# DRAFT REPORT

# MURRAY ROAD REGENERATION AREA

TORONTO, ON

**AIR QUALITY AND NOISE IMPACT STUDIES**

RWDI #1603972

August 10, 2017


**SUBMITTED TO**

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# EXECUTIVE SUMMARY

RWDI was retained by the City of Toronto to conduct air quality and environmental sound impact studies investigating ambient conditions in the Murray Road Regeneration Area (MRRA). The objective of the studies is to establish ambient air quality and environmental sound levels within the MRRA that will provide City planning staff with the necessary information to help inform their recommendations to City Council on the planning and land use study that is currently underway.

Monitoring of air quality started on September 22 and concluded on November 28, 2016 at three separate locations on Murray Road. This program involved continuous monitoring of Total Suspended Particulate (TSP), Coarse Particulate Matter ($PM_{10}$), and Fine Particulate Matter ($PM_{2.5}$) in addition to collecting wind speed and wind direction data. The $PM_{10}$ and $PM_{2.5}$ data did not pass our quality assurance checks and consequently there was a lack of confidence in the quality of the measured data. This prompted additional monitoring for $PM_{10}$ and $PM_{2.5}$ which occurred from May 19 to July 19, 2017. Subsequent monitoring occurred at two residences only.

There were no exceedances of the 24-hour TSP Ambient Air Quality Criteria (AAQC) at any of the stations. There were two exceedances of the 24-hour $PM_{10}$ AAQC at the 23 Murray Road location, and four exceedances of the 24-hour $PM_{10}$ AAQC at the 45 Murray Road location. There were no exceedances of any $PM_{2.5}$ criteria during this monitoring period at either location.

Continuous ambient sound measurements were obtained from November 2 to November 11, 2016 at one location on Murray Road. This assessment was completed using guidance from the Ministry of the Environment and Climate Change (MOECC) publications NPC-233 and NPC-300.

Long-term measurements indicate that the sound levels in the vicinity of MRRA are higher than default sound level limits for Class 1 (urban) areas outlined in NPC-300, but that sound levels are not unusual for the level of development and industrial activity in the area. Sound in the area of the MRRA is characterized by steady ambient noise consistent with distant road traffic sources, with a minor contribution from continuous sources at the existing Teskey facility, and with infrequent spikes in sound associated with local events such as vehicle pass bys on adjacent roadways, and heavy equipment operation at Teskey.

The following report includes all of the data and analysis of the information collected during the monitoring periods.

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# 1 AIR QUALITY MONITORING

## 1.1 INTRODUCTION

RWDI was retained by the City of Toronto to complete an ambient air quality monitoring study to assess air quality within the vicinity of the Murray Road Regeneration Area (MRRA). The purpose of this program was to assess ambient levels of total suspended particulate (TSP), inhalable particulate matter ($PM_{10}$) and respirable particulate matter ($PM_{2.5}$) in the MRRA, including possible impacts of air quality from the Teskey concrete plant on Murray Road.

Sampling took place from September 22 to November 28, 2016 at three locations on Murray Road; 23, 45 and 49 Murray Road. These locations were selected based on homeowner participation and power accessibility. They were also selected to obtain information on the potential air quality impacts caused by particulate emissions from Teskey which is located west of Murray Road. These locations are meant to provide representative ambient air quality in proximity of Teskey and not maximum air quality impacts from Teskey.

The $PM_{10}$ and $PM_{2.5}$ data did not pass our quality assurance checks during this monitoring period, and consequently there was a lack of confidence in the quality of the measured data. This prompted additional monitoring which occurred from May 19 to July 19, 2017 for $PM_{10}$ and $PM_{2.5}$ at two of the locations previously used during the fall sampling period. These locations were 23 and 45 Murray Road.

The enclosures with the monitoring instruments were located on the front lawns of properties facing Murray Road. These locations can be seen in Figures 1a and 1b for the fall 2016 and the spring 2017 monitoring programs, respectively. Although the influence of surrounding obstructions on the instrumentation were considered in the siting of the stations, there is no location along Murray Road where a station wouldn't be affected by an upwind obstruction.

Sampling instruments as well as an enclosure at each of the monitoring locations were installed on September 22, 2016. The meteorological tower was installed on October 4, 2016. For the second monitoring program, the instrumentation and enclosures were installed on May 17, 2017, and sampling officially commenced on May 19, 2017.

## 1.2 SAMPLING METHODOLOGY

### 1.2.1 Fall 2016

Each monitoring station was equipped with the following continuous monitors: a DustTrak DRX measuring TSP, $PM_{10}$ and $PM_{2.5}$; and a MetOne E-Sampler measuring TSP.

#### 1.2.1.1 DustTrak DRX

DustTrak is a real time aerosol monitoring system. The DustTrak DRX utilizes light-scattering technology with laser photometers to provide real time aerosol concentrations. This allows the DustTrak DRX to simultaneously measure several aerosol size fractions including $PM_{10}$, $PM_{2.5}$ and TSP. Dust concentrations are instantaneously calculated and displayed on the LCD screen and also stored via internal datalogging. As noted above, $PM_{10}$ and $PM_{2.5}$ from this monitoring period were not used.

#### 1.2.1.2 MetOne E-Sampler

The MetOne E-Sampler provides real-time particulate measurement through light scattering technology where a pump draws air into a chamber containing a laser beam. The aerosols in the air stream scatter the laser light proportionally to the particulate load within the chamber. The E-sampler also allows for gravimetric sampling of the air stream in series with the photometer, which facilitates post-calibration of the instrument, correcting for the unique optical properties of the aerosol in question. It can be programmed to auto-zero in selected intervals and can store data internally.

#### 1.2.1.3 Meteorological Tower

Meteorological data were also collected from October 4 to November 28, 2016. The 3-metre meteorological tower was outfitted with a RM Young Wind Head that recorded wind direction and wind speed. This was done so that a vector could be associated with the applicable contaminant concentrations, allowing for interpretation of the source of these contaminants. Meteorological data were collected at 1-hour intervals. A wind rose showing trends in wind speed and wind direction during this sampling period is provided in Figure 1a.

### 1.2.2 Spring 2017

A different type of monitor was used in the second monitoring period. Each monitoring station was equipped with a Beta Attenuation Monitor (BAM) 1020, measuring $PM_{10}$, and a second BAM 1020, measuring $PM_{2.5}$.

#### 1.2.2.1 Beta Attenuation Monitor

The BAMs measured concentrations of airborne particulate matter every hour by means of beta ray attenuation. The process involved directing a stream of beta particles through a filter tape to a detector. At each time step, the beta ray first passed through a clean section of the filter for a baseline reading. The filter tape then advanced from the detector to the sample line, and an external pump drew ambient air through the filter. The inlet heads, installed on the top of each of the units, were size-selective and fractionated the incoming particulate matter to less than 10 microns on one BAM, and less than 2.5 microns using a sharp-cut cyclone on the other BAM. After a sample period of approximately one (1) hour, the sample spot automatically moved back over the detector and the beta particle signal was sent through again. These before and after readings allowed the unit to calculate and report a 1-hour concentration. The process was repeated hourly throughout the monitoring period. The BAM self-calibrated once per day, and was cleaned and calibrated twice per month for flow, temperature, and barometric pressure, and checked for leaks to ensure accuracy and validity of the data. At the beginning of the program, a 72-hour zero was performed on all of the BAM units to establish instrument noise levels and set an appropriate instrument baseline zero level.

#### *1.2.2.2 Meteorological Tower*

Meteorological data were also collected from May 19 to July 19, 2017. The 3-metre meteorological tower was outfitted with a RM Young Wind Head that recorded wind direction and wind speed. This was done so that a directional vector could be associated with the applicable contaminant concentrations, allowing for interpretation of the source of these contaminants. It was calibrated for wind speed and direction on the first day of deployment. Meteorological data were collected at 5-min intervals and were averaged to 1-hour intervals for reporting purposes. A wind rose showing trends in wind speed and wind direction during this sampling period is provided in Figure 1b.

## 1.3 AIR QUALITY CRITERIA AND STANDARDS

The monitored contaminant concentrations were compared to air quality criteria and standards set by the Ontario Ministry of the Environment and Climate Change (MOECC) and by Environment Canada. The MOECC has an Ambient Air Quality Criteria (AAQC) for $PM_{10}$ and TSP. AAQCs are the maximum desirable concentrations in the outdoor air, based on effects to the environment and health (MOECC, 2012). Environment Canada has established a Canadian Ambient Air Quality Standard (CAAQS) for $PM_{2.5}$ (Environment Canada, 2013). CAAQS are health-based air quality objectives for the outdoor air.

The AAQC for $PM_{10}$ is 50 µg/m$^3$ (interim value) and for TSP is 120 µg/m$^3$. Both AAQCs are for an averaging period of 24 hours. The current CAAQS for $PM_{2.5}$ are 28 µg/m$^3$ for the 3-year average of annual 98$^{th}$ percentile 24-hour concentration, and 10 µg/m$^3$ for the 3-year average of annual average concentrations (in effect as of 2015). Note that since the monitoring only spanned two months, the CAAQS for $PM_{2.5}$ was only used as an indicator but would not be directly applicable in this circumstance.

## 1.4 HISTORICAL WEATHER

A review of historical weather from Toronto Pearson International Airport was completed for parameters that would affect that transport of particulate matter. The review focussed on precipitation (March through November to coincide with increased production at Teskey), wind speed and wind direction.

Climate normal data obtained from Environment Canada for the period of 1981 to 2010 was reviewed to ascertain precipitation (snowfall and rainfall) amounts and the number of days with rainfall by calendar month. The months with the most precipitation are May through September and November with amounts averaging between 70 and 75 mm per month. The number of days with recorded rainfall from May through to November ranges from approximately 10 through to 12 days per month. March and April have less precipitation and number of days with recorded rainfall when compared to the months of May through November.

The most common winds are from the north and west directions. Winds from the west-southwest, west-northwest, northwest and north-northwest are slightly less common. The strongest winds come from the southwest through to the north.

Weather data from Pearson Airport is included in Appendix A.

## 1.5 SUMMARY OF AMBIENT MEASUREMENTS

Summary tables of the concentration statistics from the continuous monitoring is provided below in Tables 1 and 2. Data summary tables are presented for TSP, $PM_{2.5}$, $PM_{10}$, and wind speed and wind direction in Appendix B.

**Table 1:** Murray Road Ambient TSP Particulate Air Monitoring Statistics

| Monitoring Statistics | Maximum 24 hr Mean | Monthly Mean | % valid hours |
|---|---|---|---|
| Compound | TSP (µg/m³) | TSP (µg/m³) | TSP (%) |
| 23 Murray Rd | 93 | 27 | 92.6 |
| 45 Murray Rd | 77 | 18 | 92.6 |
| 49 Murray Rd | 78 | 20 | 92.7 |
| Arithmetic Mean | 83 | 22 | 92.6 |

| Pollutant | Averaging Period | Guideline Level |
|---|---|---|
| TSP | 24-hr | 120 µg/m³ (AAQC) |

**Table 2:** Murray Road Ambient $PM_{10}$ and $PM_{2.5}$ Particulate Air Monitoring Statistics

| Monitoring Statistics | Maximum 24 hr Mean | | Sample Period Mean | | % valid hours | |
|---|---|---|---|---|---|---|
| Compound | $PM_{2.5}$ (µg/m³) | $PM_{10}$ (µg/m³) | $PM_{2.5}$ (µg/m³) | $PM_{10}$ (µg/m³) | $PM_{2.5}$ (%) | $PM_{10}$ (%) |
| 23 Murray Rd | 16 | 55 | 9 | 25 | 88.5 | 89.2 |
| 45 Murray Rd | 18 | 78 | 9 | 27 | 89.3 | 89.2 |
| Arithmetic Mean | 17 | 67 | 9 | 26 | 88.9 | 89.2 |

| Pollutant | Averaging Period | Guideline Level |
|---|---|---|
| $PM_{2.5}$ | 24-hr | 28 µg/m³ (CAAQS) |
| $PM_{10}$ | 24-hr | 50 µg/m³ (Interim AAQC) |

## 1.6 DISCUSSION

### 1.6.1 Pollution Roses

A pollution rose is an illustrative presentation of how air quality concentrations vary by wind direction. Pollution roses for TSP, $PM_{2.5}$ and $PM_{10}$ and are shown in Figures 2, 3 and 4, respectively. The wind direction data from the meteorological station installed as part of the respective monitoring program were used to generate these pollution roses.

