Environmental Baseline Data Report – Hardrock Project: Acoustics

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ENVIRONMENTAL BASELINE DATA REPORT – HARDROCK PROJECT: ACOUSTICS

This document entitled Environmental Baseline Data Report – Hardrock Project: Acoustics was prepared by Stantec Consulting Ltd. ("Stantec") for the account of Premier Gold Mines Hardrock Inc. (the "Client").

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Executive Summary

Stantec Consulting Ltd. (Stantec) was retained by Premier Gold Mines Hardrock Inc. (Premier, the Proponent) to conduct an environmental baseline study to assess and quantify the existing acoustic environment (acoustics), at and around the Project development area (PDA). This Environmental Baseline Data Report will form the basis for predicting potential noise effects from the Project. Additionally, this Environmental Baseline Data Report will be used to determine appropriate noise criteria for the environmental assessment (EA) of the Project, as required by Ontario Ministry of the Environment and Climate Change (MOECC) Environmental Noise Guideline NPC-300 (MOE, 2013).

A combination of long-term automated measurements, short term spot measurements and traffic noise predictions were used to quantify the baseline data (or acoustical environment). Both long-term automated and short term spot check measurements were taken within the local study area (LSA). In addition, traffic noise modelling was conducted to quantify the current traffic noise impacts of Highway 11 and Michael Power Boulevard on nearby residences.

The major contributors to baseline acoustical environment of the PDA were found to be the, traffic noise from Highway 11, Michael Power Boulevard, and natural environment. Baseline sound levels were found to be dominated by traffic noise during the daytime and natural environment during the nighttime. No "non-traffic anthropogenic sources" in the LSA were found to be major contributors to the acoustic environment, and no tonal or excessive low frequency noise was encountered during field studies.

The field observations and combined results of the measurements and traffic noise study conclude that the baseline conditions of the receptor area within the LSA are characteristic of a Class 2 acoustical environment. In a Class 2 acoustical environment, as defined in MOECC publication NPC-300, "urban hum" or traffic noise dominates the daytime acoustical environment while sound from natural environment dominates the night-time environment.

Abbreviations

dB	Decibel
dBA	Decibel, A-weighted
EA	Environmental Assessment
ha	Hectares
ISO	International Organization for Standardization
km	kilometre
L_{90}	90th Percentile Sound Level
LSA	Local Study Area
L_{dn}	Day-Night Sound Level
L_{eq}	Energy Equivalent Sound Level
L_{max}	Maximum Sound Level
L_{min}	Minimum Sound Level
L_p	Sound Pressure Level
L_w	Sound Power Level
LOM	Life of mine
m	metre
MOE	Ministry of the Environment
MOECC	Ministry of the Environment and Climate Change (formerly the Ministry of the Environment)
NPC-300	Ministry of the Environment and Climate Change Noise Pollution Control Guideline
PDA	Project Development Area
POR	Point of Reception
PWL	Sound Power Level
SPL	Sound Pressure Level
Stantec	Stantec Consulting Ltd.
tpd	Metric ton per day
TMF	tailings management facility
VC	Valued Component

Glossary

90th Percentile Sound Level	The A-weighted sound level equaled or exceeded 90% of time for a given time interval or event.
Airborne Sound	Sound that reaches the point of interest by propagation through air.
Attenuation	The reduction of sound intensity by various means (e.g., air, humidity and porous materials).
A-Weighting	The weighting network used to account for changes in level sensitivity as a function of frequency. The A-weighting network de-emphasizes the high (i.e., 6.3 kHz and above) and low (i.e., below 1 kHz) frequencies, and emphasizes the frequencies between 1 kHz and 6.3 kHz, in an effort to simulate the relative response of the human ear. See also frequency weighting.
Background Sound Level	All-encompassing sound that is associated with a given environment, usually a composite of sounds from many near and far field sources. Background sound includes sound from all sources other than the source being assessed.
Barrier	In an acoustical sense, an obstacle composed of a berm, wall or fence that is free of gaps within or below of its extent and of sufficient mass to prevent transmission of sound through it.
Daytime	Defined as the hours from 07:00h to 23:00h.
Decibel	A logarithmic measure of any measured physical quantity and commonly used in the measurement of sound. The decibel (dB) provides the possibility of representing a large span of signal levels in a simple manner. The difference between the sound pressure for silenced versus a loud sound is a factor of 1,000,000:1 or more, therefore it is less cumbersome to use a small range of equivalent values: 0 to 130 dB. A tenfold increase in sound power is equal to +10 dB; a tenfold increase in sound amplitude is equal to +20 dB.
Decibel, A-weighted	A-weighted decibels (dBA). Most common units for expressing sound levels since they approximate the response of the human ear.
Energy Equivalent Sound Level (L_{eq})	An energy-average sound level (L_{eq}) over a specified period that would have the same sound energy as the actual (i.e., unsteady) sound over the same period. It represents the average sound pressure encountered for the period. The period is often added as a suffix to the label (i.e., L_{eq} (24) for

	the 24-hour equivalent sound level).
Night-time	Defined as the hours from 23:00h to 07:00h.
Noise Level	Same as sound level for the purpose of this report
Point of Reception	A representative point considered for the purpose of assessment within noise-sensitive receptor such as a residence, campground, daycare, school, church, or hospital.
Sound	A wave motion in air, water, or other media. It is the rapid oscillatory compression changes in a medium that propagate to distant points. It is characterized by changes in density, pressure, motion, and temperature as well as other physical properties. Not all rapid changes in the medium are due to sound (e.g., wind distortion on a microphone diaphragm).
Sound Level	Generally, sound level refers to the weighted sound pressure level obtained by frequency weighting, usually A- or C-weighted, and expressed in decibels
Sound level meter	An instrument consisting of a microphone, amplifier, output meter and frequency-weighting networks that is used to measure noise and sound levels.
Sound Pressure	The root-mean-square of the instantaneous sound pressures during a specified time interval in a stated frequency band.
Sound Pressure Level	Logarithmic ratio of the root mean square sound pressure to the sound pressure at the threshold of human hearing (i.e., 20 micropascals).
Windscreen	A porous device used to cover the microphone of a sound level measurement system. Windscreens are designed to minimize the effects of wind disturbance on the sound levels being measured while minimizing the attenuation (i.e., less than 0.5 dB) of the signal.

1.0 INTRODUCTION

Premier Gold Mines Hardrock Inc. (Premier, the Proponent) proposes the establishment, construction, operation, and retirement (closure) of an open pit gold mine and ore processing facility, and associated ancillary activities, collectively known as the Hardrock Project (the Project). The Project is located approximately 275 kilometres (km) northeast of Thunder Bay, Ontario, approximately five km south of Geraldton, at the intersection of Highway 11 and Michael Power Boulevard (Figure 1-1).

Premier completed a Preliminary Economic Assessment (PEA) for the Project in January 2014, which indicated favourable economics for open pit mining (Stantec, 2014). Updated resource estimates were completed in July 2014 Feasibility studies and the environmental assessment (EA) are ongoing. Premier has retained Stantec to collect environmental baseline data from the Project development area (PDA), in support of the EA process.

1.1 PROJECT OVERVIEW

The Project is situated within a historical mine site for which Premier acquired the Hardrock mining claim in December 2008 from Lac Properties. The property is a brownfield site that was actively mined between 1930s-1970s and in later years was known as the MacLeod-Mosher complex. The former underground operations include the MacLeod - Mosher Mine and the Hardrock Mine.

The preliminary (conceptual) site layout includes an open pit, onsite ore processing facility, waste rock and tailings disposal, water management activities and any ancillary facilities. Premier generally anticipates that the required mine-related facilities will be placed in close proximity to the open pit to the extent practicable.

Mining of the Hardrock deposit has been designed as an open pit with an anticipated 12,000 tonnes per day (tpd) of mineralized material processed at the mill during the first two years. This is expected to increase to approximately 30,000 tpd of mineralized material processed at the mill starting during the third year, for 365 days per year of mill operation and mine operation. The estimated life of mine (LOM) is approximately 15 years.

Ore, mine rock and overburden removed from the open pit will be trucked to the surface. Ramp widths will be designed to accommodate the necessary heavy equipment.

The mill is anticipated to include ore crushing, ball milling, and gold recovery. Tailings will be stored in a constructed tailings management facility (TMF). Ongoing ore processing plant water requirements will be derived from water recycled from the TMF where possible. There may also be a need for additional surface water takings. Mine-contact water from within the perimeter of the mine facilities, and water from pit dewatering, may be directed to the TMF or the process

plant, or discharge depending on its quality. Such discharge will meet applicable federal and provincial effluent discharge requirements.

It is anticipated that site infrastructure may include maintenance garages, warehouses, a mine dry and administration buildings. Solid waste will be produced by the Project and will require collection and processing through methods that include re-use, recycling, and disposal. All waste including hazardous waste disposal shall be undertaken in accordance with existing regulations. A sewage treatment facility capable of handling approximately 300 people is envisaged for this Project.

The key components of the Project are expected to include, but not be limited to:

- open pit;
- waste rock storage areas;
- ore stockpile;
- mill feed storage area and crushing plant;
- ore milling and processing plant;
- tailings management facility;
- mine water treatment facility;
- internal access roads and pipelines;
- parking areas;
- mine dry, office building and assay lab;
- mine maintenance, shop and warehouse;
- explosives storage and manufacturing;
- aggregate pit(s);
- water supply and distribution system;
- sewage treatment facility;
- fuel supply, conversion, storage and distribution;
- power generation and distribution;
- domestic and solid waste handling facility;
- Highway 11 realignment (and potential relocation of Ministry of Transportation yard);
- watercourse realignments;
- relocation of a portion of the historical MacLeod tailings and Hardrock tailings;
- relocation of Hydro One Networks Inc. (HONI) substation; and
- natural gas pipeline.

At this time the need for a temporary camp is being considered, and will be confirmed and assessed as appropriate in the EA.

The preliminary description of the Project is conceptual in nature and should not be considered final.

All these processes have the potential to alter the existing acoustical environment, therefore Premier has retained Stantec to establish the environmental baseline in the study area, in support of the EA process.

1.2 STUDY OBJECTIVES

This Environmental Baseline Data Report) describes the current acoustical environment (baseline conditions) in the receptor area of the Project. This Environmental Baseline Data Report contributes to the subsequent EA for the Project in the following aspects:

- The baseline data will be used as the basis to predict the potential noise effects from the Project; and
- The baseline data will also be used in the determination of assessment criteria as required by MOECC Environmental Noise Guideline NPC-300 (MOE, 2013).

1.3 SPATIAL BOUNDARIES

The regional study area (RSA) is the geographic extent to which environmental noise was studied for the baseline assessment. The RSA boundaries include the areas within which the Project will be developed, and the surrounding areas which have the potential to experience noise effects from construction, operation and retirement of the project. Baseline conditions were established within the RSA using field observations, sound level measurements and a traffic noise study. The RSA contains the PDA and the local study area (LSA). (Figures 1-2, 1-3 and 1-4).

1.3.1 Project Development Area

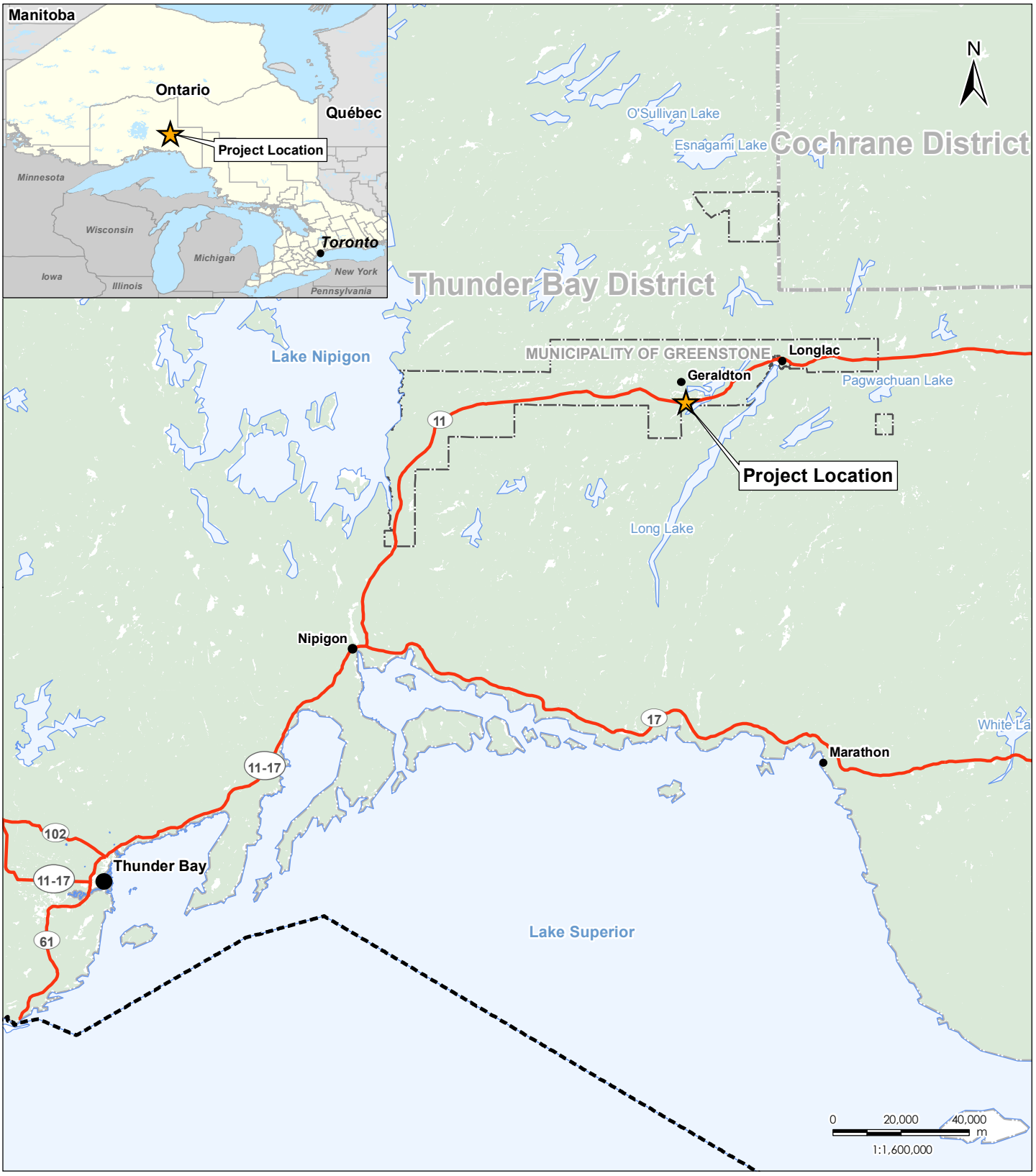
For baseline purposes, the PDA encompasses an area slightly larger than the anticipated footprint of the Project and represents the anticipated area of physical disturbance associated with the construction and operation of the Project (Shown in Figure 1-2).

