
- 5) <u>Inhalable metals and inhalable dust by NIOSH 7300/0500.</u> 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

AIHA-LAP #100324

Account# 90734

Login# L424363

November 13, 2017

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 the presentation of data and allow for the transition to the new logo.



GALSON

6601 Kirkville Road

East Syracuse, NY 13057

(315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L424363

Project No. : 22152

Date Sampled : 31-OCT-17 Date Received : 04-NOV-17 Report ID : 1029989

Date Sampled: 10/31/17 Date Analyzed: 11/07/17

Parameter	LOQ ua	Total uq	Conc	Units
rarameter		<u>uq</u>		
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

Collection Media:	MCE UW 37mm 08-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: NDC
<pre></pre>	mg -Milligrams	m3 1	-Cubic Meters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOO-Limit of Ouantitation



6601 Kirkville Road
East Syracuse, NY 13057

East Syracuse, NY 13057 (315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L424363

Project No. : 22152

Date Sampled : 31-OCT-17 Date Received : 04-NOV-17 Report ID : 1029989

LOO Total Units Conc <u>Parameter</u> ug ug Aluminum 7.5 <7.5 NA mq/m3Cadmium 0.15 <0.15 NA mq/m3Iron Oxide 11. <11 mg/m3NA Molvbdenum 0.15 <0.15 NA mg/m3Zinc Oxide 2.8 <2.8 NA mq/m3

Collection Media:	MCE UW 37mm 08-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: NDC
<pre>< -Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



6601 Kirkville Road
East Syracuse, NY 13057

(315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L424363

Project No. : 22152

Date Sampled : 31-OCT-17 Date Received : 04-NOV-17 Report ID : 1029989

Date Sampled: 10/31/17 Date Analyzed: 11/07/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media	: MCE UW 37mm : 08-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: NDC
<pre></pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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Project No. : 22152

Date Sampled : 31-OCT-17 Date Received : 04-NOV-17 Report ID : 1029989

	LOQ	Total	Conc	Units
<u>Parameter</u>	uq	<u>uq</u>		
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

	llection Media: te :	MCE UW 37mm 08-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG Q	C by: NDC
<	-Less Than	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
>	-Greater Than	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L424363

Project No. : 22152

Date Sampled : 31-OCT-17 Date Received : 04-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

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	IOM 25mm MCE 08-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: NDC
<pre>-Less Than > -Greater Than</pre>	5	m3 1		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L424363

East Syracuse, NY 13057 Project No. : 22152

Date Sampled : 31-OCT-17 Date Analyzed : 07-NOV-17 FAX: (315) 437-0571 Date Received : 04-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

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		· ·
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

Collection Media: Date :	IOM 25mm MCE 08-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: NDC
<pre>-Less Than > -Greater Than</pre>	5	m3 1		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734

Login No. : L424363 Site

Project No. : 22152

Date Sampled : 31-OCT-17 Date Analyzed : 09-NOV-17 Date Received : 04-NOV-17

Report ID : 1030330

Asbestos Fiber Count (A Rules)

		Fibers/	Fibers/	Fibers/	Air	Fibers/
Sample ID	<u>Lab ID</u>	Fields	mm2	<u> Filter</u>	Volume (cc)	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 Ouantitation : 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-17OC by: NDC

Supervisor: BDB

< -Less Than

> -Greater Than

ND -Not Detected NS -Not Specified

NA -Not Applicable

cc -Cubic Centimeters



Client : Toronto Transit Commission Ltd Account No.: 90734 6601 Kirkville Road Site

Login No. : L424363

East Syracuse, NY 13057 Project No. : 22152 (315) 432-5227

Date Sampled : 31-OCT-17 Date Analyzed : 07-NOV-17 Date Received : 04-NOV-17 Report ID : 1029717

FAX: (315) 437-0571 www.galsonlabs.com

Inhalable Dust

Sample ID	<u>Lab ID</u>	Air Vol liter	Total mq	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 Submitted by: PAH

Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV Approved by : SPR

OSHA PEL : NA Date: 07-NOV-17 NYS DOH # : 11626

Collection Media : IOM 25mm MCE Supervisor: KRK QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected

-Liters > -Greater Than ug -Micrograms NS -Not Specified ppm -Parts per Million



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Client

: Toronto Transit Commission Ltd Account No.: 90734

Login No. : L424363

Project No. : 22152

Date Sampled : 31-OCT-17 Date Received : 04-NOV-17 Date Analyzed : 07-NOV-17 Report ID : 1029698

Respirable Dust

Sample ID	<u>Lab ID</u>	Air Vol liter	Total mq	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 NYS DOH # : 11626

Supervisor: KRK QC by: NDC

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected

l -Liters > -Greater Than ug -Micrograms NS -Not Specified ppm -Parts per Million



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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L424363

Project No. : 22152

Date Sampled : 31-OCT-17 Date Analyzed : 07-NOV-17 - 12-NOV-17

Date Received : 04-NOV-17 Report ID : 1031148

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

			Air Vol		
Sample ID	<u>Lab ID</u>	<u>Analyte</u>	1	<u>uq</u>	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 Submitted: NLO Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD Approved: AJD

OSHA PEL : 50 ug/m3 RCS Date : 13-NOV-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: NDC

NA -Not Applicable ND -Not Detected l -Liters mppcf -Million Particles per Cubic Foot



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LABORATORY FOOTNOTE REPORT

GALSON

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

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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 preceding 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 (V205) 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

GALSON

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.

PEL

Parameter	Accuracy	Mean Recovery
2 11'	. / 10 60	1020
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%

Method

Beryllium	mod. NIOSH 730	00/mod. OSHA ID-1250	; ICP/M	0.0002 mg/m3 (TWA)
Magnesium Oxide	mod. NIOSH 730	00/mod. OSHA ID-1250	; ICP/I	15 mg/m3 (Total Part.)TWA
Molybdenum	mod. NIOSH 730	00/mod. OSHA ID-1250	; ICP/I	Varies, see footnote
Nickel	mod. NIOSH 730	00/mod. OSHA ID-1250	; ICP/I	1 mg/m3 (TWA)
Thallium	mod. NIOSH 730	00/mod. OSHA ID-1250	; ICP/I	0.1 mg/m3 (Soluble) (TWA)
Vanadium Pentoxide	mod. NIOSH 730	00/mod. OSHA ID-1250	; ICP/I	See footnote

L424363 (Report ID: 1029989):

Parameter

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 1 -Liters NS -Not Specified ND -Not Detected NA -Not Applicable





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GALSON

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
22 '	. / 5 50	25.22
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 -0	Cubic Meters	kg -Kilograms	ppm -Parts per Million
>	-Greater Than	ug -Micrograms	1 -1	Liters	NS -Not Specified	ND -Not Detected

NA -Not Applicable



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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.

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

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%

Aluminum Antimony Antimony Ansenic Barium Mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I 15 mg/m3 (TWA) Mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I 0.5 mg/m3 (TWA) Barium Mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I 0.01 mg/m3 (TWA) Beryllium 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 0.0002 mg/m3 (TWA) Calcium Oxide Mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I 0.005 mg/m3 (TWA) Chromium Mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I 5 mg/m3 (TWA) Copper Mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I Varies, see footnote Copper Mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I Varies, see footnote Iron Oxide 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 (Fume) (TWA) Lead Monganese 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 Varies, see footnote Mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I 5 mg/m3 (FUMA) Tinc Oxide Mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I 5 mg/m3 (FUMA) Tinc Oxide Mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I 5 mg/m3 (FUMA) Tinc Oxide Mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I 5 mg/m3 (FUMA) Tinc Oxide Mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I 5 mg/m3 (FUMA) Tinc Oxide	Parameter	Method	PEL
Antimony Arsenic 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) (TW 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 0.0002 mg/m3 (TWA) Calcium Oxide mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I 0.005 mg/m3 (TWA) Chromium mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I 5 mg/m3 (TWA) Cobalt mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I Varies, see footnote Cobalt mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I Varies, see footnote Iron Oxide mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I Varies, see footnote Iron Oxide 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 (Fume) (TWA) Manganese mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I Varies, see footnote Selenium mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I Varies, see footnote Tootnote mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I Varies, see footnote Tootnote T			
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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 Varies, see footnote 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 5 mg/m3 CEIL Selenium mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I 0.2 mg/m3 (TWA)	Antimony	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (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 5 mg/m3 (TWA) 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 5 mg/m3 CEIL Selenium mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I 0.2 mg/m3 (TWA)	Arsenic	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.01 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 Wolybdenum mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I Varies, see footnote Selenium	Barium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.5 mg/m3 (Soluble) (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)	Beryllium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.0002 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)	Cadmium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.005 mg/m3 (TWA)
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)	Calcium Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	5 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)	Chromium	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
Tron Oxide	Cobalt	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.1 mg/m3 (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)	Copper	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	Varies, see footnote
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)	Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	10 mg/m3 (Fume) (TWA)
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)	Lead	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I	0.05 mg/m3 (TWA)
Selenium mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I 0.2 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
Zinc Oxide mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I 5 mg/m3 (Fume) (TWA)	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 Meter	s kg -Kilograms	ppm -Parts per Million	
> -Greater Than	ug -Micrograms	l -Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable



FAX: (315) 437-0571 www.galsonlabs.com

East Syracuse, NY 13057 (315) 432-5227

LABORATORY FOOTNOTE REPORT

GALSON

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

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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
                 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



6601 Kirkville Road East Syracuse, NY 13057

FAX: (315) 437-0571

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LABORATORY FOOTNOTE REPORT

GALSON

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%

000		New Client?	Report To*:	Toronto Transit C	Commission	Invoice 1	^{[o*} : <u>Toronto</u>	Transit Comm	ission
SGS GA	LSON		10, -	1920 Yonge Stre	et		1920 Yo	nge Street	
	LOOI	Client Account No.		Suite 600			Suite 60		
6X626A6948791809 .e:11/04/17			- <u> </u>	Toronto, ON M48	3E2		Toronto,	ON M4S 3E2	
pper:UPS tials:KMS			Phone No.* <u>: 4</u>	116-393-6668		Phone N	No.:		
	,	K 2A2	Cell No. :			Em	ail:		
	H & BH			/irgil.Umali@ttc.ca & o	heresults@ohecons		lo.: <u>PU240835</u>		
L424363	1		Email address :			Credit C	ard 🗌 Card on Fil	le 🔲 Call for Cre	dit Card Info.
	rcharge)] Samples submitted usin	ng the FreePumpLoan™	Program Samples	submitted using the	e FreeSamplingBadge	es™Program
✓ Standard		Site Name :		Pro	oject: 22152	Sami	oled by: OHE C	Consultants	
	35%	Comments :							
3 Business Days	50%	TTC C	Λ i.	• Ouality					
2 Business Days	75%	TTC Sul	oway Air	Quality					
Next Day by 6pm	100%	List description of indu	ıstry or Process/inter	ferences present in samp	ling area :	Province samples were	Please indicate w	hich OEL this data wi	ill be used for :
Check for availability an pricin quicker turn around times						collected in (ex. ON)	OSHA PEL MSHA	ACGIHTLV Other (specify):	Cal OSHA
Sample Identification* (Maxmium of 20 Characters. ID's Ion- than 20 characters will be abbreviate		Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis Reques	ted*	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 Ar	alyses for TTC		7 22
22152 - A62		10/31/17	25 mm PCM	-	-	Subway Air Quality St	udy	-	<u> </u>
22152 - \$61		10/31/17	PW PVC in PPI	773.54	L	-			
22152 - \$62·		10/31/17	PW PVC in PPI	-	-	-			
22152 - 159		10/31/17	PW PVC in ION	M 779.53	L				
22152 - 160		10/31/17	PW PVC in ION	И -	-	-			
22152 - M61		10/31/17	UW MCE in PP	I 779.33	L	-			
22152 - M62		10/31/17	UW MCE in PP	1 -	-	-			
22152 - T61		10/31/17	UW MCE	772.58	L	-			
22152 - T62		10/31/17	ÚM WÇE	-	-	-			
^Galson Laboratories will subs	ititute our r	outine/preferred meth	od if it does not mat	tch the method listed on t	the COC unless this box	is checked: Use method(s) listed on COC		
For metals analysis: if requesting	ng an analyt	e with the option of a	ower LOQ, please in	dicate if the lower LOQ is	required (only available	for certain analytes - see SAG):		
For crystalline silica: form(s) of	silica neede	d must be indicated (C	Quartz, Cristobalite, a	nd/or Tridymite)* :					
Chain of Custody	Prin	t Name/Signature		Date Time		Print Nam	e/Signature	, Da	ate Time
Relinquished by Romain	Mathevet	(4)	1	1/01/17 10:00	Received by :	Homa Sie		0, 11/3)	17 2:1301
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		ne-	<u> </u>	<u> Report Referen</u>	ice: 1 'Generated'	#34NOOU15779.256being	hioressea.		<u> </u>

90134

The TTC file number/purchase order number is PU240835:

- 1) Total Metals by NIOSH 7300. Analyze for antimony, arsenic, barlum, beryllium, cadmium, calcium oxide, chromium III, cobalt, copper, lead, manganese, and selenium.
- 2) <u>Asbestos fibre count by NIOSH 7400.</u> In addition, analyze specifically for asbestos by FEM if the fibre count result exceeds 0.01 f/cc.
- 3) Respirable silica and respirable dust by NIOSH 7500/0600. Analyze for quartz, PFI PW PVC cristobalite, tridymite, and dust.
- 4) Respirable metals by NIOSH 7300. Analyze for aluminum, cadmium, iron oxide, PT WWMCE 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 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.



GALSON

6601 Kirkville Road

East Syracuse, NY 13057

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FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L424369

Project No. : 22152

Date Sampled : 02-NOV-17 Date Analyzed : 07-NOV-17 - 08-NOV-17

Date Received : 04-NOV-17 Report ID : 1029991

Date Sampled: 11/02/17 Date Analyzed: 11/07/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		-
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

Collection Media:	MCE UW 37mm 08-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: TJB
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOO-Limit of Ouantitation



6601 Kirkville Road
East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L424369

Project No. : 22152

Date Sampled : 02-NOV-17 Date Analyzed : 07-NOV-17 - 08-NOV-17

Date Received : 04-NOV-17 Report ID : 1029991

Date Sampled: 11/02/17 Date Analyzed: 11/07/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		· ————
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

Collection Media:	MCE UW 37mm 08-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: TJB
<pre>< -Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Site Login No. : L424369

Project No. : 22152

Date Sampled : 02-NOV-17 Date Analyzed : 07-NOV-17 - 08-NOV-17

Date Received : 04-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

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	ug		
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

Collection Media	: MCE UW 37mm : 08-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: TJB
<pre></pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734

6601 Kirkville Road Site : NS Login No. : L424369 East Syracuse, NY 13057 Project No. : 22152

(315) 432-5227 Date Sampled : 02-NOV-17 Date Analyzed : 07-NOV-17 - 08-NOV-17

FAX: (315) 437-0571 Date Received : 04-NOV-17 Report ID : 1029991

	LOQ	Total	Conc	Units
<u>Parameter</u>	uq	uq		
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

Collection Date		MCE UW 37mm 08-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG	QC	by: TJB
< -Less	Than	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable		ND -Not Detected
> -Great	ter Than	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Milli		LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L424369

6601 Kirkville Road Site : NS Login No. : L42
East Syracuse, NY 13057 Project No. : 22152

(315) 432-5227 Date Sampled : 02-NOV-17 Date Analyzed : 07-NOV-17 - 08-NOV-17

FAX: (315) 437-0571 Date Received : 04-NOV-17 Report ID : 1030133

Date Sampled: 11/02/17 Date Analyzed: 11/08/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>	·	
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	ma/m3

Collection Media: Date :	IOM 25mm MCE 08-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	! by: TJB
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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Project No. : 22152

Date Sampled : 02-NOV-17 Date Analyzed : 07-NOV-17 - 08-NOV-17

Date Received : 04-NOV-17 Report ID : 1030133

Date Sampled: 11/02/17 Date Analyzed: 11/08/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		<u> </u>
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

Collection Media: Date :	IOM 25mm MCE 08-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: TJB
<pre>-Less Than > -Greater Than</pre>	5	m3 1		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734

Login No. : L424369 Site

Project No. : 22152

Date Sampled : 02-NOV-17 Date Analyzed : 09-NOV-17

Date Received : 04-NOV-17 Report ID : 1030331

Asbestos Fiber Count (A Rules)

			Fibers/	Fibers/	Fibers/	Air	Fibers/
	<u>Sample ID</u>	<u>Lab ID</u>	Fields	mm2	Filter	Volume (cc)	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 Ouantitation : 5.5 Fibers/ 100 Fields

Microscope field area : 0.00785 mm2 Filter collection area: 385 mm2

OC by: TJB

Supervisor: BDB

Submitted by : BTM

Approved by : BDB

Date: 09-NOV-17

< -Less Than

> -Greater Than

ND -Not Detected NS -Not Specified

NA -Not Applicable

cc -Cubic Centimeters



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LABORATORY ANALYSIS REPORT

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Project No. : 22152

Date Sampled : 02-NOV-17 Date Received : 04-NOV-17 Report ID : 1029718

Inhalable Dust

<u>Sample ID</u>	<u>Lab ID</u>	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 Submitted by: PAH

Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV Approved by : SPR

OSHA PEL : NA Date : 07-NOV-17 NYS DOH # : 11626

Collection Media : IOM 25mm MCE 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

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L424369

Project No. : 22152

Date Sampled : 02-NOV-17 Date Received : 04-NOV-17 Report ID : 1029699

Respirable Dust

Sample ID	<u>Lab ID</u>	Air Vol liter	Total mq	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 Submitted by: HVN

Analytical Method : mod. NIOSH 0600; Gravimetric Approved by : SPR

OSHA PEL : PNOR 5 mg/m3 (TWA) Date : 07-NOV-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm 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

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L424369

Project No. : 22152

Date Sampled : 02-NOV-17 Date Analyzed : 07-NOV-17 - 12-NOV-17

Submitted: NLO

Date Received : 04-NOV-17 Report ID : 1031149

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

			Air Vol		
Sample ID	<u>Lab ID</u>	Analyte	1	uq	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 Approved: CMR

OSHA PEL : 50 ug/m3 RCS Date : 13-NOV-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: TJB

NA -Not Applicable ND -Not Detected l -Liters mppcf -Million Particles per Cubic Foot



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

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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 preceding 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.

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L424369 (Report ID: 1030133):
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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.

NA -Not Applicable



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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.

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

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> 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.

> > PEL

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%

Method

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):

Parameter

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	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable





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Parameter

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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: 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.

Aluminum	+/-7.7%	96.9%	
Antimony	+/-9.8%	97.3%	
Arsenic	+/-7.6%	103%	
Barium	+/-6.5%	101%	

Accuracy

< -]	Less Than	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	ppm -Parts per Million	
> -(Greater Than	ug -Micrograms	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable

Mean Recovery



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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

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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LABORATORY FOOTNOTE REPORT

GALSON

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



6601 Kirkville Road East Syracuse, NY 13057

FAX: (315) 437-0571

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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.

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.

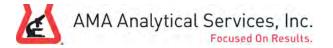
Parameter	Accuracy	Mean Recovery
	/ 12 00	
Cristobalite	+/-13.8%	101%
Quartz	+/-10.9%	93.4%
Tridymite	+/-13.6%	105%

< -Less Than -Greater Than mg -Milligrams ug -Micrograms

m3 -Cubic Meters l -Liters

kg -Kilograms NS -Not Specified ppm -Parts per Million ND -Not Detected

NA -Not Applicable



Galson Laboratories

6601 Kirkville Road

East Syracuse, NY 13057-9672

285038

CERTIFICATE OF ANALYSIS

Date Submitted: 11/10/2017

Date Analyzed: 11/17/2017

Report Date: 11/17/2017

Date Sampled: 11/02/2017

Person Submitting: Zach King

Lab Code 101143-0 NY FLAP

Lab ID 10920

Attention: Pam Weaver

Chain of Custody:

Client:

Address:

Summary of Transmission Electron Microscopy

Filter Type:	MCE	Pore Size:	0.8 um	Filter Size:	25 mm (385 mm ²)

Not Provided

Job Location: Not Provided

Job Number: L424369

P.O. Number: 90734

Job Name:

AMA Sample Number	Client Sample Number	Volume (L)	Area Analyzed (mm²)		Asbestos Type Amount	# Non Asbestos Structures	Conce	ntration Fra	ction Sample Type	Comments
				f/cc			f/mm²	f/cc		
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.