The following observations can be made by the pollution roses:

**Fall 2016 (Figure 2)**

- During the sampling period, the most frequent winds are from the east-northeast, south, north-northwest and north-northwest.
- The highest levels of TSP (i.e., the bars having the most; black, green and blue shaded areas) for 23 Murray Road occurred from the east-northeast and south-southeast through to south-southwest.
- The highest levels of TSP for 45 Murray Road occurred from the southeast through to south-west.
- The highest levels of TSP for 49 Murray Road occurred from the southeast through to south-west.
- There is potentially some influence of Teskey on the measurements, especially from the front entrance to the plant, which lies to the south of the monitoring sites.
- Table 1 and the pollution roses indicate that there are sources to the southeast through to southwest that are contributing to the levels of TSP (i.e., the results for 23 Murray Road is higher than for 45 and 49 Murray Road). TSP sources to the south could include Teskey plant entrance, local industry, and road dust from Wilson Road and Highway 401.
- It is unknown what sources, other than residential and road traffic, could be causing elevated TSP levels from the east-northeast. Air traffic and the rail yard to the east are likely too far away to cause elevated levels.

**Spring 2017 (Figures 3 and 4)**

- During the sampling period, the wind most often came from the southwest and south-southwest. Northwest, north-northwest, southeast and east-southeast were also relatively common wind directions. Northeast winds were least frequent, and this may have been due to the influence of nearby structures (residences).
- For $PM_{2.5}$, higher concentrations were most frequently associated with winds from directions between south-southeast and southwest, particularly south-southwest and southwest. These higher concentrations cannot all be attributed to Teskey operations, and suggest an important influence from other sources of particulate matter located to the south (e.g., traffic on major roadways).
- For $PM_{10}$, higher concentrations were most frequently associated with winds from directions between north-northwest and south, particularly south-southwest and southwest. This is more suggestive of an important influence from Teskey operations than was the case for $PM_{2.5}$. The indication that $PM_{10}$ was more influenced by Teskey than $PM_{2.5}$ is consistent with the fact that the majority of dust particles emitted from mineral aggregate operations are larger in size than $PM_{2.5}$.

### 1.6.2 Total Suspended Particulate (TSP) Results

Data recovery levels were high for TSP at all monitoring locations, averaging 93% valid hours of data. Both the DustTrak DRX and E-Sampler collected TSP data at each of the monitoring stations. Gravimetric analysis was completed with the E-Samplers, and the pre-weighed Teflon filters were acquired and sent to Maxxam Analytics in Mississauga, ON for filter weight gain analysis.

There were no exceedances over the TSP AAQC during the September 22 to November 28 sampling period at any of the monitoring locations.

### 1.6.3 Respirable Particulate ($PM_{2.5}$) Results

#### *1.6.3.1 23 Murray Road*

Data recovery levels were good for $PM_{2.5}$ (88.5% valid data). The 98th percentile 24-hour concentration of $PM_{2.5}$ was 16 µg/m³ which did not exceed the 24 hour CAAQS of 28 µg/m³.

#### *1.6.3.2 45 Murray Road*

Data recovery levels were good for $PM_{2.5}$ (89.3% valid data). The 98th percentile 24-hour concentration of $PM_{2.5}$ was 15 µg/m³ which did not exceed the 24 hour CAAQS of 28 µg/m³.

### 1.6.4 Inhalable Particulate ($PM_{10}$) Results

#### *1.6.4.1 23 Murray Road*

Data recovery levels were good for $PM_{10}$ (89.2% valid data). There were two (2) exceedances of the $PM_{10}$ interim AAQC over the entire sampling period. These exceedances occurred on June 8 and June 12, 2017 with values of 55 and 50 µg/m³ respectively. The highest $PM_{10}$ 24-hour averaged value was 55 µg/m³, which is 110% of the interim AAQC. Pollution roses for each of these days are presented in the Figures section of this report as Figures 6 and 7.

#### *1.6.4.2 45 Murray Road*

Data recovery levels were good for $PM_{10}$ (89.2% valid data). There were four (4) exceedances of the $PM_{10}$ interim AAQC over the entire sampling period. These exceedances occurred on May 31, June 8, June 12 and July 6, 2017 with values of 78, 72, 64 and 52 µg/m³ respectively. The highest $PM_{10}$ 24-hour averaged value was 78 µg/m³, which is 156% of the interim AAQC. Pollution roses for each of these days are presented in the Figures section of this report as Figures, 5, 6, 7 and 8.

### 1.6.5 Quality Control

During the fall 2016 monitoring period RWDI technicians visited the monitoring locations a few times per month to download data from the DustTraks and E-samplers, to perform a zero check on the DustTraks and to load and collect filters from the E-samplers. The E-samplers were programmed to auto-zero twice a day to prevent zero drift. Before deployment and during sampling onsite, the flow rate of the DustTraks and E-samplers were checked and adjusted to 3 L/min and 2 L/min respectively.

During the spring 2017 monitoring period RWDI technicians visited the monitoring locations twice per month to clean and calibrate the BAM units. This involved cleaning the sampler heads and cyclones, and cleaning internal components of the BAMs. A 72-hour zero was also performed on all of the BAMs at the beginning of the program to verify instrument noise levels and set an appropriate background zero value. During the biweekly visits, the flow rate, temperature and pressure of the BAMs were checked and adjusted accordingly. The units were also leak-checked to verify proper operation.

Outlier data points were identified on July 1, 2017 at 21:00, where all monitors ($PM_{10}$ and $PM_{2.5}$) at both locations showed concentrations of approximately 70 µg/m$^3$. We believe that this was due to fireworks occurring that evening and as it was an isolated event and coincided with the holiday. These data points were therefore invalidated.

Any data concentrations from 0 to -3 µg/m$^3$ were set to zero as a result of instrument noise, and any reported concentrations less than -3 µg/m$^3$ were invalidated.

There were occurrences where the $PM_{2.5}$ values were greater than $PM_{10}$ values at both locations during this sampling period. It is believed that this was largely attributed to electrical noise that was generated by both BAMs. The majority of these occurrences were at times when the airborne particulate matter happened to be dominated by $PM_{2.5}$, and both $PM_{2.5}$ and $PM_{10}$ concentrations were fairly low. Anytime these conditions occurred, the $PM_{10}$ and $PM_{2.5}$ readings were both invalidated. This happened for 6% of the total sample time at 23 Murray Road, and 4% of the time at 45 Murray Road.

### 1.6.6 Data Comparison to Nearby MOECC Toronto West Station

Figure 9 shows the relative locations of the MOECC's Toronto West air quality monitoring station, and the 23 Murray Road and 45 Murray Road stations operated by RWDI. As a check of the $PM_{2.5}$ data collected by RWDI, the data from May 19 through July 19 of 2017 were compared with corresponding data collected by the MOECC. The latter data were obtained from the Air Quality Ontario website for Station 35125 Toronto West. It should be noted that these data have not yet undergone final verification by the MOECC.

A figure depicting the minimum, average, average plus one standard deviation and maximum for 23 Murray Rd, 45 Murray Rd and MOECC Toronto West data from May 19 through July 19 for $PM_{2.5}$ can be seen in Figure 10. $PM_{2.5}$ experiences more influence from regional emissions and long-range transport, but is susceptible to other causes of elevated short-term concentrations. It can be seen that the statistics from Murray Road monitors in relation to the MOECC Toronto West station were very comparable, with the Murray Road monitors having slightly higher averages, similar maximums and similar standard deviations.

## 1.7 CONCLUSION

Throughout the monitoring periods there were two exceedances of the 24-hour $PM_{10}$ AAQC at 25 Murray Road, and four exceedances of the 24-hour $PM_{10}$ AAQC at 45 Murray Road. There were no exceedances of any TSP and $PM_{2.5}$ criteria during the monitoring periods at any location. The pollution rose for $PM_{10}$ is suggestive of a noticeable influence from operations at Teskey.

# 2 NOISE IMPACT STUDY

## 2.1 Introduction

The objective of this study is to understand the existing ambient noise environment in the MRRA. Sources of sound in the area include:

- The existing Teskey concrete mixing plant (54 Murray Road);
- The City of Toronto Central Yard (64 Murray Road);
- Toronto EMS Station 52 (64 Murray Road);
- Coco Paving Asphalt Plant (949 Wilson Avenue),
- Bombardier Aerospace and associated air traffic at Downsview Airport;
- Rail traffic on the Metrolinx Barrie Corridor located immediately to the west of the MRRA;
- Road traffic on Wilson Avenue, Keele Street and Highway 401; and
- Other lesser sources of ambient sound including activities at surrounding residences, and sound from nearby commercial/retail developments.

## 2.2 Applicable guidelines

This assessment considers guidance provided in NPC-300 and NPC-233. Sound associated with nearby industry is assessed at the plane of window of noise sensitive spaces and outdoor points of reception.

NPC-300 guidelines define separate sound level limits for daytime (0700 – 1900h), evening (1900 – 2300h), and nighttime (2300 – 0700h). The metric used to determine sound levels for each of these periods is a 1-hour $L_{EQ}$. The 1-hour $L_{EQ}$ is an energy equivalent sound level over a 1-hour period.

The proposed development site is considered as a Class 1 area in NPC-300. The default NPC-300 sound level limits for continuous sources of sound are summarized in Table 3. These default sound level limits would be subject to potential increases if existing background sound levels in the area are elevated due to road traffic in the area.

**Table 3:** Summary of Default NPC-300 Stationary Noise Criteria – Class 1

| Receiver | Time Period | Sound Level Criteria $L_{EQ}$, 1-hr |
|---|---|---|
| **Outdoor Point of Reception [1]** | 0700-1900h | 50 dBA |
| | 1900-2300h | 50 dBA |
| **Plane of Window** | 0700-1900h | 50 dBA |
| | 1900-2300h | 50 dBA |
| | 2300-0700h | 45 dBA |

**Notes:** [1] There is no sound level limit for outdoor points of reception during the nighttime.

## 2.3 Sound Measurements & Results

Long-term sound measurements were completed from November 2, 2016 to November 11, 2016 on a residential property at 49 Murray Road. The monitor was located at the corner of Murray Road and Spalding Avenue, as shown in Figure 1a. The monitor was set back approximately 9 m from the eastern edge of Murray Road, and at a height of approximately 2.5 m above local grade to represent the front facade of the homes along the eastern side of Murray Road. This monitoring location was selected to capture sound emanating from facility operations of the existing Teskey concrete plant, as well as to adequately represent the acoustical environment of sensitive receptors in close proximity to the proposed facility expansion.

Measurements were completed using a Type 1 integrating Sound Level Meter (SLM). Sound measurements capture all sources of sound audible at the receptor, including sources at the existing Teskey facility, road/rail/air traffic sources, sound from other industrial/commercial facilities, and other sources of sound. Any sound measurements taken during precipitation, and periods of high winds, or high humidity have been excluded from the data set and any sound levels cited in this report, in accordance with MOECC guidance.

Long-term sound measurements indicate that the sound levels in the MRRA are higher than default sound level limits for Class 1 (urban) areas outlined in NPC-300, but measured sound levels are not unusual for the level of development and industrial activity in the area. Figure C1 provided in Appendix C shows a figure of the hourly sound levels measured at the monitor location over the 9-day monitoring period. The plot shows the energy equivalent sound level averaged over each hour (1-hour $L_{EQ}$), the maximum instantaneous sound level recorded during each hour ($L_{MAX}$), and the sound level exceeded 90% of the time during a given hour ($L_{(90)}$). Table 4 provides a summary of average 1-hour $L_{EQ}$ sound levels by time period.

RWDI staff attended the monitor location on three separate occasions during the daytime period and made observations of ambient sound in the vicinity of the monitor. We observed that background sound in the vicinity of the monitor is predominantly steady in nature, but is punctuated by brief periods of elevated sound associated with local activities, such as vehicle pass bys on roadways in the immediate area, and short-duration activities at Teskey.

RWDI observed that steady ambient sound at the monitor location is dominated by distant road traffic sources, with a minor contribution from continuous sources at the Teskey concrete mixing plant (exhaust fans, HVAC, etc.). These steady background sound levels are characterized by the average 1-hour $L_{EQ}$ sound levels outlined in Table 4.

Short duration events such as vehicle pass bys on Murray Road and/or Spalding Road, and sporadic heavy equipment operation at Teskey are more aptly characterized by maximum instantaneous sound levels measured during each hour ($L_{MAX}$). Our on-site observations indicate that the highest $L_{MAX}$ levels are likely associated with vehicle pass bys of large trucks and ambulances emanating from the City of Toronto Central Yard and EMS Station 52 at 64 Murray Road, respectively.