1.3.2 Local Study Area

The LSA encompasses the area where there is potential for effects on the environment from the Project. The LSA for the acoustic study extends approximately 1.5 km from the boundaries of the PDA (Shown in Figure 1-3).

1.3.3 Regional Study Area

The RSA seeks to capture the regional context for describing baseline conditions. The RSA for the acoustic study extends approximately three km from the boundaries of the PDA (Shown in Figure 1-4).



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January 2015
160960945

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Notes

1. Coordinate System: NAD 1983 UTM Zone 16N
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Legend

- Project Location
- Town/ Village
- City
- Highway
- Canada/ U.S.A Border
- District Boundary
- Municipal Boundary
- Waterbody

Client/Project

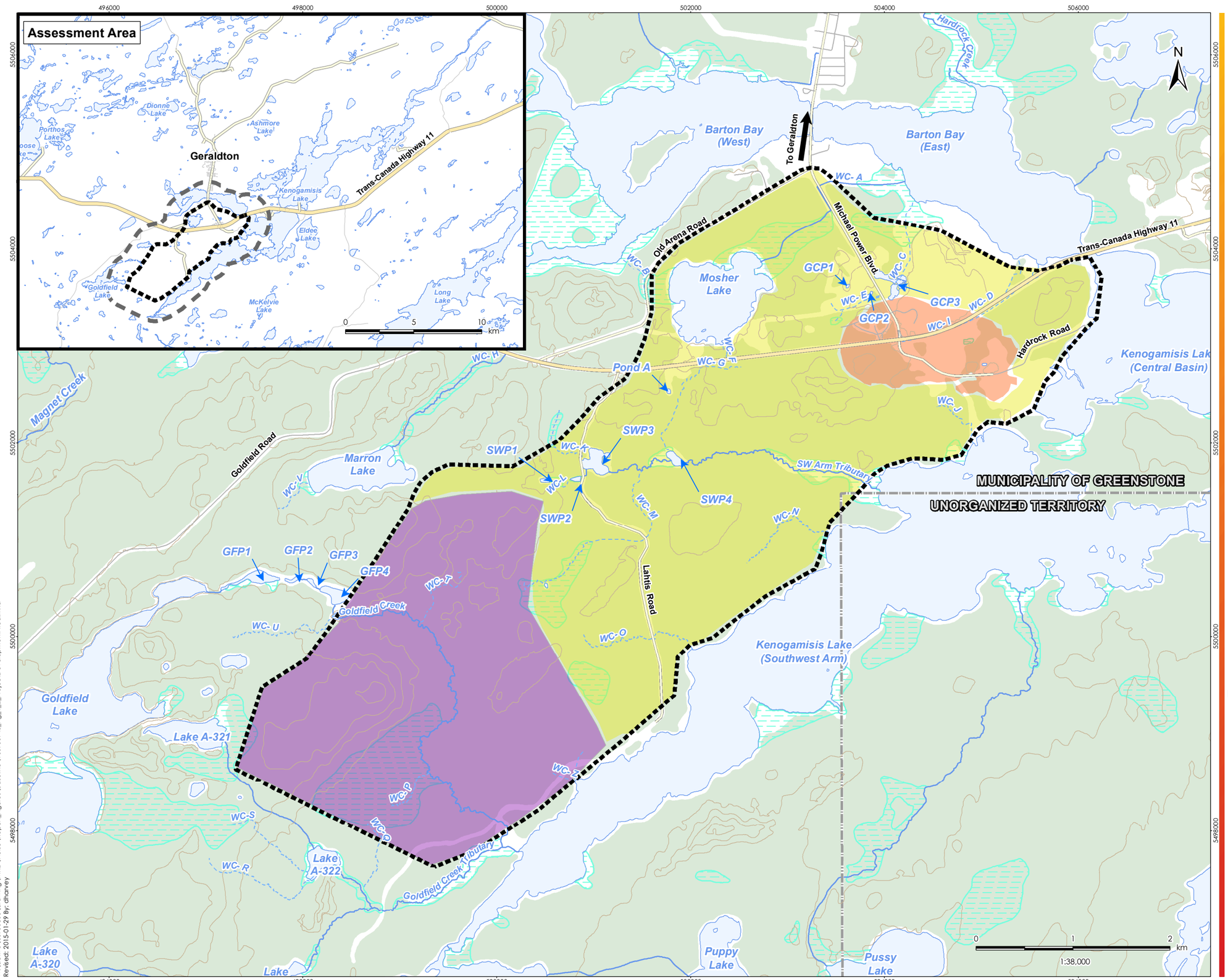
Premier Gold Mines Hardrock Inc.
Hardrock Project

Figure No.

1-1

Title

Project Location



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Revised: 2015-01-29 By: dharvey

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Legend

- Project Development Area*
- Local Study Area

General Location of Major Project Components

- Open Pit
- Conceptual Location of Tailings Management Facility
- Conceptual Location of Waste Rock Area and Other Supporting Project Infrastructure

Existing

- Contour Line (10m intervals)
- Highway
- Major Road
- Local Road
- Watercourse- Permanent
- Watercourse- Intermittent
- Municipal Boundary
- Wetland, Unevaluated
- Waterbody
- Wooded Area

Notes

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* Project Development Area may be refined as the Project progresses

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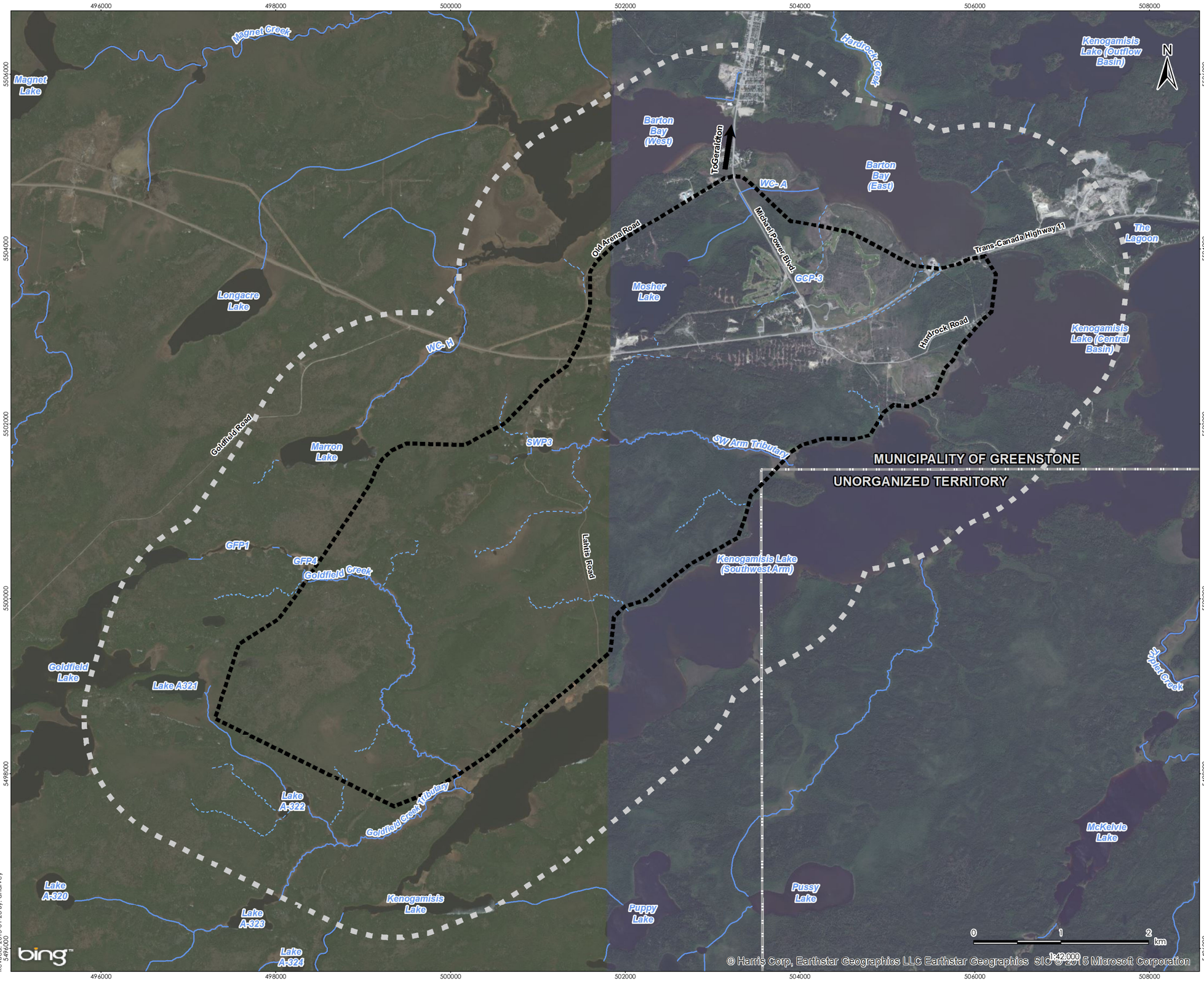
Premier Gold Mines Hardrock Inc
Hardrock Project

Figure No.

1-2

Title

Project Development Area



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Legend

- Local Study Area
- Project Development Area*
- Municipal Boundary
- Watercourse- Permanent
- Watercourse- Intermittent

Notes

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* Project Development Area may be refined as the Project progresses

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Figure No.

1-3

Title

Local Study Area

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Revised: 2015-01-28 By: dharvey

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Legend

- Regional Study Area
- Project Development Area*
- Municipal Boundary
- Highway
- Major Road
- Local Road
- Watercourse- Permanent
- Watercourse- Intermittent

Notes

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Figure No.

1-4

Title

Regional Study Area

2.0 METHODOLOGY

As discussed above, the baseline data will be used to determine the assessment criteria for points of reception (PORs, Receptors). Therefore in order to quantify baseline data, a survey of PORs was conducted. NPC-300 (MOE, 2013) defines a POR as noise sensitive land use such as residential dwellings and commercial or institutional buildings with noise sensitive uses such as hospitals, schools, or churches.

The survey indicated that the existing receptors in the RSA are primarily residential with some institutional (e.g. hospital, community care center, college, etc.) usage. These PORs falls into five major clusters/communities as shown in Figure 2-1. These clusters/communities are:

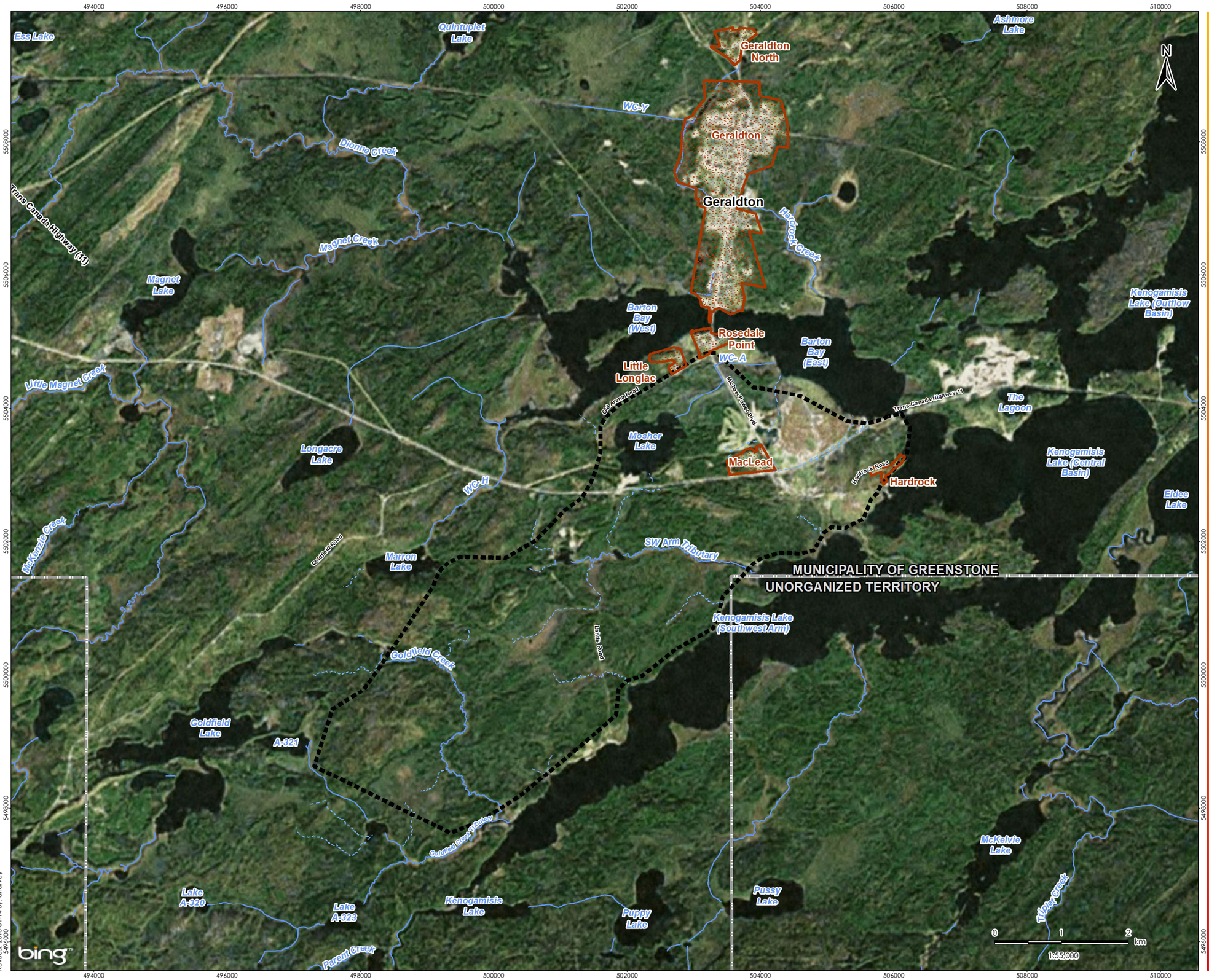
1. Geraldton;
2. Rosedale Point;
3. Little Longlac;
4. MacLead; and
5. Hardrock.