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

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a mutual protection to clients, the public, and these Laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from us. Sample types, locations, and collection protocols are based upon the information provided by the persons submitting them and, unless collected by personnel of these Laboratories, we expressly disclaim any knowledge and liability for the accuracy and completeness of this information. Residual sample material will be discarded in accordance with the appropriate regulatory guidelines, unless otherwise requested by the client. This report must not be used to claim, and does not imply product certification, approval, or endorsement by NY ELAP or any agency of the Federal Government. All rights reserved. AMA Analytical Services, Inc.

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

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

2. Address 1:	Client Name: 53/50n		Submittal Information: 1. Job Name:	
4. Contact Person: Am Web Cell:				
4. Contact Person: Am Web Cell:			3 Joh#: 424369	PO# 90734
S. Phone #: Fax #: 5. Collected by:			4 Contact Person: Pam Waa vay	Cell:
AFTER HOURS (must be pre-scheduled) AFTER HOURS (Must Betain Explain Expl	Phone #: Ear #	#.	5 Collected by: 73ch 16 inc	Cell:
AFTER HOURS (must be pre-scheduled)	Reporting Info (Results provided as soon	as technically feasible) If no TA	C/Reporting Info is provided, AMA will assign	on defaults of 5-Day and email/fax to contacts on file.
4 Hours	AFTER HOURS (must be pre-scheduled)	NORMAI		
Immediate Date Due:	Hours	☐ 4 Hours	A STATE OF THE STA	D Empile
Asbestos Analysis	nmediate Date Due:	Same Day	Results Required by Noon	
Asbestos Analysis *PCM Air - Please Indicate Filter Type:	+ Hours Time Due:	Date Due:	// ///)	
*PCM Air - Please Indicate Filter Type:	nments:	= 2200		
Date/Time: Contact:By:	M Air - Please Indicate Filter Type: □ NIOSH 7400	PLM/TEM_(Quan) ELAP 198.4/Chatfit NY State PLM/TEM Residual Ash TEM Dust* Qual. (pres/abs) Vacu Quan. (s/area) Vacu Quan. (s/area) Dust TEM Water Qual. (pres/abs) ELAP 198.2/EPA 1 ELAP 198.2/EPA 1 FPA 100.1 CTEM Water samples PLM/TEM_(Quan) If field data sheets are sub	Id(QTY)	b Paint Chip
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Received by: Page 19 of 22 Report Reference:1 Generated:21-NOV-17 17:43		Page 19 of 22 Report	Reference:1 Generated:21-NOV-17 17	
□USPS □ Courrier			MOV	
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300		AMA	Report To:	Shelly K	rause	Invoice To:	Jeanne (Glisson
-	Cho	eck if change	report to .	SGS Galson			SGS Galson	
GALS	ORIES of a	ddress		6601 Kirkv			6601 Kirkv	
6601 Kirkville Rd	Nev	v Client ? yes		East Syracuse			East Syracus	
East Syracuse, NY 13057-		no 🗌		888-432		Phone No. :		
Tel: 315-437-5227 888-432-LABS(5227)			Entrine distre			Fax No.	315-437	
Fax: 315-437-0571								
www.galsonlabs.com		Site Name :			Project :	L424369	Sampled By :	Client
Turnaround Time	Due Date		ization :					
✓ Standard	11/17/17			90734				
4 Business Days		Credit Ca	rd No. :		Card Holder Na	ime :		Exp. :
3 Business Days								
2 Business Days								
Next Day by 6pm		Fax Resu	ılts To :	Email Only Plea	ise	Fax No. :	Email Onl	y Please
Next Day by Noon				Syracuse.Subcontracting				
Same day								
Sample			Collection	*Air Volume (liters)/				
Identification	on	Date Sample	d Medium	Passive Monitors (Min)	Analysis	Requested	Method Reference	Fibers/fields
22152 - A6	63	11/2/2017	25mm MCE PCM	365.70	Transmission E	lectron Microscopy	NIOSH 7402; TEM	14.5/100
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Comments:							Onta	
	If th	e method being re	eported is not on you	r laboratory's current AIHA	scope of accredita	tion, please state the	at in your report.	
				ement in accordance with			A.5.4.3.**	D. L. CT.
Chain of Custody		Print Nam		Poporti Potovova 1 C	Signature			Date/Time
Relinquished by:		Zach Kin	g Page 20 of 22	Report Reference:1 G	enerated:Z1-NO	v-1/ 1/.43	1	1/9/2017 0:00
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		Client Account No.*	Suite 600 Suite 600 Suite 600 Suite 600 Toronto, ON M4S 3E2 Toronto, ON M					4S 3E2					
5X626A6948791809 te:11/04/17			Phone No.* : 41	·	19170	<u> </u>		 Phone N					
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L424369)		Samples submit	ted using	gthe FreePumpLoan™	Program	Samples s	submitted using th	e FreeSam	plingBadge	s™ Progra	am
Need Results By*:	(surcharge)			Samples submi		<u> </u>	- Togram						
☑ Standard	0%	Site Name :	· ·	<u> </u>	Proj	eċt: 22152		Samı	pled by: OHE (onsulta	nts		
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2 Business Days Next Day by 6pm	75% 100%				-	ngi area :	Provinc	e samples were	Please indicate v	vhich OEL 1	this data wi	li be used	for:
Check for availability an	pricing for	List description of	List description of industry or Process/interferences present in sampling area : Province samples were collected in (ex. ON) Please indicate which OEL this date of the collected in (ex. ON) MSHA Other (specific								Cal (AHZC	
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(Maxmium of 20 Characters, than 20 characters will be ab	. ID's langer	Date Sampled	Collection Medium	Sample Ti Sample Ar		L, ml,min,in2,cm2,ft2	ļ <u> </u>	Analysis Reques		Method	Reference^		(e.g., welding painting, etc.)*
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22152 - A64			25 mm PCM	 -		<u>-i</u>	Subwa	ay Air Quality S	tudy				
22152 - S63			PW PVC in PPI	719.22		L	-	<u> </u>				ļ	
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22152 - I61			PW PVC in IOM	719.94		L	-		<u> </u>	ļ		_	
22152 - 162			PW PVC in IOM	<u> </u>		-	<u> -</u>						
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^Galson Laboratories wi	ill subsititute ou	ur routine/preferred met	hod if it does not mate	the method l	isted on t	he COC unless this bo	is checke	ed: Use method	(s) listed on COC				
For metals analysis: if rec						equired (only available	e for certa	in analytes - see SAC	ā): ————————————————————————————————————				
For crystalline silica: forn	n(s) of silica nee	eded must be indicated (Quartz, Cristobalite, ar	nd/or Tridymite)*: 	· · · · · · · · · · · · · · · · · · ·					_		
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90134

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.
- Asbestos fibre count by NIOSH 7400. In addition, analyze specifically for asbestos by PCM TEM if the fibre count result exceeds 0.01 f/cc.
- 3) Respirable silica and respirable dust by NIOSH 7500/0600. Analyze for quartz, PFI PW PVC cristobalite, tridymite, and dust.
- 4) Respirable metals by NIOSH 7300. Analyze for aluminum, cadmium, Iron oxide, PPT WWMCE 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

AIHA-LAP #100324

Account# 90734

Login# L425242

November 29, 2017

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 Luab

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.



GALSON

6601 Kirkville Road
East Syracuse, NY 13057

(315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L425242

Project No. : 22152

Date Sampled : 07-NOV-17 Date Analyzed : 14-NOV-17 - 16-NOV-17

Date Received : 13-NOV-17 Report ID : 1031622

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	MCE UW 37mm 15-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: TJB
<pre></pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



6601 Kirkville Road East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734 Site Login No. : L425242

Project No. : 22152

Date Sampled : 07-NOV-17 Date Analyzed : 14-NOV-17 - 16-NOV-17

Date Received : 13-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

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media:	MCE UW 37mm 15-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: TJB
<pre>< -Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



GALSON

LABORATORY ANALYSIS REPORT

6601 Kirkville Road Sit

East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L425242

Project No. : 22152

Date Sampled : 07-NOV-17 Date Analyzed : 14-NOV-17 - 16-NOV-17

Date Received : 13-NOV-17 Report ID : 1031622

Date Sampled: 11/07/17 Date Analyzed: 11/14/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	uq		
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

Collection Media:	MCE UW 37mm 15-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: TJB
<pre>Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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East Syracuse, NY 13057

East Syracuse, NY 13057 (315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L425242

Project No. : 22152

Date Sampled : 07-NOV-17 Date Analyzed : 14-NOV-17 - 16-NOV-17

Date Received : 13-NOV-17 Report ID : 1031622

Date Sampled: 11/07/17 Date Analyzed: 11/14/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	uq	uq	·	
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

Collection Media:	MCE UW 37mm 15-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: TJB
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



6601 Kirkville Road

East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L425242

Project No. : 22152

Date Sampled : 07-NOV-17 Date Analyzed : 14-NOV-17 - 16-NOV-17

Date Received : 13-NOV-17 Report ID : 1032253

Date Sampled: 11/07/17 Date Analyzed: 11/16/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media:	IOM 25mm MCE 17-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: TJB
<pre>Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



6601 Kirkville Road

(315) 432-5227 FAX: (315) 437-0571

East Syracuse, NY 13057

www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734 Site Login No. : L425242

Project No. : 22152

Date Sampled : 07-NOV-17 Date Analyzed : 14-NOV-17 - 16-NOV-17

Date Received : 13-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

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	IOM 25mm MCE 17-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: TJB
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



: Toronto Transit Commission Ltd Account No.: 90734

Client 6601 Kirkville Road Site

Login No. : L425242

East Syracuse, NY 13057 (315) 432-5227

Project No. : 22152 Date Sampled : 07-NOV-17 Date Received : 13-NOV-17

Date Analyzed : 16-NOV-17 Report ID : 1032067

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Asbestos Fiber Count (A Rules)

			Fibers/	Fibers/	Fibers/	Air	Fibers/
	Sample ID	<u>Lab ID</u>	Fields	mm2	Filter	Volume (cc)	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 Ouantitation : 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

OC by: TJB

Supervisor: BDB

< -Less Than

> -Greater Than

ND -Not Detected NS -Not Specified

NA -Not Applicable

cc -Cubic Centimeters



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Client : Toronto Transit Commission Ltd Account No.: 90734 Login No. : L425242 Site

Project No. : 22152

Date Sampled : 07-NOV-17 Date Analyzed : 15-NOV-17

Date Received : 13-NOV-17 Report ID : 1031084

Inhalable Dust

Sample ID	<u>Lab ID</u>	Air Vol <u>liter</u>	Total mq	Conc mq/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 Submitted by: PAH

Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV Approved by : SAP/SPR

OSHA PEL : NA Date : 15-NOV-17 NYS DOH # : 11626

Collection Media : IOM 25mm MCE Supervisor: KRK QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected

-Liters > -Greater Than ug -Micrograms NS -Not Specified ppm -Parts per Million



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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L425242

Project No. : 22152

Date Sampled : 07-NOV-17 Date Received : 13-NOV-17 Report ID : 1031086

Respirable Dust

Sample ID	<u>Lab ID</u>	Air Vol liter	Total 	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 Approved by : SPR

OSHA PEL : PNOR 5 mg/m3 (TWA) Date : 16-NOV-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: TJB

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected

Submitted by: AS

> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million



GALSON

LABORATORY ANALYSIS REPORT

6601 Kirkville Road

East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L425242

Project No. : 22152

Date Sampled : 07-NOV-17 Date Analyzed : 15-NOV-17 - 20-NOV-17

Date Received : 13-NOV-17 Report ID : 1032698

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

			Air Vol		
Sample ID	<u>Lab ID</u>	<u>Analyte</u>	1	ug	ug/m3
22152-S65	L425242-5	Ouartz	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

Submitted: AJD

Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD Approved: KRK

OSHA PEL : 50 ug/m3 RCS Date : 20-NOV-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: TJB

NA -Not Applicable ND -Not Detected l -Liters mppcf -Million Particles per Cubic Foot



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LABORATORY FOOTNOTE REPORT

GALSON

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

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Any holder of this document is advised that information contained herein reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

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 preceding 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 (V205) 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

GALSON

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%

Method

rarameter	ne circu	
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 Pa	art.)TWA
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I Varies, see footno	ote
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	e) (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.

Darameter

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	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable

DET.



LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.

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: 1031622):

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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

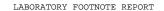
L425242-9-10 (Report ID: 1031622):

Reported results represent Respirable Metals.

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 Antimony	+/-7.7%	96.9% 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	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable



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LABORATORY FOOTNOTE REPORT

GALSON

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): 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 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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LABORATORY FOOTNOTE REPORT

GALSON

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

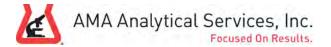
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26)

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%

NA -Not Applicable



CERTIFICATE OF ANALYSIS

Not Provided

0.8 um

Job Location: Not Provided

Pore Size:

0.006

Job Name:

Date Submitted: 11/20/2017

<8

Zach King

< 0.0239 0.0

25 mm (385 mm²)

N/P

NY FI AP 11/26/2017

Lab ID 10920

Galson Laboratories

286576

6601 Kirkville Road

East Syracuse, NY 13057-9672

Pam Weaver Attention:

Chain of Custody:

Client:

Address:

286576-2

Job Number: L425242 Report Date: 11/27/2017 P.O. Number: 90734 Date Sampled: 11/07/2017

2

Summary of Transmission Electron Microscopy

/ 1								_	\	,	
AMA Sample Number	Client Sample Number	Volume (L)	Area Analyzed (mm²)		Asbestos Type Amount	# Non Asbestos Structures	Conce	ntration	Fraction	Sample Type	Comments
				f/cc			f/mm²	f/cc			
286576-1	22152-A65B	113.8	0.532	0.0064	0	3	<8	<0.0254	0.0	N/P	

0

22152-A65C Analytical procedures used meet or exceed NIOSH 7402 protocols.

MCE

121.0

0.532

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

Analyst(s): Michael Creaghan

Filter Type:

Technical Director

Date Analyzed:

Person Submitting:

Filter Size:

Andreas Saldivar

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

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AIHA-LAP (#100470) NVLAP (#101143-0) NY ELAP (10920)

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CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 286576

Mailing/Billing Information: 1. Client Name:		Submittal Information:	
1. Client Name:		1. Job Name:	
2. Address 1:		2. Job Location:	20-21
3. Address 2:		3. Job #:	P.O. #: 90734
4. Address 3:		ii commer i ersom	Cell:
5. Phone #:I			
Reporting Info (Results provided as se			ssign 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:	□ 4 Hours □ Same Day □ Next Day □ 2 Day NORMA □ 3 Day 5 Day 5 Day +	Results Required By Noon	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: NIOSH 7402 (QTY) NIOSH 7402 (QTY) Other (specify (QTY) PLM Bulk PEPA 600 - Visual Estimate (QTY) NY State Friable 198.1 (QTY) Grav. Reduction ELAP 198.6 (QTY) Other (specify (QTY) SAMPLE INFORMATION CLIENT ID # SAMPLE LOCATION/	□ NY State PLM/TEN □ Residual Ash TEM Dust* □ Qual. (pres/abs) Va □ Quan. (s/area) Vacu □ Quan. (s/area) Dust TEM Water □ Qual. (pres/abs) □ ELAP 198.2/EPA 1 Y) □ EPA 100.1 TY) □ All samples receive (TEM Water samples) TY (TEM Water samples)	Geld	als Analysis □ Pb Paint Chip
			Date/Time: Contact:By:
			Date/Time: Contact:By:
			Date/Time: Contact:By:
Print Name	Sig	ignature Date	Time Shipping Information
Relinquished by: Received by: Relinquished by: Received for Lab by:		Reference:1 Generated:29-NOV-17	17:19

SGS Galson Laboratory SGS Carboratory SBS Carbor			AMA	2.00.526					
State Province of sample Collection Passive Monitors (Min) Analysis Requested Method Reference Fiber Passive Monitors (Min) Passive Monitors (Min) Analysis Requested Method Reference Fiber Passive Monitors (Min) Analysis Requested Method Reference Fiber Passive Monitors (Min) Passive Monitors (Min) Analysis Requested Method Reference Fiber Passive Monitors (Min) Passive Monitors (Min) Analysis Requested Method Reference Fiber Passive Monitors (Min) Pas	ago "			Report To:			Invoice To:		
New Cleint Yes Fast Syracuse, NY 13057 Fast No. 315-437-0571	IGALSO								
East Synacuse. NY 1307-9672	LABORATO	JKIE2							
Tel: 315-437-527									
Site Name : Project : L425242 Sampled By : Client		9672	no 📋	Phone No.:	888-432	-5227			
Site Name : Project : L425242 Sampled By : Client Turnaround Time Due Date Verbal Authorization :	888-432-LABS(5227)						Fax No.	315-43	7-0571
Site Name: Project: L425242 Sampled By: Client Turnaround Time Due Date Verbal Authorization: Standard 11/29/17 A Business Days 3 Business Days Next Day by 6pm Same day Same day Same day Sample Identification Date Sampled Medium Date Sample C2152-A65B 11/7/2017 25mm MCE PCM 11/7/2017 25mm MCE PCM 1121.0 Comments: State/Province of sampling event									
Standard 11/29/17 4 Business Days 2 Business Days Next Day by 6pm Next Day by Noon Sample Identification Date Sampled 22152-A65B 11/7/2017 25mm MCE PCM 121.0 Transmission Electron Microscopy NIOSH 7402; TEM 11-1 State/Province of sampling event			Site Name :			Project:	L425242	Sampled By :	Client
Credit Card No.: Card Holder Name: Exp.: A Business Days 2 Business Days Next Day by 6pm Next Day by Noon Same day Sample Identification Date Sampled Medium Passive Monitors (Min) 22152-A65B 11/7/2017 25mm MCE PCM 113.8 Transmission Electron Microscopy NIOSH 7402; TEM 11-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1		Due Date	Verbal Authoriz	ation :					
3 Business Days 2 Business Days Next Day by Spm Sample Identification Date Sample 22152-A65B 11/7/2017 25mm MCE PCM 1121.0 Transmission Electron Microscopy NIOSH 7402; TEM 11-h Comments: State/Province of sampling events	✓ Standard	11/29/17		-					
Sample Date Sampled Date Sampl	4 Business Days		Credit Card	d No. :		Card Holder N	lame :		Exp.:
Next Day by 0pm Fax Results To : Email Only Please Fax No. : Email Only Please Email Only Please	3 Business Days								
Next Day by Noon Same day Sample Identification Date Sampled Medium Passive Monitors (Min) Analysis Requested Method Reference Fiber Passive Monitors (Min) Passive Monitors (Min) Analysis Requested Method Reference Fiber Passive Monitors (Min)	2 Business Days								
Next Day by Noon Same day Sample Identification Date Sampled Medium Passive Monitors (Min) Analysis Requested Method Reference Fiber Passive Monitors (Min) Analysis Requested Method Reference Fiber Passive Monitors (Min) Analysis Requested Method Reference Fiber Passive Monitors (Min) Passive Monitors (Min) Analysis Requested Method Reference Fiber Passive Monitors (Min) Next Day by 6pm		Fax Resul	ts To :	Email Only Plea	se	Fax No. :	Email On	ly Please	
Sample Identification Date Sampled Medium Passive Monitors (Min) Analysis Requested Method Reference Fiber. 22152-A65B 11/7/2017 25mm MCE PCM 113.8 Transmission Electron Microscopy NIOSH 7402; TEM 8/1 22152-A65C 11/7/2017 25mm MCE PCM 121.0 Transmission Electron Microscopy NIOSH 7402; TEM 11-h	Next Day by Noon								
Identification Date Sampled Medium Passive Monitors (Min) Analysis Requested Method Reference Fiber	Same day			· · · · · ·					
22152-A65B 11/7/2017 25mm MCE PCM 113.8 Transmission Electron Microscopy NIOSH 7402; TEM 8/1 22152-A65C 11/7/2017 25mm MCE PCM 121.0 Transmission Electron Microscopy NIOSH 7402; TEM 11-h Image: Comments of the c	Sample			Collection	*Air Volume (liters)/			Yı —	
22152-A65C 11/7/2017 25mm MCE PCM 121.0 Transmission Electron Microscopy NIOSH 7402; TEM 11-h	Identification	on	Date Sampled	Medium	Passive Monitors (Min)	Analysi	s Requested	Method Reference	Fiber/field
Comments: State/Province of sampling event	22152-A65	В	11/7/2017	25mm MCE PCM	113.8	Transmission I	Electron Microscopy	NIOSH 7402; TEM	8/100
	22152-A65	С	11/7/2017	25mm MCE PCM	121.0	Transmission I	Electron Microscopy	NIOSH 7402; TEM	11-Nov
									1.0
						1			
	Comments:								
If the method being reported is not on your laboratory's current AIHA scope of accreditation, please state that in your report.		If th							
Please provide an uncertainty statement in accordance with AIHA LQAP policy document Section 2A.5.4.3. Chain of Custody	Chain of Custodic I				ement in accordance with A			A.5.4.3.	Data/Tima
					Report Reference: 1/G			4.	
Relinquished by: Zach King Page 20 of 23 Report Reference:1/Generated:29-NOV-17 17:19 11/17/2017 17 Received by LAB:			Zach King	1 ago 20 01 20	TOPOS MINISTER OF	5.101dt0d.20 1 1 0	J 17 17.10		1/17/2017 17:01