Short duration events at Teskey typically consisted of heavy equipment operations, which increased the overall sound levels at the monitoring location to 62-65 dBA. These events appear to be very sporadic in nature, and included operation of heavy equipment (conveyors, mixers, material loading/unloading, etc.) and mobile sources such as trucks and loaders at the Teskey facility.

**Table 4:** Summary of Measured Sound Levels over the period November 2, 2016 and November 11, 2016

| Monitor Location | Time of Day | NPC-300 Default Sound Level Limits [$L_{EQ}$] | Measured Sound Levels (dBA) | | |
|---|---|---|---|---|---|
| | | | Minimum 1-Hour Sound Level [$L_{EQ}$] | Average 1-Hour Sound Level [$L_{EQ}$] | Maximum 1-Hour Sound Level [$L_{EQ}$] |
| 49 Murray Road | Daytime (0700-1900h) | 50 | 51 | 60 | 65 |
| | Evening (1900-2300h) | 50 | 53 | 57 | 60 |
| | Nighttime (2300-0700h) | 45 | 47 | 57 | 63 |

Our observations from analysis of this data set are:

- There is a difference between measurements obtained on weekdays and weekends. Analysis of the average hourly sound level ($L_{EQ}$) for weekdays compared to weekends, as shown in Figure C2 of Appendix C, shows a strong correlation with typical traffic patterns for weekdays compared to weekends. Specifically, the minimum sound levels in the nighttime period (23:00-07:00h) occur later in the morning on weekends as opposed to weekdays, overall noise levels are lower on weekends, and weekday hourly sound levels show local maximums in the morning and afternoon corresponding to the rush hour periods.
- The data shows a diurnal pattern typical of sound from road traffic sources. This pattern is evident when comparing the measured hourly sound level to the average hourly sound level for weekdays and weekdays, as shown in Figure C3 of Appendix C. In addition, the average hourly sound levels at the monitoring location are in line with what could typically be expected based on the proximity and traffic volumes of nearby roadways.

General trends in the sound data by time period are given below.

## The Daytime Period (07:00-19:00h):

- The monitor location had an average $L_{EQ}$ of 60 dBA for the entire daytime period, and a minimum hourly $L_{EQ}$ of 51 dBA, which occurred at 11:00 on a weekend. The minimum hourly $L_{EQ}$ for the daytime period on weekdays was higher at 56 dBA, and generally occurred at 18:00, at the end of the daytime period.
  The maximum instantaneous sound level observed at the monitor location during the daytime period over the complete monitoring period was 90 dBA, however maximum instantaneous hourly sound levels of 83 dBA were more typical during the daytime period.

**The Evening Period (19:00-23:00h):**

- The monitor location had an average $L_{EQ}$ of 57 dBA for the entire evening period, and a minimum hourly $L_{EQ}$ of 53 dBA, which occurred at 21:00 on a weekend. The minimum hourly $L_{EQ}$ for the evening period on weekdays was higher at 56 dBA, generally occurring at 20:00.
- The maximum instantaneous sound level observed at the monitor location during the evening period over the complete monitoring period was 77 dBA, however maximum hourly instantaneous sound levels of 76 dBA are more typical during the evening period.

**The Nighttime Period (19:00-23:00h):**

- The monitor location had an average $L_{EQ}$ of 57 dBA for the entire nighttime period, and a minimum hourly $L_{EQ}$ of 47 dBA, which occurred at 04:00 on a weekend. The minimum hourly $L_{EQ}$ for the nighttime period on weekdays was higher at 48 dBA, generally occurring at 02:00.
- The maximum instantaneous sound levels observed at the monitor location during the nighttime period over the complete monitoring period was 83 dBA, however maximum hourly instantaneous sound levels of 77 dBA are more typical during this period.

## 2.4 Conclusions

Long-term sound measurements indicate that the sound levels in the MRRA are higher than default sound level limits for Class 1 (urban) areas outlined in NPC-300, but that sound levels are not unusual for the level of development and industrial activity in the area.

Sound in the area of the MRRA is characterized by steady ambient noise consistent with distant road traffic sources, with a minor contribution from continuous sources at the existing Teskey facility, with infrequent spikes in sound associated with local events such as vehicle pass bys on adjacent roadways, and heavy equipment operation at Teskey.

Based on current measurements outlined in this report, RWDI expects that there may be some potential for exceedance of applicable sound level limits by the existing and proposed ready-mix facilities on Murray Road, specifically for sporadic short duration events, such as heavy equipment operation. Because long-term sound measurements were not attended, RWDI is unable to be definitive in identifying sources of sound.

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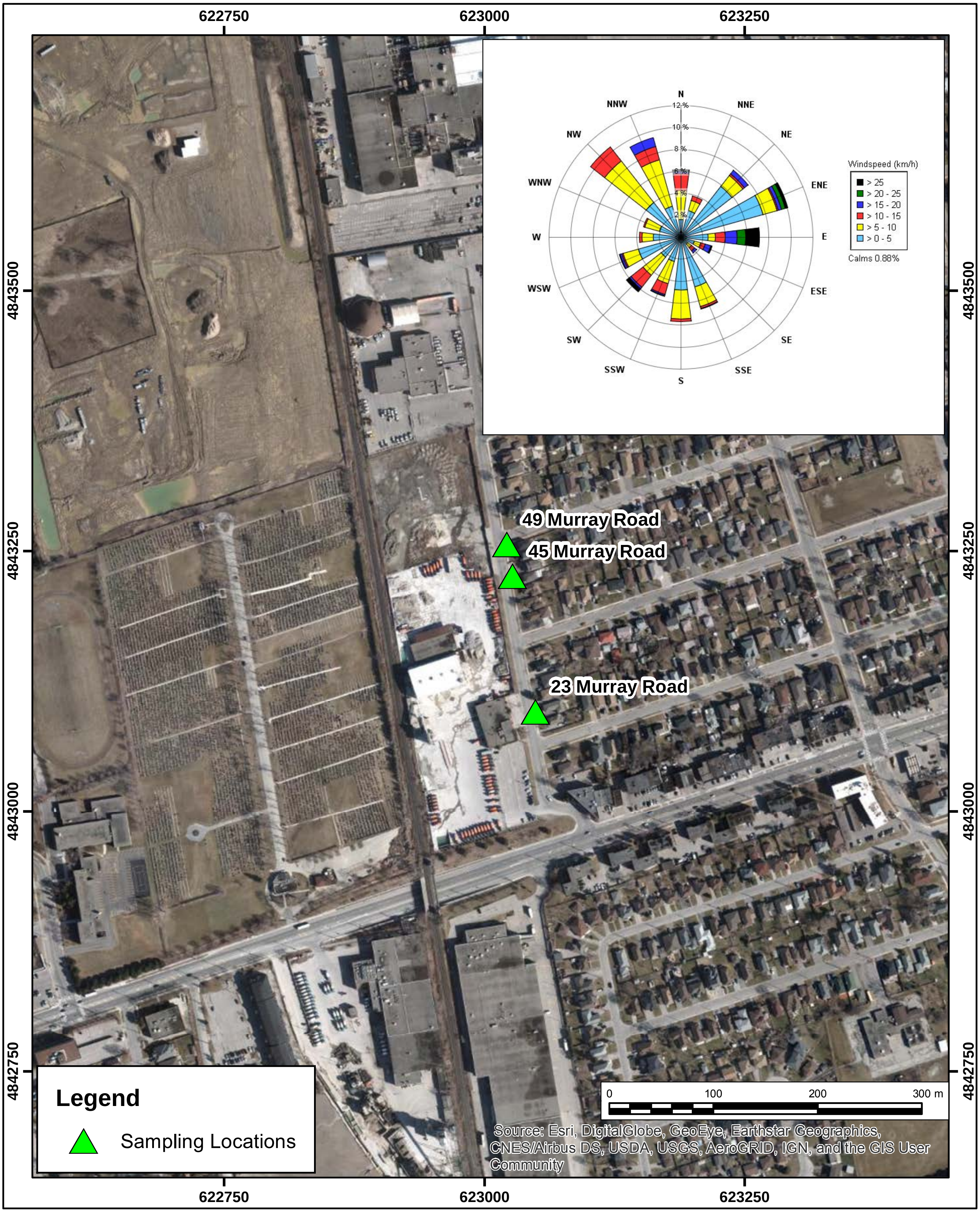
# FIGURES




Murray Road Windrose

September 22 – November 28, 2016

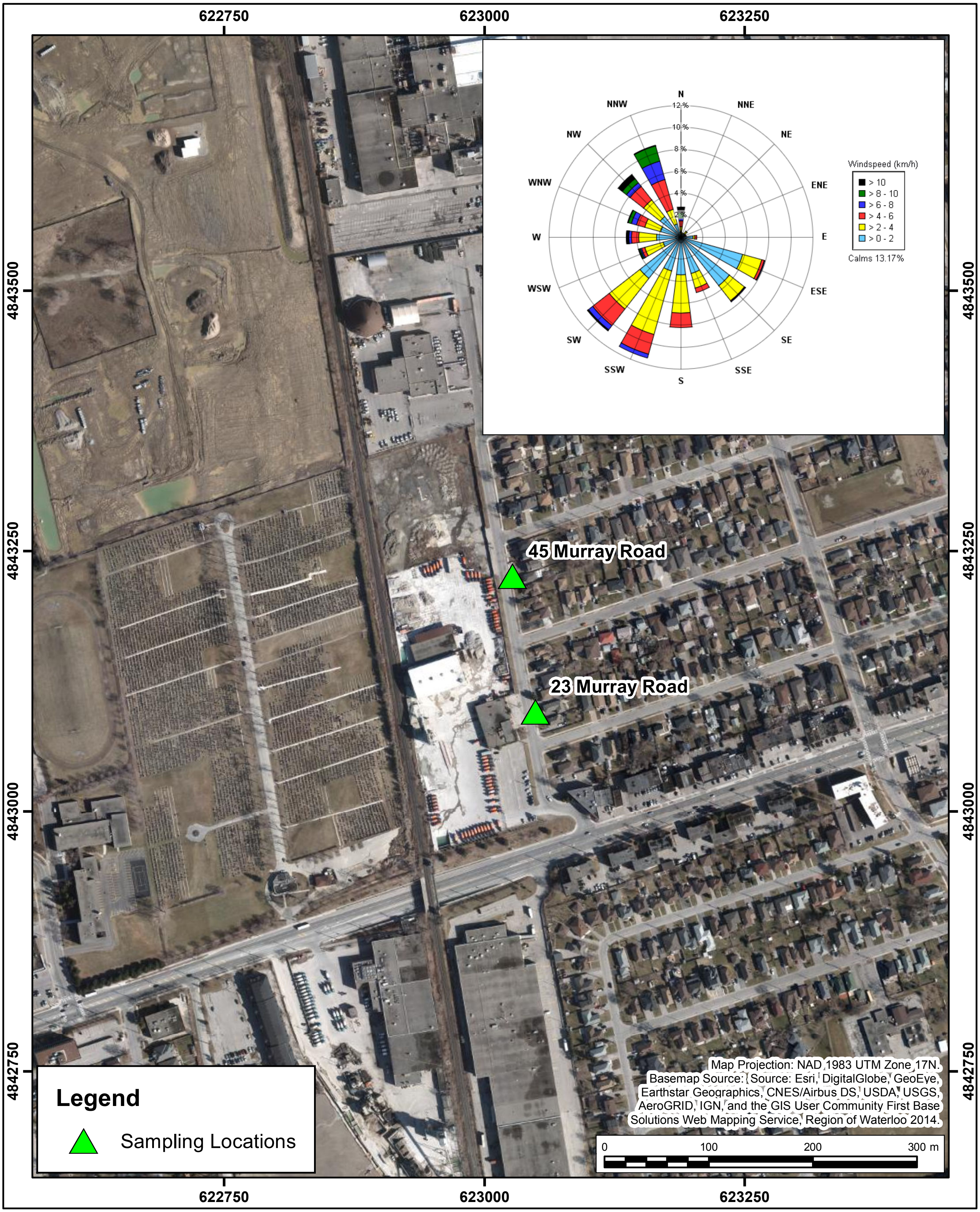
Murray Road – Toronto, Ontario

True North

Map Projection: NAD 1983 UTM Zone 17N.