In addition to these clusters/communities there are some isolated PORs also noted. Stantec's survey further indicated that these PORs falls into three distinct acoustical environments as follows:

1. Group 1 - PORs dominated by two roadways (Highway 11 and Michael Power Blvd);
2. Group 2 - PORs dominated by one roadway (Highway 11 or Michael Power Blvd); and
3. Group 3 - PORs away from roadways (away from both Highway 11 and Michael Power Blvd).

PORs associated with MacLead community fall into the Group 1 category; PORs associated with Geraldton, Rosedale fall into the Group 2 category and PORs associated with Little Longlac and Hardrock fall into the Group 3 category respectively.

In order to quantify baseline sound levels of the Project's POR, a combination of long term automated and short term spot check measurements and traffic noise predictions were used as explained further in Section 2.2.



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Legend

- Project Development Area*
- Urban Settlement Areas (as per Greenstone Official Plan)
- Municipal Boundary
- Watercourse- Permanent
- Watercourse- Intermittent

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Figure No.

2-1

Title

Receptor Locations

2.1 LONG TERM SOUND LEVEL MONITORING PROGRAM

As discussed above in-order to quantify Highway 11, Michael Power Blvd and contribution of the natural environment, the background sound level monitoring program consisted of the deployment of three sound level monitors positioned at representative locations within the LSA. These locations are shown in Figure 2-2. Long term monitoring was conducted to quantify temporal variation in existing acoustical environment (i.e. baseline acoustical conditions). The monitoring was conducted for approximately 48 hours.

Two measurement locations, locations 1 and 3 (see Figure 2-2), were chosen closer to Michael Power Blvd and Highway 11 to quantify road traffic noise. These locations are within 20 to 25 metres from the road such that time varying nature of the road traffic can be captured and used to calibrate a prediction model to establish baseline conditions for all receptor groups discussed above. Similarly, measurement location 2 was chosen to represent areas more affected by environmental sound than traffic (especially during off-peak traffic hours). This measurement was to provide an idea of the sound in the baseline environment during traffic lulls. The long term measurements also provide an insight into the time varying nature of the sound in the area. In order to understand the spatial distribution of sound, several spot checks (refer Section 2.2) were also conducted. The long term measurements were used to correlate with short term spot checks and to calibrate traffic noise modelling

Type 1 Larson Davis Model 820 noise monitors were used for the background sound level monitoring program. The monitors were deployed in a weather-proof case with the accompanying microphone attached to a tripod and fitted into a weather-protection unit with a windscreen fitted over it. During measurement periods, data was collected for equivalent sound level (L_{eq}) and 90th percentile sound level (L_{90}). The background sound level monitors were calibrated before each monitoring period and calibration was checked after each monitoring period to ensure measurement accuracy. A handheld GPS unit was used to record the location of each monitor during deployment.

Measurements were performed in accordance with the procedures outlined in MOECC Publication NPC-103 (Procedures) (MOE, 2003). Background sound level monitoring was not conducted at locations within private lands, or locations where the acoustic environment was expected to be similar to the monitored locations.

Weather data recorded at Geraldton Airport was taken from Environment Canada online records for the period the field study was conducted and is provided in Appendix B. Periods of unfavorable weather and abnormal conditions, such as high wind speed events or heavy precipitation, were excluded from the data set used in the analysis.

Equivalent sound levels were logged in one minute intervals and were screened for non-representative noise events (such as dogs barking, etc.). The minute-long measurements were used to establish one-hour equivalent sound levels (L_{eq}) as required by MOECC. The results of background sound level monitoring at these locations are summarized in Figures 3-1 to 3-3.

2.2 SPOT CHECK MEASUREMENTS

In order to establish the spatial variations in baseline conditions, spot check measurements were conducted at locations within the LSA. The spot check measurements were also used to calibrate traffic noise model. In this study, 20 spot check measurements were used to collect sound level information for sections of Highway 11 and Michael power Blvd., as well as an identified OPP station located in the west end of the PDA. Generally in order to establish spatial variation a minimum two measurements at two different setbacks from a road is considered sufficient. Therefore for both Highway 11 and Michael power Blvd a minimum of four locations is considered sufficient. However many locations were conservatively considered in this study.

These measurements were taken using a Type 1 Larson Davis Model 831 sound level meter/analyzer. During these measurement periods, overall sound level (L_{eq}), octave band data, 90th percentile sound level (L_{90}), maximum sound level (L_{max}), and minimum sound level (L_{min}) data were collected. The calibration of the analyzer was verified before and after the measurement program to ensure accuracy. Measurements were paused when irregular sound disturbances occurred (such as near field effects). A handheld GPS unit was used to record the location of each measurement.

2.2.1 Site Observations

Stantec GIS databases were accessed for the purposes of acquiring information regarding the RSA. This information included maps, large coverage of vegetation, large water bodies, topography, aerial photos and building locations. During the field studies, topography and vegetation were visually surveyed to verify information contained in the GIS databases were accurate. Field crews also verified that existing buildings and roads in the RSA were consistent with the digital geographic data.

In addition Stantec conducted qualitative field verification to validate locations of noise sensitive receptors. This involved verification of current land uses of adjacent parcels of land, identifying dwellings and institutional facilities together with height information (i.e. number of stories), and location in relation to the project site. Additionally, the field crew searched for any receptors in the RSA which were not included in geographic data and could not be identified in aerial photos.

The field survey also indicated that there are no "non-traffic anthropogenic" sources in the RSA, which contribute to the acoustic environment. In addition no tonal or excessive low frequency noise was encountered during field studies. Some land uses such as an Ontario Provincial Police station along Highway 11, small commercial buildings in Geraldton, and Premier Gold office trailers and trucks along Hardrock road were observed during the site visit but were not considered to be significant contributor to the overall acoustical environment. Therefore the study mainly focused on traffic and sounds from the environment.

2.3 TRAFFIC NOISE STUDY

Road noise in the LSA was determined to be a major source of sound contributing to the daytime acoustic environment. Land access to conduct measurements was limited, therefore in in order to quantify sound levels within the LSA, traffic noise modelling was conducted. A computerized road traffic noise prediction model (STAMSON) was used for the road noise modelling and the model was calibrated using field measurements.

In the models, noise exposure from Highway 11 and Michael Power Boulevard were studied. Current traffic data was obtained from the Ministry of Transportation Ontario, and used as an input in these models. Traffic data is included in Appendix C.

2.4 SOUND DESCRIPTORS

Sound level monitors were programmed to record several sound metrics. The key metric (sound descriptor) used in environmental noise assessments is the energy-equivalent sound level over the period of an hour (L_{eq} (1-hour)). An energy-equivalent sound level (L_{eq}) is the steady-state sound level over a specified period that would have the same sound energy as the actual (i.e., time varying) sound over the same period. For this baseline study, measured L_{eq} values were evaluated over a one hour period in accordance with MOECC noise guideline, NPC-300 [2]. Hourly L_{eq} values may be also used to determine the daytime equivalent noise level (L_D) and night-time equivalent noise level (L_N) which are used for some types of assessments.

The sound level meters were also programmed to record other sound metrics such as the 90th percentile sound level (L_{90}) and maximum and minimum sound levels (L_{max} and L_{min}). L_{90} levels indicate the sound level which is exceeded during 90% of the measurement interval. This metric is an indication of the steady component of sound in the area.

Minimum and maximum sound levels were collected to study the variation of sound levels occurring at a location.

Metrics in this study are presented in terms of A-weighted decibels (dBA). A-weighted decibels are a logarithmic measure of recorded sound which is corrected for the response of average human hearing within the commonly used frequency range.

Stantec

Legend

- Ambient Monitoring Location
- Project Development Area*
- Watercourse- Permanent
- Watercourse- Intermittent

Notes

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* Project Development Area may be refined as the Project progresses

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Figure No.

2-2

Title

Background Sound Level Monitoring Locations

W:\active\60960865\drawing\MXD\Noise\Report_Figures\Baseline\160960945_Fig2_2_BackgroundSoundLevelMonitoringLocs.mxd
Revised: 2015-01-29 By: dharvey

3.0 BASELINE CONDITIONS

Sound level data collected during the field program were analyzed to quantify the existing acoustic environment in the RSA. The results are presented in this section.

3.1 BACKGROUND SOUND LEVEL MONITORING PROGRAM DATA ANALYSIS AND RESULTS

The background sound level data collected at the three locations shown in Figure 3-1 to 3-3**.** No spurious events were found in the collected data. Weather conditions were favorable for background monitoring at the time of the measurements.

Figure 3-1: Measured One-Hour Leq Sound Levels at Monitoring Location 1 (along Michael Power Boulevard)

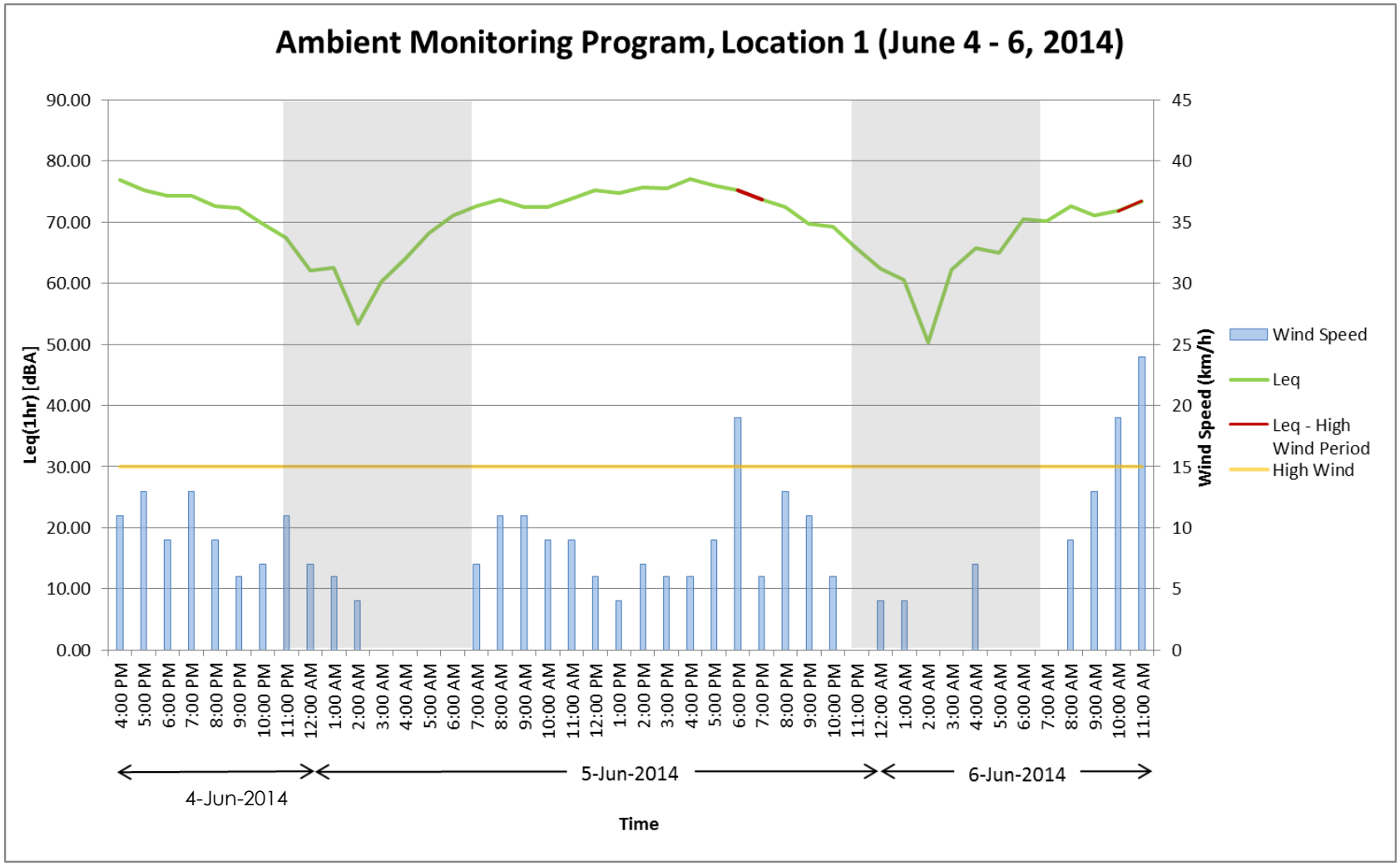


Figure 3-2: Measured One-Hour Leq Sound Levels at Monitoring Location 2 (away from roadways)