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ني سو		New Client?	Report To* : Tr	oronto Transit (Commission	Invoice	To*: Toronto	Transit Comm	ission
SGS	CALCON	_		20 Yonge Stre				nge Street	1331011
X626A6948237177	CALCIIN	Client Account No		uite 600			Suite 606		
e:				oronto, ON M4	S 3E2			ON M4S 3E2	
.pper:UPS .tials:MAK			Phone No.* : 41	•		— Phone			
		!A2	Cell No. :			· Em	 nail :		
p:UNKNOWN			Email Results to : Vir	gil.Umali@ttc.ca & d	oheresults@ohecons	ultants.com P.O. I	No.: PU240835	5	-
1425242			Email address :		- · · · · -		Card Card on Fi		dit Card Info.
とコスワスコス		•		Canada, adaminata	in a thin European and a suffi	nn		- F (C P Dd	.TM 0
Need Results By*:	(surcharge)				ing the FreePumpLoan™	'Program Samples	submitted using the	e FreeSamplingBadge	es™ Program ————————————————————————————————————
Standard Standard	0%	Site Name :		P	roject: 22152	Sam	pled by: OHE C	Consultants	
4 Business Days	35%	Comments:							
3 Business Days	50%	TTC Sul	bway Air	Quality					
2 Business Days	75%					Ta	1 51 1 11 1		
Next Day by 6pm	100%	List description of indi	ustry or Process/interfe	rences present in samp	pling area :	Province samples were collected in (ex. ON)	I	vhich OEL this data wi	II be used for :
Check for availability an quicker turn around							1 🗀	Other (specify):	
Sample Identificat (Maxmium of 20 Characters. than 20 characters will be abl	ID's longer	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis Reque		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 A	nalyses for TTC		protting, pariting, etc.,
22152 - A65b		11/07/17	25 mm PCM	113.8	L	Subway Air Quality S			
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	-			
2152 - S66		11/07/17	PW PVC in PPI	-	-				
2152 - I63		11/07/17	PW PVC in IOM	978.1	L	-		-	
2152 - I64		11/07/17	PW PVC in IOM	· · · · · · · · · · · · · · · · · · ·	-	-			
2152 - 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	r routine/preferred metl	hod if it does not match	the method listed on	the COC unless this box	is checked: Use method	(s) listed on COC	1	·
_						e for certain analytes - see SA			··· .
For crystalline silica: form	(s) of silica need	ded must be indicated ((Quartz, Cristobalite, and	d/or Tridymite)* :					
Chain of Custody	Pri	int Name/Signature	[Date Time) Print Nar	me/Signature	Da	te Time
Relinquished by Yunr	ny Desiana Le	ee 🔨		08/17 13:30	Received by :	Husman Jan	1/2	11/10	11 3:301
Relinquished by	to ma	a Jail	111/	10/17 (n. og	Received by:	Michelle Krause	Michaelle 9	11/13	1048
	, (-)	* Re			will be considered as	next day's business eby2৪-১১০ ১৯না চাৰ্ডিস্টের্	g processed.) ————————————————————————————————————	Page_1_ of _2_

-25							_							
***			New Client?	Report To	*: Toron	nto Transit (Commission		Invoice	To*: Toronto	Trancit	Comm	ionion	
	SGS	GALSON				Yonge Stre				1920 Yo			<u>iission</u>	
-		UALOUN	Client Account No	o.*:	Suite					Suite 60			_	
				_		to, ON M4	S 3E2			Toronto,		S 3F2		<u> </u>
	1140 Sheppa Unit 5	rd Avenue West		Phone No.	*: 416-39	_			Phone		011 1014	OULZ		
		Ontario, Canada M	13K 2A2	Cell No			-			nail :		 _	<u>.</u>	
ı	Tel: 888-432 www.galso					mali@ttc.ca.&.c	heresults@ohecons			No.: <u>PU240835</u>				<u> </u>
	J			Email addres	<u></u>		Meressias (a) en espira	suitaniş.com		ard Card on Fi		Call for Cre	-1:4 C 1	<u>.</u>
_									5.55	Cald Oll 1		.all lot Cre	on Caro II	nto.
-	ed Results By*:	(surcharge)			Sampi	les submitted usi 	ng the FreePumpLoan ⁿ	M Program	Samples	submitted using th	e FreeSamp	slingBadge	es™ Progra	am
\mathbf{Z}_{-}	Standard	0%	Site Name :			Pr	oject: 22152		Sam	pled by: OHE (Consultar	nts		
	4 Business Days	35%	Comments:											
<u>-</u>	3 Business Days	50%	TTC Sui	away A	۱ir O	rolity.								
<u> </u>	2 Business Days	75%	TTC Sul	Jway F	<u> </u>	Janty								
<u> </u>	Next Day by 6pm	100%	List description of indu	ustry or Process/i	nterferences	present in samp	ling area :	Province san	nples were	Please indicate v	vhich OEL th	nis data wi	II be used	l for:
_ c	heck for availability an							collected in	(ex. ON)	OSHA PEL	ACGIH	TLV	Cal	OSHA
	quicker turn around			· .						☐ MSHA	Other (specify);		
	Sample Identifica (Maxmium of 20 Characters, than 20 characters will be ab	. ID's longer	Date Sampled	Collection Med	ium	ample Volume Sample Time Sample Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis Requested* Method Reference^ Pr		Process	ent Chromium (e.g., welding			
2215	2 - T65		11/07/17	UW MCE	976	.7	L	Standardiz	ed List of Ar	nalyses for TTC			plating, p	painting, etc.)*
2215	2 - T66		11/07/17	UW MCE	-		-	Subway A	ir Quality S	tudy				
											 			
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			te with the option of a l							s) listed on COC				
			ed must be indicated (Q					- CEITAIN ANA		<u> </u>				
	n of Custody		nt Name/Signature	-	Date	Time	Ţ		Print Nam	e/Signature		Dat	to T	Time
Relin	quished by Yuηr			<u> </u>	11/08/17		Received by :	11.140 -	- (- / /	_ _			
Relin	quished by	1esma	00-11	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	11010	6.002	 	Michelle	Krause	Michalle 4	0.00		17	7:701
		1 - 1 - W	1 3 12	Sam	nples receiv	ed after 3pm v	vill be considered as	next day's bus	iness)	<u> </u>	/	10481
			* Red	uredPfeedges,216	ilone 2 ⊗cor	Roberon Refe	itencey1reGenerati	eldy20yblQ\	mbolet 75et Pa	processed.	-	Р	age 2	of 2

90134

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) <u>Asbestos fibre count by NIOSH 7400.</u> In addition, analyze specifically for asbestos by PCM TEM if the fibre count result exceeds 0.01 f/cc.
- 3) Respirable silica and respirable dust by NIOSH 7500/0600. Analyze for quartz, PFI PW PVC cristobalite, tridymite, and dust.
- 4) Respirable metals by NIOSH 7300. Analyze for aluminum, cadmium, iron oxide, PPT WWMCE 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 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 the presentation of data and allow for the transition to the new logo.



GALSON

6601 Kirkville Road

East Syracuse, NY 13057

(315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L425214

Project No. : 22152

Date Sampled : 09-NOV-17 Date Analyzed : 14-NOV-17 - 16-NOV-17

Date Received : 13-NOV-17 Report ID : 1031612

Date Sampled: 11/09/17 Date Analyzed: 11/14/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>ug</u>		
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

Collection Media: Date :	MCE UW 37mm 15-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: TJB
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



6601 Kirkville Road
East Syracuse, NY 13057

East Syracuse, NY 1305 (315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L425214

Project No. : 22152

Date Sampled : 09-NOV-17 Date Analyzed : 14-NOV-17 - 16-NOV-17

Date Received : 13-NOV-17 Report ID : 1031612

Date Sampled: 11/09/17 Date Analyzed: 11/14/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		<u> </u>
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

Collection Media: Date :	MCE UW 37mm 15-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: TJB
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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(315) 432-5227 FAX: (315) 437-0571

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Client : Toronto Transit Commission Ltd Account No.: 90734

Site Login No. : L425214

Project No. : 22152

Date Sampled : 09-NOV-17 Date Analyzed : 14-NOV-17 - 16-NOV-17

Date Received : 13-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

	LOQ	Total	Conc	Units
<u>Parameter</u>	uq	uq		
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

Collection Media:	MCE UW 37mm 15-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: TJB
<pre>Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-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

Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L425214

Project No. : 22152

Date Sampled : 09-NOV-17 Date Analyzed : 14-NOV-17 - 16-NOV-17

Date Received : 13-NOV-17 Report ID : 1031612

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	uq		
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

Collection Media: Date :	MCE UW 37mm 15-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: TJB
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



FAX: (315) 437-0571

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(315) 432-5227

East Syracuse, NY 13057

LABORATORY ANALYSIS REPORT

GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L425214

Project No. : 22152

Date Sampled : 09-NOV-17 Date Analyzed : 14-NOV-17 - 16-NOV-17

Date Received : 13-NOV-17 Report ID : 1032251

Date Sampled: 11/09/17 Date Analyzed: 11/16/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	IOM 25mm PW PVC 17-NOV-17	ubmitted by: YS DOH # :		Approved by: JJL Supervisor: KEG	QC by: TJB
<pre>-Less Than > -Greater Than</pre>	3	ubic Meters iters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Millio	ND -Not Detected n LOQ-Limit of Quantitation



GALSON

6601 Kirkville Road Si

East Syracuse, NY 13057 (315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L425214

Project No. : 22152

Date Sampled : 09-NOV-17 Date Analyzed : 14-NOV-17 - 16-NOV-17

Date Received : 13-NOV-17 Report ID : 1032251

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	IOM 25mm PW PVC 17-NOV-17	ubmitted by: YS DOH # :		Approved by: JJL Supervisor: KEG	QC by: TJB
<pre>-Less Than > -Greater Than</pre>	3	ubic Meters iters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Millio	ND -Not Detected n LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd Account No.: 90734 Login No. : L425214 6601 Kirkville Road Site

East Syracuse, NY 13057 Project No. : 22152

(315) 432-5227 Date Sampled : 09-NOV-17 Date Analyzed : 16-NOV-17 FAX: (315) 437-0571 Date Received : 13-NOV-17 Report ID : 1032065

Asbestos Fiber Count (A Rules)

		Fibers/	Fibers/	Fibers/	Air	Fibers/
Sample ID	<u>Lab ID</u>	Fields	mm2	<u> Filter</u>	Volume (cc)	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 Approved by : RCF Limit of Ouantitation: 5.5 Fibers/ 100 Fields Date: 16-NOV-17

Microscope field area : 0.00785 mm2 Filter collection area: 385 mm2

Supervisor: BDB

OC by: TJB

NS -Not Specified

Submitted by : BTM

< -Less Than > -Greater Than ND -Not Detected

NA -Not Applicable cc -Cubic Centimeters

mm2 -Square millimeters



LABORATORY ANALYSIS REPORT

6601 Kirkville Road

East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L425214

Project No. : 22152

Date Sampled : 09-NOV-17 Date Received : 13-NOV-17 Report ID : 1031070

Inhalable Dust

<u>Sample ID</u>	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 Submitted by: GMG

Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV Approved by : SPR

OSHA PEL : NA Date : 15-NOV-17 NYS DOH # : 11626

Collection Media : IOM 25mm PW PVC 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



LABORATORY ANALYSIS REPORT

6601 Kirkville Road
East Syracuse, NY 13057

East Syracuse, NY 13057 (315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L425214

Project No. : 22152

Date Sampled : 09-NOV-17 Date Received : 13-NOV-17 Report ID : 1031071

Respirable Dust

Sample ID	<u>Lab ID</u>	Air Vol liter	Total mq	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 Submitted by: AS

Analytical Method : mod. NIOSH 0600; Gravimetric Approved by : SPR

OSHA PEL : PNOR 5 mg/m3 (TWA) Date : 16-NOV-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm 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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Client : Toronto Transit Commission Ltd Account No.: 90734

Login No. : L425214 Site

Project No. : 22152

Date Sampled : 09-NOV-17 Date Analyzed : 15-NOV-17 - 20-NOV-17

Submitted: AJD

Approved: KRK

Date Received : 13-NOV-17 Report ID : 1032697

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

			Air Vol		
Sample ID	<u>Lab ID</u>	<u>Analyte</u>	1	<u>uq</u>	ug/m3
22152-S67	L425214-3	Ouartz	668.5	<5.0	<7.5
22132 507	1113211 3	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

Date : 20-NOV-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: TJB

-Parts per Million < -Less Than mg -Milligrams kg -Kilograms ppm > -Greater Than ug -Micrograms m3 -Cubic Meters -Not Specified

NA -Not Applicable ND -Not Detected -Liters mppcf -Million Particles per Cubic Foot



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LABORATORY FOOTNOTE REPORT

GALSON

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

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Any holder of this document is advised that information contained herein reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

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 preceding 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 (V205) 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

GALSON

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%

Method

rarameter	I-IC CII	ou					F 13 13
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.

Darameter

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	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable

DET.



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L425214 (Report ID: 1031612):

LABORATORY FOOTNOTE REPORT

GALSON

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

```
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
```

L425214-7-8 (Report ID: 1031612):

Reported results represent Respirable Metals.

TLV for ZINC OXIDE: 2 mg/m3 (Respirable)
TLV for MOLYBDENUM: Varies, see footnote

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%

|--|



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

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)

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<	-Less Than	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	ppm -Parts per Million	
>	-Greater Than	ug -Micrograms	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable



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LABORATORY FOOTNOTE REPORT

GALSON

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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LABORATORY FOOTNOTE REPORT

GALSON

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: 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 Quartz	+/-13.8% +/-10.9%	101% 93.4%
Tridymite	+/-13.6%	105%

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms ppm -Parts per Million
> -Greater Than ug -Micrograms 1 -Liters NS -Not Specified ND -Not Detected NA -Not Applicable

Z5X626A6948237177 ate:11/13/17 hipper:UPS nitials:MAK	(surcharge) 0% 35%	New Client? Client Account No.	t: Su To Phone No.*: 416 Cell No.: Email Results to : Viro Email address:	gil.Umali@ttc.ca & ol	et 3E2 neresults@oheconsu	Phone N Ema Iltants.com P.O. N Credit Co Program Samples s	1920 Yor Suite 600 Toronto, No.: ail: Card on File	ON M4S 3E2 e Call for Cred	dit Card Info.
3 Business Days 2 Business Days	50% 75%	TTC Sub	oway Air	Quality					
Next Day by 6pm Check for availability an quicker turn around		List description of indu	istry or Process/interfer	rences present in sampl	ing area :	Province samples were collected in (ex. ON)	OSHA PEL	/hich OEL this data wil ACGIH TLV Other (specify):	II be used for: Cal OSHA
Sample Identifica (Maxmium of 20 Characters. than 20 characters will be ab	ID's fonger	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis Reque	sted*	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 Ar	nalyses for TTC		
22152 - A68		11/09/17	25 mm PCM	-	-	Subway Air Quality S	tudy		
22152 - S67		11/09/17	PW PVC in PPI	668.5	L	-			
22152 - S68		11/09/17	PW PVC in PPI	-	-	-			
22152 - 165		11/09/17	PW PVC in IOM	670.8	L	-			
22152 - 166		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 ∄pc	669.9	L	-			
22152 - T68		11/09/17	UW MCE	-	-	-			
	 .		3/11/3/1	7					
			nod if it does not match	h the method listed on		is checked: Use method			
For crystalline silica: form					, and the second		<u></u>		
Chain of Custody		int Name/Signature		Date Time		. 1 Primt Nar	ne/Signature	Da	ateTime
Relinquished by Yun				/10/17 10:00	Received by:	W/man Ja	7/	- 11//0	105.8 CILC
	tomar	1// 7	7 111	10/17 6:en	Received by :	Michelle Krause	man	June 11/13	15 10/91
			Sample:	s received after 3pm	will be considered as endentagemetriated	next day's business le20-iN/0Vr-samples48ein	f. r-ac		Page <u> 1</u> of <u>1</u>

90134

The TTC file number/purchase order number is PUZ40835:

- 1) <u>Total Metals by NIOSH 7300.</u> 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 PCM TEM if the fibre count result exceeds 0.01 f/cc.
- 3) Respirable silica and respirable dust by NIOSH 7500/0600. Analyze for quartz, PFI PW PVC cristobalite, tridymite, and dust.
- 4) Respirable metals by NIOSH 7300. Analyze for aluminum, cadmium, iron oxide, ppg WWMCE molybdenum, and zinc oxide.
- 5) <u>Inhalable metals and inhalable dust by NIOSH 7300/0500.</u> 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 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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Client : Toronto Transit Commission Ltd Account No.: 90734

Login No. : L426412 Site : NS

Project No. : 22152

Date Sampled : 14-NOV-17 Date Analyzed : 28-NOV-17 Date Received : 22-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

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media	: MCE UW 37mm : 29-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: AMD
<pre></pre>	mg -Milligrams	m3 1	-Cubic Meters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOO-Limit of Ouantitation



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(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L426412

Project No. : 22152

Date Sampled : 14-NOV-17 Date Received : 22-NOV-17 Report ID : 1034209

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		-
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

Collection Media:	MCE UW 37mm 29-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG Q0	C by: AMD
<pre></pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L426412

Project No. : 22152

(315) 432-5227 Date Sampled : 14-NOV-17 Date Analyzed : 28-NOV-17 FAX: (315) 437-0571 Date Received : 22-NOV-17 Report ID : 1034209

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	uq		
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

	llection Media: te :	MCE UW 37mm 29-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG Q	C by: AMD
<	-Less Than	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
>	-Greater Than	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L426412

Project No. : 22152

Date Sampled : 14-NOV-17 Date Received : 22-NOV-17 Report ID : 1034209

<u>Parameter</u>	uq	uq		
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

Collection Media Date	: MCE UW 37mm : 29-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG Q0	C by: AMD
<pre></pre>	mg -Milligrams	m3 1	-Cubic Meters -Liters	kg -Kilograms	NA -Not Applicable	ND -Not Detected LOO-Limit of Ouantitation



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LABORATORY ANALYSIS REPORT

GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L426412

Project No. : 22152

Date Sampled : 14-NOV-17 Date Received : 22-NOV-17 Report ID : 1034175

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	IOM 25mm PW PVC 29-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: AMD
<pre>-Less Than > -Greater Than</pre>	5	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Project No. : 22152

Date Sampled : 14-NOV-17

Date Received : 22-NOV-17

Report ID : 1034175

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		<u> </u>
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

Collection Media: Date :	IOM 25mm PW PVC 29-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: AMD
<pre>-Less Than > -Greater Than</pre>	5	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Login No. : L426412 Site

Project No. : 22152

Date Sampled : 14-NOV-17 Date Analyzed : 29-NOV-17

Date Received : 22-NOV-17 Report ID : 1034279

Asbestos Fiber Count (A Rules)

			Fibers/	Fibers/	Fibers/	Air	Fibers/
	<u>Sample ID</u>	Lab ID	Fields	mm2	<u> Filter</u>	Volume (cc)	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 Ouantitation: 5.5 Fibers/ 100 Fields

Microscope field area : 0.00785 mm2 Filter collection area: 385 mm2

Date: 30-NOV-17OC by: AMD

Supervisor: BDB

Submitted by : BTM

Approved by : BDB

< -Less Than

> -Greater Than

cc -Cubic Centimeters

ND -Not Detected

NA -Not Applicable mm2 -Square millimeters NS -Not Specified



LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L426412

Project No. : 22152

Date Sampled : 14-NOV-17 Date Received : 22-NOV-17 Report ID : 1033441

Inhalable Dust

Sample ID	<u>Lab ID</u>	Air Vol liter	Total mq	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 Submitted by: AS

Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV Approved by : SPR

OSHA PEL : NA Date : 28-NOV-17 NYS DOH # : 11626

Collection Media : IOM 25mm PW PVC 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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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L426412

Project No. : 22152

Date Sampled : 14-NOV-17 Date Received : 22-NOV-17 Report ID : 1033442

Respirable Dust

Sample ID	<u>Lab ID</u>	Air Vol liter	Total mq	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 Submitted by: GMG

Analytical Method : mod. NIOSH 0600; Gravimetric Approved by : SPR

OSHA PEL : PNOR 5 mg/m3 (TWA) Date : 29-NOV-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 ND -Not Detected

> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million



LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L426412

Project No. : 22152

Date Sampled : 14-NOV-17 Date Analyzed : 29-NOV-17 - 02-DEC-17

Submitted: AJD

Date Received : 22-NOV-17 Report ID : 1034982

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

			Air Vol		
<u>Sample ID</u>	<u>Lab ID</u>	<u>Analyte</u>	1	uq	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 Approved: CMR

OSHA PEL : 50 ug/m3 RCS Date : 04-DEC-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: AMD

NA -Not Applicable ND -Not Detected l -Liters mppcf -Million Particles per Cubic Foot



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LABORATORY FOOTNOTE REPORT

GALSON

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

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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 preceding 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 (V205) 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 1 -Liters NS -Not Specified ND -Not Detected NA -Not Applicable



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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.