Project #1603972

| | |
|---|---|
| Drawn by: VML | Figure: 1a |
| Approx. Scale: | 1:5,000 |
| Date Revised: | Jan. 4, 2016 |




Murray Road Windrose

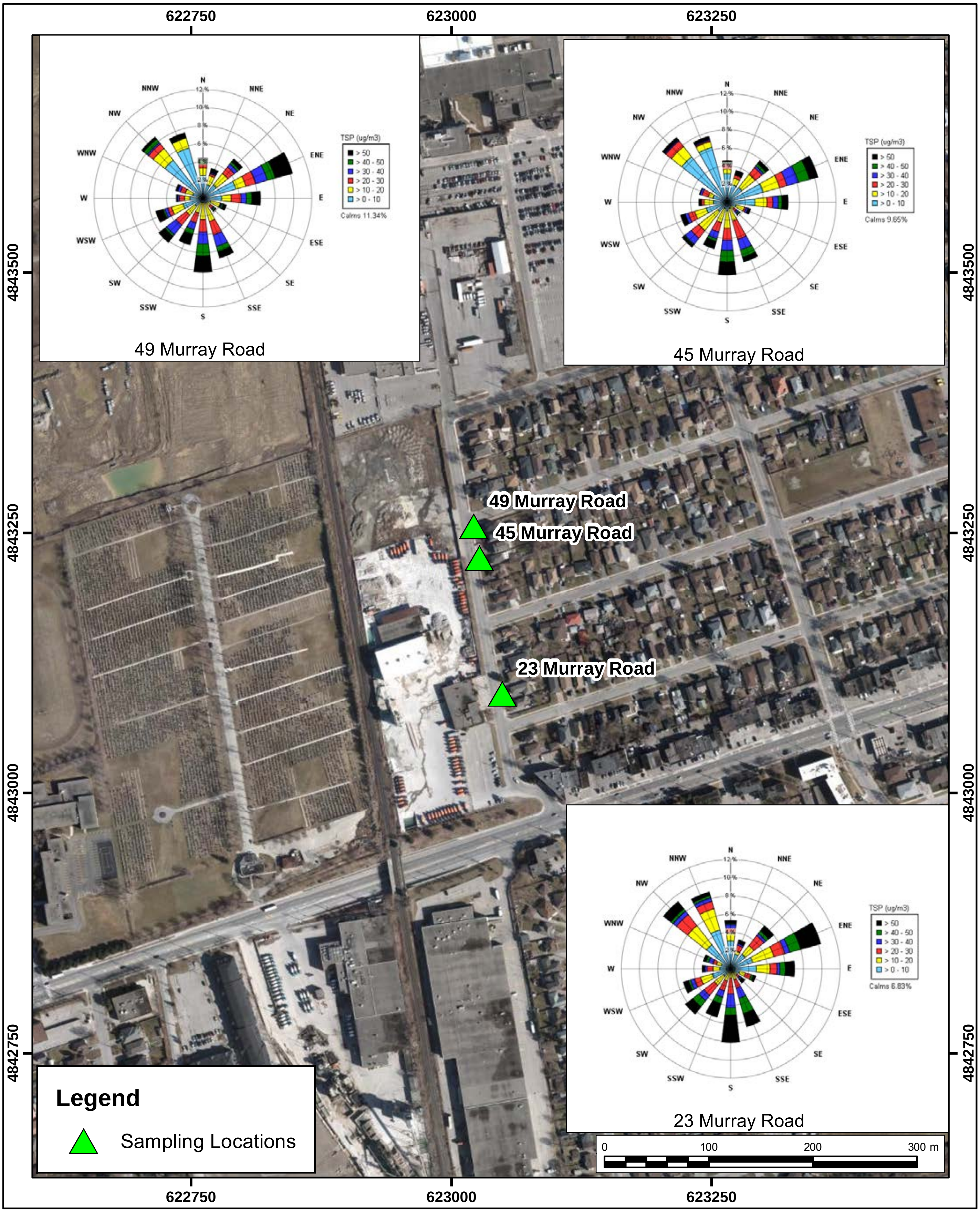
May 19 - July 19, 2017

Murray Road – Toronto, Ontario

True North

Project #1603972

| | |
|---|---|
| Drawn by: VML | Figure: 1b |
| Approx. Scale: | 1:5,000 |
| Date Revised: | Aug 3, 2017 |




Murray Road TSP Pollution Roses

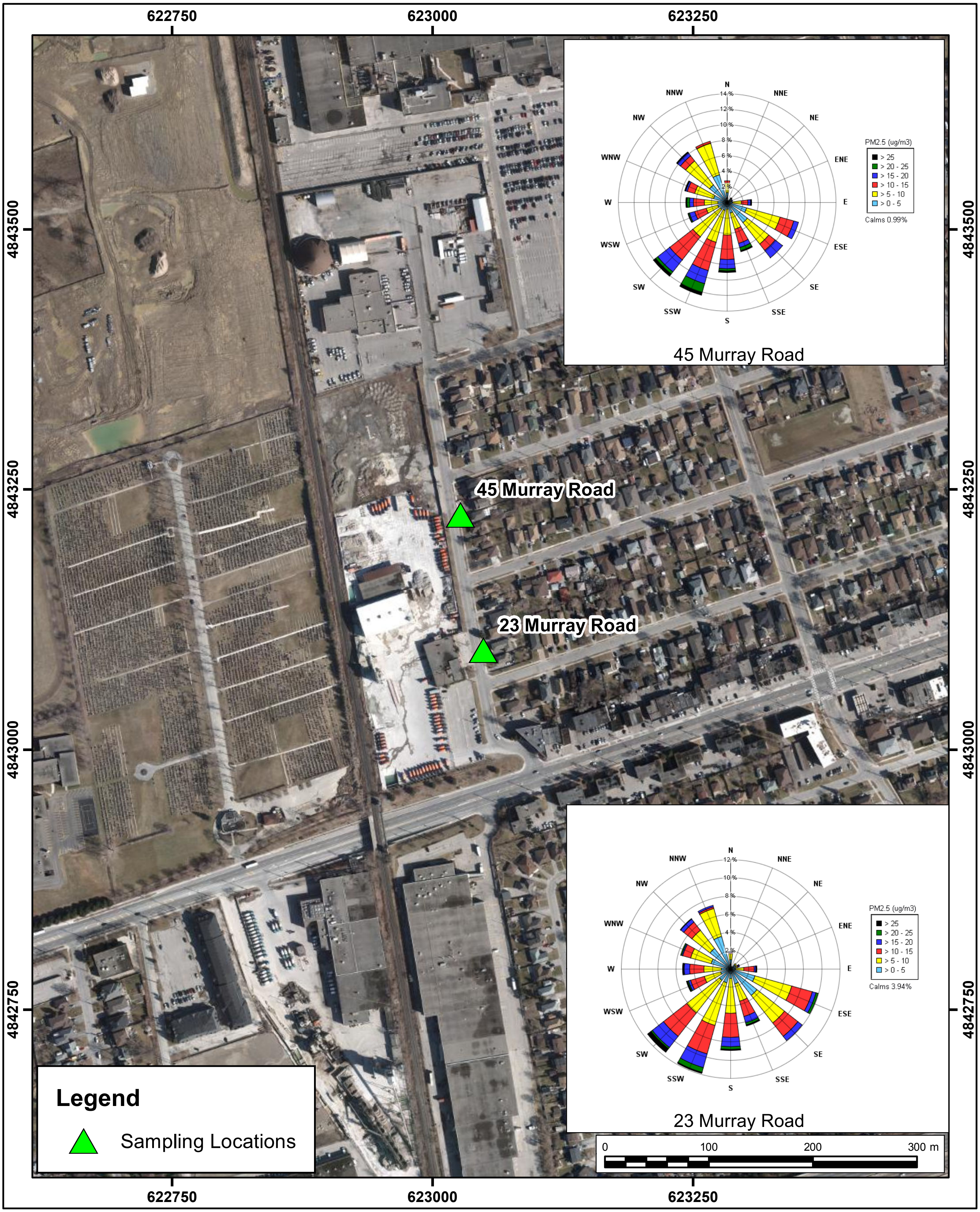
September 22 – November 28, 2016

Murray Road – Toronto, Ontario

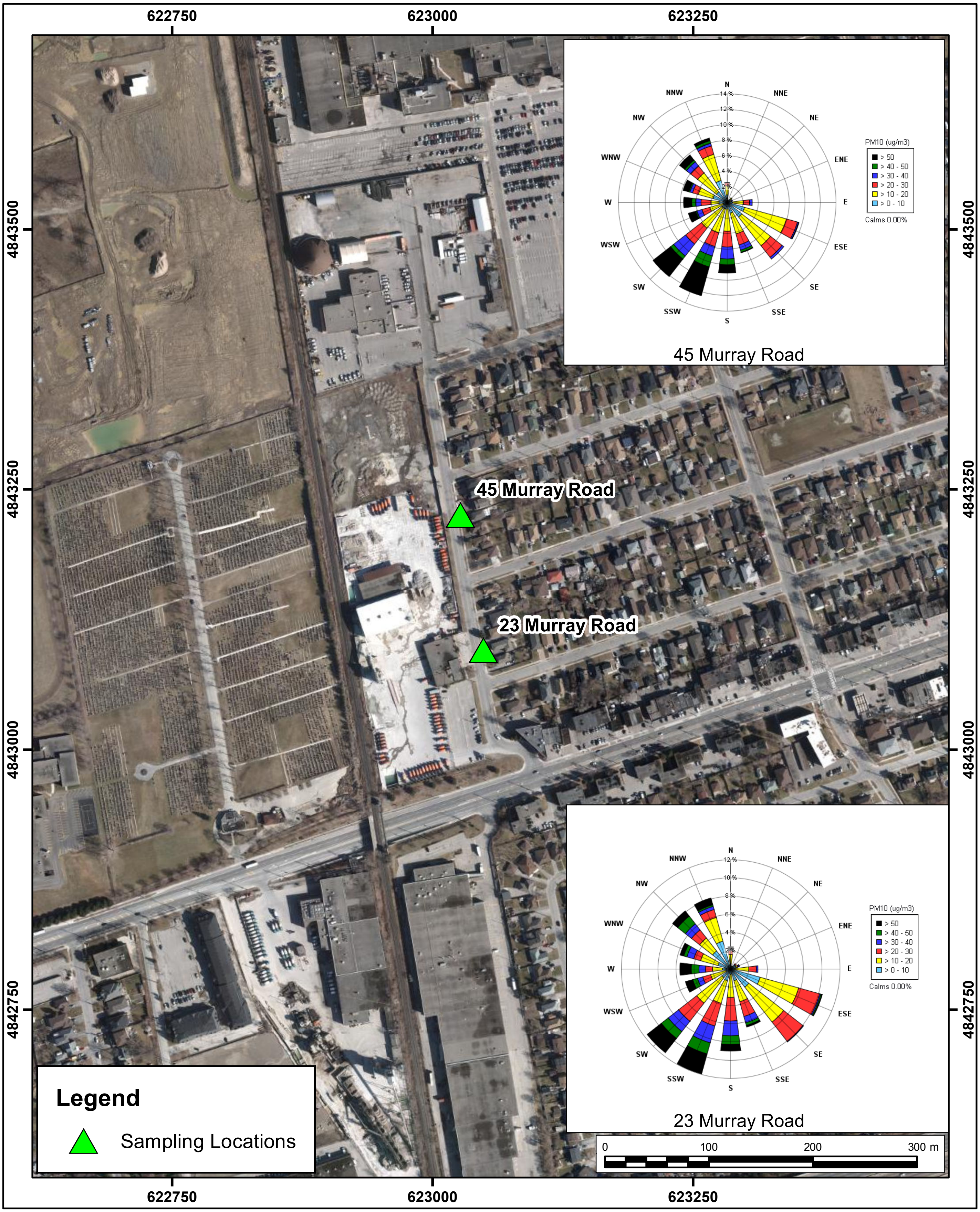
True North

Project #1603972

| | |
|---|---|
| Drawn by: VML | Figure: 2 |
| Approx. Scale: | 1:5,000 |
| Date Revised: | Jan. 4, 2016 |




| | | | |
|---|---|---|---|
| Murray Road PM2.5 Pollution Roses<br>May 19 – July 19, 2017 | True North | Drawn by: VML | Figure: 3 |
| | | Approx. Scale: | 1:5,000 |
| Murray Road – Toronto, Ontario | Project #1603972 | Date Revised: | Aug 3, 2017 |