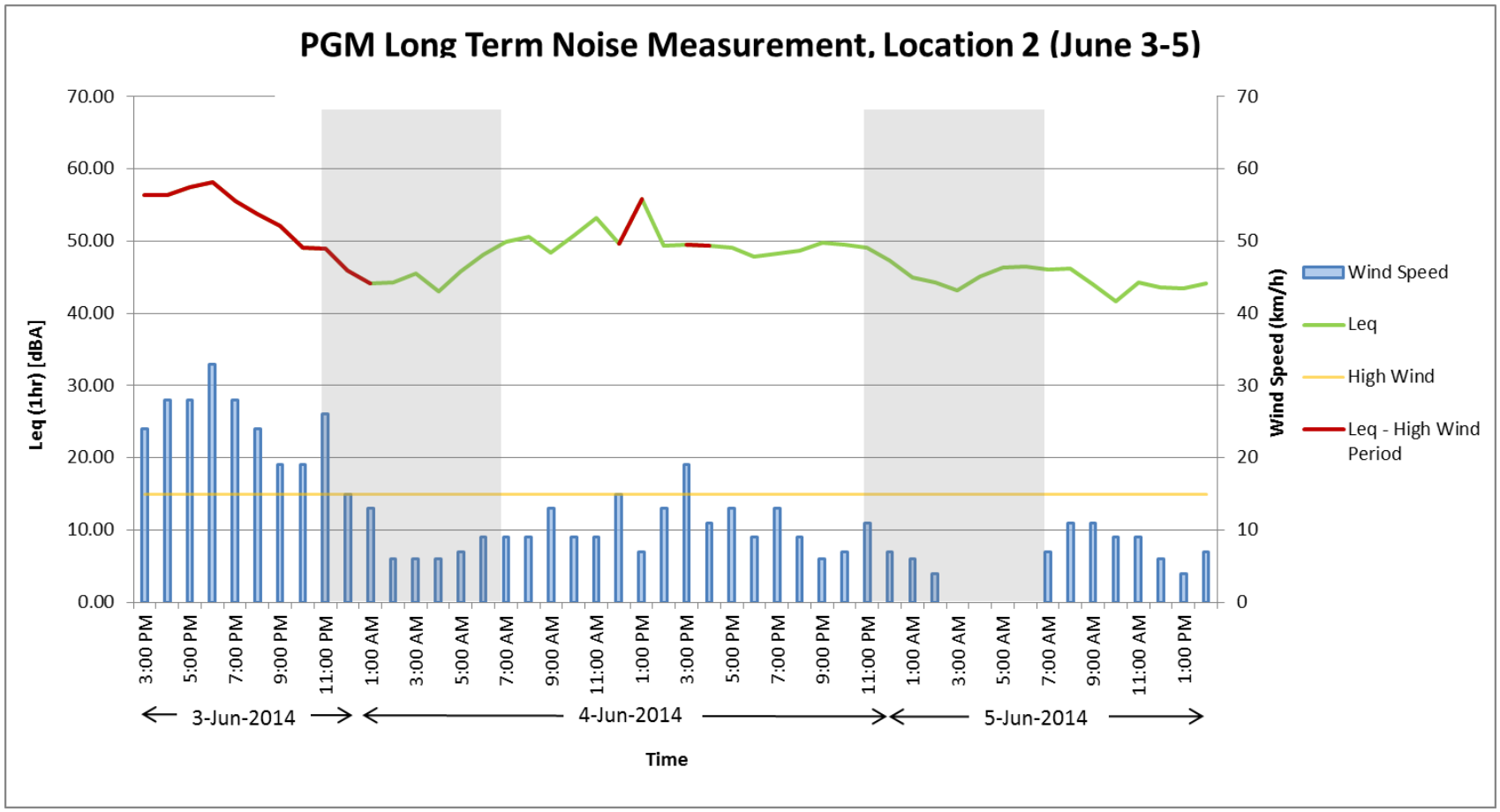
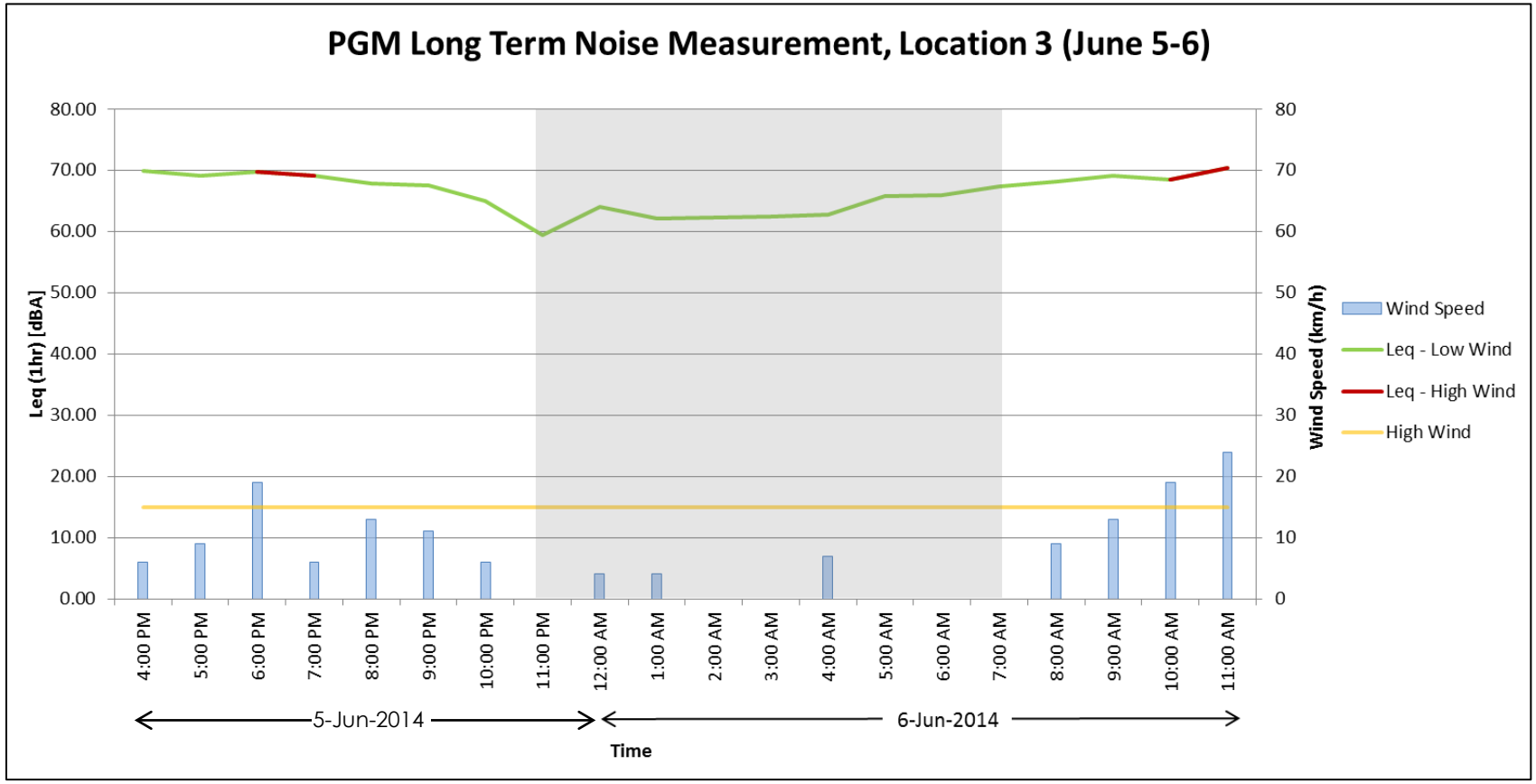


Figure 3-3: Measured One-Hour Leq Sound Levels at Monitoring Location 3 (along Highway 11)



For all three locations, hourly equivalent sound levels were observed to decrease during the night-time hours. At Locations 1 and 3, which were located in areas considered similar to the acoustic environment of majority of receptors (i.e. Group 2 PORs or PORs in Geraldton, and Rosedale area), daytime sound level is found to be dominated by traffic noise. The results of the background sound level monitoring at these locations also show a decrease in sound level during night-time hours consistent with a decrease in traffic volume.

The measurements at locations 2 indicate that the acoustical environment seems to follow the speed of the wind rather than the flow of traffic (i.e. it does not closely follow traffic). The minimum 1-hour daytime sound level measured at Location 2 (42 dBA) was found to be similar to the minimum night time level (43 dBA) at the same location. These were measured at a location with a larger setback from roadways than either Locations 1 or 3 and thus were less affected by traffic noise. The minimum hourly sound level during the daytime hours (42 dBA) and nighttime hours (43 dBA) are within 1 dB. This indicates that at locations away from the road, the natural environment dominates the baseline conditions.

Graphs of measured L_{90} levels recorded at the background sound level monitoring locations are provided in Appendix D. Each of the recorded L_{90} measurements was similar in pattern and sound level, indicating that the acoustical environment is relatively steady.

3.2 SPOT CHECK MEASUREMENTS

Data collected from the spot check measurements showed similar results to the background sound level monitoring program in the acoustic environment within the LSA. No abnormal or unexpected sources of noise were identified as a result of spot check measurements. A summary of the spot check measurements is provided in Appendix E.

3.3 ROAD NOISE MODEL RESULTS

As previously discussed, in order to further investigate the baseline conditions, six receptor areas were studied and traffic noise predictions were performed in these areas. These areas are as follows:

1. PORs, within 50 metres from Highway 11;
2. PORs located 50 metres to 100 metres from Highway 11;
3. PORs beyond 100 metres from Highway 11;
4. PORs within 50 metres from Michael Power Blvd;
5. PORs located 50 metres to 100 metres from Michael Power Blvd; and
6. PORs beyond 100 metres from Michael Power Blvd.

Among the three groups of PORs considered, Group 1 (i.e. near two roadways) will not be representative of future PORs as the roads may be realigned. The Group 2 PORs (i.e. near one roadway) are categorized further in to PORs that are near the roads (i.e. less than 50 metres), PORs located at a moderate distance away (e.g. between 50 metres and 100 metres), and PORs located well away from the road (e.g. more than 100 metres). The PORs belonging to Group 3 are also considered well away from the road.

For the above 6 groups, a traffic noise prediction was performed using traffic modelling software (STAMSON) and the model was calibrated against the long and short term measurements. The following Figures (Figures 3-4 through 3-9) show the results of the traffic noise model for the above scenarios.

Figure 3-4: Baseline Traffic noise (Traffic) and overall sound (Traffic + Nat. Env.) for PORs within 50 m of Highway 11

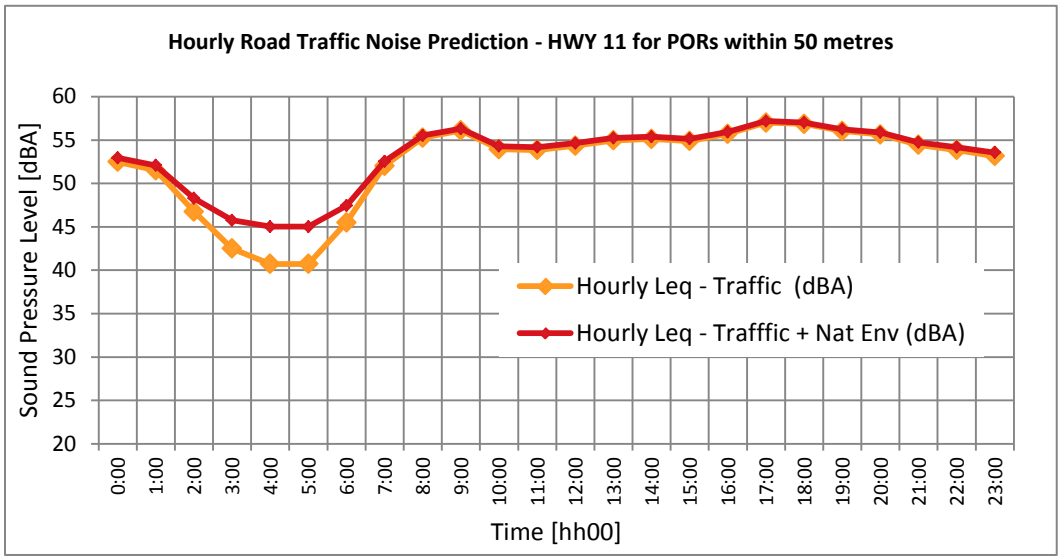


Figure 3-5: Baseline Traffic noise (Traffic) and overall sound (Traffic + Nat. Env.) for PORs within 50 to 100 m of Highway 11

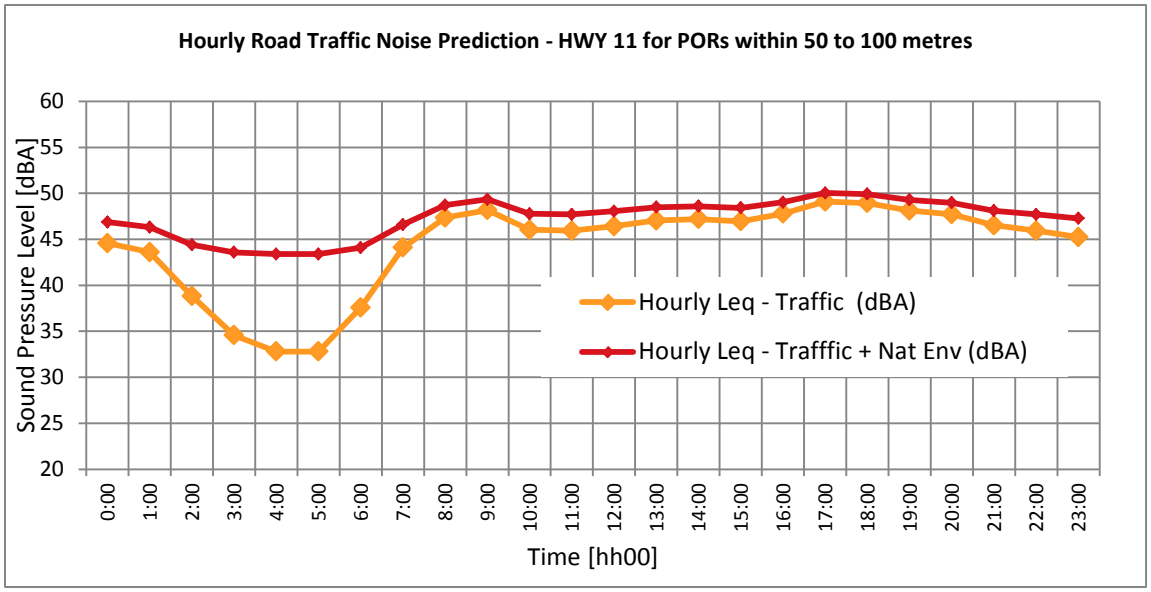


Figure 3-6: Baseline Traffic noise (Traffic) and overall sound (Traffic + Nat. Env.) for PORs beyond 100 m of Highway 11