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
	4 10 50	1000
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
_	-Creater Than	ug -Migrograms	1	-Titere	NS -Not Specified	ND -Not Detected

NA -Not Applicable



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LABORATORY FOOTNOTE REPORT

GALSON

Client Name : Toronto Transit Commission Ltd.

Site :

Reported Results represent Respirable Metals.

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

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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):
```



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LABORATORY FOOTNOTE REPORT

GALSON

Client Name : Toronto Transit Commission Ltd.

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; I	[CD/T 15 mg/m3 (TWA)	
Antimony		7300/mod. OSHA ID-125G; I		
Arsenic		7300/mod. OSHA ID-125G; I		
Barium			ICP/I 0.5 mg/m3 (Soluble)) (ሞ₩Δ)
Beryllium			ICP/I 0.0002 mg/m3 (TWA)	(1 1111)
Cadmium		7300/mod. OSHA ID-125G; I		
Calcium Oxide		7300/mod. OSHA ID-125G;]		
outotum ontac	mod. Wiodii	. 555,	101,1 3 mg, mg (1M11)	
mg -Milligrams	m3 -Cubic Meters	kg -Kilograms g	ppm -Parts per Million	
ug -Milligrams	l -Liters		JD -Not Detected	NA -Not Applicable
ag micrograms	1 110019	THE THOSE EPECETIFICA I	ab 1400 beceeded	1411 140c 11ppiicabie



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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.

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-1	25G; ICP/I Varies, see footnote
Cobalt	mod. NIOSH 7300/mod. OSHA ID-1	25G; ICP/I 0.1 mg/m3 (TWA)
Copper	mod. NIOSH 7300/mod. OSHA ID-1	25G; ICP/I Varies, see footnote
Iron Oxide	mod. NIOSH 7300/mod. OSHA ID-1	25G; ICP/I 10 mg/m3 (Fume) (TWA)
Lead	mod. NIOSH 7300/mod. OSHA ID-1	25G; ICP/I 0.05 mg/m3 (TWA)
Manganese	mod. NIOSH 7300/mod. OSHA ID-1	25G; ICP/I 5 mg/m3 CEIL
Molybdenum	mod. NIOSH 7300/mod. OSHA ID-1	25G; ICP/I Varies, see footnote
Selenium	mod. NIOSH 7300/mod. OSHA ID-1	25G; ICP/I 0.2 mg/m3 (TWA)
Zinc Oxide	mod. NIOSH 7300/mod. OSHA ID-1	25G; ICP/I 5 mg/m3 (Fume) (TWA)
port ID: 1034279):		
The sample results may have	e a negative bias; the filter surface was cove	ered by

+L426412-1-2 (Repo

fine particulate that may have obscured fibers.

L426412 (Report ID: 1034279):

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

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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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.

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)

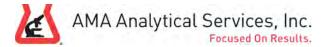
L426412 (Report ID: 1034982):

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 Quartz	+/-13.8% +/-10.9%	101% 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



CERTIFICATE OF ANALYSIS

Chain of Custody: 286379

Client: Galson Laboratories

Address: 6601 Kirkville Road

East Syracuse, NY 13057-9672

Pam Weaver Attention:

Job Name: Not Provided

Job Location: Not Provided

Job Number: L426412

P.O. Number: 90734

Date Submitted:

Date Analyzed: 12/08/2017

12/01/2017

Report Date: 12/08/2017

Date Sampled: 11/14/2017

Person Submitting: Zach King

NY ELAP Lab ID 10920

Summary of Transmission Electron Microscopy

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

AMA Sample Number	Client Sample Number	Volume (L)	Area Analyzed (mm²)	Analytical Sensitivity f/cc	Asbestos Type Amount	# Non Asbestos Structures	_		ction Sample Type	Comments
286379-1	22152-A69A	143.8	0.532	0.005	0	0	f/mm ² <8	f/cc <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.

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

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a mutual protection to clients, the public, and these Laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from us. Sample types, locations, and collection protocols are based upon the information provided by the persons submitting them and, unless collected by personnel of these Laboratories, we expressly disclaim any knowledge and liability for the accuracy and completeness of this information. Residual sample material will be discarded in accordance with the appropriate regulatory guidelines, unless otherwise requested by the client. This report must not be used to claim, and does not imply product certification, approval, or endorsement by NY ELAP or any agency of the Federal Government. All rights reserved. AMA Analytical Services, Inc.

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

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)

2. Address 2:	Mailing/Billing Information:		Submittal Information: 1. Job Name:		
3. Address 2: 4. Address 3: 5. Phone #: Reporting Info (Results provided as soon as technically feasible). If no TATReporting Info is provided, AMA will assign defaults of 5-hay and email/lax to contacts on file. AFTER INCURS (must be pre-scheduled) 3 Hours 1 Same Day 2 Hours 1 Same Day 2 Same Day 3 Day 3 Day 3 Day 3 Day 4 Hours 1 Same Day 3 Day 4 Hours 1 Same Day 3 Day 4 Hours 1 Same Day 3 Day 4 Hours 1 Same Day 3 Day 4 Hours 1 Same Day 3 Day 4 Hours 1 Same Day 3 Day 4 Hours 1 Same Day 4 Hours 1 Same Day 1 Sam	2 Address 1:		2 Inh I mestions		3
S. Phone #: Fax #: 5. Collected by: Reporting Info (Results provided as sona as technically feasible). If no TATREPORTIng Info is provided, AMA will assign defaults of 5-Day and email/fax to contacts on file. APTER BOURS (must be pre-schoduled) I Hours Immediate Date Due: Same Day 23 Day 24 Hours Same Day 24 Hours Same Day 25 Day 25 Day 26 Day 27 Day 28 Day 29 Day 29 Day 29 Day 29 Day 29 Day 20 Day 20 Day 20 Day 20 Day 20 Day 20 Day 20 Day 20 Day 21 Day 21 Day 22 Day 23 Day 24 Hours Date Due: Date D			3. Job #: L47.6t	112	PO #: 9073H
S. Phone #: Fax #: 5. Collected by: Cell: Reporting Info (Results provided as soon as technically feasible). If no TATREPORTing Info is provided, AMA will assign defaults of 5-bay and email/fax to contacts on file. APTER BOURS (must be pre-schooled) AFTER BOURS (must be pre-schooled) ARABOLIS (MUST BOURS (must be pre-schooled) ARABOLIS (MUST BOURS (must be pre-schooled) AFTER BOURS (must be pre-schooled) AFTER BOURS (must be pre-schooled) AFTER BOURS (must be pre-schooled) ARABOLIS (MUST BOURS (must be pre-schooled) AFTER BOURS (must be pre-schooled) AFTER BOURS (must be pre-schooled) ARABOLIS (MUST BOURS (must be pre-schooled) ARABOLIS (MUST BOURS (must be pre-schooled) ARABOLIS (MUST BOURS (must be pre-schooled) ARABOLIS (MUST BOURS (must be pre-schooled) ARABOLIS (MUST BOURS (must be pre-schooled) ARABOLIS (MUST BOURS (must be pre-schooled) ARABOLIS (MUST BOURS (must be pre-schooled) ARABOLIS (MUST BOURS (must be pre-schooled) AR			4. Contact Person: PC	em Wearse	Cell:
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3 Day Same Day S	Reporting Info (Results provided as	soon as technically feasible). If no	o TAT/Reporting Info is provid	ed, AMA will assign	n defaults of 5-Day and email/fax to contacts on file.
#ECMATE - Please Indicate Filter Type: NINSBI 7400	☐ 4 Hours ☐ Immediate Date Due: ☐ 24 Hours Time Due: Comments:	☐ 4 Hours ☐ Same Day ☐ Next Day ☐ Next Day ☐ Date Date	And the same of th		D Email:
Pring Name Signature Date Time Shipping Information Relinquished by: Pring Name Signature Date Time Shipping Information Other	*PCM Air - Please Indicate Filter Type: NIOSH 7400	PLAP 198.4/C NY State PLM Residual Ash TEM Dust* Qual. (pres/ab Quan. (s/area) Quan. (s/area) TEM Water Qual. (pres/ab) Qual. (pres/ab Qual. (pres/ab) Qual. (pre	M/TEM(QTY) os) Vacuum/Dust(QTY) Os) Vacuum/Dust(QTY) Os) Vacuum D5755-95((OTY)) os)(QTY) bs)(QTY) EPA 100.2(QTY) (QTY) eccived in good condition unless othe mples°C) are submitted, there is no need to complete	Pb Pb Pb Pb Pb Pb Pb Pb	Paint Chip
Relinquished by: ZQCM hin G Other			Signature	Date	Date/Time: Contact:By:
Received by: Received for Lab by: Received for Lab by: Received for Lab by:	Relinquished by: Received by: Relinquished by:	g		d:11-DEC-17 12:2	Clubs

2000		AMA						SP
300			Report To :	Shelly K		Invoice To:		
GALS	OIN of a	ck if change ddress		SGS Galson			SGS Galson	
LABORAT	OKIES	2.40.30.57		6601 Kirkvi			6601 Kirkv	
6601 Kirkville Rd		v Client ? yes	2.77	East Syracuse			East Syracuse	
East Syracuse, NY 13057- Tel: 315-437-5227	-9072	no 🗀	Phone No.:	888-432	-5227		888-432	
888-432-LABS(5227))					Fax No.	315-437	7-0571
Fax: 315-437-0571 www.galsonlabs.com								
		Site Name :			Project:	L426412	Sampled By :	Client
Turnaround Time	Due Date	Verbal Authoriz	ation :					
Standard	12/08/17			90734				
4 Business Days		Credit Card	No. :		Card Holder N	lame :		Exp.:
3 Business Days								
2 Business Days		7						
Next Day by 6pm		Fax Result	ts To :	Email Only Plea	se	Fax No. :	Email Onl	y Please
Next Day by Noon				Syracuse.Subcontracting				
Same day								
Sample			Collection	*Air Volume (liters)/				
Identification	on	Date Sampled	Medium	Passive Monitors (Min)	Analysi	s Requested	Method Reference	Fibers/field
22152 - A6	W	11/14/2017	25mm MCE PCM	143.8	Transmission I	Electron Microscopy	NIOSH 7402; TEM	10.5/100
22152 - A6		11/14/2017	25mm MCE PCM	7455	Transmission I	Electron Microscopy	NIOSH 7402; TEM	7/100
22102 - 710	00	11/14/2017	ZOTILIT WOLLT OW	201.0	Transmission	_iccircit iviidi coccepy	THOUT THE TEM	77.100
Comments:							State/Province of san Onta	
	If the			laboratory's current AIHA				
01-1-10-1-1				ement in accordance with A			A.5.4.3.**	Data/Tires
Chain of Custody		Print Name		Report Reference:1 G	Signatu			Date/Time
Relinquished by :	4	Zach King	1 aye 20 01 22	Keport Kelejelleri G		_0-11 12.21	11	/30/2017 17:12
Received by LAR .								

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SGS GALSON	New Client?	19	oronto Transit C 920 Yonge Stre		Invoi	1920 Yo	Transit Comm	ission
1Z5X626A6648744848 Date: 11/22/17 Shipper: UPS	Client Account No		uite 600 oronto, ON M48	3E2		-	00 , ON M4S 3E2	
Initials:KMS	2A2	Cell No. : Email Results to : Vir	gil.Umali@ttc.ca & o	heresults@ohecons	ultants.com P.C	ne No. : Email : D. No. : <u>PU24083</u>		
L426412 Need Results By*: (surcharge)	<u> </u>	Email address :	Samples submitted usir	<u> </u>		it Card Card on F les submitted using tl	ile Call for Cre he FreeSamplingBadge	
Standard 0% 4 Business Days 35% 3 Business Days 50% 2 Business Days 75%		Barcode bway Air	- Kms 11/22/1	oject : 22152 7	S	ampled by: OHE	Consultants	
Next Day by 6pm 100% Check for availability an pricing for quicker turn around times.	List description of ind	ustry or Process/interfe	rences present in sampl	ing area :	Province samples were collected in (ex. ON)	Please indicate OSHA PEL MSHA	which OEL this data wi ACGIH TLV Other (specify):	ill be used for : Cal OSHA
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 Red	quested*	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	;	promising partition of the promise o
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	-	<u> </u>		-
22152 - S70	11/14/17	PW PVC in PPI	_		-			
22152 - 167	11/14/17	PW PVC in IOM	685.6	L	-			
22152 - 168	11/14/17	PW PVC in IOM	_	-	-	.		
22152 - M69	11/14/17	UW MCE in PPI		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 substitute out	r routine/preferred metl	nod if it does not match	the method listed on t	he COC unless this box	is checked: Use meth	od(s) listed on COC		<u>. </u>
For metals analysis: if requesting an analy								
For crystalline silica: form(s) of silica need	ded must be indicated ((Quartz, Cristobalite, and	d/or Tridymite)* :	,·				
	int Name/Signature	(Date Time		Print N	ame/Signature	, Da	ite Time
Relinquished by Yunny Desiana Le	^\ <i>[7] /</i> }	11/	15/17 11:00	Received by:	K. Alichon		el 1/21	17 53)
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90134

The TTC file number/purchase order number is PUZ40835:

- 1) Total Metals by NIOSH 7300. Analyze for antimony, arsenic, barium, beryllium, cadmium, calcium oxide, chromium III, cobalt, copper, lead, manganese, and selenium.
- 2) <u>Asbestos fibre count by NIOSH 7400.</u> In addition, analyze specifically for asbestos by TEM if the fibre count result exceeds 0.01 I/cc.
- 3) Respirable silica and respirable dust by NIOSH 7500/0600. Analyze for quartz, PL PW PVC cristobalite, tridymite, and dust.
- 4) Respirable metals by NIOSH 7300. Analyze for aluminum, cadmium, iron oxide, PPT WWMCE 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 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.



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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS

6601 Kirkville Road Login No. : L426409 East Syracuse, NY 13057 Project No. : 22152

Date Sampled : 16-NOV-17 (315) 432-5227 Date Analyzed : 27-NOV-17 - 28-NOV-17

FAX: (315) 437-0571 Date Received : 22-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

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	MCE UW 37mm 28-NOV-17	Submitted NYS DOH #	•	Approved by: JJL Supervisor: KEG QC	C by: AMD
<pre></pre>	mg -Milligrams	m3 -Cubic Mete	rs kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	l -Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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6601 Kirkville Road

East Syracuse, NY 13057 (315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L426409

Project No. : 22152

Date Sampled : 16-NOV-17 Date Analyzed : 27-NOV-17 - 28-NOV-17

Date Received : 22-NOV-17 Report ID : 1033906

Date Sampled: 11/16/17 Date Analyzed: 11/27/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media:	MCE UW 37mm 28-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: AMD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1	- 1	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



6601 Kirkville Road
East Syracuse, NY 13057

East Syracuse, NY 13057 (315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L426409

Project No. : 22152

Date Sampled : 16-NOV-17 Date Analyzed : 27-NOV-17 - 28-NOV-17

Date Received : 22-NOV-17 Report ID : 1033906

Date Sampled: 11/16/17 Date Analyzed: 11/27/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	uq	<u>uq</u>		
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

Collection Media	: MCE UW 37mm : 28-NOV-17	Submitted : NYS DOH #	•	Approved by: JJL Supervisor: KEG QC	C by: AMD
<pre></pre>	mg -Milligrams ug -Micrograms	m3 -Cubic Mete	rs kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



6601 Kirkville Road

(315) 432-5227

East Syracuse, NY 13057

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734 Login No. : L426409

Site Project No. : 22152

Date Sampled : 16-NOV-17 Date Analyzed : 27-NOV-17 - 28-NOV-17

Date Received : 22-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

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	uq		
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

Collection Media:	MCE UW 37mm 28-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: AMD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1	- 1	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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6601 Kirkville Road
East Syracuse, NY 13057

East Syracuse, NY 13057 (315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L426409

Project No. : 22152

Date Sampled : 16-NOV-17 Date Analyzed : 27-NOV-17 - 28-NOV-17

Date Received : 22-NOV-17 Report ID : 1034491

Date Sampled: 11/16/17 Date Analyzed: 11/28/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	uq	<u>uq</u>	<u> </u>	
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	mq/m3

Collection Media: Date :	IOM 25mm PW PVC 30-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: AMD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



GALSON

6601 Kirkville Road

East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-0571

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Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L426409

Project No. : 22152

Date Sampled : 16-NOV-17 Date Analyzed : 27-NOV-17 - 28-NOV-17

Date Received : 22-NOV-17 Report ID : 1034491

Date Sampled: 11/16/17 Date Analyzed: 11/28/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	uq	<u>uq</u>		
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

Collection Media: Date :	IOM 25mm PW PVC 30-NOV-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	by: AMD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



6601 Kirkville Road

East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734 Login No. : L426409 Site

Project No. : 22152

Date Sampled : 16-NOV-17 Date Analyzed : 29-NOV-17

Date Received : 22-NOV-17 Report ID : 1034278

Asbestos Fiber Count (A Rules)

			Fibers/	Fibers/	Fibers/	Air	Fibers/
	Sample ID	<u>Lab ID</u>	Fields	mm2	<u> Filter</u>	<u>Volume (cc)</u>	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 Ouantitation: 5.5 Fibers/ 100 Fields

Microscope field area : 0.00785 mm2 Filter collection area: 385 mm2

OC by: AMD

Supervisor: BDB

Submitted by : BTM

Approved by : BDB

Date: 30-NOV-17

< -Less Than

> -Greater Than

ND -Not Detected NS -Not Specified

NA -Not Applicable

cc -Cubic Centimeters

mm2 -Square millimeters



CALSON

LABORATORY ANALYSIS REPORT

6601 Kirkville Road
East Syracuse NY 13057

East Syracuse, NY 13057 (315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L426409

Project No. : 22152

Date Sampled : 16-NOV-17 Date Received : 22-NOV-17 Report ID : 1033443

Inhalable Dust

Sample ID	<u>Lab ID</u>	Air Vol <u>liter</u>	Total mq	Conc mq/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 Submitted by: AS

Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV Approved by : SPR

OSHA PEL : NA Date : 30-NOV-17 NYS DOH # : 11626

Collection Media : IOM 25mm PW PVC 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



GALSON

LABORATORY ANALYSIS REPORT

6601 Kirkville Road

East Syracuse, NY 13057 (315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L426409

Project No. : 22152

Date Sampled : 16-NOV-17 Date Received : 22-NOV-17 Report ID : 1033444

Respirable Dust

Sample ID	<u>Lab ID</u>	Air Vol liter	Total mq	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 Submitted by: HVN

Analytical Method : mod. NIOSH 0600; Gravimetric Approved by : SPR

OSHA PEL : PNOR 5 mg/m3 (TWA) Date : 29-NOV-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 ND -Not Detected

> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million



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LABORATORY ANALYSIS REPORT

6601 Kirkville Road

East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L426409

Project No. : 22152

Date Sampled : 16-NOV-17 Date Analyzed : 29-NOV-17 - 02-DEC-17

Date Received : 22-NOV-17 Report ID : 1034924

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

			Air Vol		
Sample ID	<u>Lab ID</u>	<u>Analyte</u>	1	uq	uq/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 Submitted: SPR/AJD

Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD Approved: KRK

OSHA PEL : 50 ug/m3 RCS Date : 04-DEC-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: AMD

NA -Not Applicable ND -Not Detected l -Liters mppcf -Million Particles per Cubic Foot



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LABORATORY FOOTNOTE REPORT

GALSON

Client Name : Toronto Transit Commission Ltd.

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

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Any holder of this document is advised that information contained herein reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

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 (V205) 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 NS -Not Specified

ppm -Parts per Million ND -Not Detected

NA -Not Applicable



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LABORATORY FOOTNOTE REPORT

GALSON

Client Name : Toronto Transit Commission Ltd.

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: 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 mod. NIOSH 7300/mod. OSHA ID-125G; ICP/I Varies, see footnote Molybdenum 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 1 -Liters NS -Not Specified ND -Not Detected NA -Not Applicable





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East Syracuse, NY 13057 (315) 432-5227

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

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.

Reported from Oxide(Fe2O3) results assume that all detected from is present as from 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.

LABORATORY FOOTNOTE REPORT

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	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable





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GALSON

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

. / 6 5%	101%
+/-10.8%	103%
+/-8.6%	102%
+/-10.6%	105%
+/-11.2%	103%
+/-8.5%	103%
+/-10.3%	103%
+/-9.6%	106%
+/-9.1%	100%
+/-8.3%	99.8%
+/-7.6%	100%
+/-11.6%	105%
+/-8.9%	102%
	+/-10.6% +/-11.2% +/-8.5% +/-10.3% +/-9.6% +/-9.1% +/-8.3% +/-7.6% +/-11.6%

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	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable



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LABORATORY FOOTNOTE REPORT

GALSON

Client Name : Toronto Transit Commission Ltd.

Site :

Project No. : 22152

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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LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.

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	+/-13.8%	93.4%
Tridymite	+/-13.6%	105%

< -Less Than -Greater Than mg -Milligrams ug -Micrograms

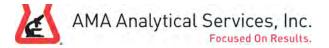
l -Liters

m3 -Cubic Meters

kg -Kilograms NS -Not Specified ppm -Parts per Million

ND -Not Detected

NA -Not Applicable



CERTIFICATE OF ANALYSIS

Chain of Custody: 286378

Client: Galson Laboratories

Address: 6601 Kirkville Road

East Syracuse, NY 13057-9672

Pam Weaver Attention:

Job Name: Not Provided Job Location: Not Provided

Job Number: L426409

P.O. Number: 90734

Date Submitted: Date Analyzed:

12/01/2017

12/08/2017

Report Date:

12/08/2017

Date Sampled: 11/16/2017

Person Submitting: Zach King

NY ELAP Lab ID 10920

Summary of Transmission Electron Microscopy

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

AMA Sample Number	Client Sample Number	Volume (L)	Area Analyzed (mm²)	•	Asbestos Type Amount	# Non Asbestos Structures	Conce	ntration	Fraction	Sample Type	Comments
				f/cc			f/mm²	f/cc			
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.

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

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a mutual protection to clients, the public, and these Laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from us. Sample types, locations, and collection protocols are based upon the information provided by the persons submitting them and, unless collected by personnel of these Laboratories, we expressly disclaim any knowledge and liability for the accuracy and completeness of this information. Residual sample material will be discarded in accordance with the appropriate regulatory guidelines, unless otherwise requested by the client. This report must not be used to claim, and does not imply product certification, approval, or endorsement by NY ELAP or any agency of the Federal Government. All rights reserved. AMA Analytical Services, Inc.

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

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AIHA-LAP (#100470) NVLAP (#101143-0) NY ELAP (10920)

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CHAIN OF CUSTODY

(Please Refer To This Number For Inquires)

286378

Mailing/Billing Information 1. Client Name:		Submittal Inform	nation:		
1. Client Name: 5415014		The state of the s			
2. Address 1:		2. Job Location:	1-1160		007211
3. Address 2:		3. Job #: <u>CYZ</u>	0509		P.O. #: 90734 Cell:
4. Address 3:		 Contact Perso 	n: Yam wea	Ner	_ Cell:
5. Phone #:					
Reporting Info (Results provided as s	oon as technically feasible). If	no TAT/Reporting Info is	provided, AMA will as	sign defaults of 5-Da	y and email/fax to contacts on file.
AFTER HOURS (must be pre-scheduled) 4 Hours Immediate Date Due: 24 Hours Time Due: Comments: Asbestos Analysis	4 Hours	Day Due: 2 8 7	sults Required By Noon	☐ Email 2:	REPORT TO:
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) EPA 600 - Visual Estimate (QTY) NY State Friable 198.1 (QTY) Grav. Reduction ELAP 198.6 (QTY) Other (specify (QTY) State Friable 198.1 (QTY) Grav. Reduction ELAP 198.6 (QTY) State Friable 198.1 (QTY) Grav. Reduction ELAP 198.6 (QTY) State Friable 198.1 (QTY) Grav. Reduction ELAP 198.6 (QTY) State Friable 198.1 (QTY) Grav. Reduction ELAP 198.6 (QTY) State Friable 198.1 (QTY) State Friable 198.1 (QTY) State Friable 198.1 (QTY) State Friable 198.1 (QTY) State Friable 198.1 (QTY) State Friable 198.1 (QTY) State Friable 198.1 (QTY) State Friable 198.1 (QTY) State Friable 198.1 (QTY) State Friable 198.1 (QTY) State Friable 198.1 (QTY) State Friable 198.1 (QTY) State Friable 198.1 (QTY) State Friable 198.1 (QTY) State Friable 198.1 (QTY) State Friable 198.1 (QTY) State Friable 198.1 (QTY)	NY State P Residual A TEM Dust* Qual. (pres Quan. (s/ar Quan. (s/a		—(QTY) —(QTY) —(QTY) Funga ΓΥ) ess otherwise noted.	*Pb Air Pb Soil/Solid Pb TCLP Drinking Water □ Pb Waste Water □ Pb Pb Furnace (Media Analysis Collection Apparatus for Collection Media *Spore-Trap (Q' *Surface Swab (0 *Surface Tape (0 Other (Specify)	ype
SAMPLE INFORMATION CLIENT ID # SAMPLE LOCATION	/ID DATE/ VOL (L)/	ANALYSIS ANALYSIS	CLL CLL	SWAB	(LABORATORY STAFF ONLY)
Stim Ed Edention	TIME Wipe Area E	7 2 2 2 4	B D B O BL		
				Date/Ti	me: Contact:By:
				Date/Ti	me: Contact:By:
				Date/Ti	ime: Contact:By:
Relinquished by: Zach King	Page 19 of 22	Signature Report Reference:1 Get	Date nerated:11-DEC-17	Time 12:23	Shipping Information Dodgs
Relinquished by: Received for Lab by:	161		12/17	1030	USPS Courrier Airbill/Tracking No:

Report To: Shelly Krause Invoice To: GALSON Check if change SGS Galson Laboratory of address	SGS Galson	
		Laboratory
	6601 Kirkvi	
LABORATORIES GLAUGICSS 6601 KIRKVIIIe Road		lle Road
6601 Kirkville Rd New Client ? yes East Syracuse, NY 13057	East Syracuse	
East Syracuse, NY 13057-9672 no Phone No. : 888-432-5227 Phone No. :	888-432	
888-432-LABS(5227) Fax No.	315-437	-0571
Fax: 315-437-0571 www.galsonlabs.com		
	Sampled By :	Client
Turnaround Time Due Date Verbal Authorization :		
Standard 12/08/17 90734		
4 Business Days Credit Card No. : Card Holder Name :		Exp. :
3 Business Days		3 11 1
2 Business Days		
Next Day by 6pm Fax Results To: Email Only Please Fax No. :	Email Only	Please
Next Day by Noon Email Results To: Syracuse.Subcontracting@sgs.com		
Same day		
Sample Collection *Air Volume (liters)/		
Identification Date Sampled Medium 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
2210271118 THIOLOGY Edition Model on 21111 Transmission Electron Ministratory	71100111102,1211	7.0.700
	A	
Comments:	State/Province of sam	pling event:
Somments.	Onta	
If the method hains reported in not an arrival the section is account AIIIA annual of approximation where the	at in your rone #	
If the method being reported is not on your laboratory's current AIHA scope of accreditation, please state tha **Please provide an uncertainty statement in accordance with AIHA LQAP policy document Section 2/	ас III your герогт. А 5 4 3 **	
Chain of Custody Print Name Signature	, ,, ,, , ,,	Date/Time
Relinquished by: Zach King Page 20 of 22 Report Reference/1 Generated:11-DEC-17 12:23	11/	30/2017 17:19
Received by LAB:	117	20/2017 11:10

1	-42640C	7		P	96	·				
	SGS	GALSON	New Client?	19	oronto Transit C 320 Yonge Stree uite 600		Invoice		Transit Comminge Street	ission
	5X626A6648744848		`` 		pronto, ON M4S	3E2	 		ON M4S 3E2	-
	te:11/22/17 ipper:UPS			Phone No.* : 41	6-393-6668	·	Phone		·· <u> </u>	-
Initials:KMS 			< 2A2	Cell No. :		<u>· </u>	Email:			
			Email Results to : <u>Virgil Umali@ttc.ca & oheresults@oheconsultants.com</u> Email address:					P.O. No.: PU240835 Credit Card Card on File Call for Credit Card Info.		
-	Need Results By*:	(surcharge)	/		Samples submitted usin	ig the FreePumpLoan™			e FreeSamplingBadge	
	✓ Standard	0%	Site Name :			ject: 22152		pled by: OHE C	Consultants	
	4 Business Days	35%	Comments: * 10'5	arc 22152	-I69 4 I7t	> - Did not	rec 57/4572 -	Kms 11/22	okai	1 Kms
	3 Business Days	50%	TTC Sub	oway Air	Quality	•				•
	2 Business Days Next Day by 6pm	75%				ing area :	Province samples were	Diago indicate v	vhich OEL this data wil	I be weed for
	Check for availability an quicker turn around	pricing for	List description of industry or Process/interferences present in sampling area : Province sam collected in (,		Cal OSHA
	Sample Identificat (Maxmium of 20 Characters. I than 20 characters will be abl	ID's longer	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis Reque	sted*	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 Ar	nalyses for TTC		paring, parining, ecc.,
	22152 - A71B		11/16/17	25 mm PCM	244.4	L	Subway Air Quality S	tudy		
	22152 - A72		11/16/17	25 mm PCM	-	-				
X	22152 - S71		11/16/17	PW PVC in PPI	984.2	L	-			_
X	22152 - S72		11/16/17	PW PVC in PPI	_		-			
	22152 - 169		11/16/17	PW PVC in IOM	975.6	L	_	··· - <u>-</u>		
	22152 - 170		11/16/17	PW PVC in IOM	-	-	-			; - :
	22152 - M71	-	11/16/17	UW MCE in PPI	969.1	L	-			
1	22152 - M72		11/16/17	UW MCE in PPI	-	-	-		2	
Ì	22152 - T71		11/16/17	UW MCE	967.9	L	-			
	22152 - T72		11/16/17	UW MCE	-	_				-
i	^Galson Laboratories will	subsititute our			the method listed on th	ne COC unless this box	is checked: Use method	(s) listed on COC		
ļ							for certain analytes - see SAC			-
Ì	For crystalline silica: form((s) of silica need	ed must be indicated (C	uartz, Cristobalite, and	l/or Tridymite)* :	<u> </u>				-
ľ	Chain of Custody	Prin	nt Name/Signature		Date Time		Print Nam	ne/Sjgnature	, Dat	te Time
[Relinquished by Yunn	y Desiana Le	e fuetos	11/	17/17 13:30	Received by :	KAhchone	11/22	(-4/1/21)	17 1530
	Relinquished by	Ahcho	ng Ka	45 116	-11 - 11 - 12 - 2	Received by :			ML 11/22	17 1030
	U		* Re		received after 3pm w		next day's business	n processed.	, · /	age_1_ of _1_

90134

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 PLM TEM if the fibre count result exceeds 0.01 f/cc.
- 3) Respirable silica and respirable dust by NIOSH 7500/0600. Analyze for quartz, PL PW PVC cristobalite, tridymite, and dust.
- 4) Respirable metals by NIOSH 7300. Analyze for aluminum, cadmium, iron oxide, PPT WWMCE 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 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

and Wear

Enclosure(s)



GALSON

6601 Kirkville Road

East Syracuse, NY 13057

(315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L428986

Project No. : 22152

Date Sampled : 04-DEC-17 Date Analyzed : 21-DEC-17 - 23-DEC-17

Date Received : 19-DEC-17 Report ID : 1039388

Date Sampled: 12/04/17 Date Analyzed: 12/21/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>ug</u>		
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

Collection Media: Date :	MCE UW 37mm 26-DEC-17		Submitted by: NYS DOH # :		Approved by: JJL/SJW Supervisor: KEG QC	by: CRD
<pre></pre>		m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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East Syracuse, NY 13057 (315) 432-5227

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L428986

Project No. : 22152

Date Sampled : 04-DEC-17 Date Analyzed : 21-DEC-17 - 23-DEC-17

Date Received : 19-DEC-17 Report ID : 1039388

Date Sampled: 12/04/17 Date Analyzed: 12/21/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		<u> </u>
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

Collection Media:	MCE UW 37mm 26-DEC-17		Submitted by: NYS DOH # :		Approved by: JJL/SJW Supervisor: KEG QC	by: CRD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1	- •	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L428986

Project No. : 22152

Date Sampled : 04-DEC-17 Date Analyzed : 21-DEC-17 - 23-DEC-17

Date Received : 19-DEC-17 Report ID : 1039388

Date Sampled: 12/04/17 Date Analyzed: 12/22/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media:	MCE UW 37mm 26-DEC-17	Submitted by: NYS DOH # :		Approved by: JJL/SJW Supervisor: KEG QC	by: CRD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L428986

East Syracuse, NY 13057 Project No. : 22152 (315) 432-5227 Date Sampled : 04-DEG

Date Sampled : 04-DEC-17 Date Analyzed : 21-DEC-17 - 23-DEC-17

Date Received : 19-DEC-17 Report ID : 1039388

LOO Total Units Conc <u>Parameter</u> uq uq Antimony 0.90 <0.90 NA mq/m30.30 Arsenic <0.30 NA mq/m3Barium 0.15 <0.15 mg/m3NA <0.15 Bervllium 0.15 NA mq/m3Cadmium 0.15 <0.15 NA mq/m3Calcium Oxide 100. <100 NA mq/m3Chromium 7.5 <7.5 NA mq/m3Cobalt 0.45 <0.45 NA mq/m30.30 <0.30 Copper NA mq/m3Lead 0.38 <0.38 NΑ mq/m3Manganese 0.15 <0.15 mq/m3NA Selenium 2.3 < 2.3 NA mq/m3

Collection Media:	MCE UW 37mm 26-DEC-17		Submitted by: NYS DOH # :		Approved by: JJL/SJW Supervisor: KEG QC	by: CRD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1	- •	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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FAX: (315) 437-0571

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LABORATORY ANALYSIS REPORT

Clie

Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L428986

East Syracuse, NY 13057 Project No. : 22152 (315) 432-5227 Date Sampled : 04-DEG

Date Sampled : 04-DEC-17 Date Analyzed : 21-DEC-17 - 23-DEC-17

Date Received : 19-DEC-17 Report ID : 1039662

Date Sampled: 12/04/17 Date Analyzed: 12/23/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	IOM 25mm PW PVC 26-DEC-17		Submitted by: NYS DOH # :		Approved by: SJW Supervisor: KEG QC	by: CRD
<pre>-Less Than > -Greater Than</pre>	5	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734
6601 Kirkville Road Site : NS Login No. : L428986

East Syracuse, NY 13057 Project No. : 22152

(315) 432-5227 Date Sampled : 04-DEC-17 Date Analyzed : 21-DEC-17 - 23-DEC-17

FAX: (315) 437-0571 Date Received : 19-DEC-17 Report ID : 1039662

Date Sampled: 12/04/17 Date Analyzed: 12/23/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	uq	<u>uq</u>		
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

Collection Media: Date :	IOM 25mm PW PVC 26-DEC-17		Submitted by: NYS DOH # :		Approved by: SJW Supervisor: KEG QC	by: CRD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L428986

Project No. : 22152

Date Sampled : 04-DEC-17 Date Received : 19-DEC-17 Report ID : 1039714

Asbestos Fiber Count (A Rules)

		Fibers/	Fibers/	Fibers/	Air	Fibers/
Sample ID	<u>Lab ID</u>	Fields	mm2	<u> Filter</u>	Volume (cc)	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 Ouantitation: 5.5 Fibers/ 100 Fields

Microscope field area: 0.00785 mm2 Filter collection area: 385 mm2

Approved by : BDB Date : 26-DEC-17 OC by: CRD

Submitted by : BTM

Supervisor: BDB

< -Less Than

> -Greater Than

ND -Not Detected NS -Not Specified

NA -Not Applicable

cc -Cubic Centimeters

mm2 -Square millimeters



MOZIAS

LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L428986

Project No. : 22152

Date Sampled : 04-DEC-17 Date Received : 19-DEC-17 Report ID : 1038456

Inhalable Dust

Sample ID	<u>Lab ID</u>	Air Vol liter	Total mq	Conc mg/m3
22152-171	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

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FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L428986

Project No. : 22152

Date Sampled : 04-DEC-17 Date Received : 19-DEC-17 Report ID : 1038457

Respirable Dust

Sample ID	<u>Lab ID</u>	Air Vol liter	Total mq	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 Submitted by: HVN

Analytical Method : mod. NIOSH 0600; Gravimetric Approved by : SPR

OSHA PEL : PNOR 5 mg/m3 (TWA) Date : 22-DEC-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm 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

6601 Kirkville Road

East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L428986

Project No. : 22152

Date Sampled : 04-DEC-17 Date Analyzed : 22-DEC-17 - 23-DEC-17

Date Received : 19-DEC-17 Report ID : 1039533

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

			Air Vol		
Sample ID	<u>Lab ID</u>	<u>Analyte</u>	1	uq	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 Submitted: SPR/AJD

Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD Approved: CMR

OSHA PEL : 50 ug/m3 RCS Date : 26-DEC-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: CRD

NA -Not Applicable ND -Not Detected l -Liters mppcf -Million Particles per Cubic Foot



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LABORATORY FOOTNOTE REPORT

GALSON

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

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Any holder of this document is advised that information contained herein reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

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 preceding 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 (V205) 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 1 -Liters NS -Not Specified ND -Not Detected NA -Not Applicable



LABORATORY FOOTNOTE REPORT

GALSON

Client Name : Toronto Transit Commission Ltd.

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):

6601 Kirkville Road

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East Syracuse, NY 13057 (315) 432-5227

> 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
P11	. / 14 19.	1049
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 l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable ug -Micrograms





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GALSON

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: 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

 ${\tt biased \ low.}$

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(Fe203) 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	m	3 -Cubic Meters	kg -Kilograms	ppm -Parts per Million
>	-Greater Than	ug -Micrograms	1	-Liters	NS -Not Specified	ND -Not Detected

NA -Not Applicable





6601 Kirkville Road East Syracuse, NY 13057

FAX: (315) 437-0571

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GALSON

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



FAX: (315) 437-0571

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East Syracuse, NY 13057 (315) 432-5227

LABORATORY FOOTNOTE REPORT

GALSON

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: 1039714):
                 The current intra-laboratory coefficients of variation (CVs) for the applicable fiber ranges are as
                 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):
                 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)
```