Murray Road PM10 Pollution Roses

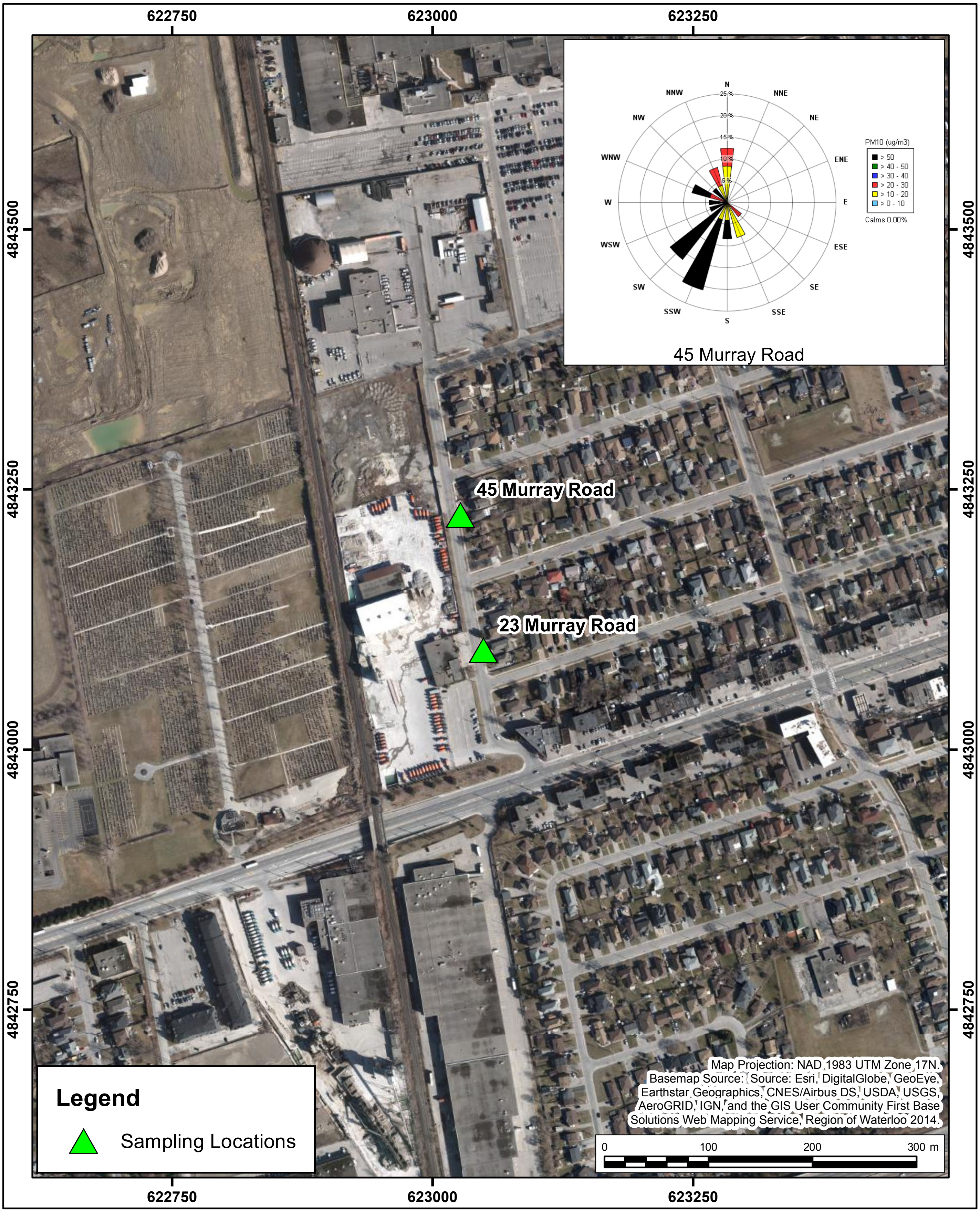
May 19 – July 19, 2017

Murray Road – Toronto, Ontario

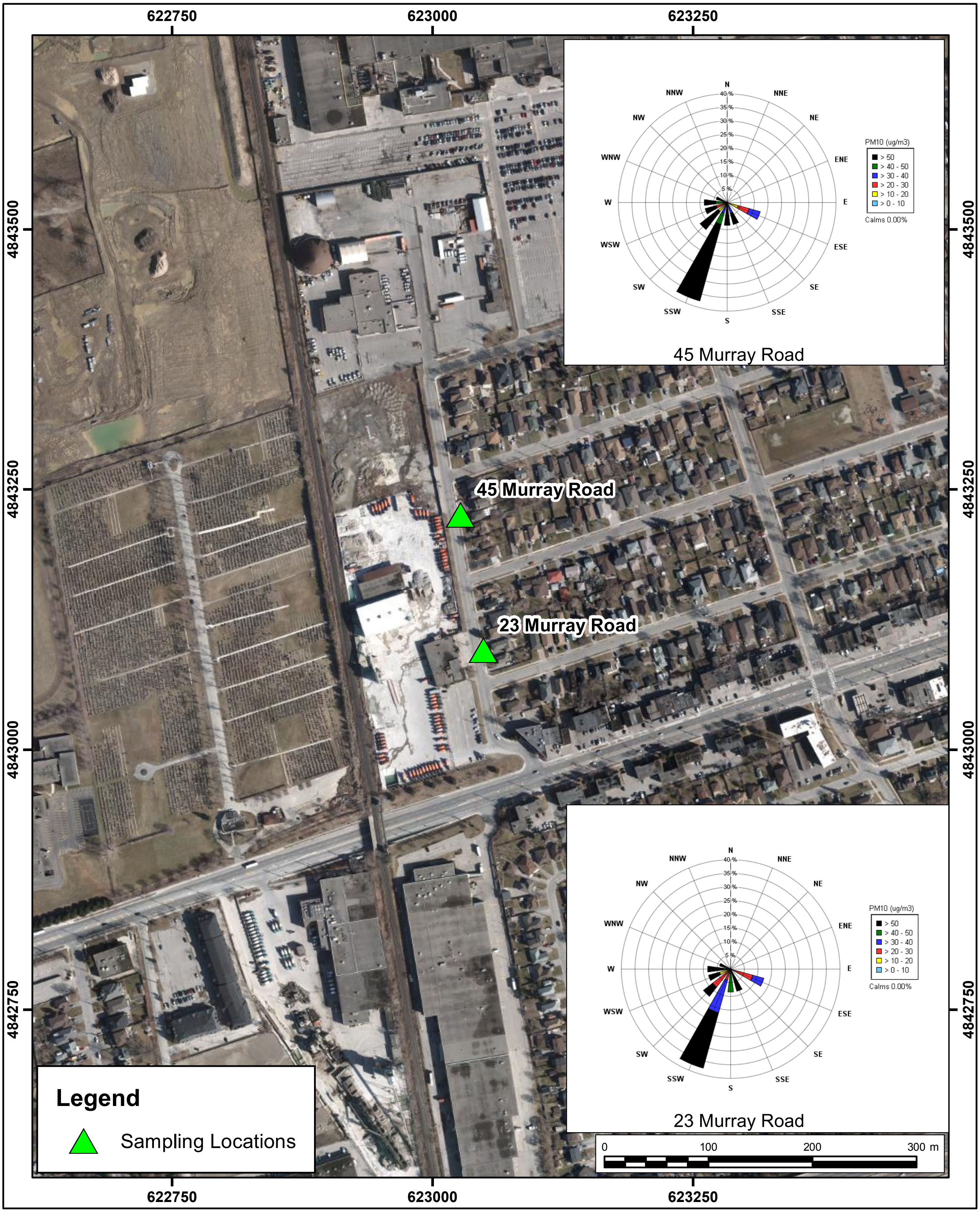
True North

Project #1603972

| | | |
|---|---|---|
| Drawn by: VML | Figure: 4 | |
| Approx. Scale: | 1:5,000 | |
| Date Revised: | Aug 3, 2017 | |




| Murray Road PM10 Exceedance Day Pollution Roses<br>May 31, 2017<br><br>Murray Road – Toronto, Ontario | True North<br><br>Project #1603972 | Drawn by: VML | Figure: 5 |
|---|---|---|---|
| | | Approx. Scale: 1:5,000 | |
| | | Date Revised: Aug 4, 2017 | |




Murray Road PM10 Exceedance Day Pollution Roses

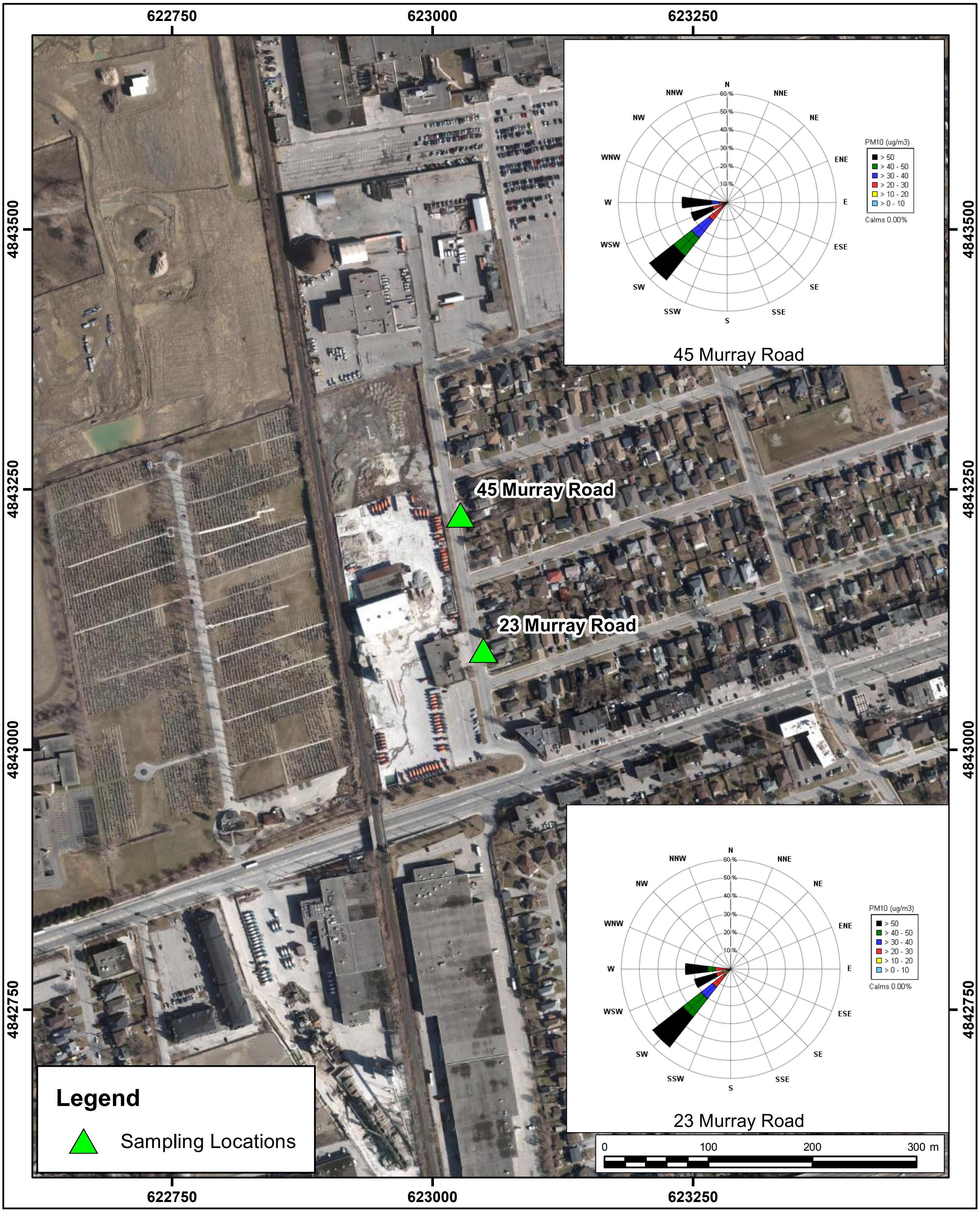
June 8, 2017

Murray Road – Toronto, Ontario

True North

Project #1603972

| Drawn by: VML | Figure: 6 |
|---|---|
| Approx. Scale: | 1:5,000 |
| Date Revised: | Aug 4, 2017 |