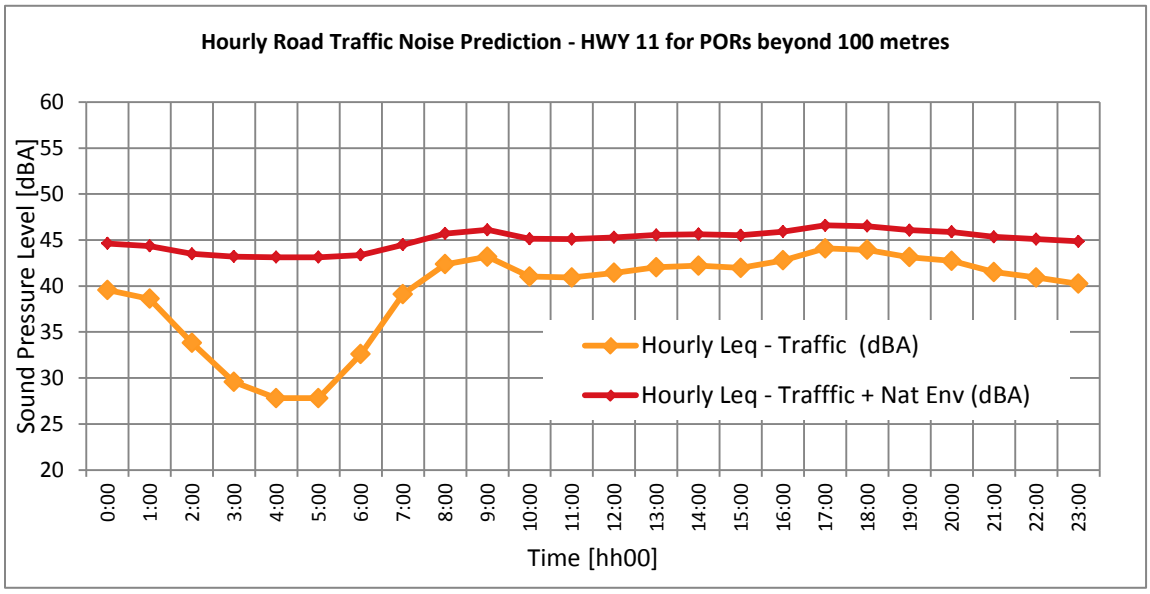


Figure 3-7: Baseline Traffic noise (Traffic) and overall sound (Traffic + Nat. Env.) for PORs within 50 m of Michael Power Blvd

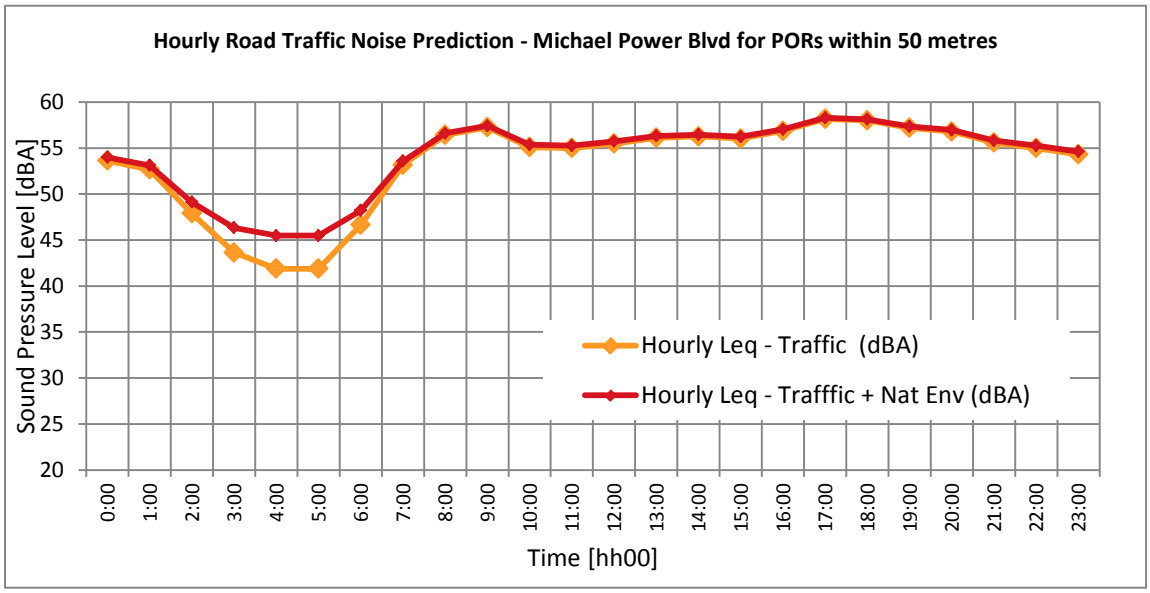


Figure 3-8: Baseline Traffic noise (Traffic) and overall sound (Traffic + Nat. Env.) for PORs within 50 to 100 m of Michael Power Blvd

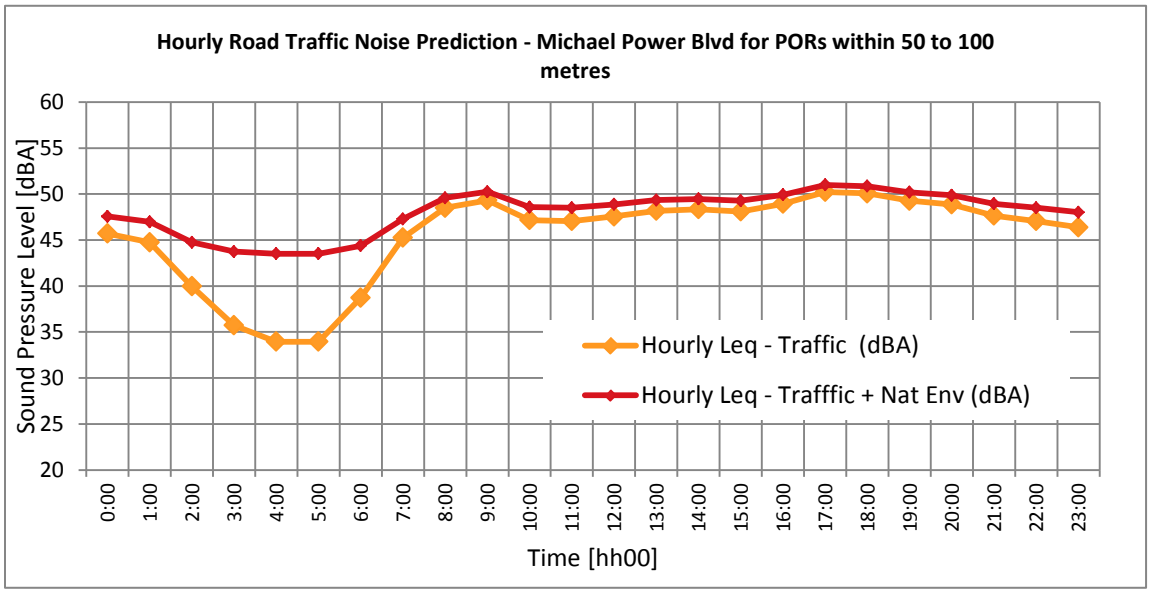
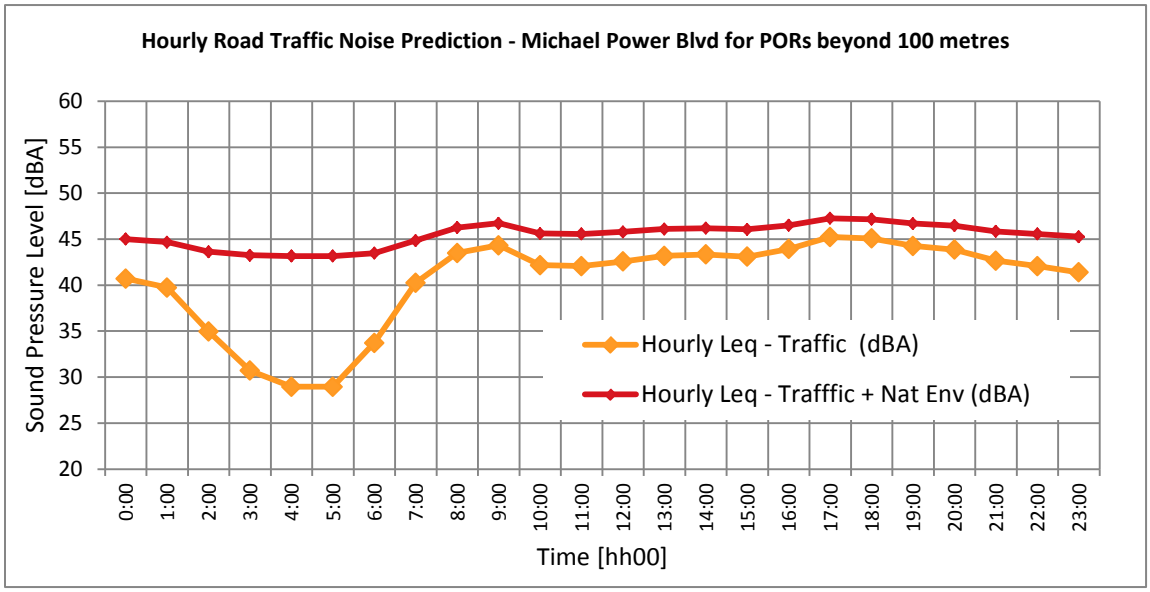


Figure 3-9: Baseline Traffic noise (Traffic) and overall sound (Traffic + Nat. Env.) for PORs beyond 100 m of Michael Power Blvd



The above Figures show sound levels at PORs that are located 50 metres or more from the roadways are in the range of 45 to 50 dBA. However, PORs within 50 metres of roadways are in the range of 45 to 55 dBA. The study confirms the baseline conditions in the receptor area, within the LSA and RSA, are characteristic of a Class 2 acoustical environment as defined in MOECC Publication NPC-300.

4.0 KEY FINDINGS AND CONCLUSIONS

The field survey also indicated that there are no "non-traffic anthropogenic" sources in the RSA, which contribute to the acoustic environment. In addition no tonal or excessive low frequency noise was encountered during field studies. Some land uses such as an Ontario Provincial Police station along Highway 11, small commercial buildings in Geraldton, and Premier Gold office trailers and trucks along Hardrock road were observed during the site visit but were not considered to be significant contributor to the overall acoustical environment.

The study considered time varying (temporal) and spatial characteristics of the existing acoustical environment. It was found vehicle traffic along Highway 11 and Michael Power Boulevard were the dominant sources of noise within the RSA during daytime hours. Further it was observed sound from the natural environment dominated the nighttime hours.

This is typical for small communities located near a major highway, where daytime traffic dominates the acoustic environment at 50 dBA and natural sounds dominate in the absence of traffic noise, closer to 40-45 dBA.

Therefore the receptor area of the Project within the LSA and RSA are characteristic of a Class 2 acoustical environment; that is defined by the MOECC publication NPC-300, as an environment which experiences "urban hum" or traffic noise during daytime hours while sound from the natural environment dominates the night-time.

5.0 REFERENCES

[1] Ontario Ministry of the Environment (MOE). 2003. "NPC-103 – Procedures, February 7, 2003"

[2] Ontario Ministry of the Environment (MOE). 2013. "Stationary and Transportation Sources – Approval and Planning, Publication NPC-300, August 2013"

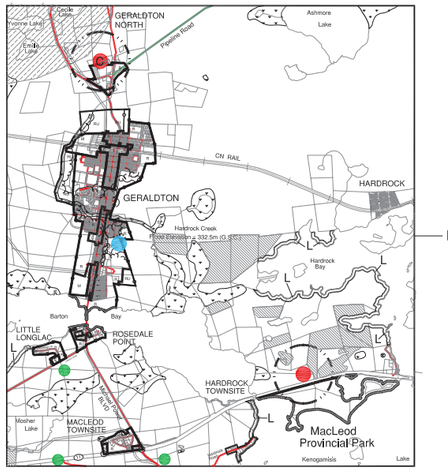
[3] Health Canada. 2012. "Useful Information for Environmental Assessments"

[4] Schroter, V; Chiu, C. 1989. Ontario, Noise Assessment and Systems Support Approvals Branch "Ontario Road Noise Analysis Method for Environment and Transportation, October 1989"

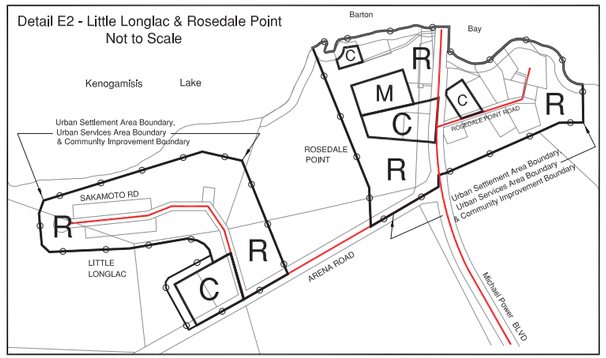
[5] Stantec Consulting Ltd. (Stantec) 2014. Trans-Canada Property Hardrock and Brookbank Projects Preliminary Economic Assessment NI 43-101 Technical Report. Prepared for Premier Gold Mines Limited.