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



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LABORATORY FOOTNOTE REPORT

GALSON

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%



CERTIFICATE OF ANALYSIS

Date Submitted: 12/27/2017

Date Analyzed: 01/04/2018

Report Date: 01/04/2018

12/04/2017

Person Submitting: Zach King

Date Sampled:



Lab ID 10920

Chain of Custody:

604729

Galson Laboratories

Client: Address:

6601 Kirkville Road

East Syracuse, NY 13057-9672

Pam Weaver Attention:

Summary of Transmission Electron Microscopy

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

Not Provided

Job Location: Not Provided

Job Number: L428986

P.O. Number: 90734

Job Name:

AMA Sample Number	Client Sample Number	Volume (L)	Area Analyzed (mm²)	Analytical Sensitivity	Asbestos Type Amount	# Non Asbestos Structures	Conce	ntration	Fraction	Sample Type	Comments
				1/66			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.

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

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a mutual protection to clients, the public, and these Laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from us. Sample types, locations, and collection protocols are based upon the information provided by the persons submitting them and, unless collected by personnel of these Laboratories, we expressly disclaim any knowledge and liability for the accuracy and completeness of this information. Residual sample material will be discarded in accordance with the appropriate regulatory guidelines, unless otherwise requested by the client. This report must not be used to claim, and does not imply product certification, approval, or endorsement by NY ELAP or any agency of the Federal Government. All rights reserved. AMA Analytical Services, Inc.