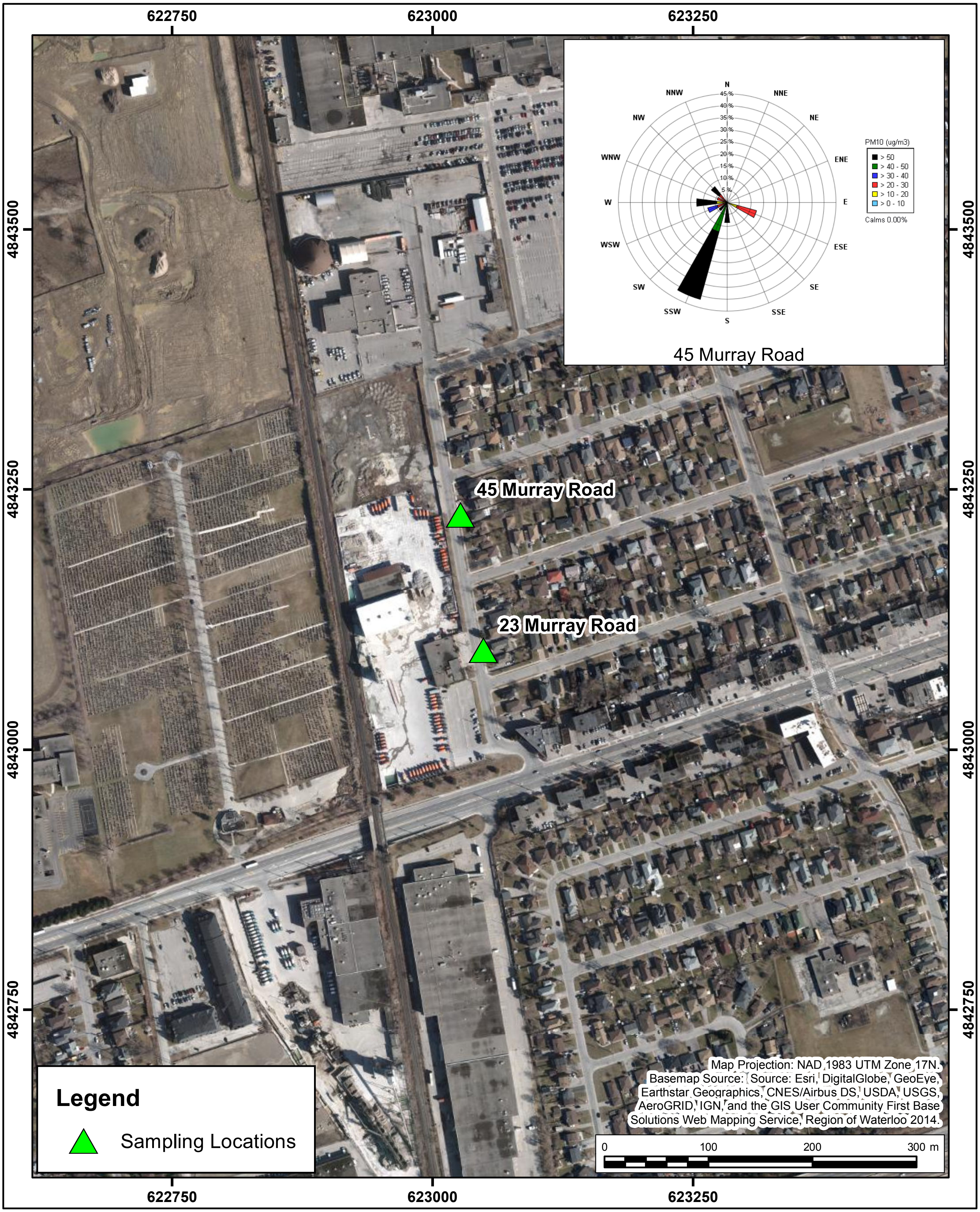

Murray Road PM10 Exceedance Day Pollution Roses
June 12, 2017

Murray Road – Toronto, Ontario

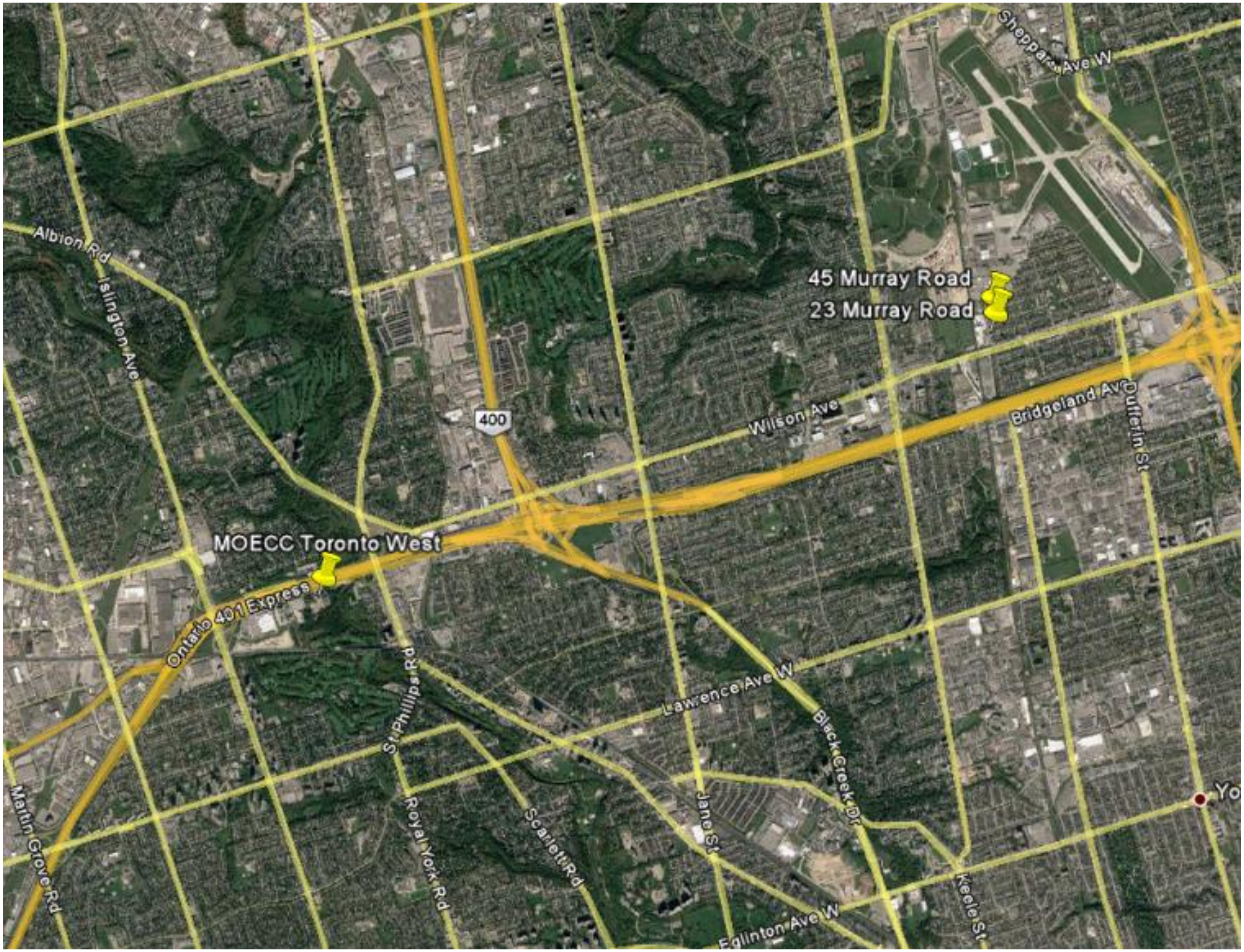
True North

Project #1603972

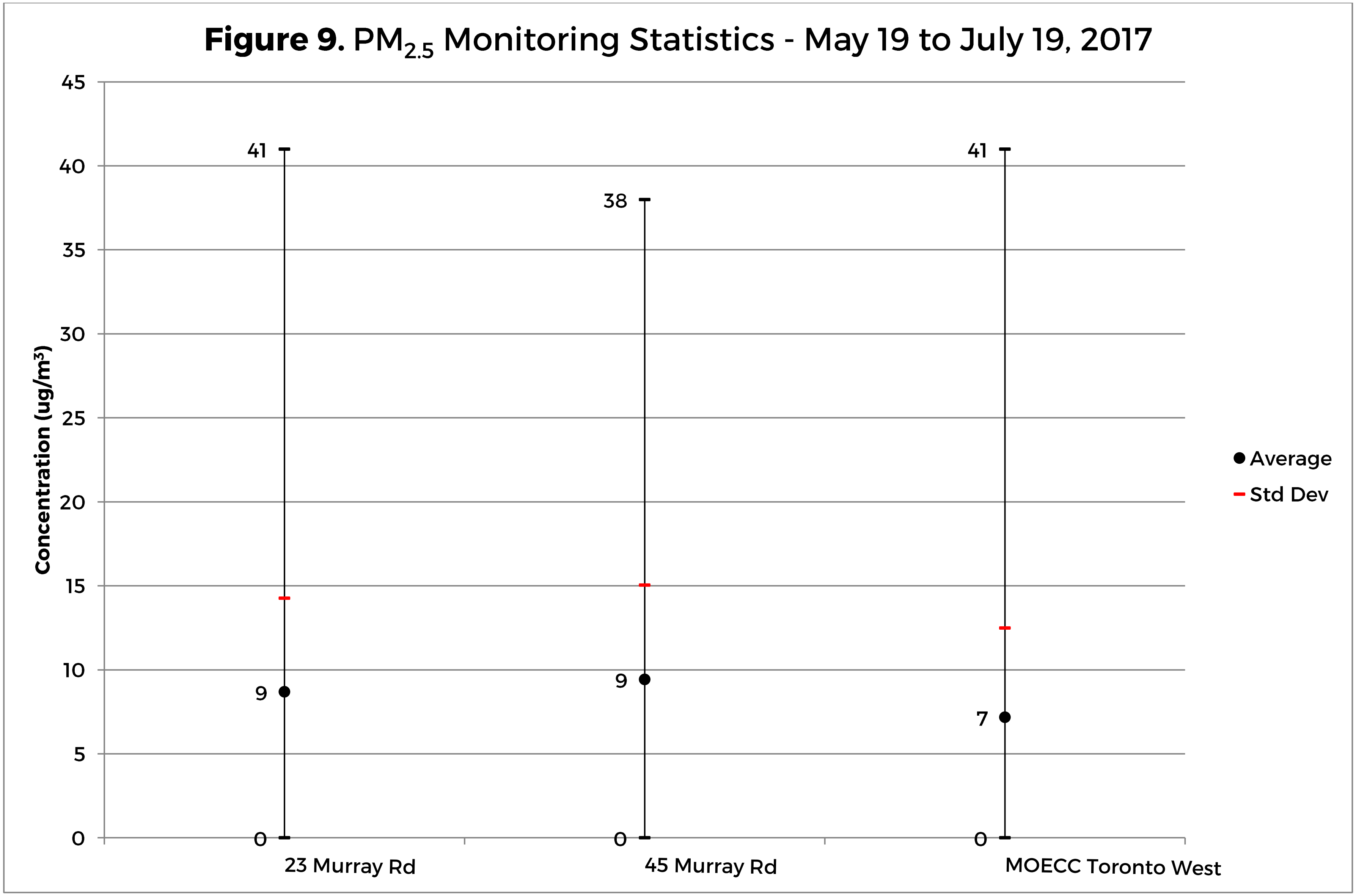
| | | |
|---|---|---|
| Drawn by: VML | Figure: 7 | |
| Approx. Scale: | 1:5,000 | |
| Date Revised: | Aug 4, 2017 | |




| | | | |
|---|---|---|---|
| Murray Road PM10 Exceedance Day Pollution Roses<br>July 6, 2017 | True North | Drawn by: VML | Figure: 8 |
| | | Approx. Scale: 1:5,000 | |
| Murray Road – Toronto, Ontario | Project #1603972 | Date Revised: Aug 4, 2017 | |




| | | | |
|---|---|---|---|
| **MOECC Toronto West, 23 Murray Road and 45 Murray Road Monitoring Locations** | **Project #1603972** | Figure No. 9<br>Date: Aug 08, 2017 | RWDI |




| | | |
|---|---|---|
| $PM_{2.5}$ **Monitoring Statistics – May 19 to July 19, 2017** Project #16039720 | Figure No. 10<br>Date: Aug 08, 2017 | |

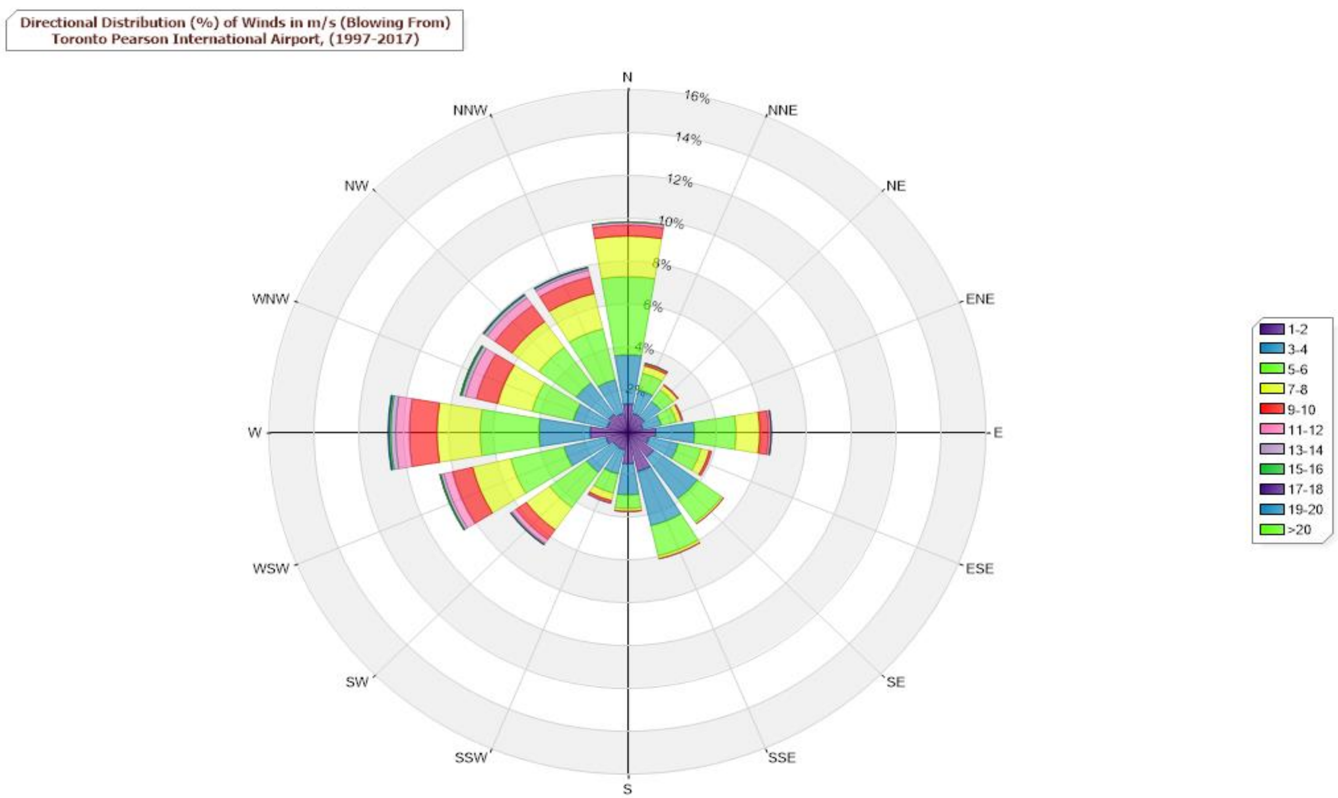
# APPENDIX A

**1981 to 2010 Canadian Climate Normals station data - Toronto Pearson International Airport**

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rainfall (mm) | 25.1 | 24.3 | 32.6 | 63 | 74.3 | 71.5 | 75.7 | 78.1 | 74.5 | 60.6 | 68 | 34 | 681.6 |
| Snowfall (cm) | 29.5 | 24 | 17.7 | 4.5 | 0 | 0 | 0 | 0 | 0 | 0.4 | 7.5 | 24.9 | 108.5 |
| Precipitation (mm) | 51.8 | 47.7 | 49.8 | 68.5 | 74.3 | 71.5 | 75.7 | 78.1 | 74.5 | 61.1 | 75.1 | 57.9 | 785.9 |

Days with Rainfall

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| >= 0.2 mm | 5.4 | 4.6 | 7.4 | 11.3 | 12.5 | 10.8 | 10.4 | 10.2 | 10.5 | 12 | 11 | 7.1 | 113.2 |
| >= 5 mm | 1.6 | 1.7 | 2.1 | 4.2 | 4.8 | 5 | 4.1 | 4.2 | 4.5 | 3.8 | 4.1 | 2.6 | 42.6 |
| >= 10 mm | 0.77 | 0.93 | 1.1 | 2.1 | 2.4 | 2.5 | 2.6 | 2.4 | 2.4 | 2 | 2.4 | 1.1 | 22.5 |
| >= 25 mm | 0.07 | 0.1 | 0.03 | 0.23 | 0.27 | 0.4 | 0.83 | 0.9 | 0.6 | 0.2 | 0.5 | 0.1 | 4.2 |



# APPENDIX B

**Table B1: Murray Road Ambient Particulate Monitoring Results**

| Monitoring Statistics | Maximum 24 hr Mean | Monthly Mean | % valid hours |
|---|---|---|---|
| Compound | TSP | TSP | TSP |
| | (µg/m3) | (µg/m3) | (%) |
| 23 Murray Rd | 93 | 27 | 92.6 |
| 45 Murray Rd | 77 | 18 | 92.6 |
| 49 Murray Rd | 78 | 20 | 92.7 |
| Arithmetic Mean | 83 | 22 | 92.6 |

| MET Statistic | Maximum 1 hr | Maximum 24 hr | Period Mean | % valid hours | |
|---|---|---|---|---|---|
| Met Station 49 | WS | WS | WS | WS | WD |
| Murrray | (km/hr) | (km/hr) | (km/hr) | (%) | |
| Sept 22 - Nov 28 | 18 | 12 | 5 | 80 | 80 |

| Pollutant | Averaging Period | Guideline Level |
|---|---|---|
| TSP | 24-hr | 120 µg/m$^3$ (AAQC) |

## Table B2: Monitoring Results for TSP for 23 Murray Rd

| Data Statistics | Events > 24 hr AAQC | Arithmetic Mean | Maximum 1 hr Mean | Maximum 24 hr Mean | Number of valid Hours | % valid data |
|---|---|---|---|---|---|---|
| Time Period | TSP | TSP | TSP | TSP | TSP | TSP |
| | No. | (ug/m$^3$) | (ug/m$^3$) | (ug/m$^3$) | No. | % |
| Sept 22 - Nov 28 | 0 | 27 | 179 | 93 | 1482 | 92.6 |

## Table B3: Monitoring Results for TSP for 45 Murray Rd

| Data Statistics | Events > 24 hr AAQC | Arithmetic Mean | Maximum 1 hr Mean | Maximum 24 hr Mean | Number of valid Hours | % valid data |
|---|---|---|---|---|---|---|
| Time Period | TSP | TSP | TSP | TSP | TSP | TSP |
| | No. | (ug/m$^3$) | (ug/m$^3$) | (ug/m$^3$) | No. | % |
| Sept 22 - Nov 28 | 0 | 18 | 146 | 77 | 1485 | 92.6 |

**Table B4: Monitoring Results for TSP for 49 Murray Rd**

| Data Statistics | Events > 24 hr AAQC | Arithmetic Mean | Maximum 1 hr Mean | Maximum 24 hr Mean | Number of valid Hours | % valid data |
|---|---|---|---|---|---|---|
| Time Period | TSP | TSP | TSP | TSP | TSP | TSP |
| | No. | (ug/m$^3$) | (ug/m$^3$) | (ug/m$^3$) | No. | % |
| Sept 22 - Nov 28 | 0 | 20 | 158 | 78 | 1485 | 92.7 |

## Table B5: Murray Road Meterological Station Windspeed Data Summary

| MET Statistics | Maximum 1 hr Mean | Maximum 24 hr | Period Mean | % valid hours |
|---|---|---|---|---|
| Time Period | Wind Speed | Wind Speed | Wind Speed | Wind Speed |
| | (km/hr) | (km/hr) | (km/hr) | (%) |
| Sept 22 - Nov 28 | 18 | 12 | 5 | 80.3 |

## Table B6: Murray Road Meterological Station Wind Direction Data Summary

| MET Statistics | % valid hours |
| --- | --- |
| Time Period | Wind Direction |
| | (%) |
| Sept 22 - Nov 28 | 80.3 |

**Table B7: Murray Road Ambient Particulate Monitoring Results**

| Monitoring Statistics | Maximum 24 hr Mean | | Sample Period Mean | | % valid hours | |
|---|---|---|---|---|---|---|
| Compound | $PM_{2.5}$ | $PM_{10}$ | $PM_{2.5}$ | $PM_{10}$ | $PM_{2.5}$ | $PM_{10}$ |
| | (µg/m$^3$) | | (µg/m$^3$) | | (%) | |
| 23 Murray Rd | 16 | 55 | 9 | 25 | 88.5 | 89.2 |
| 45 Murray Rd | 18 | 78 | 9 | 27 | 89.3 | 89.2 |
| Arithmetic Mean | 17 | 67 | 9 | 26 | 88.9 | 89.2 |

| Pollutant | Averaging Period | Guideline Level |
|---|---|---|
| $PM_{2.5}$ | 24-hr | 28 µg/m$^3$ (CAAQS) |
| $PM_{10}$ | 24-hr | 50 µg/m$^3$ (Interim AAQC) |

| Event Statistics | Events > 24 hr | |
|---|---|---|
| Compound | $PM_{2.5}$ | $PM_{10}$ |
| 23 Murray Rd | 0 | 2 |
| 45 Murray Rd | 0 | 4 |
| Total | 0 | 6 |

| MET Statistic | Maximum 1 hr | | Maximum 24 hr | | Period Mean | | % valid hours | |
|---|---|---|---|---|---|---|---|---|
| Met Station 45 Murrray | WS | WD | WS | WD | WS | WD | WS | WD |
| | (km/hr) | (°) | (km/hr) | (°) | (km/hr) | (°) | (%) | |
| May 19 - July 19 | 16 | - | 9 | - | 3 | - | 100 | 100 |

**Table B8: Monitoring Results for $PM_{2.5}$ for 23 Murray Rd**

| Data Statistics | Events > 24 hr AAQC | Arithmetic Mean | Maximum 1 hr Mean | Maximum 24 hr Mean | Number of valid Hours | % valid data |
|---|---|---|---|---|---|---|
| Time Period | $PM_{2.5}$ | $PM_{2.5}$ | $PM_{2.5}$ | $PM_{2.5}$ | $PM_{2.5}$ | $PM_{2.5}$ |
| | No. | (µg/m$^3$) | (µg/m$^3$) | (µg/m$^3$) | No. | % |
| May 19 - July 19 | 0 | 9 | 41 | 16 | 1294 | 88.5 |

**Table B9: Monitoring Results for $PM_{2.5}$ for 45 Murray Rd**

| Data Statistics | Events > 24 hr AAQC | Arithmetic Mean | Maximum 1 hr Mean | Maximum 24 hr Mean | Number of valid Hours | % valid data |
|---|---|---|---|---|---|---|
| Time Period | $PM_{2.5}$ | $PM_{2.5}$ | $PM_{2.5}$ | $PM_{2.5}$ | $PM_{2.5}$ | $PM_{2.5}$ |
| | No. | (µg/m$^3$) | (µg/m$^3$) | (µg/m$^3$) | No. | % |
| May 19 - July 19 | 0 | 9 | 38 | 18 | 1317 | 89.3 |

**Table B10: Monitoring Results for $PM_{10}$ for 23 Murray Rd**

| Data Statistics | Events > 24 hr AAQC | Arithmetic Mean | Maximum 1 hr Mean | Maximum 24 hr Mean | Number of valid Hours | % valid data |
|---|---|---|---|---|---|---|
| Time Period | $PM_{10}$ | $PM_{10}$ | $PM_{10}$ | $PM_{10}$ | $PM_{10}$ | $PM_{10}$ |
| | No. | (µg/m$^3$) | (µg/m$^3$) | ` | No. | % |
| May 19 - July 19 | 2 | 25 | 164 | 55 | 1314 | 89.2 |

**Table B11: Monitoring Results for $PM_{10}$ for 45 Murray Rd**

| Data Statistics | Events > 24 hr AAQC | Arithmetic Mean | Maximum 1 hr Mean | Maximum 24 hr Mean | Number of valid Hours | % valid data |
|---|---|---|---|---|---|---|
| Time Period | $PM_{10}$ | $PM_{10}$ | $PM_{10}$ | $PM_{10}$ | $PM_{10}$ | $PM_{10}$ |
| | No. | (µg/m$^3$) | (µg/m$^3$) | (µg/m$^3$) | No. | % |
| May 19 - July 19 | 4 | 27 | 308 | 78 | 1306 | 89.2 |

**Table B12: Murray Road Meterological Station Windspeed Data Summary**

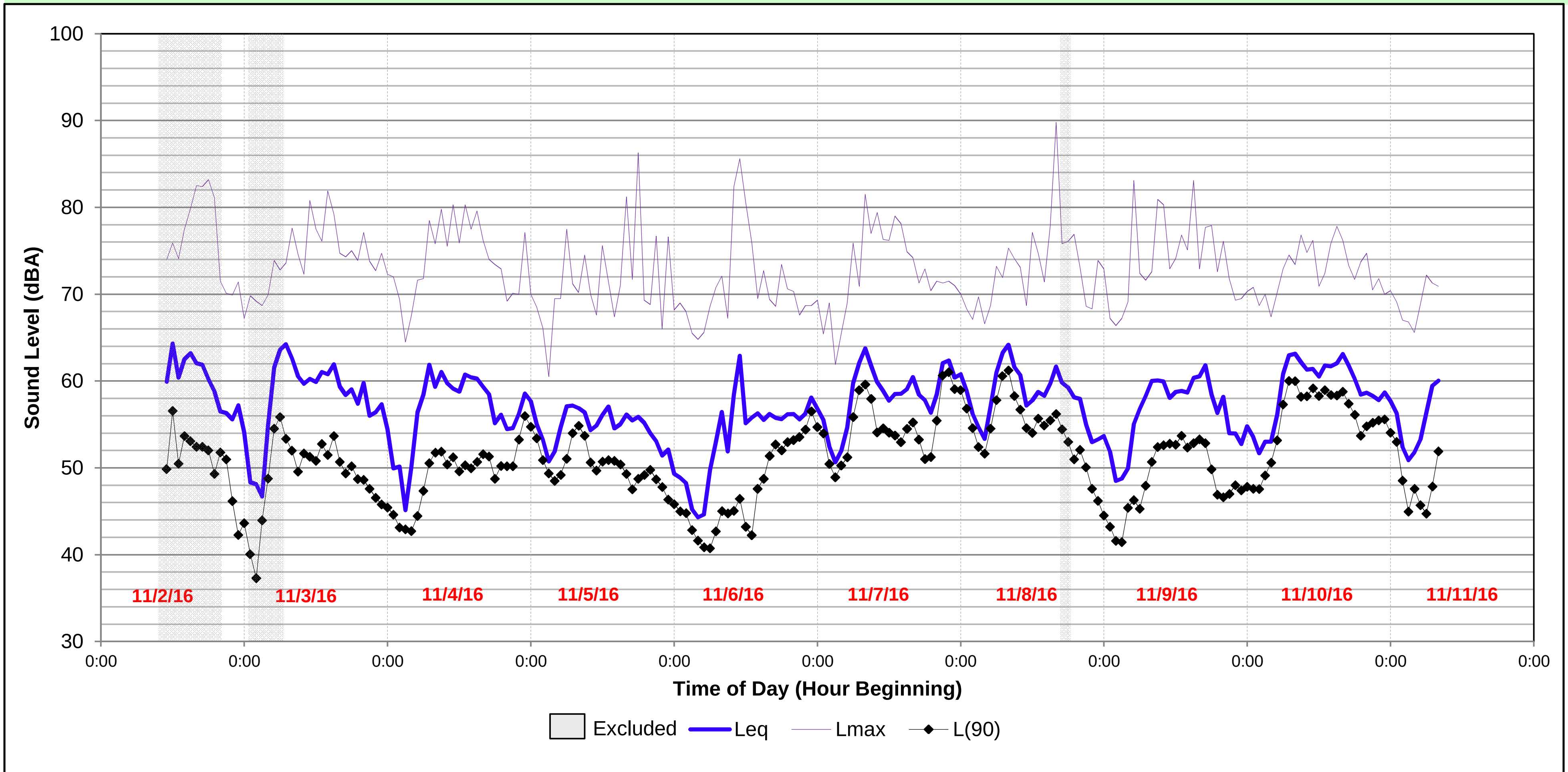
| MET Statistics | Maximum 1 hr Mean | Maximum 24 hr | Period Mean | % valid hours |
|---|---|---|---|---|
| Time Period | Wind Speed | Wind Speed | Wind Speed | Wind Speed |
| | (km/hr) | (km/hr) | (km/hr) | (%) |
| May 19 - July 19 | 16 | 9 | 3 | 99.9 |

**Table B13: Murray Road Meterological Station Wind Direction Data Summary**

| MET Statistics | % valid hours |
|---|---|
| Time Period | Wind Direction (%) |
| May 19 - July 19 | 99.9 |

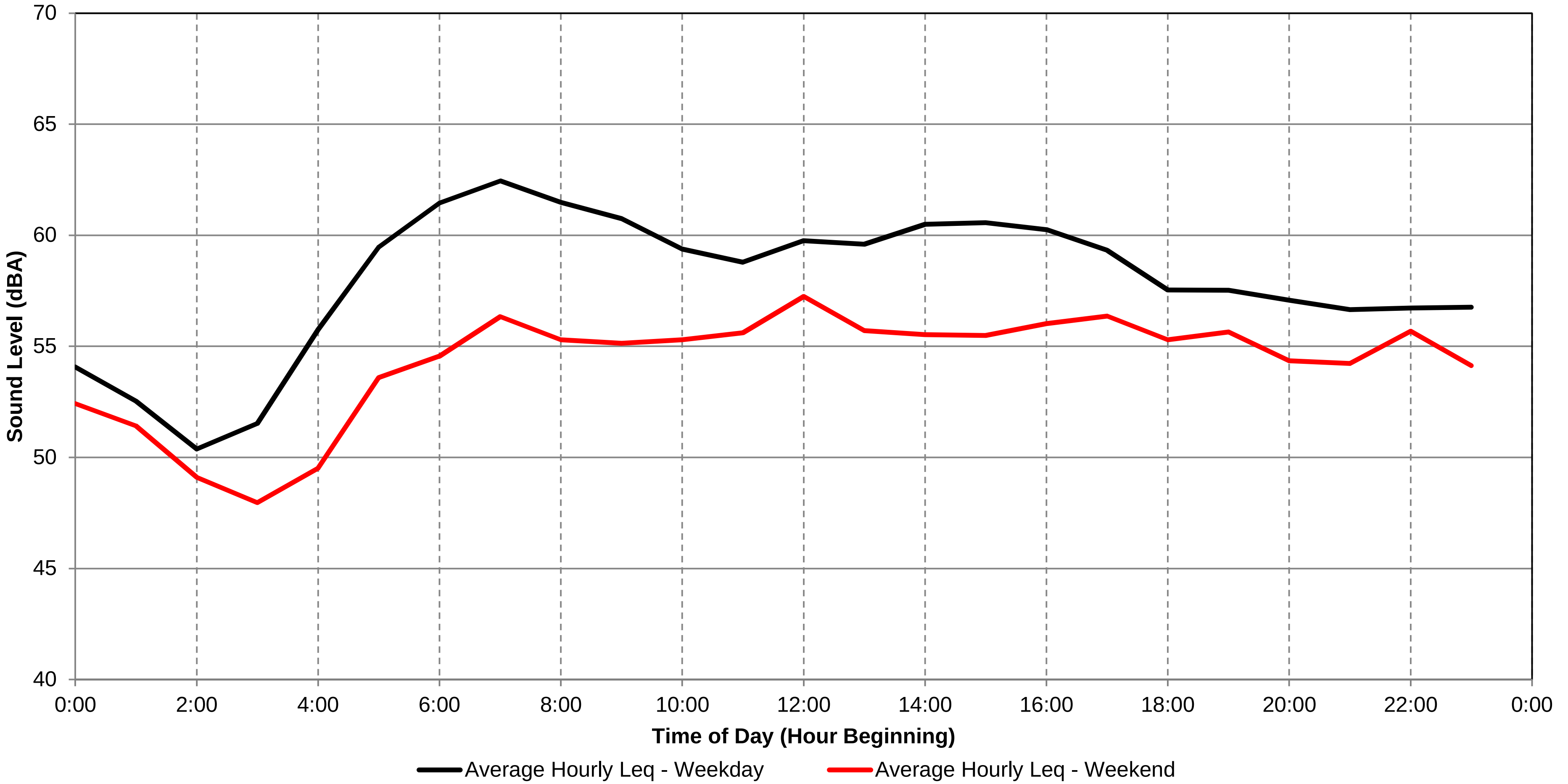
# APPENDIX C

# Long-Term Measurement Results - 49 Murray Road
## 1-Hour Sound Levels



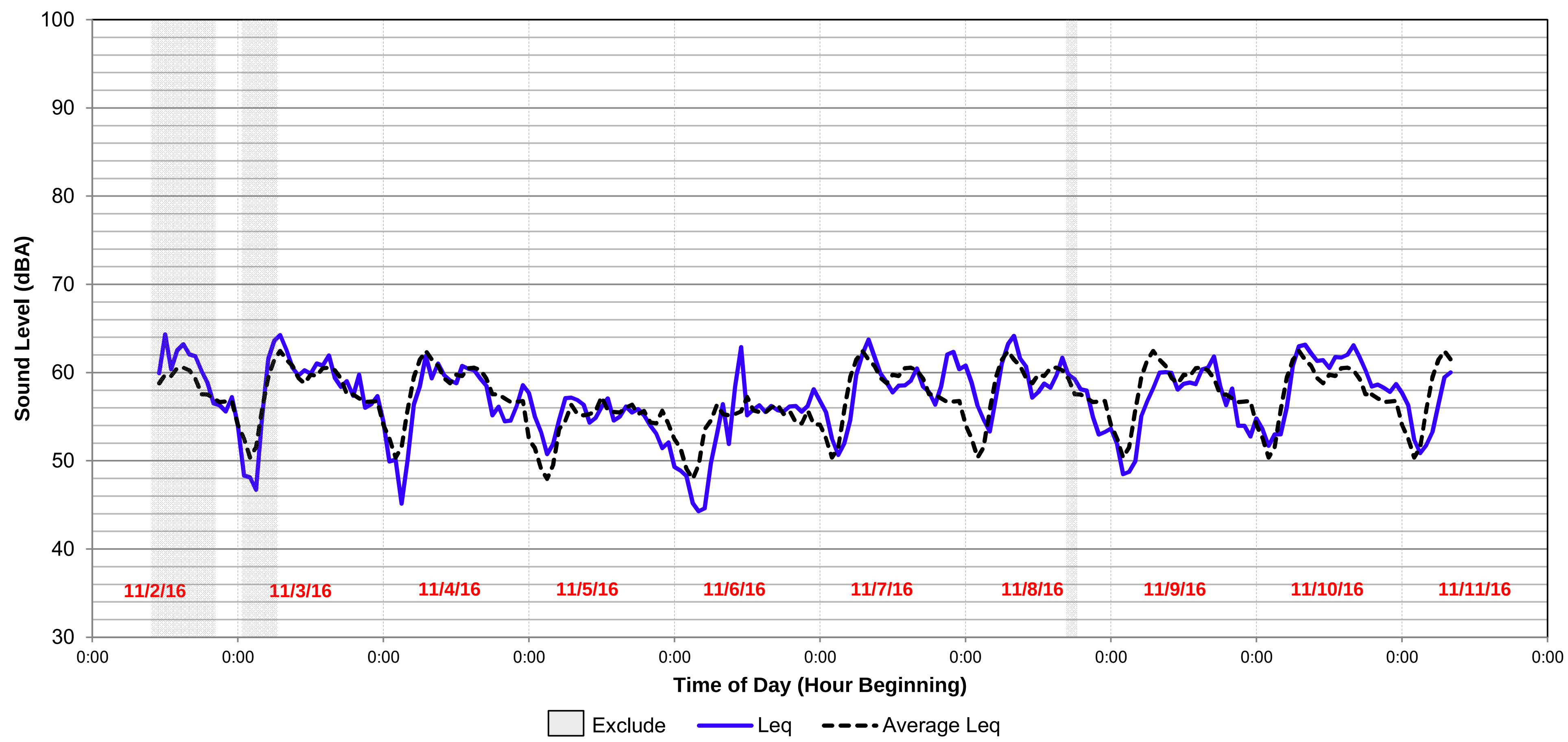

| **Measured Ambient Sound Levels** | Figure No. | **C1** |
|---|---|---|
| From 11/2/16 11:00:00 to 09/11/16 08:00:00 | Date: | Dec. 20, 2016 |
| Project # 1603972 | | |

## Long-Term Measurement Results - 49 Murray Road
## Average Weekday and Weekend $L_{EQ}$ Sound Levels




| | | |
|---|---|---|
| **Measured Ambient Sound Levels**<br>From 11/2/16 11:00:00 to 09/11/16 08:00:00<br>Project # 1603972 | Figure No. **C2**<br>Date: Dec. 20, 2016 | RWDI |

## Long-Term Measurement Results - 49 Murray Road
## Hourly Sound Levels vs. Average Weekend/Weekday Sound Levels




| Measured Ambient Sound Levels | Figure No. | C3 |
|---|---|---|
| From 11/2/16 11:00:00 to 09/11/16 08:00:00 | Date: | Dec. 20, 2016 |
| Project # 1603972 | | |