Appendix A

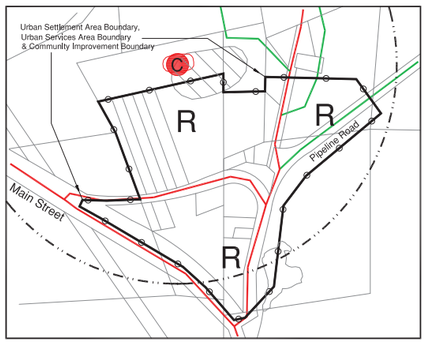
Zoning Plan



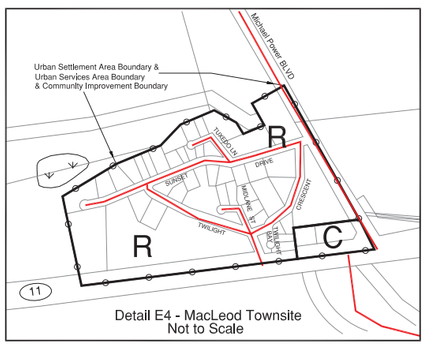
Detail E5 - Scale 1:50,000



Detail E2 - Little Longlac & Rosedale Point
Not to Scale

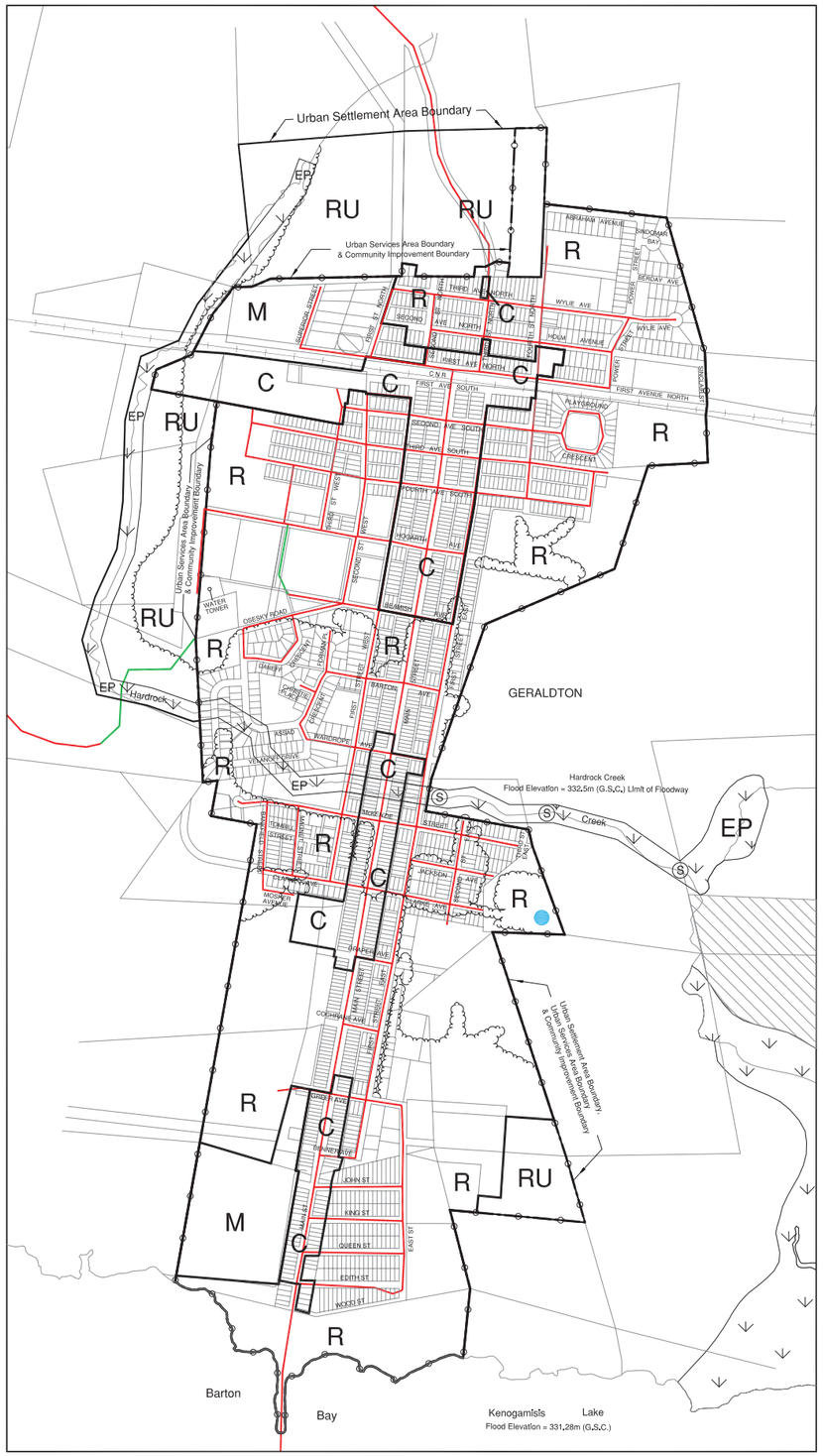


Detail E3 - Geraldton North
Not to Scale



Detail E4 - MacLeod Townsite
Not to Scale

Detail E6 - Hardrock Townsite Area
Not to Scale



Detail E1 - Geraldton
Not to Scale

Digital Mapping Provided By:
Paul H. Torrance Surveying Ltd.
Elliot Lake, Ontario

Tunnock Consulting Ltd

The Municipality of

GREENSTONE

OFFICIAL PLAN
Schedule E - Land Use Plan

Date: June 14, 2010

Legend

- Urban Settlement Boundary
- Rural Settlement Area Boundary
- Urban Service Area Boundary
- Community Improvement Area Boundary

1. Land Use Districts

- R — Residential District
- C — Commercial District
- M — Industrial District
- RU — Rural District
- EP — Environmental Protection Area

Rural Area

- RU — Rural District
- L — Lakefront District
- RM — Industrial District
- A — Airport District
- SY — Salvage Yard Use
- Waste Disposal Facility (Closed=C)
- 500m Influence Area
- Mineral Aggregate Resources
- (P) Pit
- (Q) Quarry
- Mine Hazards
- MMO — Mineral Mining Operation

2. Natural Heritage Features

- PSW — Provincially Significant Wetlands
- Unclassified Wetlands, includes Unstable or Organic Soils
- Areas of Natural and Scientific Interest (ANSI)

Fish Habitat

- (S) Spawning Area
- CWS — Cold Water Stream

Wildlife Habitat

- MWA — Moose Wintering Area
- MAF — Moose Aquatic Feeding Area
- WCA — Woodland Caribou Area
- (N) Nesting Site
- (WF) High Waterfowl Use Area
- Provincial Park

3. Transportation Facilities

- (684) Provincial Highway

Municipal Roads

- Year Round Maintained
- Seasonally Maintained

Unassumed

- Private Road
- Rail Line
- ARL — Abandoned Rail Line
- GAS — Trans-Canada Pipeline
- Geraldton Water Supply Area
- Sewage Treatment Plant

4. Natural and Human Made Hazards

Flood Elevation - Long Lake=326.1m (G.S.C.)
- Hardrock Creek=332.5m (G.S.C.)
- Lake Nipigon=260.6m (G.S.C.)
- Kenogamisis Lake 331.28m (G.S.C.)

- Flood Fringe

Appendix B

Weather Data

Date	Time	Humidity %	Wind dir. (10s of degrees)	Wind Speed (km/hr)	Conditions
3-Jun-14	3:00 PM - 4:00 PM	92	31	24	Rain,Fog
	4:00 PM - 5:00 PM	92	30	28	Rain,Fog
	5:00 PM - 6:00 PM	87	30	28	Rain
	6:00 PM - 7:00 PM	87	30	33	Cloudy
	7:00 PM - 8:00 PM	87	32	28	Rain
	8:00 PM - 9:00 PM	82	32	24	Rain
	9:00 PM - 10:00 PM	80	32	19	Mostly Cloudy
	10:00 PM - 11:00 PM	83	33	19	Mostly Cloudy
	11:00 PM - 12:00 AM	83	33	26	Mostly Cloudy
4-Jun-14	12:00 AM - 1:00 AM	84	33	15	Mostly Cloudy
	1:00 AM - 2:00 AM	83	30	13	Mostly Cloudy
	2:00 AM - 3:00 AM	83	29	6	Mainly Clear
	3:00 AM - 4:00 AM	77	30	6	Mainly Clear
	4:00 AM - 5:00 AM	77	30	6	Mostly Cloudy
	5:00 AM - 6:00 AM	79	29	7	Mostly Cloudy
	6:00 AM - 7:00 AM	83	31	9	Mostly Cloudy
	7:00 AM - 8:00 AM	75	31	9	Mostly Cloudy
	8:00 AM - 9:00 AM	72	31	9	Cloudy
	9:00 AM - 10:00 AM	61	36	13	Mostly Cloudy
	10:00 AM - 11:00 AM	51	33	9	Mostly Cloudy
	11:00 AM - 12:00 PM	46	33	9	Mostly Cloudy
	12:00 PM - 1:00 PM	46	36	15	Mostly Cloudy
	1:00 PM - 2:00 PM	44	30	7	Cloudy
	2:00 PM - 3:00 PM	39	36	13	Cloudy
	3:00 PM - 4:00 PM	43	34	19	Cloudy
	4:00 PM - 5:00 PM	40	2	11	Cloudy
	5:00 PM - 6:00 PM	41	32	13	Mostly Cloudy
	6:00 PM - 7:00 PM	39	32	9	Mostly Cloudy
	7:00 PM - 8:00 PM	40	1	13	Mostly Cloudy
	8:00 PM - 9:00 PM	43	1	9	Mostly Cloudy
	9:00 PM - 10:00 PM	64	1	6	Mostly Cloudy
	10:00 PM - 11:00 PM	61	5	7	Mainly Clear
	11:00 PM - 12:00 AM	56	6	11	Mainly Clear
5-Jun-14	12:00 AM - 1:00 AM	57	6	7	Mainly Clear
	1:00 AM - 2:00 AM	64	8	6	Mostly Cloudy
	2:00 AM - 3:00 AM	70	8	4	Mostly Cloudy
	3:00 AM - 4:00 AM	82		0	Mainly Clear
	4:00 AM - 5:00 AM	87		0	Mainly Clear
	5:00 AM - 6:00 AM	92		0	Mainly Clear
	6:00 AM - 7:00 AM	88		0	Mainly Clear
	7:00 AM - 8:00 AM	74	21	7	Clear
	8:00 AM - 9:00 AM	60	12	11	Clear
	9:00 AM - 10:00 AM	54	14	11	Clear
	10:00 AM - 11:00 AM	46	9	9	Clear
	11:00 AM - 12:00 PM	42	15	9	Clear

	12:00 PM - 1:00 PM	33	9	6	Clear
	1:00 PM - 2:00 PM	34	27	4	Mainly Clear
	2:00 PM - 3:00 PM	35	34	7	Mainly Clear
	3:00 PM - 4:00 PM	33	10	6	Mainly Clear
	4:00 PM - 5:00 PM	29	19	6	Mainly Clear
	5:00 PM - 6:00 PM	32	12	9	Mostly Cloudy
	6:00 PM - 7:00 PM	31	15	19	Mostly Cloudy
	7:00 PM - 8:00 PM	34	18	6	Mostly Cloudy
	8:00 PM - 9:00 PM	45	22	13	Mostly Cloudy
	9:00 PM - 10:00 PM	46	21	11	Mostly Cloudy
	10:00 PM - 11:00 PM	54	21	6	Mostly Cloudy
	11:00 PM - 12:00 AM	67		0	Mostly Cloudy
6-Jun-14	12:00 AM - 1:00 AM	82	26	4	Mostly Cloudy
	1:00 AM - 2:00 AM	77	23	4	Mostly Cloudy
	2:00 AM - 3:00 AM	78		0	Cloudy
	3:00 AM - 4:00 AM	77		0	Cloudy
	4:00 AM - 5:00 AM	70	17	7	Cloudy
	5:00 AM - 6:00 AM	64		0	Cloudy
	6:00 AM - 7:00 AM	65		0	Cloudy
	7:00 AM - 8:00 AM	59		0	Cloudy
	8:00 AM - 9:00 AM	64	24	9	Cloudy
	9:00 AM - 10:00 AM	74	22	13	Cloudy
	10:00 AM - 11:00 AM	66	21	19	Mostly Cloudy
	11:00 AM - 12:00 PM	63	22	24	Mostly Cloudy