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

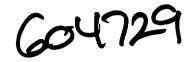


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CHAIN OF CUSTODY

(Please Refer To This Number For Inquires)



Mailing/Billing Inform 1. Client Name: GALS	nation: SON					ı bmitt I Job		forma	tion:							
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www.galsonlabs.com		Site Name :			Project:	L428986	Sampled By :	Client
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	If t	the method being r	eported is not on you	laboratory's current AIHA	scope of accreditation	n, please state tha	at in your report.	
		Please provi	de an uncertainty stat	ement in accordance with	THA LQAP policy do	cument Section 2	A.5.4.3.	
Chain of Custody		Print Nan		D. Add	Signature	2.40.05		Date/Time
Relinquished by :		Zach Kir	ng Page 20 of 22	Report Reference:1 Ge	enerated:05-JAN-18	3 12:25	12/2	26/2017 17:18
Received by LAB:								

Invoice To*: Toronto Transit Commission Report To*: Toronto Transit Commission New Client? 1920 Yonge Street 1920 Yonge Street 125X626A6647630463 Suite 600 Suite 600 Client Account No.*: Toronto, ON M4S 3E2 Toronto, ON M4S 3E2 Shipper:UPS Initials:CEM Phone No.*: 416-393-6668 2A2 Email: Cell No.: Prep: UNKNOWN Email Results to : Virgil.Umali@ttc.ca & oheresults@oheconsultants.com P.O. No.: PU240835 Credit Card Card on File Email address: Call for Credit Card Info. Samples submitted using the FreePumpLoan™ Program Samples submitted using the FreeSamplingBadges™ Program Need Results By*: (surcharge) Project: 22152 Sampled by: OHE Consultants Site Name: Standard 0% 4 Business Days 35% Comments: 3 Business Days 50% TTC Subway Air Quality 2 Business Days 75% Next Day by 6pm 100% List description of industry or Process/interferences present in sampling area: Province samples were Please indicate which OEL this data will be used for: collected in (ex. ON) OSHA PEL ACGIH TLV Cal OSHA Check for availability an pricing for ☐ MSHA Other (specify): quicker turn around times. Hexavalent Chromium Sample Volume Sample Identification* Samole Units*: (Maximum of 20 Characters, ID's longer Date Sampled Collection Medium Sample Time Analysis Requested* Method Reference^ Process (e.g., welding L. ml.min.in2.cm2.ft2 Sample Area* than 20 characters will be abbreviated.) plating, painting, etc.)* 22152 - A73A 12/04/17 25 mm PCM 120.98 Standardized List of Analyses for TTC 22152 - A73B 25 mm PCM* 113.92 Subway Air Quality Study 22152 - A73C 25 mm PCM 120.98 22152 - A73D 25 mm PCM 116.95 25 mm PCM₋ 22152 -A74 946.77 22152 - M73 UW MCE in PPI 22152 - M74 UW MCE in PPI 22152 - T73 **UW MCE** 930.19 22152 - T74 UW MCE

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

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)*:

Date:

Chain of Custody	Print Name/Signature	Date	Time		Print Name/Signature Date	Time
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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	New Client? Client Account No.	*: Sı	oronto Tra 920 Yonge uite 600 oronto, ON	Stree	et	Ir	nvoice T	1920 You Suite 600	Transit Comm nge Street O ON M4S 3E2	
1140 Sheppa Unit 5	ard Avenue West		Phone No.* : 41	6-393-6668				hone N	10. :		
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Mr. Virgil Umali Toronto Transit Commission Ltd. 1920 Yonge St Suite 600 Toronto, ON M4S 3E2 Canada

AIHA-LAP #100324

Account# 90734

Login# L428951

January 04, 2018

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)



LABORATORY ANALYSIS REPORT

GALSON

6601 Kirkville Road

East Syracuse, NY 13057

(315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L428951

Project No. : 22152

Date Sampled : 05-DEC-17 Date Analyzed : 21-DEC-17 - 23-DEC-17

Date Received : 19-DEC-17 Report ID : 1039384

Date Sampled: 12/05/17 Date Analyzed: 12/21/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media:	MCE UW 37mm 26-DEC-17		Submitted by: NYS DOH # :		Approved by: JJL/SJW Supervisor: KEG QC	C by: CRD
<pre>< -Less Than > -Greater Than</pre>	mg -Milligrams	m3 1	-Cubic Meters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOO-Limit of Ouantitation



MOSIA

LABORATORY ANALYSIS REPORT

6601 Kirkville Road
East Syracuse, NY 13057

(315) 432-5227 EAX: (315) 437-0571

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Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L428951

Project No. : 22152

Date Sampled : 05-DEC-17 Date Analyzed : 21-DEC-17 - 23-DEC-17

Date Received : 19-DEC-17 Report ID : 1039384

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		<u> </u>
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

Collection Media:	MCE UW 37mm 26-DEC-17		Submitted by: NYS DOH # :		Approved by: JJL/SJW Supervisor: KEG QC	by: CRD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1	- •	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L428951

East Syracuse, NY 13057 Project No. : 22152

(315) 432-5227 Date Sampled : 05-DEC-17 Date Analyzed : 21-DEC-17 - 23-DEC-17

Date Received : 19-DEC-17 Report ID : 1039384

Date Sampled: 12/05/17 Date Analyzed: 12/22/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media:	MCE UW 37mm 26-DEC-17		Submitted by: NYS DOH # :		Approved by: JJL/SJW Supervisor: KEG QC	by: CRD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L428951

East Syracuse, NY 13057 Project No. : 22152

Date Sampled : 05-DEC-17 Date Analyzed : 21-DEC-17 - 23-DEC-17

Date Received : 19-DEC-17 Report ID : 1039384

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	uq		
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

Collection Media:	MCE UW 37mm 26-DEC-17		Submitted by: NYS DOH # :		Approved by: JJL/SJW Supervisor: KEG QC	by: CRD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1	- •	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L428951

East Syracuse, NY 13057 Project No. : 22152

Date Sampled : 05-DEC-17 Date Analyzed : 21-DEC-17 - 23-DEC-17

Date Received : 19-DEC-17 Report ID : 1039659

Date Sampled: 12/05/17 Date Analyzed: 12/23/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	IOM 25mm PW PVC 26-DEC-17		Submitted by: NYS DOH # :		Approved by: SJW Supervisor: KEG QC	C by: CRD
<pre>-Less Than > -Greater Than</pre>	5	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L42895

6601 Kirkville Road Site : NS Login No. : L428951 East Syracuse, NY 13057 Project No. : 22152

(315) 432-5227 Date Sampled : 05-DEC-17 Date Analyzed : 21-DEC-17 - 23-DEC-17

FAX: (315) 437-0571 Date Received : 19-DEC-17 Report ID : 1039659

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		<u> </u>
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

Collection Media: Date :	IOM 25mm PW PVC 26-DEC-17		Submitted by: NYS DOH # :		Approved by: SJW Supervisor: KEG QC	C by: CRD
<pre>-Less Than > -Greater Than</pre>	5	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



LABORATORY ANALYSIS REPORT

GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734

6601 Kirkville Road Site : NS Login No. : L428951 East Syracuse, NY 13057 Project No. : 22152

(315) 432-5227 Date Sampled : 05-DEC-17 Date Analyzed : 26-DEC-17

FAX: (315) 437-0571 Date Received : 19-DEC-17 Report ID : 1039712 www.qalsonlabs.com

Asbestos Fiber Count (A Rules)

		Fibers/	Fibers/	Fibers/	Air	Fibers/
Sample ID	<u>Lab ID</u>	Fields	mm2	Filter	Volume (cc)	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 Submitted by : BTM

Analytical Method: mod. NIOSH 7400 "A" Rules Approved by: BDB Limit of Quantitation: 5.5 Fibers/ 100 Fields Date: 26-DEC-17

Microscope field area: 0.00785 mm2 QC by: CRD Filter collection area: 385 mm2 Supervisor: BDB

< -Less Than > -Greater Than ND -Not Detected

NA -Not Applicable cc -Cubic Centimeters NS -Not Specified

mm2 -Square millimeters



LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734 Login No. : L428951 Site

Project No. : 22152

Date Sampled : 05-DEC-17 Date Analyzed : 20-DEC-17 Date Received : 19-DEC-17 Report ID : 1038475

Inhalable Dust

Sample ID	<u>Lab ID</u>	Air Vol liter	Total mq	Conc mg/m3
22152-173	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 Submitted by: GMG

Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV Approved by : SPR

OSHA PEL

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

-Liters > -Greater Than ug -Micrograms NS -Not Specified ppm -Parts per Million

Date: 21-DEC-17

NYS DOH # : 11626



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LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L428951

Project No. : 22152

Date Sampled : 05-DEC-17 Date Received : 19-DEC-17 Report ID : 1038476

Respirable Dust

Sample ID	Lab ID	Air Vol liter	Total mq	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

Supervisor: KRK QC by: CRD

Submitted by: HVN

Approved by : SPR

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected

> -Greater Than ug -Micrograms l -Liters NS -Not Specified ppm -Parts per Million



MOSIAS

LABORATORY ANALYSIS REPORT

6601 Kirkville Road Site

East Syracuse, NY 13057 Project No.

(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L428951

Project No. : 22152

Date Sampled : 05-DEC-17 Date Received : 19-DEC-17 Report ID : 1039602

Hexavalent Chromium

Sample ID	Lab ID	Air Vol liter	Total uq	Conc ug/m3
22152-Н15	L428951-14	911.55	<0.030	<0.033
22152-н16	L428951-15	NA	<0.030	NA

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

Level of quantitation: 0.030 ug Submitted by: MCM

Analytical Method : mod. OSHA ID-215 (version 2); IC/UV Approved by : NKP

OSHA PEL : 5 ug/m3 (TWA) Date : 26-DEC-17 NYS DOH # : 11626

Collection Media : PVC UW 37mm Supervisor: MWJ 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

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(315) 432-5227 FAX: (315) 437-0571 www.galsonlabs.com Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L428951

Project No. : 22152

Date Sampled : 05-DEC-17 Date Analyzed : 22-DEC-17 - 25-DEC-17

Date Received : 19-DEC-17 Report ID : 1039581

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

			Air Vol		
<u>Sample ID</u>	<u>Lab ID</u>	<u>Analyte</u>	1	<u>uq</u>	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 Submitted: SPR/AJD

Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD Approved: CMR

OSHA PEL : 50 ug/m3 RCS Date : 26-DEC-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: CRD

NA -Not Applicable ND -Not Detected l -Liters mppcf -Million Particles per Cubic Foot



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LABORATORY FOOTNOTE REPORT

GALSON

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

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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 preceding 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 (V205) 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

GALSON

Client Name : Toronto Transit Commission Ltd.

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
		1040
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	Meth	od					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 l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable ug -Micrograms





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GALSON

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
22	. / 5 40	0.7.00
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	1	-Liters	NS -Not Specified	ND -Not Detected

NA -Not Applicable





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GALSON

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

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	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable



FAX: (315) 437-0571

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East Syracuse, NY 13057 (315) 432-5227

LABORATORY FOOTNOTE REPORT

GALSON

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
                 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):
                 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.
```

> -Greater Than ug -Micrograms l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable	<	-Less Than	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	ppm -Parts per Million	
	>	-Greater Than	ug -Micrograms	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable



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LABORATORY FOOTNOTE REPORT

GALSON

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

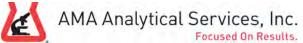
SOPs: ix-xrdreview(13), ix-xrdashprep(29), ix-calibrate(12), ix-xrdstdprep(26)

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%

m3 -Cubic Meters kg -Kilograms ppm -Parts per Million 1 -Liters NS -Not Specified ND -Not Detected NA -Not Applical
--



CERTIFICATE OF ANALYSIS

Job Number: L428951

Chain of Custody: 604734

Client: Galson Laboratories

Address: 6601 Kirkville Road

East Syracuse, NY 13057-9672

Pam Weaver Attention:

Job Name: Not Provided **Date Submitted:** 12/27/2017

Job Location: Not Provided Date Analyzed: 01/04/2018

P.O. Number: 90734 Date Sampled: 12/05/2017

> Person Submitting: Zach King

01/04/2018

Report Date:

NY ELAP Lab ID 10920

Summary of Transmission Electron Microscopy

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

AMA Sample Number	Client Sample Number	Volume (L)	Area Analyzed (mm²)	Analytical Sensitivity f/cc	Asbestos Type Amount	# Non Asbestos Structures	Conce	ntration I	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.

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

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a mutual protection to clients, the public, and these Laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from us. Sample types, locations, and collection protocols are based upon the information provided by the persons submitting them and, unless collected by personnel of these Laboratories, we expressly disclaim any knowledge and liability for the accuracy and completeness of this information. Residual sample material will be discarded in accordance with the appropriate regulatory guidelines, unless otherwise requested by the client. This report must not be used to claim, and does not imply product certification, approval, or endorsement by NY ELAP or any agency of the Federal Government. All rights reserved. AMA Analytical Services, Inc.

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



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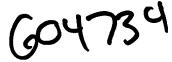
AIHA-LAP (#100470) NVLAP (#101143-0) NY ELAP (10920)

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)



1. Job Name:
3. Address 2: 4. Address 3: 5. Phone #: Fax #: 5. Collected by: 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 ROURS (must be pre-scheduled) AFTER ROURS (must be pre-scheduled) AFTER ROURS (must be pre-scheduled) AFTER ROURS (must be pre-scheduled) AFTER ROURS (must be pre-scheduled) AFTER ROURS (must be pre-scheduled) AHOURS Aman Day Bame Day Ba
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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 Morman
AFTER HOURS (must be pre-scheduled)
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Asbestos Analysis Second Please Indicate Filter Type:
Asbestos Analysis
*PCM Air – Please Indicate Filter Type:
NY State PLM/TEM QTY Pb Dust Wipe (wipe type (QTY Pb Dail Wipe (wipe type (QTY Pb Dail Wipe (wipe type (QTY Pb Dail Wipe (wipe type (QTY Pb Dail Wipe (wipe type (QTY Pb Dail Wipe (wipe type (QTY Pb Dail Wipe (wipe type (QTY Pb Dail Wipe (wipe type (QTY Pb Dail Wipe (wipe type (QTY Pb Dail Wipe (wipe type (QTY
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TEM Dust* - Please Indicate Filter Type:
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Collection Apparatus for Spore Traps/Air Samples: Collection Apparatus for Spore Traps/Air Samples: Collection Apparatus for Spore Traps/Air Samples: Collection Apparatus for Spore Traps/Air Samples: Collection Apparatus for Spore Traps/Air Samples: Collection Apparatus for Spore Traps/Air Samples: Collection Media *Spore-Trap (QTY) Surface Vacuum Dust (QTY) *Surface Swab (QTY) Collection Media *Spore-Trap (QTY) Surface Vacuum Dust (QTY) *Surface Swab (QTY) Culturable ID Genus (Media) (QTY) *Surface Swab (QTY) Culturable ID Genus (Media) (QTY) *Surface Tape (QTY) Culturable ID Species (Media) (QTY) *Surface Tape (QTY) Culturable ID Species (Media) (QTY) *It is recommended that blank samples be submitted with all air and surface samples SAMPLE INFORMATION DATE/ CLIENT ID # SAMPLE LOCATION/ ID TIME VOL (L) SAMPLE INFORMATION CLIENT CONTACT CLIEN
Grav. Reduction ELAP 198.6
Grav. Reduction ELAP 198.6 (QTY) Other (specify)
MISC Vermiculite Vermiculi
Vermiculite (1EM Water samplesC) *Surface Tape(QTY) Culturable ID Species (Media) (QTY) Asbestos Soil PLM_(Qual) PLM_(Qual) PLM/IEM_(Qual) PLM/IEM_(Qual) If field data sheets are submitted, there is no need to complete bottom section. Other (Specify) (QTY *It is recommended that blank samples be submitted with all air and surface samples
*It is recommended that blank samples be submitted with all air and surface samples *ANALYSIS *AN
SAMPLE INFORMATION DATE/ VOL (L)/
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Received by: Relinquished by: Page 20 of 24, Report Reference:1 Generated:04-JAN-18 16:03 Drop Box
Received for Lab by:

000		AMA		100			Parent.	
			Report To:	Shelly K		Invoice To	:Jeanne (
GALS		neck if change		SGS Galson	Laboratory	_	SGS Galson	Laboratory
LABORAT	OKIES	address		6601 Kirkv	ille Road		6601 Kirkv	ille Road
6601 Kirkville Rd		ew Client? yes		East Syracuse	e, NY 13057		East Syracuse	e, NY 13057
East Syracuse, NY 13057- Tel: 315-437-5227	-9672	no 📙	Phone No.:	888-432	-5227	Phone No.	:888-432	2-5227
888-432-LABS(5227)						Fax No.	315-437	7-0571
Fax: 315-437-0571 www.galsonlabs.com								
3-12-11-11-11-11-11-11-11-11-11-11-11-11-		Site Name :			Project:	L428951	Sampled By :	Client
Turnaround Time	Due Date	Verbal Authoriz	ation :					
Standard	01/04/18			90734		=		
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3 Business Days						· -		
2 Business Days								
Next Day by 6pm		Fax Result	s To :	Email Only Plea	ise	Fax No.	Email Onl	y Please
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Same day						3'-		
Sample			Collection	*Air Volume (liters)/				Specific DL
Identification	on	Date Sampled	Medium	Passive Monitors (Min)	Analysis Re	equested	Method Reference	Needed
22152-A75	δA	12/5/2017	25mm MCE PCM	120.91	Transmission Elec	tron Microscopy	NIOSH 7402; TEM	
22152-A75	В	12/5/2017	25mm MCE PCM	100.76	Transmission Elec	tron Microscopy	NIOSH 7402; TEM	
22152-A75	iC .	12/5/2017	25mm MCE PCM	120.91	Transmission Elec	tron Microscopy	NIOSH 7402; TEM	
22152-A75	5D	12/5/2017	25mm MCE PCM	113.86	Transmission Elec	tron Microscopy	NIOSH 7402; TEM	1
								-
Comments:							State/Province of sam Onto	
	If th	ne method being repo	orted is not on your	laboratory's current AIHA	scope of accreditation	n, please state th	at in your report.	
		Please provide	an uncertainty state	ement in accordance with A	AIHA LQAP policy do	cument Section 2	A.5.4.3.	
Chain of Custody		Print Name			Signature			Date/Time
Relinquished by :		Zach King	Page 21 of 24	Report Reference: Ge	enerated:04-JAN-18	3 16:03	12/	26/2017 17:21
Received by LAR .								

L428	961					, [0	
ccc	New Client?			: Commission	Invoice		Transit Comm	ission
X626A6647630463 e:12/19/17 pper:UPS	Client Account N	o.*: St	920 Yonge St uite 600 pronto, ON M		- RG	Suite 60	nge Street 0 ON M4S 3E2	
tials:CEM	3K 2A2	Phone No.* : 41 Cell No. : Email Results to : Vir	6-393-6668	& oheresults@ohecons	ultants.com P.O.	No.:	ō	
Need Results By*: (surcharge)	1	Email address :	Samples submitted a	using the FreePumpLoan		Card Card on Fit	le Call for Cre	
Standard 0%	Site Name :			Project: 22152	San	pled by: OHE C	Consultants	
□ 4 Business Days 35% □ 3 Business Days 50% □ 2 Business Days 75%	Comments:	bway Air	Quality					
Next Day by 6pm 100% Check for availability an pricing for quicker turn around times.	dustry or Process/interfe	rences present in sai	mpling area :	Province samples were collected in (ex. ON)	Please indicate which OEL this data will OSHA PEL ACGIH TLV MSHA Other (specify):		Cal OSHA	
Sample identification* (Manmium 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 Requ	ested*	Method Reference^	Hexavalent Chromius Process (e.g., welding plating, painting, etc.
22152 - A75A	12/05/17	25 mm PCM *	120.91	L ·	Standardized List of A	nalyses for TTC		
22152 - A75B	12/05/17	25 mm PCM •	100.76	L	Subway Air Quality S	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	-			
-	<u> </u>	_	-	-	-			
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	-			<u> </u>
4,	<u> </u>							
^Galson Laboratories will substitute ou						d(s) listed on COC		- :
For metals analysis: if requesting an ana	<u> </u>) is required (only available	e for certain analytes - see SA	G): 	·	
For crystalline silica; form(s) of silica nee					Driet No.	mo/Signature	<u> </u>	ate Time
Chain of Custody P Relinquished by Romain Matheve	rint Name/Signature		Date Tim /11/17 09:0		 	me/Signature	_ 12/17	
Dollar wish and had	()		13/1) Voice		Candace Mass		eshwar by	127 1050
Reinquished by Luwiw	3	Samples	received after 3pt	m will be considered as	C) BOHN 41-11-11-11-11-11-11-11-11-11-11-11-11-1			Page 1 of 2

- 1		New Client?	Report To*: To	ronto Trar	nsit Co	nmmission	Invoice T	o": Toronto	Transit Comm	ission	
CCC		New Cheme:	19		1920 Yonge Street						
000	GALSON	Client Account No			Suite 600						
-				ronto, ON	M4S	3E2			ON M4S 3E2		•
1140 Shepper Unit 5	d Avenue West		Phone No.* : 41		-	-	Phone N	lo. :			
North York, O	ntario, Canada M	13K 2A2	Cell No. :				Ema	nil :			
Tel: 888-432- www.gaisor			Email Results to : Vin	gil.Umali@ttc.	ca & oh	eresults@oheconsu	ultants.com P.O. N	o.: PU240835	<u> </u>		
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Need Results By*:	(surcharge)			Samples submit		g the FreePumpLoan™	Program Samples s	ubmitted using the	e FreeSamplingBadge	s™ Progran	n
✓ Standard	0%	Site Name :			Proj	ect: 22152 .	Samp	led by: OHE C	Consultants		
4 Business Days	35%	Comments:									
3 Business Days	50%	TTC Sul	bway Air	Oualit	٧,						
2 Business Days	75%	110 Su	Dway All	Quant	<u>y</u>		·				
Next Day by 6pm	· 100%	List description of ind	ustry or Process/interfer	rences present i	n samplie	ng area :	Province samples were collected in (ex. ON)		which OEL this data wi		
Check for availability an quicker turn around			•	•			Collected in (ex. ON)	OSHA PEL MSHA	Other (specify):	Cal O	SHA
				Sample Vole	me					Hexavalen	nt Chromlum
Sample Identification (Maxmlum of 20 Characters than 20 characters will be ab	ID's longer	Date Sampled	Collection Medium	Sample Tir Sample Are	ne	Sample Units*: L, ml,min,in2cm2,ft2	Analysis Request	ted*	Method Reference^	Process (e.	.g., welding inting, etc.)*
22152 - \$75		12/05/17	PW PVC in PPI	902.15		L	Standardized List of An	alyses for TTC			
22152 - S76		12/05/17	PW PVC in PPI	-		L	Subway Air Quality Study				
22152 - 173		12/05/17	PW PVC in IOM	898.00		L		-		:	
22152 - 174		12/05/17	PW PVC in IOM	-		L					
-				-		_					-
22152 - H15		12/05/17	2pc UW PVC	911.55			Hexavalent Chromium	 1	mod.OSHA 215	Other	
22152 - H16		12/05/17	2pc UW PVC	l			Hexavalent Chromium	<u> </u>	mod.OSHA 215	Other	
22152 - 1110		1203/17	2pc 011 1 VC			<u> </u>	TICKETHICIT CITIONIGH		11100:00:111210	<u> </u>	
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^Galson Laboratories wil	li subsititute ou	r routine/preferred met	hod if it does not match	the method lis	ted on th	ne COC unless this box	is checked: Use method(s) listed on COC			
For metals analysis: if req	uesting an anal	lyte with the option of a	lower LOQ, please indi	cate if the lower	LOQ is re	equired (only available	for certain analytes - see SAG):			
For crystalline silica: form	n(s) of silica need	ded must be indicated (Quartz, Cristobalite, and	d/or Tridymite)	·:						
Chain of Custody	Pr	int Name/Signature	[Date	Time		Print Nam	e/Signature	Da		Time
Relinquished by Ron	ηain Mathevet		12/	11/17	09:00	Received by:	Lummson	-/-	12/1	8117	11322c
Relinquished by	Jumm.	Sul	1/2/	13/17/6	'ays	<u> </u>	Candace Mass	urin (A	(a) 12 (24 71	1652
		* R					next day's business elay in your samples being		1	Page 2 o	of <u>2</u>

90134

The TTC file number/purchase order number is PU240835:

- 1) Total Metals by NIOSH 7300. Analyze for antimony, arsenic, barlum, beryllium, cadmium, calcium oxide, chromium ili, cobait, copper, lead, manganese, and selenium.

 Actorics 51
- 2) Asbestos fibre count by NIOSH 7400. In addition, analyze specifically for asbestos by PCM TEM if the fibre count result exceeds 0.01 f/cc.
- 3) Respirable silica and respirable dust by NIOSH 7500/0600. Analyze for quartz, PPI PW PVC cristobalite, tridymite, and dust.
- 4) Respirable metals by NIOSH 7300. Analyze for aluminum, cadmium, Iron oxide, pp_ WWMCE mplybdenum, and zinc oxide.
- 5) <u>Inhalable metals and inhalable dust by NIOSH 7300/0500.</u> 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 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

and Wear

Enclosure(s)



GALSON

6601 Kirkville Road

East Syracuse, NY 13057

(315) 432-5227 FAX: (315) 437-

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L428988

Project No. : 22152

Date Sampled : 06-DEC-17 Date Analyzed : 21-DEC-17 - 23-DEC-17

Date Received : 19-DEC-17 Report ID : 1039389

Date Sampled: 12/06/17 Date Analyzed: 12/21/17

Parameter	LOQ ua	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

Collection Media:	MCE UW 37mm 26-DEC-17		Submitted by: NYS DOH # :		Approved by: JJL/SJW Supervisor: KEG QC	C by: CRD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOO-Limit of Ouantitation



6601 Kirkville Road East Syracuse, NY 13057

(315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734 Site Login No. : L428988

Project No. : 22152

Date Sampled : 06-DEC-17 Date Analyzed : 21-DEC-17 - 23-DEC-17

Date Received : 19-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

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		<u> </u>
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

Collection Media:	MCE UW 37mm 26-DEC-17		Submitted by: NYS DOH # :		Approved by: JJL/SJW Supervisor: KEG QC	by: CRD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1	- •	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L428988

Project No. : 22152

Date Sampled : 06-DEC-17 Date Analyzed : 21-DEC-17 - 23-DEC-17

Date Received : 19-DEC-17 Report ID : 1039389

Date Sampled: 12/06/17 Date Analyzed: 12/22/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	uq	uq		
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	mq/m3

Collection Media:	MCE UW 37mm 26-DEC-17		Submitted by: NYS DOH # :		Approved by: JJL/SJW Supervisor: KEG QC	by: CRD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1	- •	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Site : NS Login No. : L428988

Project No. : 22152

Date Sampled : 06-DEC-17 Date Analyzed : 21-DEC-17 - 23-DEC-17

Date Received : 19-DEC-17 Report ID : 1039389

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	uq		
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

Collection Media:	MCE UW 37mm 26-DEC-17	Submitted by: NYS DOH # :		Approved by: JJL/SJW Supervisor: KEG QC	by: CRD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

GALSON

Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L428988

East Syracuse, NY 13057 Project No. : 22152

Date Sampled : 06-DEC-17 Date Analyzed : 21-DEC-17 - 23-DEC-17

Date Received : 19-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

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media:	IOM 25mm PW PVC 26-DEC-17		Submitted by: NYS DOH # :		Approved by: SJW Supervisor: KEG QC	C by: CRD
<pre>-Less Than > -Greater Than</pre>	5	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L428988

Project No. : 22152

Date Sampled : 06-DEC-17 Date Analyzed : 21-DEC-17 - 23-DEC-17

Date Received : 19-DEC-17 Report ID : 1039664

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media: Date :	IOM 25mm PW PVC 26-DEC-17		Submitted by: NYS DOH # :		Approved by: SJW Supervisor: KEG QC	by: CRD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



Client : Toronto Transit Commission Ltd Account No.: 90734 Login No. : L428988 6601 Kirkville Road Site

East Syracuse, NY 13057 Project No. : 22152

(315) 432-5227 Date Sampled : 06-DEC-17 Date Analyzed : 26-DEC-17

FAX: (315) 437-0571 Date Received : 19-DEC-17 Report ID : 1039715 www.galsonlabs.com

Asbestos Fiber Count (A Rules)

			Fibers/	Fibers/	Fibers/	Air	Fibers/
	Sample ID	<u>Lab ID</u>	Fields	mm2	<u>Filter</u>	Volume (cc)	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 Submitted by : BTM

Analytical Method: mod. NIOSH 7400 "A" Rules Approved by : BDB Limit of Ouantitation : 5.5 Fibers/ 100 Fields Date : 26-DEC-17

Microscope field area : 0.00785 mm2 OC by: CRD Filter collection area: 385 mm2 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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Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L428988

Project No. : 22152

Date Sampled : 06-DEC-17 Date Received : 19-DEC-17 Report ID : 1038453

Inhalable Dust

Sample ID	<u>Lab ID</u>	Air Vol liter	Total <u>mq</u>	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 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



LABORATORY ANALYSIS REPORT

: Toronto Transit Commission Ltd Account No.: 90734

Login No. : L428988

Client
6601 Kirkville Road Site

bul Kirkville Road Site : NS

East Syracuse, NY 13057 Project No. : 22152

(315) 432-5227 Date Sampled : 06-DEC-17 Date Analyzed : 20-DEC-17 FAX: (315) 437-0571 Date Received : 19-DEC-17 Report ID : 1038454

Respirable Dust

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Sample ID	Lab ID	Air Vol liter	Total mq	Conc mg/m3
22152-S77	L428988-10	922.46	0.30	0.33
22152-S78	L428988-11	NA	<0.050	NA

 $\underline{\mathtt{COMMENTS:}}$ Please see attached lab footnote report for any applicable footnotes.

Level of quantitation: 0.050 mg Submitted by: AS

Analytical Method : mod. NIOSH 0600; Gravimetric Approved by : SPR

OSHA PEL : PNOR 5 mg/m3 (TWA) Date : 21-DEC-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected



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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L428988

Project No. : 22152

Date Sampled : 06-DEC-17 Date Received : 19-DEC-17 Report ID : 1039603

Hexavalent Chromium

Sample ID	Lab ID	Air Vol liter	Total uq	Conc ug/m3
22152-Н17	L428988-14	918.79	<0.030	<0.033
22152-Н18	L428988-15	NA	<0.030	NA

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

Level of quantitation: 0.030 ug Submitted by: MCM

Analytical Method : mod. OSHA ID-215 (version 2); IC/UV Approved by : NKP

OSHA PEL : 5 ug/m3 (TWA) Date : 26-DEC-17 NYS DOH # : 11626

Collection Media : PVC UW 37mm Supervisor: MWJ QC by: CRD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected



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Site : NS Login No. : L428988

Project No. : 22152

Date Sampled : 06-DEC-17 Date Analyzed : 20-DEC-17 - 22-DEC-17

Date Received : 19-DEC-17 Report ID : 1039382

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

			Air Vol		
Sample ID	<u>Lab ID</u>	<u>Analyte</u>	1	uq	ug/m3
22152-S77	L428988-10	Ouartz	922.46	<5.0	<5.4
22132 377	1120000 10	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 Submitted: AJD Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD Approved: CMR

OSHA PEL : 50 ug/m3 RCS Date : 26-DEC-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: CRD

NA -Not Applicable ND -Not Detected l -Liters mppcf -Million Particles per Cubic Foot



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LABORATORY FOOTNOTE REPORT

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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

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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 preceding 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 (V205) 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



LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.

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):

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> 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
		1040
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 -Migrograme	l _Litere	NG -Not Specified	ND -Not Detected

NA -Not Applicable





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GALSON

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(Fe203) 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 Cadmium	+/-12.8% +/-8.5%	103% 101%

<	-Less Than	mg -Milligrams	n	3 -Cubic Meters	kg -Kilograms	ppm -Parts per Million
>	-Greater Than	ug -Micrograms	1	-Liters	NS -Not Specified	ND -Not Detected

NA -Not Applicable





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Date Sampled: 06-DEC-17 Account No.: 90734
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Date Analyzed: 20-DEC-17 - 26-DEC-17

+/-10%	105%
,	
+/-12.5%	103%
+/-8.6%	102%
+/-10.5%	103%
+/-9.8%	106%
+/-9.4%	99.7%
+/-11.2%	99.5%
+/-8.5%	100%
+/-10.5%	104%
+/-8.8%	100%
	+/-10.5% +/-9.8% +/-9.4% +/-11.2% +/-8.5% +/-10.5%

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	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable



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LABORATORY FOOTNOTE REPORT

GALSON

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: 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	1	-Liters	NS -Not Specified	ND -Not Detected	NA -Not Applicable



FAX: (315) 437-0571

www.galsonlabs.com

East Syracuse, NY 13057 (315) 432-5227

LABORATORY FOOTNOTE REPORT

GALSON

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)

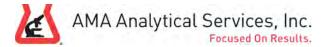
The Quartz blank spike recovery was outside the control limits of 77.0% to 110.% at 74.2% recovery. Where possible, control limits are statistically generated in-house. The Quartz blank spike duplicate recovery was within control limits.

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%

|--|



CERTIFICATE OF ANALYSIS

Chain of Custody: 604733

Client: Galson Laboratories

Address: 6601 Kirkville Road

East Syracuse, NY 13057-9672

Pam Weaver Attention:

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

NY ELAP

Lab ID 10920

Summary of Transmission Electron Microscopy

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

AMA Sample Number	Client Sample Number	Volume (L)	Area Analyzed (mm²)	Analytical Sensitivity f/cc	Asbestos Type Amount	# Non Asbestos Structures	Conce	ntration Fract	ion Sample Type	Comments
604733-1	22152-A77A	121.26	0.532	0.006	0	0		<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.

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

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a mutual protection to clients, the public, and these Laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from us. Sample types, locations, and collection protocols are based upon the information provided by the persons submitting them and, unless collected by personnel of these Laboratories, we expressly disclaim any knowledge and liability for the accuracy and completeness of this information. Residual sample material will be discarded in accordance with the appropriate regulatory guidelines, unless otherwise requested by the client. This report must not be used to claim, and does not imply product certification, approval, or endorsement by NY ELAP or any agency of the Federal Government. All rights reserved. AMA Analytical Services, Inc.

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

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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 Inform	ation:			Si	ubmit	tal In	format	tion:								
1. Client Name: GALS					Job	Name	»:									
2. Address 1:				2.			ion:									
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East Syracuse, NY 13057- Tel: 315-437-5227	9672	no 🗌	Phone No.:	888-432	-5227	Phone No. :	888-43	2-5227
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22152-A77	'B	12/6/2017	25mm MCE PCM	114.19	Transmission Electro	on Microscopy	NIOSH 7402; TEM	
22152-A77	'C	12/6/2017	25mm MCE PCM	121.26	Transmission Electro			
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L428988

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L	For metals analysis: i	f requesting an ana	lyte with the option of a	a lower LOQ, please ind	icate if the lower LOQ is	required (only available	e for certain analytes - see SAG):				
L	For crystalline silica:	form(s) of silica nee	ded must be indicated	(Quartz, Cristobalite, ar	nd/or Tridymite)* :							
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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.



GALSON

6601 Kirkville Road

East Syracuse, NY 13057

(315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734

Site : NS Login No. : L428473

Project No. : 22152