Appendix C

Traffic Data

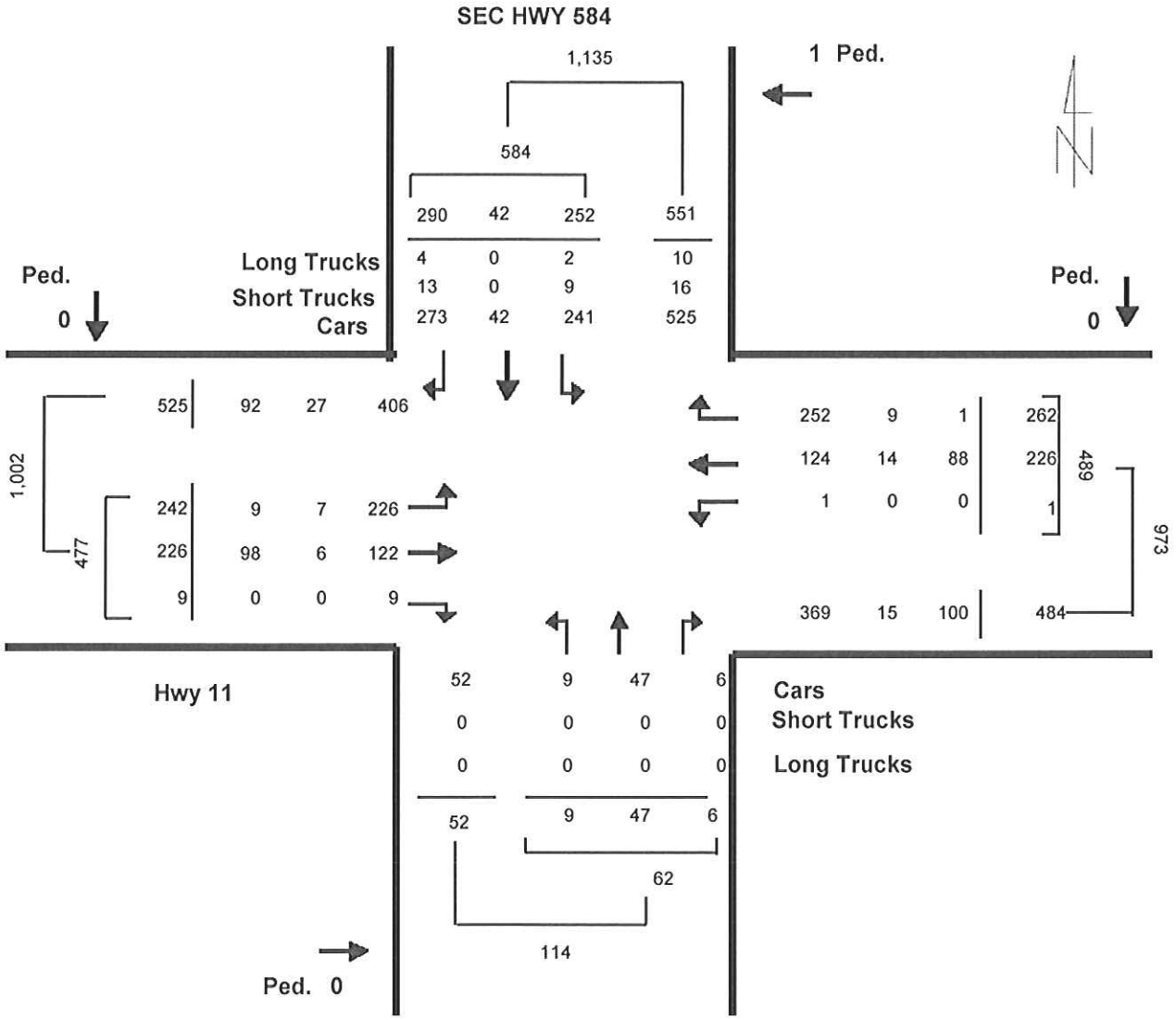
Traffic
Engineering
Software

8 Hr COUNT TOTAL

HWY 11 & SEC HWY 584

Northwest

Intersection ID:17880 00.00 Date: Mon – Tues, July 21 -22, 2014

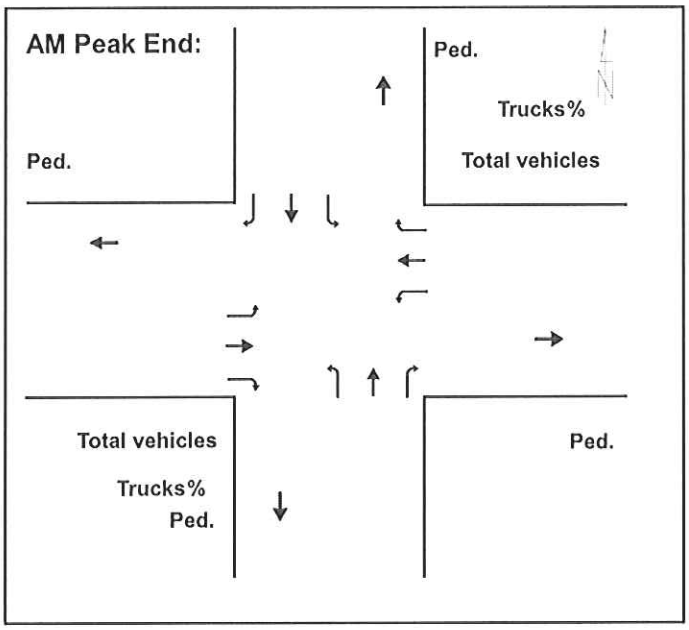


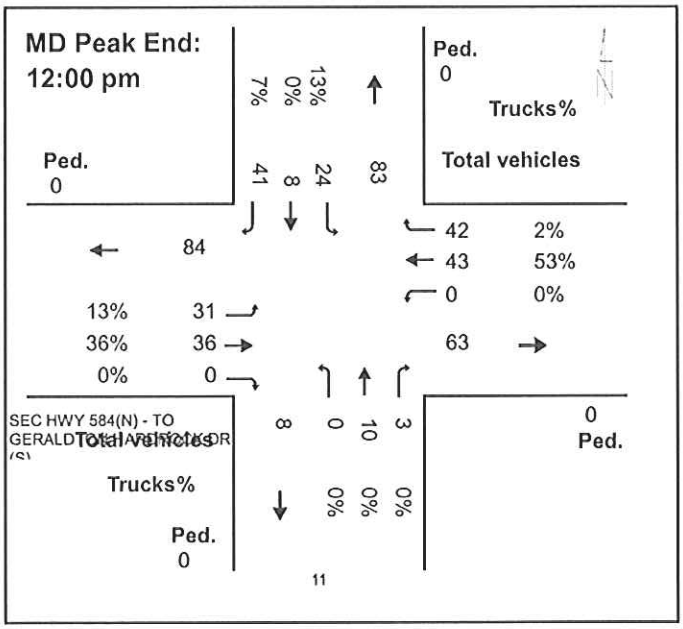
Ontario

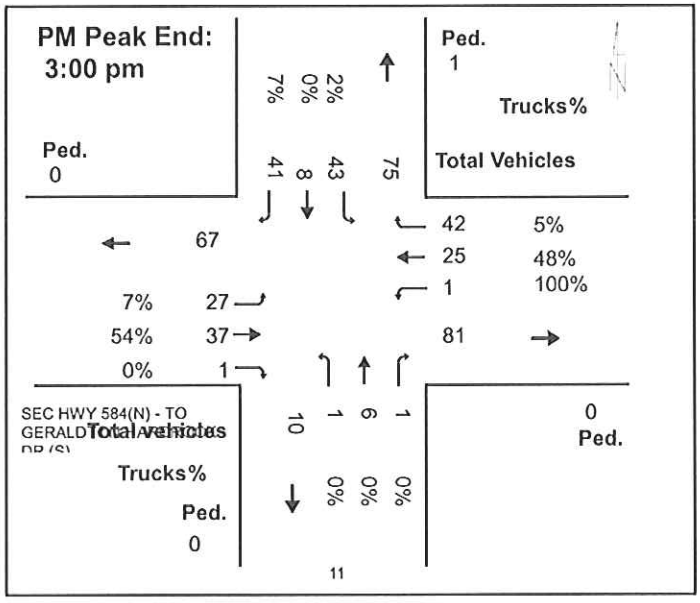
HWY 11 @ SEC HWY 584(N) - TO GERALDTON HARDROCK DR (S)

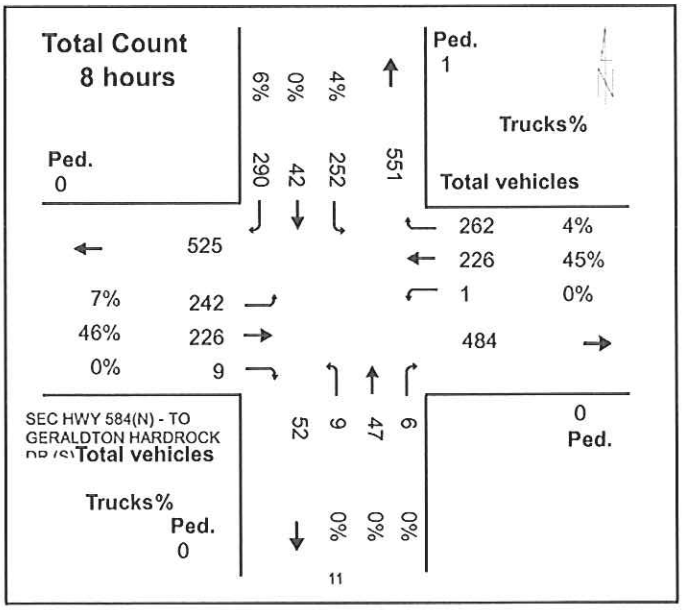
Northwest

Intersection ID:178800000 | Count Day: Monday | Count Date: 21-Jul-2014









15 MIN REPORT

Intersection ID:178800000 **HWY 11 @ SEC HWY 584(N) - TO GERALDTON HAI** **Municipality: Northwest** **Date: 21-Jul-2014**

	NORTH APPROACH										EAST APPROACH										SOUTH APPROACH										WEST APPROACH										
Time	Cars			Trucks			Heavies			Ped	Cars			Trucks			Heavies			Ped	Cars			Trucks			Heavies			Ped	Cars			Trucks			Heavies			Ped	Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		
Period1																																									
13:15	9	1	2	0	0	1	0	0	0	0	0	5	4	0	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0	6	9	0	0	0	0	0	5	0	0	46
13:30	12	0	9	1	0	0	0	0	0	0	0	4	6	0	3	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0	5	1	0	1	1	0	0	3	0	0	50
13:45	2	0	12	0	0	0	0	0	0	0	0	4	8	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	3	8	0	0	1	0	1	2	0	0	43
14:00	9	2	11	0	0	0	0	0	0	0	0	2	5	0	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	11	3	0	1	0	0	0	4	0	0	53
14:15	8	1	13	0	0	0	0	0	0	1	0	5	15	0	1	1	0	4	0	0	0	1	0	0	0	0	0	0	0	0	5	4	0	1	0	0	0	4	0	0	64
14:30	13	2	10	0	0	1	0	0	0	0	0	0	10	0	1	0	0	3	0	0	0	1	0	0	0	0	0	0	0	0	6	4	1	0	0	0	0	5	0	0	57
14:45	14	3	10	0	0	0	0	0	0	0	1	2	8	0	0	0	0	1	0	0	1	2	1	0	0	0	0	0	0	0	7	2	0	0	0	0	0	4	0	0	56
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15:30	7	3	12	1	0	0	0	0	0	0	0	3	7	0	0	0	0	1	0	0	0	2	0	0	0	0	0	0	0	0	13	6	0	0	0	0	0	3	0	0	58
15:45	12	2	17	0	0	0	0	0	0	0	0	6	9	0	0	1	0	2	0	0	0	1	1	0	0	0	0	0	0	0	10	0	0	0	0	0	0	3	0	0	64
16:00	5	1	9	1	0	0	0	0	0	0	0	5	8	0	3	0	0	3	0	0	0	3	0	0	0	0	0	0	0	0	4	4	0	1	0	0	0	1	0	0	48
16:15	12	1	10	0	0	0	0	0	0	0	0	2	9	0	0	0	0	1	0	0	0	2	0	0	0	0	0	0	0	0	5	3	1	0	1	0	0	2	0	0	49
16:30	10	0	5	0	0	0	0	0	0	0	0	4	8	0	0	1	0	1	0	0	0	2	0	0	0	0	0	0	0	0	12	4	0	0	0	0	0	1	0	0	48
16:45	12	0	13	0	0	0	0	0	1	0	0	3	9	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	8	8	0	0	0	0	1	1	0	0	58
17:00	9	1	8	0	0	0	0	0	0	0	0	4	13	0	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0	4	2	0	0	0	0	0	2	0	0	47
Period2																																									
8:15	6	3	5	0	0	0	0	0	0	0	0	4	5	0	0	0	0	3	0	0	0	1	0	0	0	0	0	0	0	0	4	3	0	0	0	0	0	4	0	0	38
8:30	13	1	5	0	0	1	0	0	0	0	0	1	4	0	0	0	0	3	0	0	0	2	0	0	0	0	0	0	0	0	8	2	0	0	0	0	0	2	0	0	42
8:45	2	1	5	0	0	1	0	0	0	0	0	2	11	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	9	2	0	0	0	0	1	4	0	0	41
9:00	5	0	3	1	0	1	0	0	0	0	0	6	10	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	7	0	1	0	1	0	0	2	0	0	39
9:15	8	0	12	0	0	1	1	0	0	0	0	9	8	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	8	3	0	0	0	0	0	3	0	0	54
9:30	7	4	12	0	0	0	0	0	0	0	0	3	7	0	0	0	0	2	0	0	1	1	0	0	0	0	0	0	0	0	6	0	0	1	0	0	0	2	0	0	46
9:45	5	0	10	0	0	0	0	0	0	0	0	2	5	0	0	0	0	2	0	0	2	2	0	0	0	0	0	0	0	0	11	2	0	0	0	0	0	3	0	0	44
10:00	6	4	6	0	0	1	0	0	0	0	0	3	3	0	0	2	0	6	0	0	2	1	0	0	0	0	0	0	0	0	6	3	2	0	1	0	0	2	0	0	48
10:15	5	0	7	1	0	1	0	0	0	0	0	2	5	0	0	0	0	7	0	0	1	3	0	0	0	0	0	0	0	0	10	5	2	1	0	0	1	6	0	0	57
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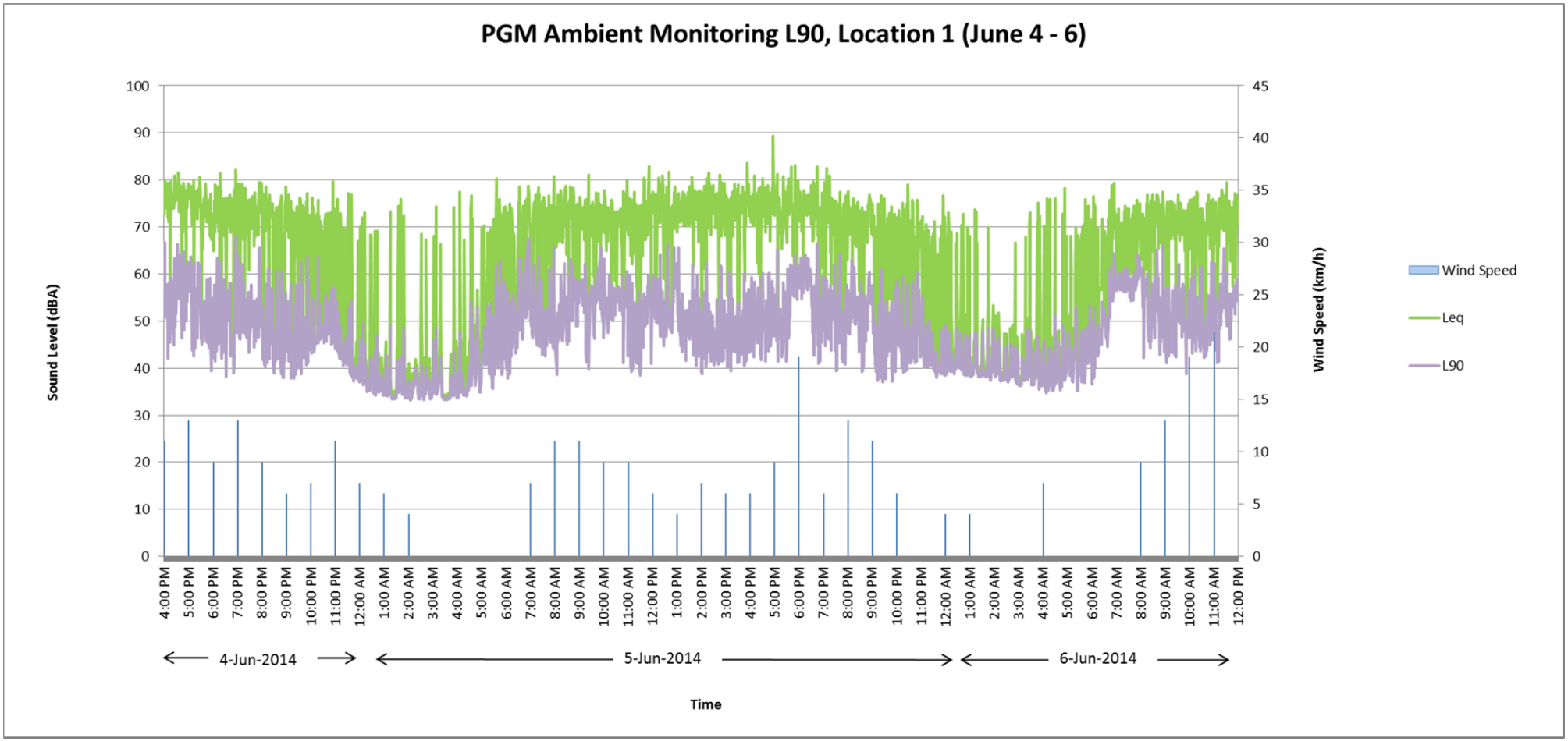
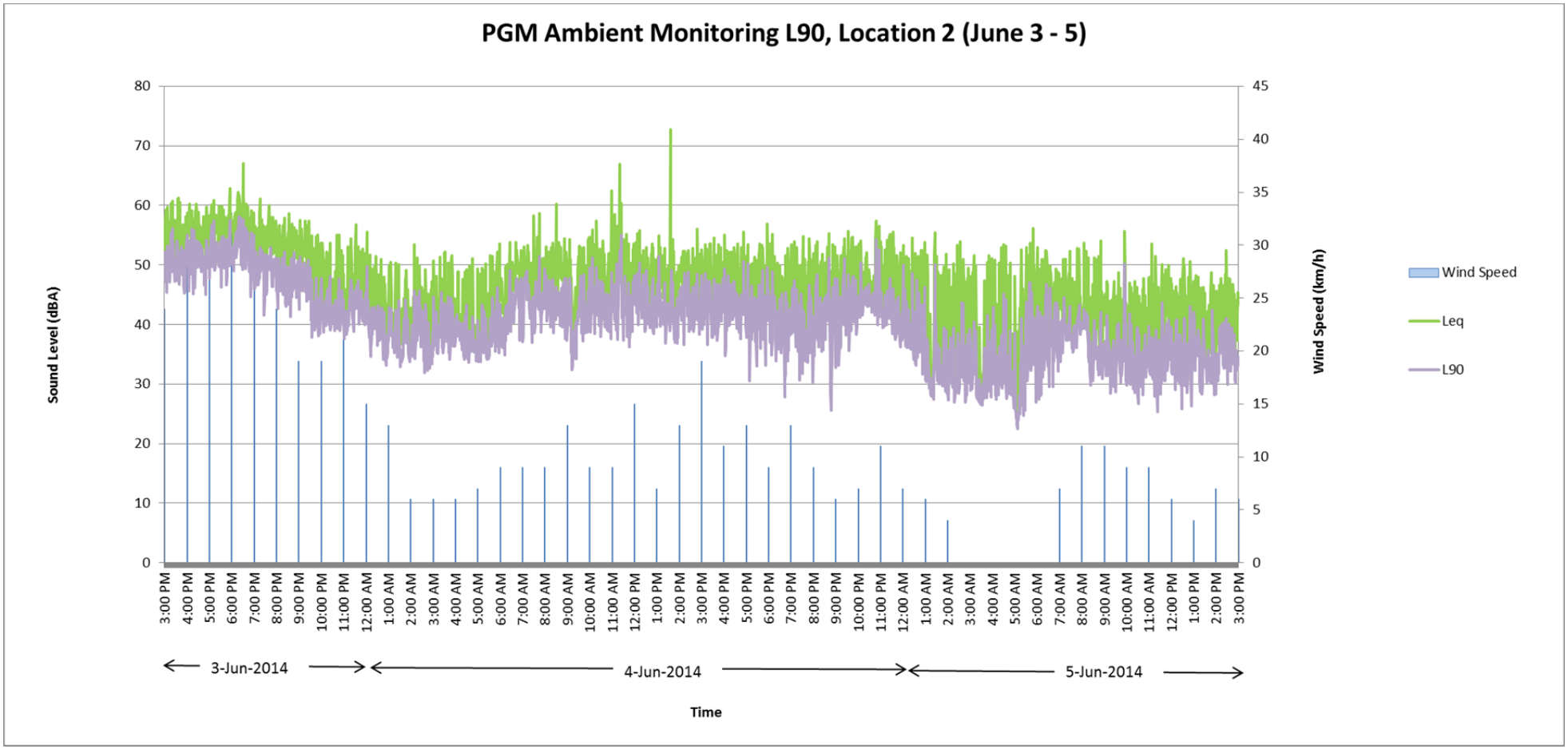
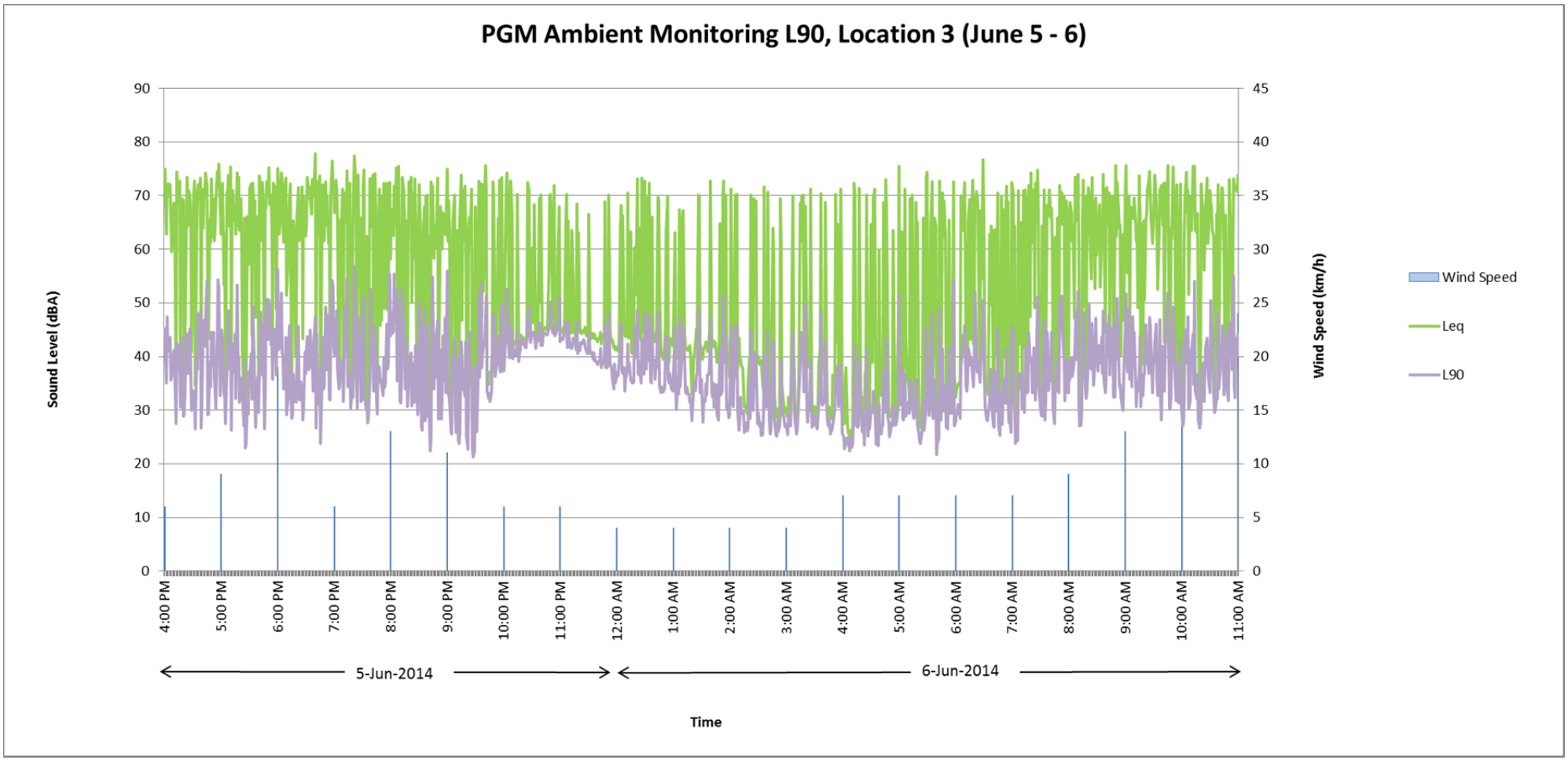
10:45	6	1	8	0	0	1	0	0	0	0	0	4	8	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	6	0	1	0	0	0	0	2	0	0	39
11:00	3	1	5	0	0	0	0	0	1	0	0	5	6	0	1	1	0	4	0	0	0	3	0	0	0	0	0	0	0	0	8	6	1	0	0	0	0	5	0	0	50
11:15	9	0	10	0	0	0	0	0	0	0	0	5	9	0	3	0	0	3	0	0	0	1	0	0	0	0	0	0	0	0	9	7	0	0	0	0	1	6	0	0	63
11:30	2	2	10	2	0	0	0	0	0	0	0	8	10	0	0	1	0	4	0	0	0	3	0	0	0	0	0	0	0	0	7	4	0	0	0	0	1	2	0	0	56
11:45	6	3	8	0	0	0	1	0	2	0	0	6	13	0	1	0	0	6	0	0	0	1	0	0	0	0	0	0	0	0	6	8	0	1	0	0	0	2	0	0	64
12:00	4	3	10	0	0	1	0	0	0	0	0	1	9	0	0	0	0	6	0	0	0	5	3	0	0	0	0	0	0	0	5	4	0	0	0	0	1	3	0	0	55

Appendix D

Measured L90 Levels


PGM Ambient Monitoring L90, Location 1 (June 4 - 6)
Sound Level (dBA)
Wind Speed (km/h)
Wind Speed
Leq
L90
Time
4-Jun-2014
5-Jun-2014
6-Jun-2014


PGM Ambient Monitoring L90, Location 2 (June 3 - 5)
Sound Level (dBA)
Wind Speed (km/h)
Time
Wind Speed
Leq
L90
3-Jun-2014
4-Jun-2014
5-Jun-2014


PGM Ambient Monitoring L90, Location 3 (June 5 - 6)
Sound Level (dBA)
Wind Speed (km/h)
Time
Wind Speed
Leq
L90
5-Jun-2014
6-Jun-2014
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM

Appendix E

Spot Check Measurements

Device	Measurement	Type	Date	Location	Start Time	Duration	LAeq	L90
LD831	Pre_Gld001	Spot	4-Jun-14	South of Hardrock Road, 500m west of Hardrock Townsite	9:04 AM	2m	40	33.5
LD831	Pre_Gld002	Spot	4-Jun-14	Sunset Drive, 170m west of Michael Power Blvd.	2:15 PM	1.5m	45.3	39.1
LD831	Pre_Gld003	Spot	4-Jun-14	West end of Sunset Drive, just north of OPP station.	2:59 PM	2m	44.9	41.5
LD831	Pre_Gld004	Spot	4-Jun-14	Twilight Crescent, 85m west of Midlane St.	3:07 PM	1m	43.8	34.8
LD831	Pre_Gld005	Spot	4-Jun-14	Twilight Crescent, 85m west of Midlane St.	3:09 PM	2m	50.7	37.1
LD831	Pre_Gld006	Spot	4-Jun-14	Sunset Drive, 90m west of Michael Power Blvd.	3:19 PM	1m	51.0	43.8
LD831	Pre_Gld007	Spot	4-Jun-14	Michael Power Blvd. at north end of golf course. 1km north of Hwy 11	3:30 PM	10m	62.4	38.9
LD831	Pre_Gld008	Spot	4-Jun-14	Michael Power Blvd. at Old Arena Rd.	4:50 PM	30s	35.5	31.4
LD831	Pre_Gld009	Spot	4-Jun-14	Michael Power Blvd. at Old Arena Rd.	4:52 PM	5m	55.4	39.8
LD831	Pre_Gld010	Spot	4-Jun-14	Michael Power Blvd. at golf course. 760m north of Hwy 11	5:00 PM	2m	70.7	49.4
LD831	Pre_Gld011	Spot	4-Jun-14	End of Barrick Dr., northeast of Michael Power Blvd. and Hwy 11	5:10 PM	3m	49.1	36.6
LD831	Pre_Gld012	Spot	4-Jun-14	Michael Power Blvd. and Hwy 11	5:29 PM	10m	69.8	40.2
LD831	Pre_Gld013	Spot	4-Jun-14	Southeast of Michael Power Blvd. and Hwy 11	5:45 PM	5m	48.8	37.2
LD831	Pre_Gld014	Spot	4-Jun-14	West End of Hardrock Townsite	6:10 PM	2m	57.5	38.7
LD831	Pre_Gld015	Spot	4-Jun-14	West End of Hardrock Townsite	6:14 PM	1m	39.0	32.8
LD831	Pre_Gld016	Spot	4-Jun-14	Hwy 11, 670m west of Michael Power Blvd. South of OPP Station	6:25 PM	1m	39.8	38.1
LD831	Pre_Gld017	Spot	4-Jun-14	Hwy 11, 1.5km east of Michael Power Blvd.	6:38 PM	1.5m	66.6	44.1
LD831	Pre_Gld018	Spot	4-Jun-14	Hwy 11, 2.4km west of Michael Power Blvd.	6:50 PM	2m	73.3	38.4
LD831	Pre_GldN001	Spot	5-Jun-14	West End of Hardrock Townsite	12:17 AM	1.5m	36.8	27.9
LD831	Pre_GldN002	Spot	5-Jun-14	West End of Hardrock Townsite	12:51 AM	1m	37.7	34.4