Date Sampled : 07-DEC-17 Date Analyzed : 18-DEC-17 - 20-DEC-17

Date Received : 14-DEC-17 Report ID : 1038259

Date Sampled: 12/07/17 Date Analyzed: 12/18/17

Parameter	LOQ ua	Total	Conc	Units
<u>Parameter</u>	<u> </u>	<u>uq</u>		
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

Collection Media:	MCE UW 37mm 19-DEC-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: AMD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams	m3 1	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOO-Limit of Ouantitation



LABORATORY ANALYSIS REPORT

6601 Kirkville Road
East Syracuse, NY 13057

East Syracuse, NY 13057 (315) 432-5227

FAX: (315) 437-0571 www.galsonlabs.com

Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L428473

Project No. : 22152

Date Sampled : 07-DEC-17 Date Analyzed : 18-DEC-17 - 20-DEC-17

Date Received : 14-DEC-17 Report ID : 1038259

Date Sampled: 12/07/17 Date Analyzed: 12/18/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		<u> </u>
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

Collection Media: Date :	MCE UW 37mm 19-DEC-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: AMD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Project No. : 22152

Date Sampled : 07-DEC-17 Date Analyzed : 18-DEC-17 - 20-DEC-17

Date Received : 14-DEC-17 Report ID : 1038259

Date Sampled: 12/07/17 Date Analyzed: 12/18/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	uq		-
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

Collection Media: Date :	MCE UW 37mm 19-DEC-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG QC	C by: AMD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 1		kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L428473

East Syracuse, NY 13057 Project No. : 22152

Date Sampled : 07-DEC-17 Date Analyzed : 18-DEC-17 - 20-DEC-17

Date Received : 14-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

	LOQ	Total	Conc	Units
<u>Parameter</u>	uq	uq		
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

Collection Media	: MCE UW 37mm : 19-DEC-17		Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG Q	C by: AMD
<pre></pre>	mg -Milligrams	m3	-Cubic Meters	kg -Kilograms	NA -Not Applicable	ND -Not Detected
	ug -Micrograms	1	-Liters	NS -Not Specified	ppm -Parts per Million	LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L428473

Project No. : 22152

Date Sampled : 07-DEC-17 Date Analyzed : 18-DEC-17 - 20-DEC-17

Date Received : 14-DEC-17 Report ID : 1038625

Date Sampled: 12/07/17 Date Analyzed: 12/20/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	<u>uq</u>	<u>uq</u>		
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

Collection Media:	IOM 25mm PW PVC 20-DEC-17		ted by: JMR H # : 11626	Approved by: JJL Supervisor: KEG Q	C by: AMD
<pre>-Less Than > -Greater Than</pre>	mg -Milligrams ug -Micrograms	m3 -Cubic I 1 -Liters	3 3	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L428473

East Syracuse, NY 13057 Project No. : 22152

Date Sampled : 07-DEC-17 Date Analyzed : 18-DEC-17 - 20-DEC-17

Date Received : 14-DEC-17 Report ID : 1038625

Date Sampled: 12/07/17 Date Analyzed: 12/20/17

	LOQ	Total	Conc	Units
<u>Parameter</u>	uq	<u>uq</u>		
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

Collection Media:	IOM 25mm PW PVC 20-DEC-17	Submitted by: NYS DOH # :		Approved by: JJL Supervisor: KEG Q	C by: AMD
<pre>-Less Than > -Greater Than</pre>	5	-Cubic Meters -Liters	kg -Kilograms NS -Not Specified	NA -Not Applicable ppm -Parts per Million	ND -Not Detected LOQ-Limit of Quantitation



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Client : Toronto Transit Commission Ltd Account No.: 90734 Login No. : L428473 Site

Project No. : 22152

Date Sampled : 07-DEC-17 Date Analyzed : 20-DEC-17 Date Received : 14-DEC-17 Report ID : 1038673

Asbestos Fiber Count (A Rules)

			Fibers/	Fibers/	Fibers/	Air	Fibers/
	<u>Sample ID</u>	<u>Lab ID</u>	Fields	mm2	Filter	Volume (cc)	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 Ouantitation : 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

OC by: AMD Supervisor: BDB

< -Less Than

> -Greater Than

ND -Not Detected NS -Not Specified

NA -Not Applicable

cc -Cubic Centimeters

mm2 -Square millimeters



LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L428473

Project No. : 22152

Date Sampled : 07-DEC-17 Date Received : 14-DEC-17 Report ID : 1037929

Inhalable Dust

Sample ID	<u>Lab ID</u>	Air Vol liter	Total mq	Conc mg/m3
22152-177	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 Submitted by: GMG

Analytical Method : mod. NIOSH 0500/MDHS 14/4; GRAV Approved by : KRK/SPR

Collection Media : IOM 25mm PW PVC Supervisor: KRK QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected



LABORATORY ANALYSIS REPORT

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Client : Toronto Transit Commission Ltd Account No.: 90734 Site : NS Login No. : L428473

Project No. : 22152

Date Sampled : 07-DEC-17 Date Received : 14-DEC-17 Report ID : 1037980

Respirable Dust

Sample ID	<u>Lab ID</u>	Air Vol liter	Total mq	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 NYS DOH # : 11626

Supervisor: KRK QC by: AMD

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms NA -Not Applicable ND -Not Detected



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LABORATORY ANALYSIS REPORT

Client : Toronto Transit Commission Ltd Account No.: 90734
Site : NS Login No. : L428473

Project No. : 22152

Date Sampled : 07-DEC-17 Date Analyzed : 18-DEC-17 - 19-DEC-17

Date Received : 14-DEC-17 Report ID : 1038574

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

			Air Vol		
Sample ID	<u>Lab ID</u>	Analyte	1	<u>uq</u>	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 Submitted: AMD/AJD

Analytical Method : mod. NIOSH 7500/mod. OSHA ID-142; XRD Approved: CMR

OSHA PEL : 50 ug/m3 RCS Date : 20-DEC-17 NYS DOH # : 11626

Collection Media : PVC PW 37mm Supervisor: KRK QC by: AMD

NA -Not Applicable ND -Not Detected l -Liters mppcf -Million Particles per Cubic Foot



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LABORATORY FOOTNOTE REPORT

GALSON

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

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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 -Greater Than mg -Milligrams

ug -Micrograms

l -Liters

m3 -Cubic Meters

NS -Not Specified

kg -Kilograms

ND -Not Detected

ppm -Parts per Million

NA -Not Applicable



LABORATORY FOOTNOTE REPORT

Client Name : Toronto Transit Commission Ltd.

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):

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> 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 l -Liters NS -Not Specified ND -Not Detected NA -Not Applicable ug -Micrograms





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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

 ${\tt biased \ low.}$

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	1	-Titers	NS -Not Specified	ND -Not Detected

NA -Not Applicable





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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)

arts per Million	kg -Kilograms	m3 -Cubic Meters	mg -Milligrams	< -Less Than	<
L Detected NA -Not Applicab	NS -Not Specified	1 -Liters	ug -Micrograms	> -Greater Than	>





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GALSON

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),

<pre>< -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</pre>
--



6601 Kirkville Road East Syracuse, NY 13057

FAX: (315) 437-0571

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LABORATORY FOOTNOTE REPORT

GALSON

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%



CERTIFICATE OF ANALYSIS

NATVÁ

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 Ty	rpe: MCE			Pore Si	ze: 0.8 um			Filter Size:	2	5 mm (385 mm²)
AMA Sample Number	Client Sample Number	Volume (L)	Area Analyzed (mm²)	Analytical Sensitivity f/cc	Asbestos Type Amount	# Non Asbestos Structures	Conc		n 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.

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

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a mutual protection to clients, the public, and these Laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from us. Sample types, locations, and collection protocols are based upon the information provided by the persons submitting them and, unless collected by personnel of these Laboratories, we expressly disclaim any knowledge and liability for the accuracy and completeness of this information. Residual sample material will be discarded in accordance with the appropriate regulatory guidelines, unless otherwise requested by the client. This report must not be used to claim, and does not imply product certification, approval, or endorsement by NY ELAP or any agency of the Federal Government. All rights reserved. AMA Analytical Services, Inc.

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

M

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:	mation:					Su	loh	tal In	forma	tion:	4	286	17	3					
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AHERA NIOSH 7402 Other (specify	(QTY) (QTY) ate Filter Type:	PLM/TEM(Q	□ ELA □ NY S □ Residence Res	State P dual A. I. (presant. (s/arm. (s/arm. (s/arm. 1. (presant. 1. (LM/TF sh /abs) V ea) Va- ea) Dus /abs) 2/EPA s receive eample:	/acuum.cuum Det D6486 100.2 ved in gsubmitted	(Q'/Dust 05755-\ 0-99 (QTY cood co _^C)	(QTY) (OTY) (OTY) (OTY)	QTY) (QTY) n unless	_(QTY	ottom s	noted.	Fungal	*Pb D *Pb A Pb So Pb TC Drink Waste Pb Fu I Anal Collect *Spor *Surf: *Surf: Other (S	oust W ir il/Solid CLP ing Wis water race (ysis etion A etion M re-Trap ace Sw ace Ta Specify	dater □ Pb r □ Pb (Media pparatus fo fedia (Q' /ab(pe((QTY) (QTY) (QTY) (QTY) (QTY) (QTY) (QTY) (QTY) (QTY) (QTY) (QTY) (QTY) (QTY)	(QTY) Y) Cu(QTY) □ As(Q Cu(QTY) □ As(QT) □ Cu(QTY) □ As(QT) □ (QTY) raps/Air Samples: □ Surface Vacuum Dust(Q □ Culturable ID Genus (Media) □ Culturable ID Species (Media) CLIENT CONTACT SORATORY STAFF ONLY)	TY)
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GALSO		eck if change		SGS Galson	Laboratory		SGS Galson	Laboratory
LABORATO	DRIES	nddress		6601 Kirkv	lle Road		6601 Kirkv	ille Road
601 Kirkville Rd		w Client ? yes		East Syracuse			East Syracuse	
ast Syracuse, NY 13057- el: 315-437-5227	9672	no 🗌	Phone No.:	888-432	-5227	Phone No. :	888-432	
888-432-LABS(5227)						Fax No.	315-437	'-0571
ax: 315-437-0571 www.galsonlabs.com								
		Site Name :			Project :	L428473	Sampled By :	Client
Turnaround Time	Due Date	Verbal Authoriz	ation :					
Standard	12/29/17			90734				
4 Business Days		Credit Card	d No. :		Card Holder N	Name :		Exp. :
3 Business Days								
2 Business Days								
Next Day by 6pm		Fax Resul		Email Only Plea		Fax No. :	Email Only	y Please
Next Day by Noon		Email Resul	ts To :	Syracuse.Subcontracting	@sgs.com			
Same day								
Sample			Collection	*Air Volume (liters)/			- 20 W - W - 20 Proper 7 5 D	fibers/
Identification	n	Date Sampled	Medium	Passive Monitors (Min)	Analysi	is Requested	Method Reference	field
22152-A79	Α	12/7/2017	25mm MCE PCM	125.7	Transmission	Electron Microscopy	NIOSH 7402; TEM	4/100
22152-A79	В	12/7/2017	25mm MCE PCM	113.13	Transmission	Electron Microscopy	NIOSH 7402; TEM	5/100
22152-A79	С	12/7/2017	25mm MCE PCM	125.7	Transmission	Electron Microscopy	NIOSH 7402; TEM	7.5/100
22152-A79	D	12/7/2017	25mm MCE PCM	115.23	Transmission	Electron Microscopy	NIOSH 7402; TEM	5.5/100
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annaratako.							Ctate / Drayings of any	noling overt
Comments:							State/Province of sam	npling event:
	If th			laboratory's current AIHA ement in accordance with A				
Chain of Custody		Print Name		ement in accordance with A	Signatu			Date/Time
Relinquished by :			din gage 20 of 22	Report Reference:2 G			1:	2/22/17 0914
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L428473

CCS 1Z5X626A6646919270 Date:12/14/17 Shipper:UPS Initials:MAK	B1880 # 19 00 88	New Client? Client Account No	25.*: Si Phone No.*: 41 Cell No.:	oronto Transit C 920 Yonge Stre uite 600 oronto, ON M45 6-393-6668 gil.Umali@ttc.ca & o	et 3 3E2	Phone N Emi	1920 Yo Suite 600 Toronto,	ON M4S 3E2	R119
Need Results By*:	(surcharge)	1		Samples submitted usir	ng the FreePumpLoan™	Program Samples s	ubmitted using th	e FreeSamplingBadge	s™ Program
✓ Standard	0%	Site Name :		Pro	oject: 22152	Samj	oled by: OHE C	Consultants	
4 Business Days	35%	Comments:							
3 Business Days	50%	TTC Su	bway Air	Quality					
2 Business Days	75%	11000		Quality			1		
Next Day by 6pm Check for availability an quicker turn around		List description of ind	ustry or Process/interfe	rences present in samp	Province samples were collected in (ex. ON)	Please indicate w OSHA PEL MSHA	vhich OEL this data wil ACGIH TLV Other (specify):	ll be used for: Cal OSHA	
Sample Identifica (Maxmium of 20 Characters than 20 characters will be at	. ID's longer	Date Sampled	Collection Medium	Sample Volume Sample Time Sample Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis Reques	ted*	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 An	alyses for TTC		
22152 - A79B		12/07/17	25 mm PCM	113.13	L	Subway Air Quality St	udy		
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	<u></u>	12/07/17	UW MCE	935.25	L	-			
22152 - T80		12/07/17	UW MCE	-	L	-			
^Galson Laboratories wil	ll subsititute ou	ur routine/preferred met	hod if it does not matcl	the method listed on t	the COC unless this box	is checked: Use method(s) fisted on COC	•	
For metals analysis; if req	uesting an ana	lyte with the option of a	lower LOQ, please indi	cate if the lower LOQ is	required (only available	e for certain analytes - see SAG):		
For crystalline silica: form	n(s) of silica nee	ded must be indicated (Quartz, Cristobalite, an	d/or Tridymite)* :	•				
Chain of Custody	Pr	rint Name/Signature	l	Date Time		Print Nam	e/Signature	Da	te Time
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Relinquished by	trym	Sun/1		17/7 (1cop	Received by :	Michelle Krause	Maralle 44	12/14	17 1/12
	·	٠ * R	Samples equired fields, failure Page 21 of 22	received after 3pm v to complete these fi Report Referen	will be considered as	next day's business lelay in your samples being 18-JAN-18 16 17	,	,	Page 1 of 2

	000		New Client?	Report To* :	Toronto	Transit C	ommission	Invo	oice To*: Toronto	Transit Comm	ission					
ľ	565	GALSON		_	1920 Yo	nge Stre	et		1920 Yo	nge Street						
		UNLOUN	Client Account No.	.*:	Suite 60				Suite 600							
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	1140 Sheppar Unit 5	d Avenue West		Phone No.* : 4	416-393-6											
		ntario, Canada M	3K 2A2	Cell No. :												
	Tel: 888-432- www.gaisor			Email Results to : \	/irgil.Umali	⊚ttc.ca & o	heresults@ohecons	ultants.com F	O. No. : <u>PU240835</u>							
				Email address :					dit Card Card on Fi		dit Card Info.					
Nee	ed Results By*:	(surcharge)] Samples s	ubmitted usir	ig the FreePumpLoan™	Program Sam	oles submitted using th	e FreeSamplingBadge	s™ Program					
<u> </u>	Standard	0%	Site Name :			Pro	ject: 22152		Sampled by: OHE (Consultants	·					
-	4 Business Days	35%	Comments:			710	·									
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	Next Day by 6pm	100%	List description of indu	 -				Province camples were		」ン vhich OEL this data wi	ll be used for:					
	eck for availability an	pricing for		,		F	. 	collected in (ex. ON)	OSHA PEL		Cal OSHA					
CII	quicker turn around								☐ MSHA	Other (specify):						
	Sample Identification* (Maxmium of 20 Characters. ID's longer Date Sampled Collection than 20 characters will be abbreviated.)			Collection Medium	Sam	le Volume ple Time ple Area*	Sample Units*: L, ml,min,in2,cm2,ft2	Analysis R	equested*	Method Reference^	Hexavalent Chromium Process (e.g., welding plating, painting, etc.)*					
22152	2 - S79		12/07/17	PW PVC in PP	l 907.83 L S			Standardized List of	of Analyses for TTC		3,,					
22152	2 - S80		12/07/17	PW PVC in PP	-		L	Subway Air Quality Study								
22152	2 - 179		12/07/17	PW PVC in IO	M 935.71		L									
22152	2 - 180		12/07/17	PW PVC in IOI	VI -		L									
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	· · · · · · · · · · · · · · · · ·	· • · · · · · · · · · · · · · · · · · ·	- V		es received	after 30m v	vill be considered as			7						
			* Red	quired fields, failu	re to compl	ete these fie	lds may result in a d	elay in xour samples b	eing processed.	·	Page 2 of 2					

APPEN	IDIX G
Brief and Scala Model Sample Calculations	

Table 1a. Air Sampling Results with Brief and Scala Model Sample Calculations

Transit Enforcement – Special Constables

G 1			Sample						Agent M	lonitored						
Sample Number	Date	Date Location	ate Location	Duration						Total Meta	als (mg/m³)					
rumber			(minutes)	Sb	As	Ba	Be	Cd	CaO	Cr	Co	Cu	Pb	Mn	Se	
Occupation	al Exposure L	imits		0.5	0.1	0.5	0.002	0.01	2	0.5	0.02	1	0.05	0.02	0.2	
Adjusted O	ELs (Brief and	l 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: S	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	
		Numbe	er 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	
		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

g 1			Sample					A	gent Monitor	ed				
Sample Number	Date	Location	Duration		Respira	ble Metals (ng/m³)				Inhalable Me	etals (mg/m³)		
Number			(minutes)	Al	Cd	FeO	Mo	ZnO	Be	MgO	Mo	Ni	Tl	V_2O_5
Occupation	al Exposure L	imits		0.5	0.1	0.5	1	0.002	5	3	2	0.00005	10	10
Adjusted O	ELs (Brief and	l 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: S	pecial Constal	oles												
A3, S3, I3, M3, T3	I3, M3, 11-Aug-17 Constables 5:00 AM - 615		615	<0.0061	<0.00012	0.074	<0.00012	<0.0023	NA	<0.010	<0.00012	<0.00024	<0.0012	<0.00065
		Numbe	er 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
		Avera	ge % 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:

Table 1c. Air Sampling Results with Brief and Scala Model Sample Calculations

Transit Enforcement – Special Constables

			Sample					Ag	ent Monitore	d				
Sample	Date	Location	Duration	Resp	pirable Silica (n	ng/m³)	Resp.	Inh. Dust	PM _{2.5}	Asbesto	os (f/cc)	со	NO_2	CO_2
Number			(minutes)	Quartz	Cristoballite	Tridymite	Dust (mg/m³)	(mg/m^3)	Dust	PCM	TEM	(ppm)	(ppm)	(ppm)
Occupation	al Exposure L	imits		0.1	0.05	NA	3	10	NA	0.1	0.1	25	3	5000
Adjusted O	ELs (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: S	b Title: Special Constables													
A3, S3, I3, M3, T3	b Title: Special Constables A3, S3, 3, M3, 11-Aug-17 Constables 5:00 AM - 615		615	<0.0041	<0.0041	<0.016	0.11	0.18	0.078	0.009	NA	<1	<0.1	NA
		Numbe	er 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
		Avera	ge % 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:

Table 2a. Air Sampling Results with Brief and Scala Model Sample Calculations

Transit Enforcement – Fare Inspectors

g ,			Sample						Agent M	lonitored					
Sample Number	Date	Location	Duration						Total Meta	als (mg/m³)					
Number			(minutes)	Sb	As	Ba	Be	Cd	CaO	Cr	Co	Cu	Pb	Mn	Se
Occupation	al Exposure L	imits		0.5	0.1	0.5	0.002	0.01	2	0.5	0.02	1	0.05	0.02	0.2
Adjusted O	ELs (Brief and	l 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: F	are Inspectors	l .													
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
		Numbe	er 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
		Avera	ge % 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

g 1			Sample					A	gent Monitor	ed				
Sample Number	Date	Location	Duration		Respira	ıble Metals (ı	ng/m³)				Inhalable Me	etals (mg/m³)		
Number			(minutes)	Al	Cd	FeO	Mo	ZnO	Be	MgO	Mo	Ni	Tl	V_2O_5
Occupation	al Exposure L	imits		0.5	0.1	0.5	1	0.002	5	3	2	0.00005	10	10
Adjusted O	ELs (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: F	are 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
	T5 4:30 PM Number of Samp		er 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
		Avera	ge % 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:

Table 2c. Air Sampling Results with Brief and Scala Model Sample Calculations

Transit Enforcement – Fare Inspectors

			Sample					Ag	ent Monitore	d				
Sample	Date	Location	Duration	Resp	oirable Silica (n	ng/m³)	Resp.	Inh. Dust	PM _{2.5}	Asbesto	os (f/cc)	СО	NO ₂	CO2
Number			(minutes)	Quartz	Cristoballite	Tridymite	Dust (mg/m³)	(mg/m³)	Dust	PCM	TEM	(ppm)	(ppm)	(ppm)
Occupation	cupational Exposure Limits justed OELs (Brief and Scala Model)		0.1	0.05	NA	3	10	NA	0.1	0.1	25	3	5000	
Adjusted O	ELs (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: F	are Inspectors													
A5, S5, I5, M5, T5	5, M5, 14-Aug-17 6:30 AM - 550			<0.0046	<0.0046	<0.018	0.18	0.38	0.118	0.01	NA	<1	<0.1	NA
		Numbe	er 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
		Avera	ge % 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

G 1			Sample						Agent M	Ionitored					
Sample Number	Date	Location	Duration				•		Total Met	als (mg/m³)		•	•		
rumber			(minutes)	Sb	As	Ba	Be	Cd	CaO	Cr	Co	Cu	Pb	Mn	Se
Occupation	al Exposure L	imits		0.5	0.1	0.5	0.002	0.01	2	0.5	0.02	1	0.05	0.02	0.2
Adjusted O	ELs (Brief and	l 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: S	ubway Operat	or / Guards – Lin	e 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
		Numbe	er 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
		Averaş	ge % 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 = $\left\{\frac{8}{h} \times \binom{24-h}{16}\right\}$, where h = hours worked per day.

Example for Sb:

Adjusted OEL = $0.5 \times \left\{\frac{8}{10} \times \binom{24-10}{16}\right\} = 0.350$

Table 3b. Air Sampling Results with Brief and Scala Model Sample Calculations

Subway Operators / Guards

g ,			Sample					A	gent Monitor	ed				
Sample Number	Date	Location	Duration		Respira	able Metals (r	ng/m³)				Inhalable Me	tals (mg/m³)		
rvanibei			(minutes)	Al	Cd	FeO	Mo	ZnO	Be	MgO	Mo	Ni	Tl	V_2O_5
Occupation	al Exposure L	imits		0.5	0.1	0.5	1	0.002	5	3	2	0.00005	10	10
Adjusted O	ELs (Brief and	l 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: S	lubway Operat	or / Guards – Lin	e 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
		Numbe	er 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
		Averag	ge % 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:

Table 3c. Air Sampling Results with Brief and Scala Model Sample Calculations

Subway Operators / Guards

			Sample						Agent Monito	red					
Sample	Date	Location	Duration	Resp	irable Silica (n	ng/m³)	Resp.	Inh.	PM _{2.5}	Asbest	os (f/cc)	CO	NO ₂	CO2	Cr VI
Number			(minutes)	Quartz	Cristoballite	Tridymite	Dust (mg/m³)	Dust (mg/m³)	Dust	PCM	TEM	(ppm)	(ppm)	(ppm)	(mg/m^3)
Occupation	al Exposure Li	imits		0.1	0.05	NA	3	10	NA	0.1	0.1	25	3	5000	0.01
Adjusted O	ELs (Brief and	l 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: S	ubway Operat	or / Guards – Lin	e 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
		Numbe	r 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
		Averaş	ge % 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

g ,			Sample						Agent M	lonitored					
Sample Number	Date	Location	Duration						Total Met	als (mg/m³)					
Number			(minutes)	Sb	As	Ba	Be	Cd	CaO	Cr	Со	Cu	Pb	Mn	Se
Occupation	al Exposure L	imits		0.5	0.1	0.5	0.002	0.01	2	0.5	0.02	1	0.05	0.02	0.2
Adjusted O	ljusted OELs (Brief and Scala Model) h Title: End Terminal Cleaners			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: E	and Terminal (Cleaners													
A43, S43, I41, M43, T43, H7	b Title: End Terminal Cleaners 43, S43, 1, M43, 5-Oct-17 Kennedy 8:00 AM - 4:30 PM 510		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
		Numbe	er 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
		Averaş	ge % 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

a ,			Sample					A	Agent Monitor	ed				
Sample Number	Date	Location	Duration		Respira	ble Metals (mg/m³)				Inhalable Me	etals (mg/m³)		
Number			(minutes)	Al	Cd	FeO	Mo	ZnO	Be	MgO	Mo	Ni	Tl	V ₂ O ₅
Occupation	al Exposure L	imits		0.5	0.1	0.5	1	0.002	5	3	2	0.00005	10	10
Adjusted O	ELs (Brief and	l 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: E	End Terminal (Cleaners						•				•	•	•
A43, S43, I41, M43, T43, H7	b Title: End Terminal Cleaners 13, S43, 1, M43, 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
		Numbe	er of Samples	1	1	1	1	1	1	1	1	1	1	1
	Number of Samp Aver			0.0073	0.000015	0.061	0.000073	0.0027	0.000007	0.012	0.00007	0.00015	0.00073	0.00078
		Averaş	ge % 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:

Table 4c. Air Sampling Results with Brief and Scala Model Sample Calculations

End Terminal Cleaners

			Comple						Agent Monite	ored					
Sample	Date	Location	Sample Duration	Resp	oirable Silica (n	ng/m³)	Resp.	Inh.	PM _{2.5}	Asbest	os (f/cc)	СО	NO ₂	CO ₂	Cr VI
Number			(minutes)	Quartz	Cristoballite	Tridymite	Dust (mg/m³)	Dust (mg/m³)	Dust	PCM	TEM	(ppm)	(ppm)	(ppm)	(mg/m^3)
Occupationa	Occupational Exposure Limits Adjusted OELs (Brief and Scale)	imits		0.1	0.05	NA	3	10	NA	0.1	0.1	25	3	5000	0.01
Adjusted Ol	ljusted 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: E	and Terminal (Cleaners													
A43, S43, I41, M43, T43, H7	1, M43, 5-Oct-17 Kennedy 8:00 AM - 4:30 PM 510				<0.0048	<0.019	0.11	0.32	0.055	0.007	NA	<0.1	<0.1	605	<0.00003
		Numbe	er 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
		Averaş	ge % 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: