

Appendix F

Noise Assessment

March 18, 2021

Prepared for



BRAMPTON
Flower City

Prepared by



IBI GROUP



Preliminary

Brampton Transit Facility Highway 50 at Cadetta Road City of Brampton Acoustical Report



Prepared for City of Brampton
by IBI Group

March 15, 2021

Document Control Page

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1 Introduction

IBI Group was retained by City of Brampton to complete a preliminary Acoustical Report in support of a Class Environmental Assessment to analyze the potential impacts of environmental noise generated by the proposed Brampton Transit Facility located southwest of the intersection of Highway 50 and Cadetta Road in the City of Brampton.

The City of Brampton is proposing a bus maintenance and storage facility which will be constructed in two phases. For Phase 1, the facility will include a single storey structure (approximately 12 m high), an outdoor bus storage layby area, a stormwater management (SWM) pond, a snow storage/melting area, an electrical substation, and a future energy storage area. Phase 2 will include a building expansion. Phase 1 and Phase 2 are shown on Figure A3 and A4, respectively (included in Appendix A). The facility will operate 24 hours a day, seven days a week.

The proposed site is currently zoned as agricultural by the City of Brampton. The property is bounded by a residential zoned development to the south, agricultural lands to the west and existing industrial zoned development to the north and east. The site location and layout are shown on the Noise Information Plans in Appendix A. A zoning map of the area is also provided in Appendix A.

This report documents the preliminary acoustical analysis, findings, and recommendations required to support the development from an acoustical perspective. The report also proposes mitigation measures, as required, to bring site noise levels as received by the surrounding sensitive receivers into compliance with Ministry of Environment, Conservation and Parks (MECP) guidelines.

2 Previous Studies

A Noise Baseline and Impact Assessment titled “Municipal Operations Centres Class EA – Northeast Yard – Noise Baseline and Impact Assessment” was previously completed for the City of Brampton by AECOM (March, 2012) and is included in Appendix C. The previous report was prepared in support of an Environmental Assessment of the proposed Brampton Municipal Operations Centre that had previously been proposed on the subject lands.

The previous study included on-site noise monitoring to establish the ambient background noise levels for the sensitive receiver locations adjacent to the site. The results of the monitoring and target noise levels are summarized in Section 3.2 below.

3 Background and Noise Criteria

The MECP noise guideline NPC-300 “Stationary and Transportation Sources – Approval and Planning” was used to determine the criteria considered for this study. The primary noise sources that may impact existing off-site sensitive receivers are on-site stationary noise sources (e.g., HVAC equipment, bus traffic, tools and equipment, emergency generators, etc.).

3.1 Area Classification

A sensitive noise receptor can be located in one of four area classifications as defined by the MECP. These classifications are defined by the MECP as follows (Section A5 of NPC 300):

- a) "Class 1 area": An area with an acoustical environment typical of a major population centre, where the background sound level is dominated by the activities of people, usually road traffic, often referred to as "urban hum."
- b) "Class 2 area": An area with an acoustical environment that has qualities representative of both Class 1 and Class 3 areas:
 - Sound levels characteristic of Class 1 during daytime (07:00 to 19:00 or to 23:00 hours); and
 - Low evening and night background sound level defined by natural environment and infrequent human activity starting as early as 19:00 hours (19:00 or 23:00 to 07:00 hours).
- c) "Class 3 area": A rural area with an acoustical environment that is dominated by natural sounds having little or no road traffic, such as:
 - A small community;
 - Agricultural area;
 - A rural recreational area such as a cottage or a resort area; or
 - A wilderness area.
- d) "Class 4 area": An area or specific site that would otherwise be defined as Class 1 or 2 and which:
 - Is an area intended for development with new noise sensitive land use(s) that are not yet built;
 - Is in proximity to existing, lawfully established stationary source(s); and
 - Has formal confirmation from the land use planning authority with the Class 4 area classification which is determined during the land use planning process.

On review of the above descriptions and the area surrounding the subject site, it is determined that the appropriate classification for the lands is Class 1 given that it is located within an established industrial/commercial area in the City of Brampton with significant daytime and nighttime ambient noise.

3.2 Stationary Noise Criteria

The MECP criteria for noise levels resulting from steady and varying sound stationary noise sources is the maximum of the ambient noise level or the exclusionary limits summarized in Table 1 (refer to section C4.5.1 of NPC 300).

Table 1 – Stationary Noise Level Criteria

TIME PERIOD	LOCATION	CLASS 1	CLASS 2	CLASS 3	CLASS 4
0700 – 1900	Outdoor Living Area	50 dBA	50 dBA	45 dBA	55 dBA
1900 – 2300	Outdoor Living Area	50 dBA	45 dBA	40 dBA	55 dBA
0700 – 1900	Plane of Window	50 dBA	50 dBA	45 dBA	60 dBA
1900 – 2300	Plane of Window	50 dBA	50 dBA	40 dBA	60 dBA
2300 – 0700	Plane of Window	45 dBA	45 dBA	40 dBA	55 dBA

Based on the monitoring of ambient background noise completed in the 2012 study, the noise level limits were determined to be 55 dBA during the daytime and evening and 54dBA during the nighttime for Receiver 1, and 51 dBA during the daytime and evening and 50dBA during the nighttime for Receiver 2 (refer to Section 4.2 below for description of receiver locations).

In order to be conservative in the assessment and mitigation of the proposed site at this preliminary stage of the project design, it is proposed that the exclusionary limits provided in Table 1 be applied as the criteria for the site.

3.3 Emergency Equipment Noise Criteria

The MECP has also specified noise criteria for emergency equipment (e.g., stand-by generators) that operate during non-emergency times such as testing and maintenance (refer to C4.5.3 of NPC-300).

The noise level criterion is 5 dBA greater than those for stationary noise listed in Table 1, and this noise is assessed independent of the other stationary noise sources.

4 Noise Prediction Methods and Noise Data

The industry-recognized noise modeling software “Cadna A v2020” by DataKustik that utilizes ISO 9613-2, was used to analyze the stationary noise model of the subject site.

4.1 On-Site Noise

The proposed site will include a maintenance facility building, bus driving lanes, vehicular parking areas, and landscaped areas. The Noise Abatement Action Plans in Appendix A shows the site layout and the location of noise sources and sensitive noise receivers.

The following “worst-case” operational data and assumptions were used in the noise modelling:

- a) Maintenance building height assumed to be 12.0m, office building height assumed to be 7.5m;
- b) Fifteen (15) rooftop air-handling units (AHU) units for the maintenance building, with an additional ten (10) units for the Phase 2 expansion. Rooftop AHUs are assumed to be operating in steady-state during the daytime and nighttime. Operates with a sound power level of 95 dBA;

- c) Twenty (20) rooftop electric fans (EF) on the maintenance building, with an additional ten (10) units for the Phase 2 expansion. Rooftop electric fans (EF) are assumed to be operating in steady-state during the daytime and nighttime. Operates with a sound power level of 70 dBA;
- d) Four (4) rooftop air-conditioning (AC) units for the office building. All rooftop AC units and are assumed to be operating 45 minutes per hour during the daytime and 30 minutes per hour during the nighttime. Operates with a sound power level of 85 dBA;
- e) Two (2) forklifts operating in the driveway south of the maintenance bays. Forklifts are assumed to be operating 30 minutes per hour during the daytime and 30 minutes per hour during the nighttime. Operates with a sound power level of 90 dBA;
- f) Two (2) compressors in the tank farm area. Compressors are assumed to be operating 30 minutes per hour during the daytime and 30 minutes per hour during the nighttime. Operates with a sound power level of 100 dBA;
- g) One (1) transformer in the main electrical substation areas area. The transformer is assumed to be operating in steady-state. Operates with a sound power level of 85 dBA;
- h) Ten (10) impact wrenches at the maintenance bays doors, with an additional six (6) for the Phase 2 expansion. Operate with a sound power level of 105 dBA. Given the number of impact wrenches and the proximity of the bay doors to the receiver locations, it is required that impact wrenches may only be operated with the bay doors closed so that they are not considered a stationary noise source;
- i) One (1) snow melting device at the west part of the yard. Snow melting equipment is assumed to be operating in steady-state during the daytime only. Operates with a sound power level of 105 dB;
- j) One (1) dump truck/plough at the snow storage area. The truck is assumed to be operating 30 minutes per hour during the daytime and 30 minutes per hour during the nighttime. Operates with a sound power level of 100 dBA;
- k) One (1) fueling truck at the west side of the proposed building. The truck is assumed to be operating 30 minutes per hour during the daytime and 30 minutes per hour during the nighttime. Operates with a sound power level of 110 dBA at a height of 2.0m;
- l) Bus traffic:
 - 350 vehicles departing in the day;
 - 200 vehicles departing in the evening;
 - 200 vehicles arriving in the day;
 - 200 vehicles arriving in the evening;
 - 150 vehicles arriving in the night;
 - Modelled as a line source travelling at 10 km/hour;
 - Bus diesel engine and exhaust sound power level (typical) at 100 dBA with a height of 3.0m.
- m) Bus brake testing, assumes 20 vehicles/day, modelled as a line sources travelling maximum 30 km/hour. Sound power level adjusted to 105 dBA to account for additional brake noise;

- n) Four (4) emergency generators adjacent to the east building facade. Generators are assumed to be operating 30 minutes per hour during the daytime while testing. Operates with a sound power level of 110 dBA;
- o) Other incidental noise sources (idling buses inside building, delivery vehicles, fueling trucks, etc.) would not be significant compared to the outdoor noise and are therefore not included in the modelling.

The preliminary acoustic assessment summary is shown in Table 2.

Table 2 – Acoustic Assessment Summary Table

SOURCE ID	SOURCE DESCRIPTION	SOUND POWER LEVEL (DBA)	SOURCE LOCATION	SOUND CHARACTERISTICS	NOISE CONTROL MEASURES
1	Departing Buses	100	Outside	Steady	Barrier
2	Arriving Buses	100	Outside	Steady	Barrier
3	Brake Test Buses	105	Outside	Steady	Barrier
4	Compressor 1	100	Outside	Steady	Barrier
5	Compressor 2	100	Outside	Steady	Barrier
6	Facility Rooftop HVAC (P1-15, P2-25)	95	Outside	Steady	Rooftop Barrier
7	Electric Fans (P1-20, P2-30)	70	Outside	Steady	Barrier
8	Forklift 1	90	Outside	Steady	Barrier
9	Forklift 2	90	Outside	Steady	Barrier
10	Fueling Truck	110	Outside	Steady	Barrier
11	Office Rooftop HVAC	85	Outside	Steady	Rooftop Barrier
12	Snow Dump/Plough	100	Outside	Steady	Barrier
13	Snow Melting Machine	105	Outside	Steady	Barrier
14	Substation	85	Outside	Tonal	Barrier
15	Impact Wrenches*	105	Inside	Impulsive	Bay Doors to Remain Closed
16	Emergency Generator 1	110	Outside	Steady	Barrier
17	Emergency Generator 2	110	Outside	Steady	Barrier
18	Emergency Generator 3	110	Outside	Steady	Barrier
19	Emergency Generator 4	110	Outside	Steady	Barrier

* Impact wrenches not considered as stationary noise sources since bay doors to remain closed.

4.2 Receiver Locations

4.2.1 Off-Site

To facilitate analysis and description, various sensitive receiver locations were identified. All receivers were located at the worst-case locations, which is typically the most exposed sensitive receiver, for both daytime and nighttime noise. As all receivers are residential buildings, the receiver locations are situated flush with the building façade on the upper floor of the building to represent the outside of bedroom and living room windows.

In terms of Outdoor Living Areas (OLAs) receiver locations, all are considered to be located at the most exposed location and coincide with the building façade receiver locations.

Note, if noise levels exceed criteria, on-site mitigation must be provided to protect the entire property from noise impacts, not only at the specific receiver locations.

Table 3 identifies the existing off-site receiver locations that correspond with Noise Abatement Action Plans in Appendix A.

Note that areas to west include agricultural buildings, which are not considered sensitive receivers.

Table 3 – Receiver Locations (Off-Site)

RECEIVER	LOCATION	REPRESENTS
Receiver 1	10192 Highway 50, Residential House	Façade Floors 1-2, OLA
Receiver 2	10192 Highway 50, Residential House	Façade Floors 1-2, OLA

5 Results

The noise modelling program “Cadna A v2020 by DataKustik, was used to predict the Stationary Noise Levels from the on-site noise sources on off-site and on-site receivers.

5.1 Off-Site Receivers

Noise levels produced by the on-site preliminary stationary noise sources as received by the existing off-site residential receivers were modelled and are summarized in Table 4 and Table 5 for the **unmitigated** Phase 1 and Phase 2 conditions of the site. Results are also shown graphically on the Cadna A output included in Appendix B.

Table 4 – Point of Reception Noise Impact Table (Phase 1)

SOURCE ID	DISTANCE TO R1 (M)	SOUND LEVEL (DBA) AT R1 (L _{Eq}) DAYTIME	SOUND LEVEL (DBA) AT R1 (L _{Eq}) NIGHTTIME	DISTANCE TO R2 (M)	SOUND LEVEL (DBA) AT R2 (L _{Eq}) DAYTIME	SOUND LEVEL (DBA) AT R2 (L _{Eq}) NIGHTTIME
1	49	51	-	40	54	-
2	53	46	46	120	40	40
3	84	33	-	49	39	-
4	143	30	30	169	21	21
5	134	42	42	163	27	27
6	156	34	34	120	35	35
7	176	11	11	140	11	11
8	125	34	34	61	41	41
9	94	35	35	93	37	37
10	307	32	-	235	34	-
11	255	17	15	263	14	12
12	315	34	34	233	36	36
13	334	41	-	250	44	-
14	370	20	20	385	10	10
15	112	-	-	76	-	-
Total		54	50		56	50
Generators						
16	133	31		164	28	
17	137	31		169	28	
18	141	32		174	28	
19	145	32		179	28	
Total		37	-		34	-

Table 5 – Point of Reception Noise Impact Table (Phase 2)

SOURCE ID	DISTANCE TO R1 (M)	SOUND LEVEL (DBA) AT R1 (L _{Eq}) DAYTIME	SOUND LEVEL (DBA) AT R1 (L _{Eq}) NIGHTTIME	DISTANCE TO R2 (M)	SOUND LEVEL (DBA) AT R2 (L _{Eq}) DAYTIME	SOUND LEVEL (DBA) AT R2 (L _{Eq}) NIGHTTIME
1	49	51	-	40	54	-
2	53	46	41	120	40	35
3	84	33	-	49	39	-
4	143	30	30	169	21	21
5	134	42	42	163	27	27
6	156	36	36	120	39	39
7	176	11	11	140	11	11
8	125	34	34	61	41	41
9	94	35	35	93	37	37
10	307	31	-	235	32	-
11	255	17	15	263	14	12
12	315	22	22	233	24	24
13	334	34	-	250	37	-
14	370	20	20	385	10	10
15	112	-	-	76	-	-
Total		54	50		56	51
Generators						
16	133	31		164	28	
17	137	31		169	28	
18	141	32		174	28	
19	145	32		179	28	
Total		37	-		34	-

Since the total unmitigated noise levels exceed the MECP criteria, on-site mitigation is required. Mitigation in the form of 4.5m high acoustic barriers to screen the rooftop equipment and a 5.5m high acoustic barrier (noise wall, berm, or a combination of the two) at the south property line are proposed to protect sensitive off-site receivers from on-site noise sources. Each acoustic barrier shall have a minimum surface density of 20 kg/m² and be constructed without holes or gaps. The preliminary locations and dimensions of the barriers and berm are provided on the Noise Abatement Action Plans in Appendix A and the Cadna A output in Appendix B. The mitigated noise levels for Phase 1 and Phase 2 conditions are summarized in Table 6 and Table 7, respectively.

Table 6 – Acoustic Assessment Summary Table (Phase 1)

POINT OF RECEPTION ID	POINT OF RECEPTION DESCRIPTION	SOUND LEVEL (DBA) AT POINT OF RECEPTION DAYTIME (L _{EQ})	SOUND LEVEL (DBA) AT POINT OF RECEPTION NIGHTTIME (L _{EQ})	VERIFIED BY ACOUSTIC AUDIT?	PERFORMANCE LIMIT (DBA) DAYTIME/ NIGHTTIME (L _{EQ})	COMPLIANCE WITH PERFORMANCE LIMIT?
R1	Residential House to South	49	45	NO	50/45	YES
R2	Residential House to South	50	45	NO	50/45	YES

Table 7 – Acoustic Assessment Summary Table (Phase 2)

POINT OF RECEPTION ID	POINT OF RECEPTION DESCRIPTION	SOUND LEVEL (DBA) AT POINT OF RECEPTION DAYTIME (L _{EQ})	SOUND LEVEL (DBA) AT POINT OF RECEPTION NIGHTTIME (L _{EQ})	VERIFIED BY ACOUSTIC AUDIT?	PERFORMANCE LIMIT (DBA) DAYTIME/ NIGHTTIME (L _{EQ})	COMPLIANCE WITH PERFORMANCE LIMIT?
R1	Residential House to South	49	43	NO	50/45	YES
R2	Residential House to South	50	45	NO	50/45	YES

Note that the Phase 2 building expansion provides screening of on-site equipment and therefore further mitigates the noise level at the off-site receivers.

As shown in Table 6 and Table 7, and graphically on the plan included in Appendix B, the noise levels produced by the proposed on-site stationary noise sources do not exceed daytime and nighttime limits, provided that mitigation is provided. The mitigated noise results demonstrate that daytime and nighttime noise will meet the minimum criteria at each sensitive receiver location.

At final design, the exact configuration of the noise attenuation barrier will be confirmed. Based on available space, the barrier could be an earth berm, a noise wall or combination of both.

Mobile equipment such as snow melting machines, loaders, and fueling trucks should be located away from the south property line, or should be located such that the proposed building breaks the line of sight between the equipment and the sensitive receiver locations.

5.2 Emergency Generator Noise

Cadna A was used to predict the noise levels produced by the proposed on-site emergency generator testing of all generators operating concurrently as received by the existing off-site residential receivers. The results are summarized in Table 8.

Table 8 – Acoustic Assessment Summary Table (Emergency Generators)

POINT OF RECEPTION ID	POINT OF RECEPTION DESCRIPTION	SOUND LEVEL (DBA) AT POINT OF RECEPTION DAYTIME (L _{EQ})	VERIFIED BY ACOUSTIC AUDIT?	PERFORMANCE LIMIT (DBA) (L _{EQ})	COMPLIANCE WITH PERFORMANCE LIMIT?
R1	Residential House to South	37	NO	55	YES
R2	Residential House to South	34	NO	55	YES

As shown in Table 8, the noise levels produced by the proposed emergency generators while in operation during testing (assumed to be during daytime hours) do not exceed 55 dBA at the existing off-site receiver locations, and accordingly additional noise mitigation is not required. The Cadna A output is included in Appendix B. Note that the modelling assumed all generators operating at full load during the testing.

6 Recommendations

To mitigate noise from the on-site noise producing equipment on off-site receivers, the following recommendation is made:

Recommendation #1 (Mitigation for Off-Site Receivers)

Due to the proposed on-site equipment's noise exceedance of MECP and minimum background noise criteria, the mechanical equipment on the south rooftop of the maintenance building shall be screened with 4.5m high acoustic barrier. A 5.5m high acoustic barrier shall be constructed along the south property line (barrier and/or berm). The garage bay doors must remain closed to provide mitigation from impact wrench use. These mitigation features are shown on the Noise Abatement Action Plans in Appendix A. The acoustic barriers shall have a minimum surface density of 20 kg/m² and be constructed without holes or gaps.

The assumptions and results of this Acoustical Report must be confirmed during detailed design. Revised modelling and analysis will be required to reflect the final building layout and elevations and the noise generating equipment proposed for the site.

Based on the preceding, with the implementation of the proposed noise mitigation measures, we conclude that the proposed development can be appropriately designed to address noise impacts from the on-site stationary noise sources.

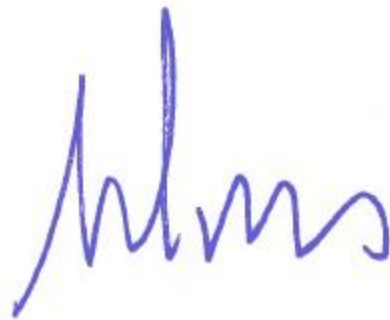
* * * * *

Yours truly

IBI GROUP



John Perks, MBA, P.Eng
Associate Director



Andy Kroess, M.Eng., P.Eng.
Senior Engineer

Appendix A – Noise Information Plans

Company Name

Region of Peel

Company Address

Unit Number	Street Number	Street Name	PO Box
		Highway 50	

City/Town	Province	Postal Code
Brampton	Ontario	

Location of Facility
Highway 50 at Cadetta Road, Brampton, Ontario

The attached Acoustic Assessment Report was prepared in accordance with the guidance in the ministry document "Information to be Submitted for Approval of Stationary Sources of Sound" (NPC-233) dated October 1995 and the minimum required information identified in the check-list on the reverse of this sheet has been submitted.

Company Contact

Company Contact
City of Brampton

Last Name	First Name	Middle Initial
Bobb	Compton	

Title	Telephone Number
Senior Project Engineer, Transportation Special Projects	905-874-2581

Signature	Date (yyyy/mm/dd)

Technical Contact

Technical Contact
IBI Group Professional Services (Canada) Inc.

Last Name	First Name	Middle Initial
Perks	John	

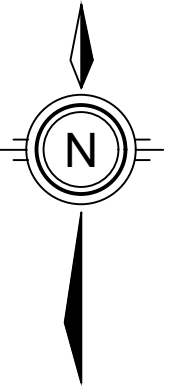
Representing	Telephone Number
City of Kingston	519 585-2255

Signature	Date (yyyy/mm/dd)

	Required Information	Submitted	Explanation/Reference
1.0	Introduction (Project Background and Overview)	<input checked="" type="checkbox"/> Yes	Refer to report section 1
2.0	Facility Description		
	2.1 Operating hours of Facility and significant Noise Sources	<input checked="" type="checkbox"/> Yes	Refer to report section 1
	2.2 Site Plan identifying all significant Noise Sources	<input checked="" type="checkbox"/> Yes	Refer to report Appendix A
3.0	Noise Source Summary		
	3.1 Noise Source Summary Table	<input checked="" type="checkbox"/> Yes	Refer to report section 4.1
	3.2 Source noise emissions specifications	<input checked="" type="checkbox"/> Yes	Refer to report section 4.1
	3.3 Source power/capacity ratings	<input checked="" type="checkbox"/> Yes	Refer to report section 4.1
	3.4 Noise control equipment description and acoustical specifications	<input checked="" type="checkbox"/> Yes	Refer to report section 4.1
4.0	Point of Reception Noise Impact Calculations		
	4.1 Point of Reception Noise Impact Table	<input checked="" type="checkbox"/> Yes	Refer to report section 5.1
	4.2 Point(s) of Reception (POR) list and description	<input checked="" type="checkbox"/> Yes	Refer to report section 4.2
	4.3 Land-use Zoning Plan	<input checked="" type="checkbox"/> Yes	Refer to report Appendix A
	4.4 Scaled Area Location Plan	<input checked="" type="checkbox"/> Yes	Refer to report Appendix A
	4.5 Procedure used to assess noise impacts at each POR	<input checked="" type="checkbox"/> Yes	Refer to report section 3
	4.6 List of parameters/assumptions used in calculations	<input checked="" type="checkbox"/> Yes	Refer to report Appendix B
5.0	Acoustic Assessment Summary		
	5.1 Acoustic Assessment Summary Table	<input checked="" type="checkbox"/> Yes	Refer to report section 4 and 5
	5.2 Rationale for selecting applicable noise guideline limits	<input checked="" type="checkbox"/> Yes	Refer to report section 3
	5.3 Predictable Worst Case Impacts Operating Scenario	<input checked="" type="checkbox"/> Yes	Refer to report section 4
6.0	Conclusions		
	6.1 Statement of compliance with the selected noise performance limits	<input checked="" type="checkbox"/> Yes	Refer to report section 6
7.0	Appendices (Provide details such as)		
	Listing of Insignificant Noise Sources	<input type="checkbox"/> Yes	Not Applicable
	Manufacturer's Noise Specifications	<input checked="" type="checkbox"/> Yes	Refer to report section 4
	Calculations	<input checked="" type="checkbox"/> Yes	Refer to report Appendix B
	Instrumentation	<input type="checkbox"/> Yes	Future Monitoring
	Meteorology during Sound Level Measurements	<input type="checkbox"/> Yes	Future Monitoring
	Raw Data from Measurements	<input type="checkbox"/> Yes	Future Monitoring
	Drawings (Facility / Equipment)	<input checked="" type="checkbox"/> Yes	Refer to report Appendix A



EASTING: 606392.45m
NORTHING: 4852274.94m



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101 - 410 Albert Street
Waterloo ON N2L 3V3 Canada
tel 519 585 2255
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SCALE 1:7500
DATE MARCH 2021
PROJECT No. 121785

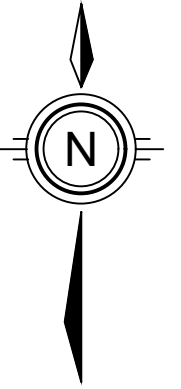
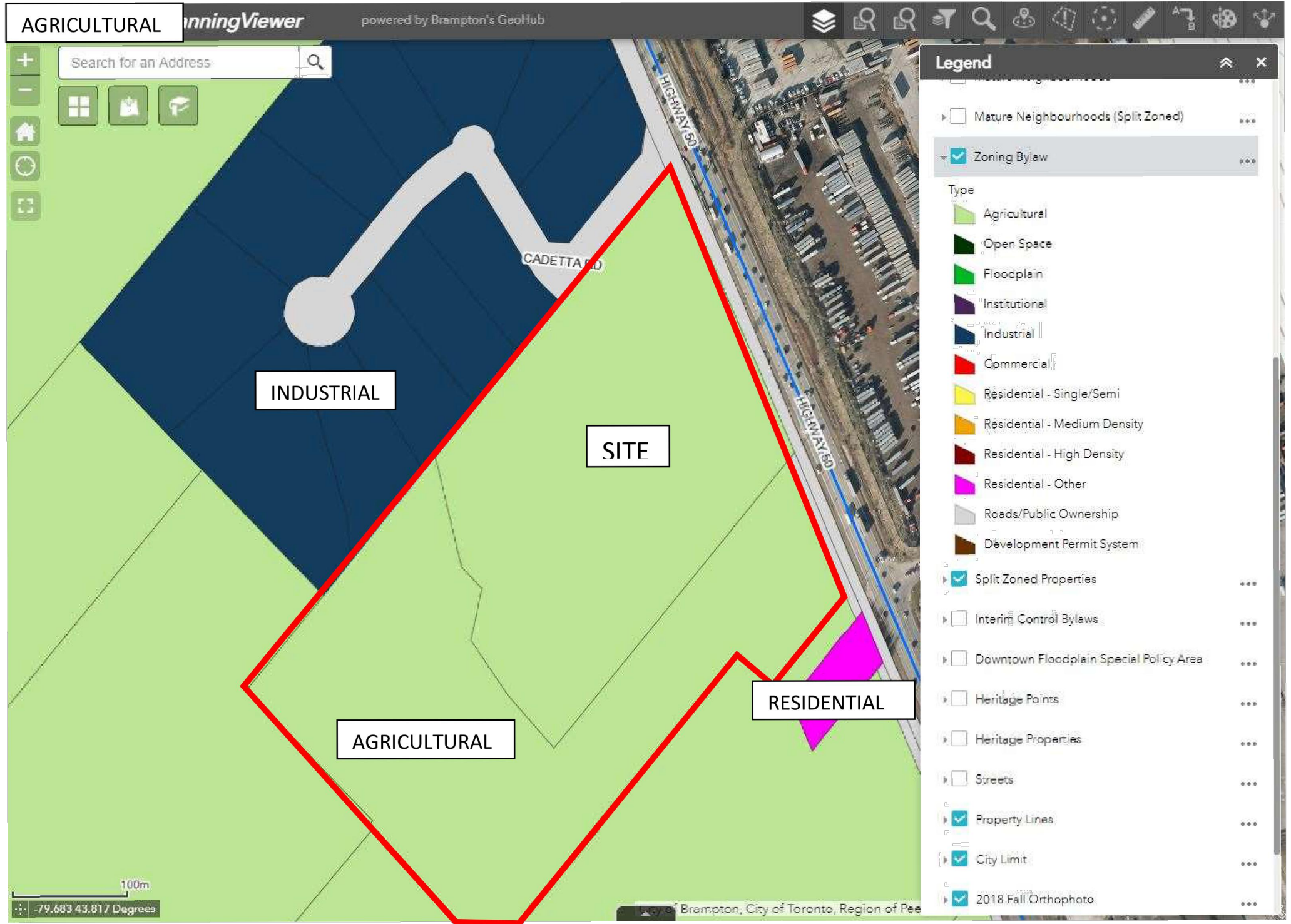
HWY 50 & CADETTA ROAD
CITY OF BRAMPTON
ONTARIO

BRAMPTON TRANSIT
FACILITY

SCALED AREA
LOCATION PLAN

FIGURE A1

ZONING OF SUBJECT SITE



IBI GROUP
 101 - 410 Albert Street
 Waterloo ON N2L 3V3 Canada
 tel 519 585 2255
 ibigroup.com

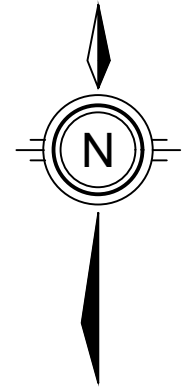
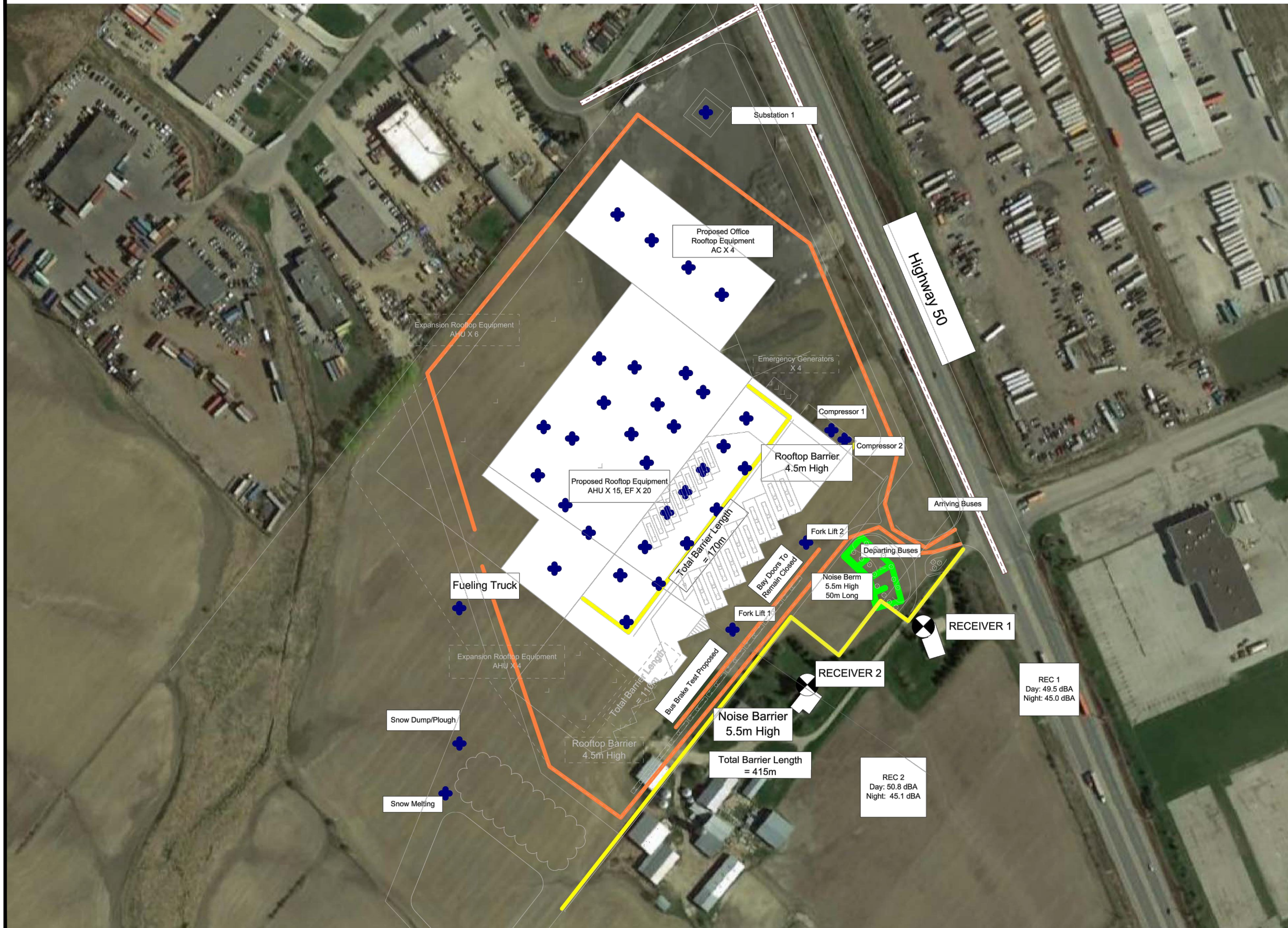
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 DATE: MARCH 2021
 PROJECT No.: 121785

HWY 50 & CADETTA ROAD
 CITY OF BRAMPTON
 ONTARIO

BRAMPTON TRANSIT
 FACILITY

ZONING OF
 SUBJECT SITE

FIGURE A2



IBI GROUP
 101 - 410 Albert Street
 Waterloo ON N2L 3V3 Canada
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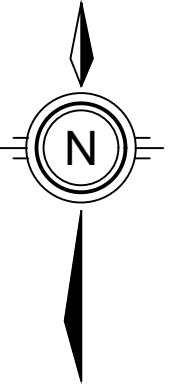
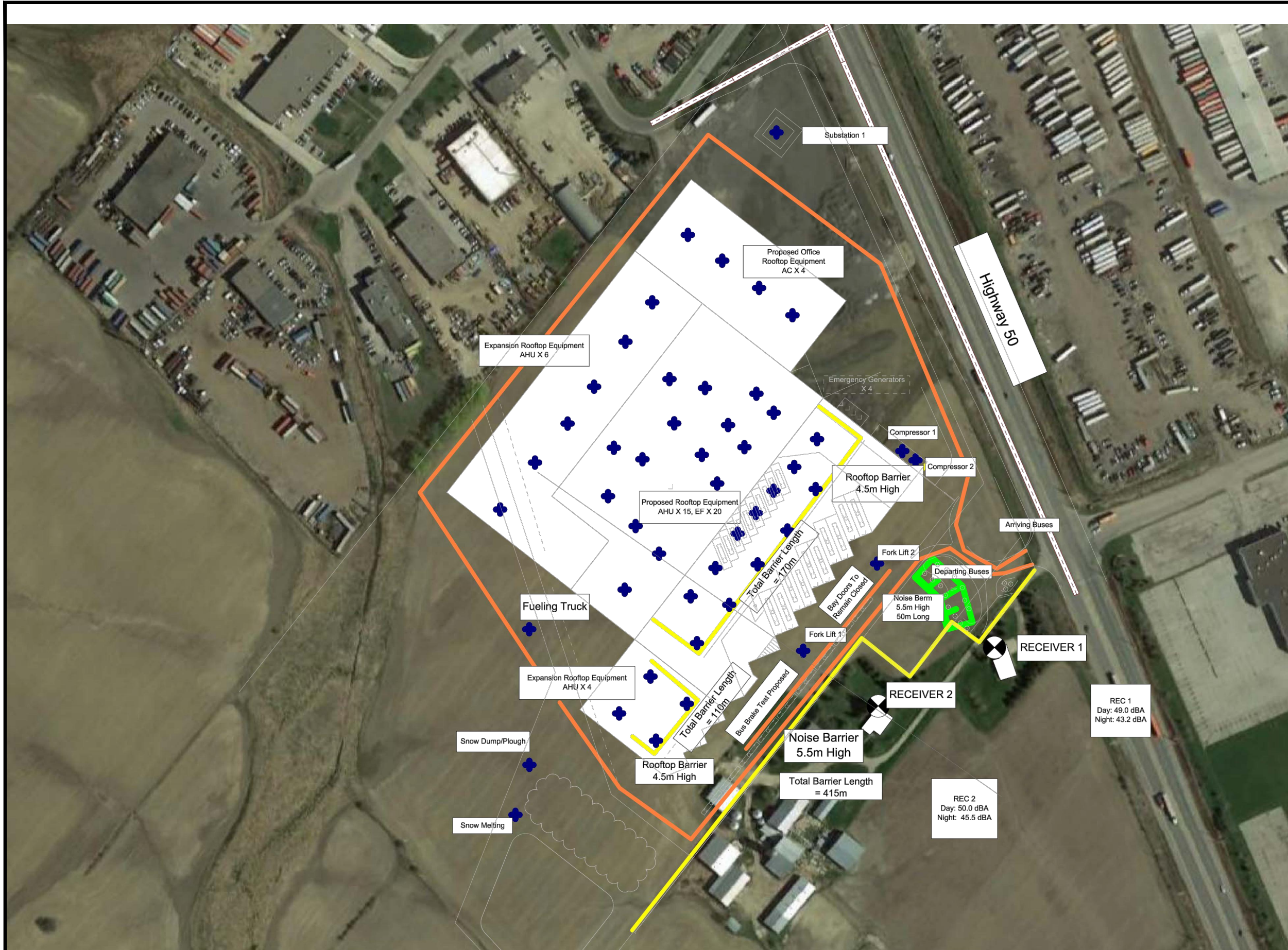
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**BRAMPTON TRANSIT
 FACILITY**

**PHASE 1
 NOISE ABATEMENT ACTION PLAN**

FIGURE A3



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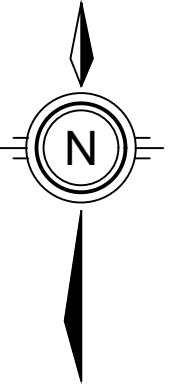
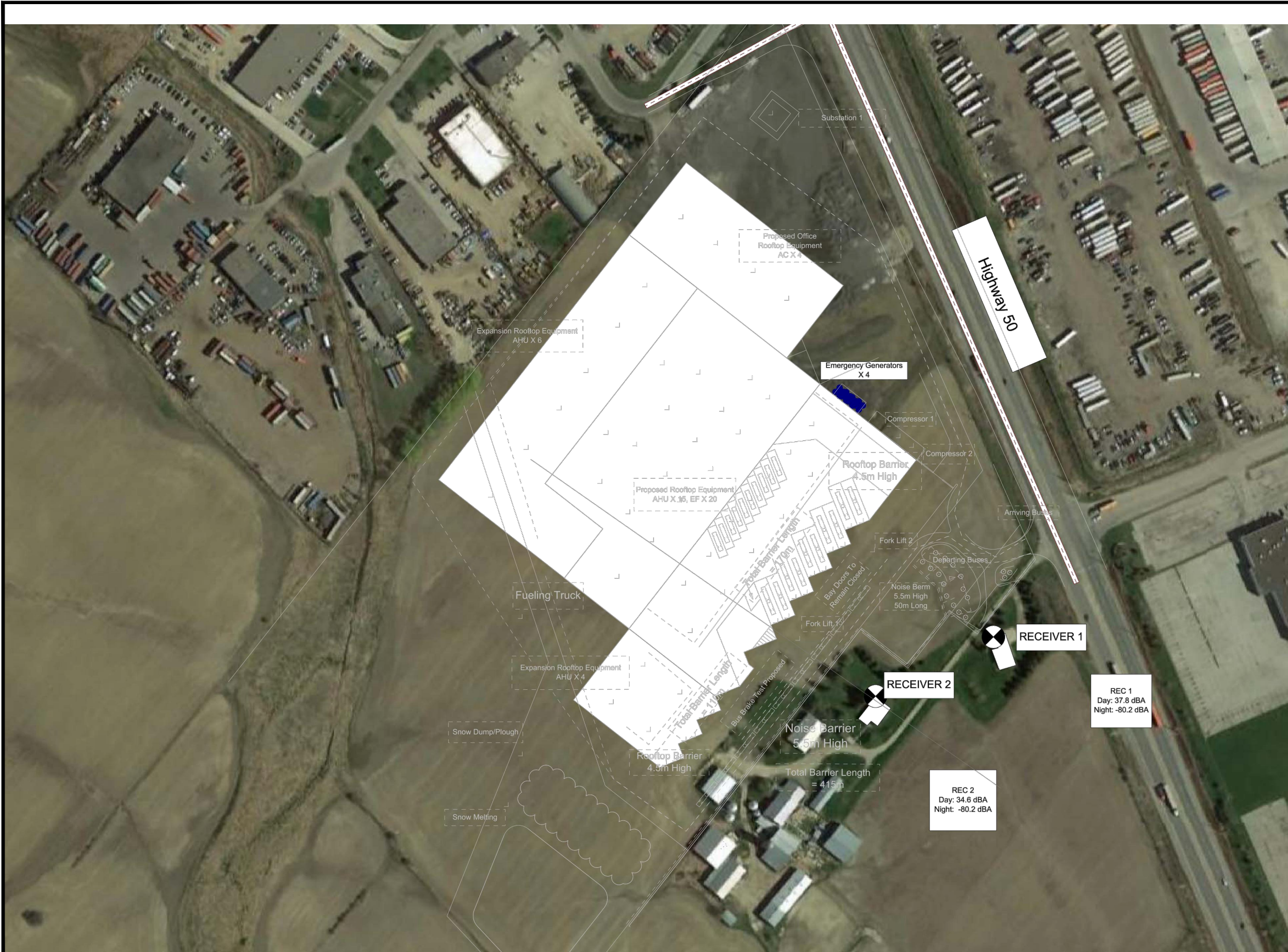
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**BRAMPTON TRANSIT
 FACILITY**

**PHASE 2
 NOISE ABATEMENT ACTION PLAN**

FIGURE A4



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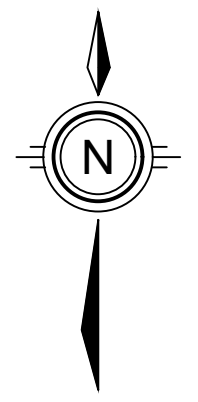
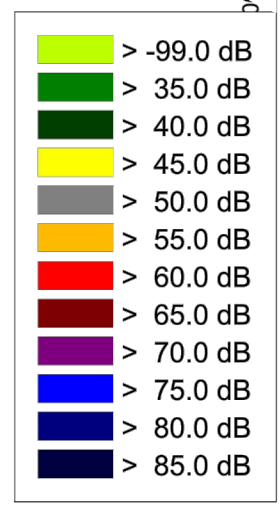
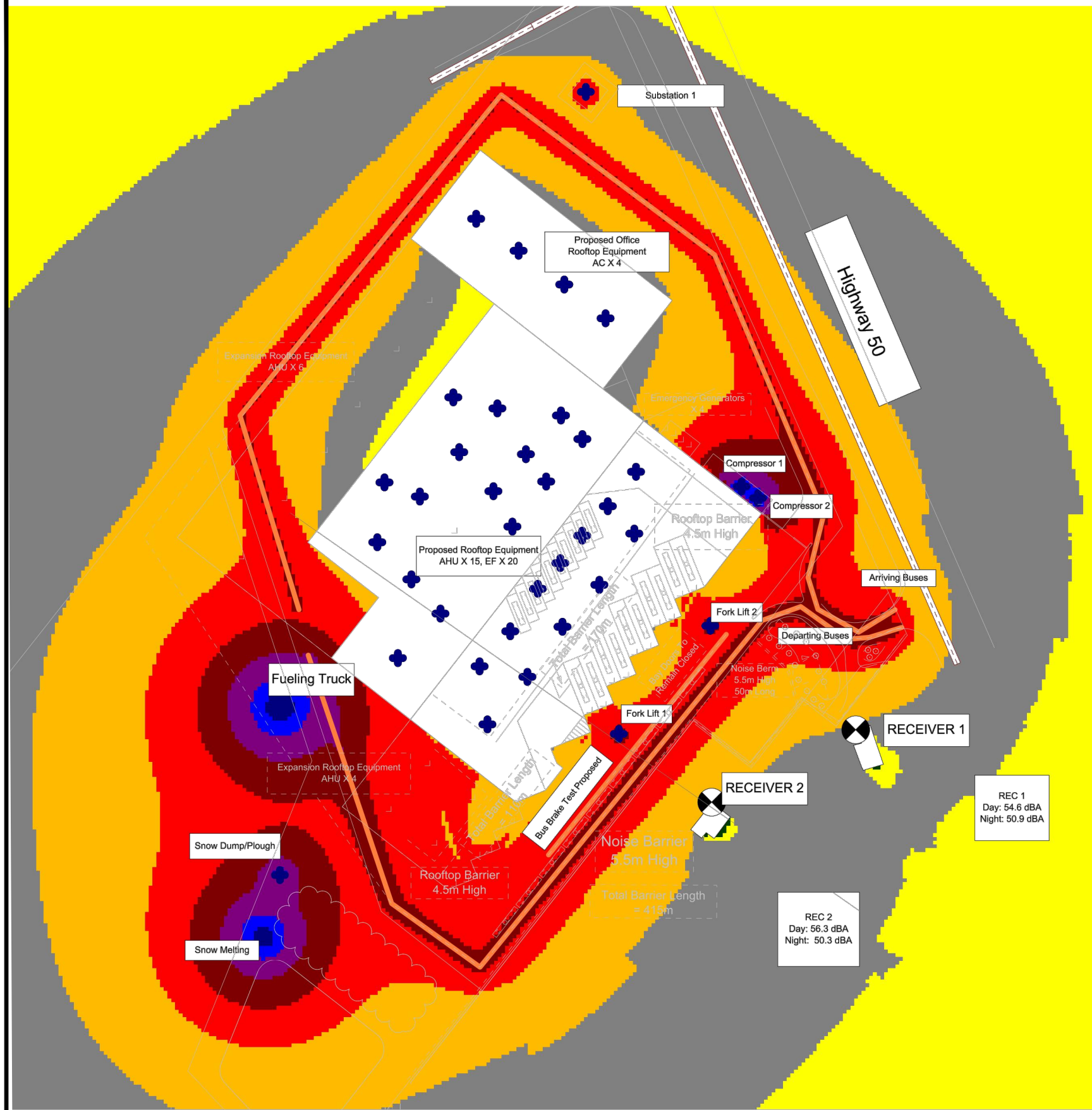
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EMERGENCY GENERATORS
 NOISE ABATEMENT ACTION PLAN

FIGURE A5

Appendix B – Cadna A Output



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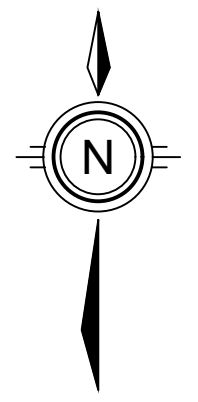
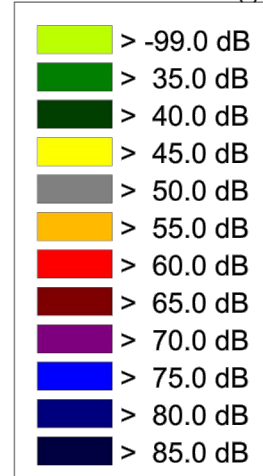
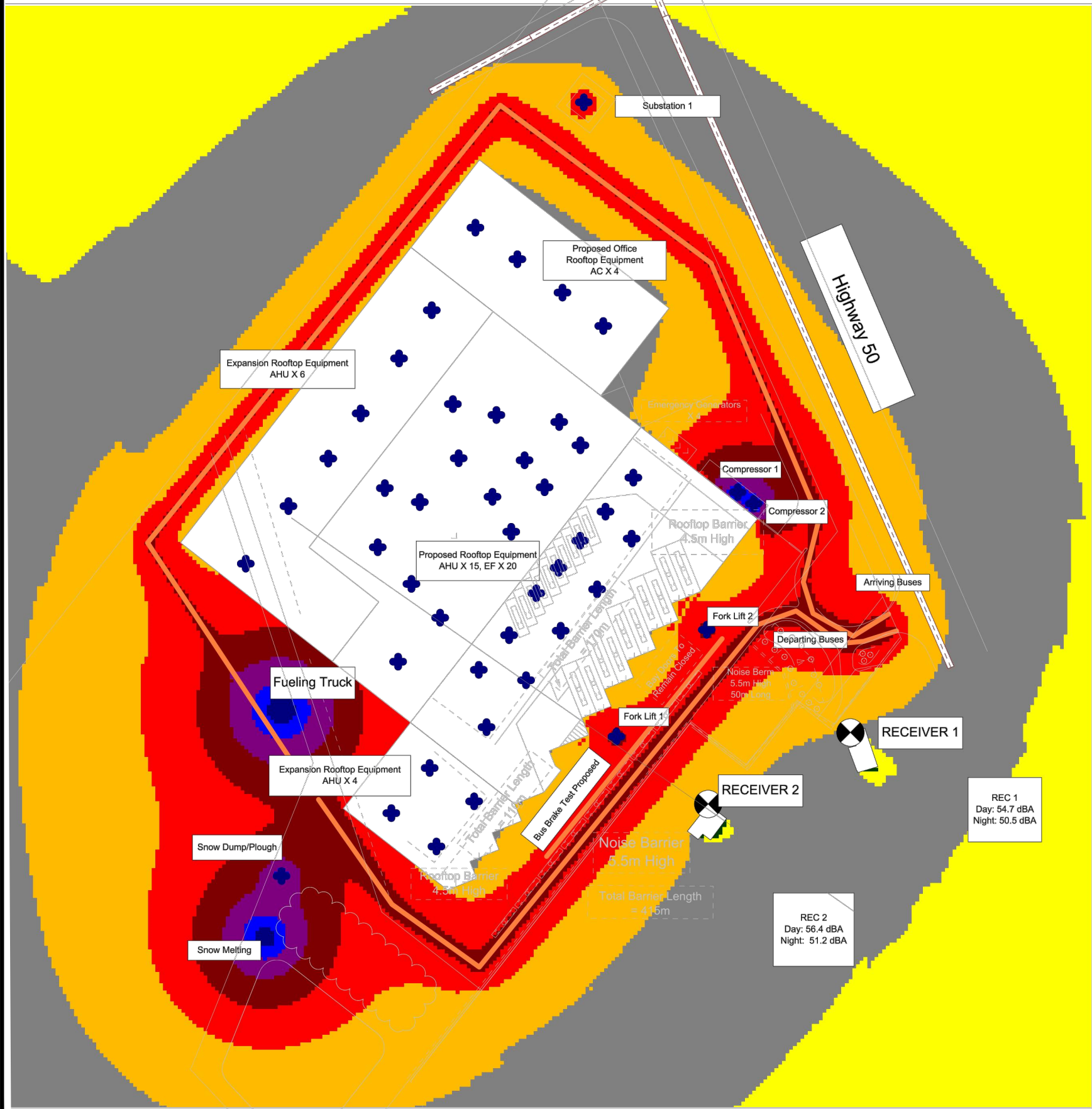
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HWY 50 & CADETTA ROAD
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BRAMPTON TRANSIT
 FACILITY

PHASE 1
 UNMITIGATED NOISE LEVELS

FIGURE B1



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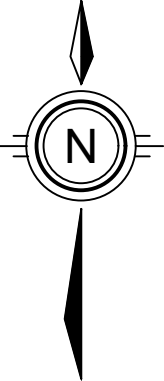
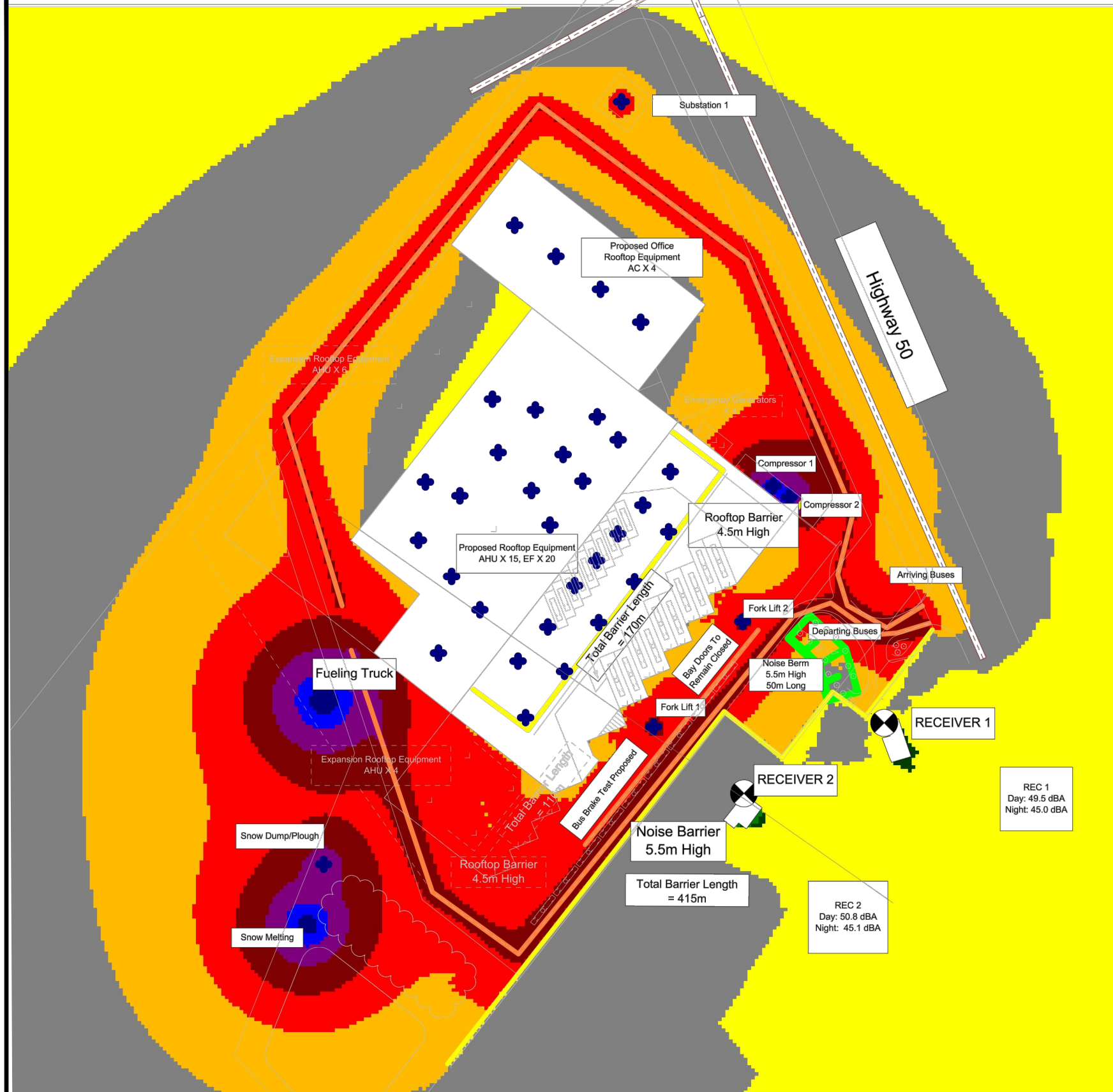
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HWY 50 & CADETTA ROAD
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PHASE 2
 UNMITIGATED NOISE LEVELS

FIGURE B2



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HWY 50 & CADETTA ROAD
 CITY OF BRAMPTON
 ONTARIO

BRAMPTON TRANSIT FACILITY

**PHASE 1
 MITIGATED NOISE LEVELS**

FIGURE B3

- > -99.0 dB
- > 35.0 dB
- > 40.0 dB
- > 45.0 dB
- > 50.0 dB
- > 55.0 dB
- > 60.0 dB
- > 65.0 dB
- > 70.0 dB
- > 75.0 dB
- > 80.0 dB
- > 85.0 dB

REC 1
 Day: 49.5 dBA
 Night: 45.0 dBA

REC 2
 Day: 50.8 dBA
 Night: 45.1 dBA

Noise Barrier
 5.5m High
 Total Barrier Length
 = 415m

Bus Brake Test Proposed
 Total Barrier Length
 = 170m

Rooftop Barrier
 4.5m High

Fork Lift 1

Fork Lift 2

Rooftop Barrier
 4.5m High

Compressor 1

Compressor 2

Highway 50

Proposed Office
 Rooftop Equipment
 AC X 4

Expansion Rooftop Equipment
 AHU X 6

Proposed Rooftop Equipment
 AHU X 15, EF X 20

Fueling Truck

Expansion Rooftop Equipment
 AHU X 4

Snow Dump/Plough

Snow Melting

Arriving Buses

Departing Buses

RECEIVER 1

RECEIVER 2

Bay Doors to
 Remain Closed

Noise Berm
 5.5m High
 50m Long

Noise Barrier
 5.5m High

Rooftop Barrier
 4.5m High

Expansion Rooftop Equipment
 AHU X 4

Snow Dump/Plough

Snow Melting

Arriving Buses

Departing Buses

RECEIVER 1

RECEIVER 2

Bay Doors to
 Remain Closed

Noise Berm
 5.5m High
 50m Long

Noise Barrier
 5.5m High

Rooftop Barrier
 4.5m High

Expansion Rooftop Equipment
 AHU X 4

Snow Dump/Plough

Snow Melting

Arriving Buses

Departing Buses

RECEIVER 1

RECEIVER 2

Bay Doors to
 Remain Closed

Noise Berm
 5.5m High
 50m Long

Noise Barrier
 5.5m High

Rooftop Barrier
 4.5m High

Expansion Rooftop Equipment
 AHU X 4

Snow Dump/Plough

Snow Melting

Arriving Buses

Departing Buses

RECEIVER 1

RECEIVER 2

Bay Doors to
 Remain Closed

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 50m Long

Noise Barrier
 5.5m High

Rooftop Barrier
 4.5m High

Expansion Rooftop Equipment
 AHU X 4

Snow Dump/Plough

Snow Melting

Arriving Buses

Departing Buses

RECEIVER 1

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Noise Barrier
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 AHU X 4

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Expansion Rooftop Equipment
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Snow Dump/Plough

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RECEIVER 1

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Noise Berm
 5.5m High
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Noise Barrier
 5.5m High

Rooftop Barrier
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Expansion Rooftop Equipment
 AHU X 4

Snow Dump/Plough

Snow Melting

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Noise Berm
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Noise Barrier
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Rooftop Barrier
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 AHU X 4

Snow Dump/Plough

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Arriving Buses

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RECEIVER 1

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 50m Long

Noise Barrier
 5.5m High

Rooftop Barrier
 4.5m High

Expansion Rooftop Equipment
 AHU X 4

Snow Dump/Plough

Snow Melting

Arriving Buses

Departing Buses

RECEIVER 1

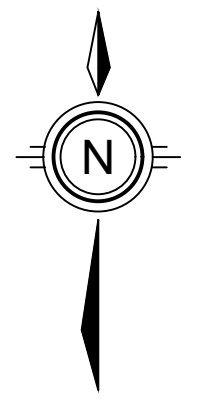
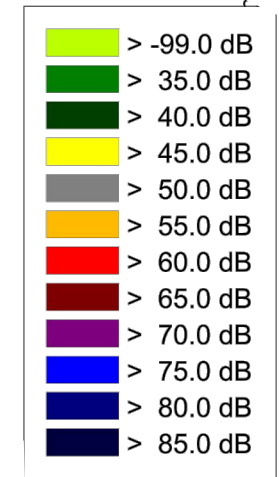
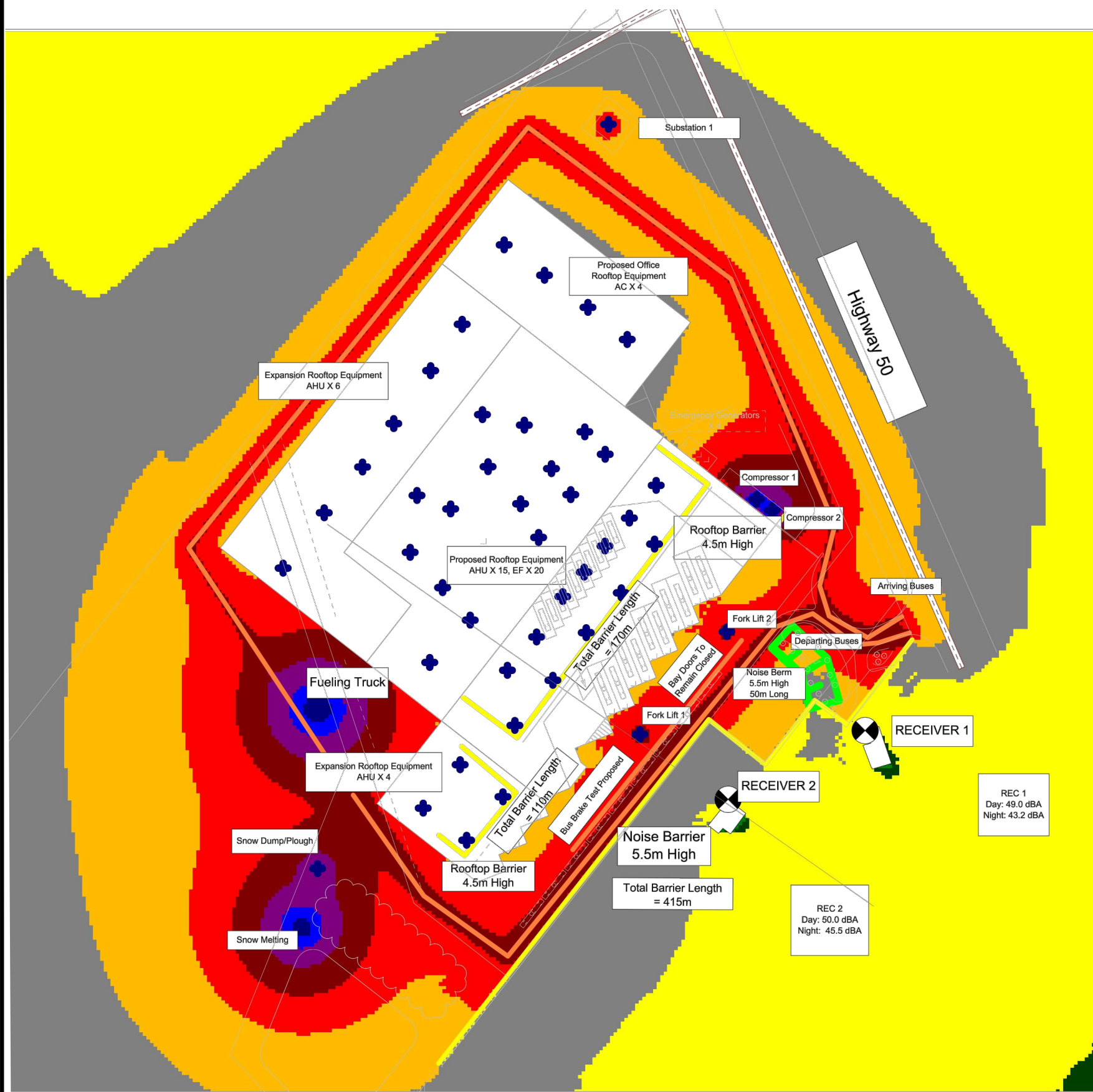
RECEIVER 2

Bay Doors to
 Remain Closed

Noise Berm
 5.5m High
 50m Long

Noise Barrier
 5.5m High

Roo



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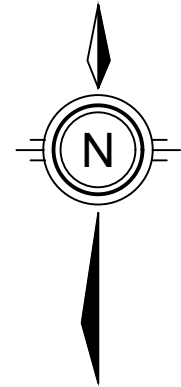
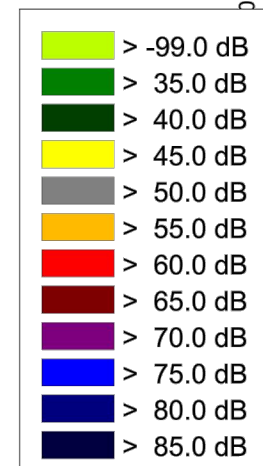
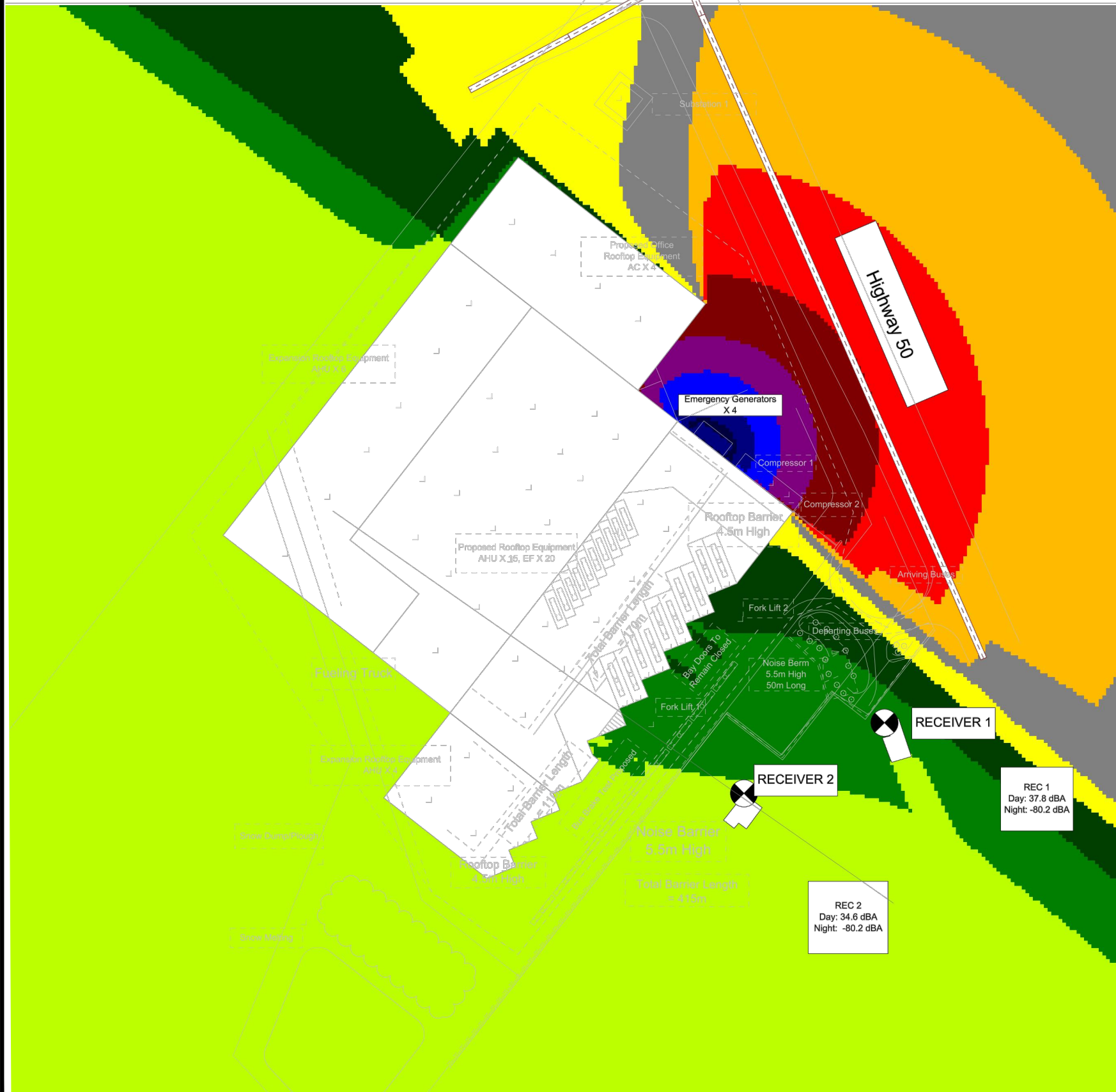
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**PHASE 2
 MITIGATED NOISE LEVELS**

FIGURE B4



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 FACILITY

EMERGENCY GENERATORS
 UNMITIGATED NOISE LEVELS

FIGURE B5

REC 1
 Day: 37.8 dBA
 Night: -80.2 dBA

REC 2
 Day: 34.6 dBA
 Night: -80.2 dBA

Configuration of Calculation



Country	General	Partition	Ref. Time	Eval.Param.	DTM	Ground Abs.	Reflection
	Industry		Road		Railroad		

Lateral Diffraction: if Distance smaller (m):

No sub. of neg. Ground Att. No neg. path difference

Obst. within Area Src do not shield Src. in Building/Cyl. do not shield

Barrier Coefficients: C1: C2: C3:

Temperature (°C): Meteorology:

rel. Humidity (%):

Ground Attenuation:

Calculation in 1/3-Octave Bands

Appendix C – 2012 Noise Baseline and Impact Assessment

City of Brampton

Municipal Operations Centres Class EA – Northeast Yard – Noise Baseline and Impact Assessment

Prepared by:

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Mississauga, ON, Canada L5R 3E9

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Project Number:

60160133

Date:

March, 2012

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- was prepared for the specific purposes described in the Report and the Agreement
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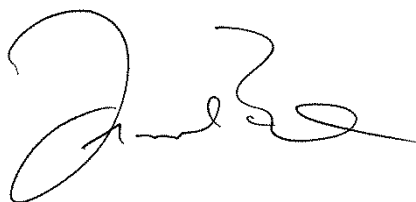
AECOM Signatures

Report Prepared By:



James Au, E.I.T.
Acoustics Engineer-in-Training

Report Reviewed By:



Frank Babic, P.Eng.
Manager Acoustics Engineering

Executive Summary

AECOM Canada Ltd. (AECOM) was retained by the City of Brampton to prepare an environmental noise baseline and impact assessment report in support of an Environmental Assessment of the proposed Brampton Municipal Operations Centres. This report specifically addresses the operational noise impact of the proposed Northeast Yard (the Facility).

Due to the stage of the project (preliminary design), assumptions were made in the operation and equipment at the Facility to complete the assessment. These assumptions are required to be re-evaluated during detailed design. This report addresses the operational noise expected from the Facility on a preliminary basis. In some cases, additional work may be required during detailed design. This has been noted in the recommendations provided in this report.

A general qualitative noise assessment of the construction is also provided. A detailed construction noise assessment is recommended as part of the detailed design.

The noise impact assessment indicates that the noise impact on identified PORs, by the operation of the Facility, will be negligible during the evening and night time. Complaints may be expected during the daytime deployment and resupplying of the snow ploughing vehicles if no noise mitigation is installed.

With the recommendations summarized in Section 5 and detailed in Section 4, and provided that the assumptions in Section 4.2.1 are valid, the noise impact on the surrounding PORs by the proposed Brampton Municipal Operation Centre Southwest Yard should be minimized.

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- Appendix B: Noise Monitoring Data
- Appendix C: Manufacturer Information
- Appendix D: Weather Data
- Appendix E: Instrumentation
- Appendix F: Glossary of Terms and Acronyms

1. Introduction

AECOM Canada Ltd. (AECOM) was retained by the City of Brampton to prepare an environmental noise baseline and impact assessment report in support of an Environmental Assessment of the proposed Brampton Municipal Operations Centres.

The City of Brampton Operation Study and ten (10) Year Plan Report (Published by the City of Brampton, dated January 2008) has identified that the development of two (2) new Works and Transportation yards will be required to meet increased service demands. One (1) yard is proposed in the southwest quadrant of the City of Brampton, with the other yard proposed in the northeast quadrant of the City. This report specifically addresses the operational noise impact of the proposed Northeast Yard (the Facility).

Due to the stage of the project (preliminary design), assumptions were made in the operation and equipment at the Facility to complete the assessment. These assumptions are required to be re-evaluated during detailed design. This report addresses the operational noise expected from the Facility on a preliminary basis. In some cases, additional work may be required during detailed design, this has been noted in the recommendations provided in this report.

A general qualitative noise assessment of the construction is also provided; a detailed construction noise assessment is recommended as part of the detailed design.

2. Description of the Study Area

The proposed Facility will be located southwest of the intersection of County Road 50 and Cadetta Road in the northeast quadrant of Brampton, Ontario. The location of the site and the surrounding area are shown on Figure 1.

The proposed Facility will be located on lands currently zoned as agricultural by the City of Brampton. A zoning map of the area (provided in Appendix A) indicates that the lands surrounding the proposed Facility area are zoned for agricultural and industrial usage. A single lot to the south of the proposed Facility is zoned for residential usage. The property on the east side of County Road 50 appears to be industrial in nature.

3. Baseline Assessment

Noise monitoring was representative of the ambient background noise in the vicinity of the proposed Facility. See Figure 2 for the noise monitoring location. The results of the ambient monitoring were compiled into a baseline assessment which provides an indication of the existing pre-project noise conditions.

3.1 Points of Reception

The area surrounding the Facility consists mainly of agricultural and industrial areas with scattered residential dwellings. The nearest noise sensitive points of reception are located to the southeast of the proposed Facility.

The identified PORs are shown on Figure 3 with descriptions provided in Table 1. The ambient monitoring location is shown on Figure 2.

Table 1: Assessment Location Description

Location	Description
POR_1	Two story, single family dwelling, located on the west side of County Road 50, southeast of the proposed Facility
POR_2	Two story, single family dwelling, located on the west side of County Road 50, southeast of the proposed Facility

3.2 Methods

Noise monitoring could not be completed at locations directly representative of the identified noise sensitive receptors due to access considerations. It was identified, during the noise monitor setup that the traffic noise from County Road 50 is the dominant source of background noise in the area. As roadway noise can be considered a noise line source, a distance correction was used to adjust the measured noise levels to be descriptive of the background noise at the noise sensitive points of reception. The noise monitor was placed at the best available location, a pole approximately 136 metres from the road centreline, and the results were corrected for distance to be representative of the noise sensitive points of reception.

Noise monitoring was conducted between April 5, 2011 and April 11, 2011. The ambient monitoring location is shown on Figure 2.

Noise monitoring measurements were made with a Quest Technologies model 1900 sound level meter. See Appendix E for the specifications of the noise monitoring equipment. The noise monitor was mounted to an existing structure (power/lamp pole) such that the microphone height was approximately 3 metres above the ground. The noise monitor was setup to record L_{EQ} , L_{10} and L_{90} , in dBA, in each one hour interval. The sound level meter was set with a range from 30 dBA to 90 dBA, to use a slow time constant (1 second), and an A-weighted filter network (see Section 3.1 and Figure 2).

A photo of a sample equipment setup is provided as Figure 4.

The noise monitor calibrations were verified before the monitoring period using a Quest Technologies Model CA-12B Sound Calibrator.

3.3 Data Compilation and Analysis

The noise measurement data is included in Appendix B. Data collected during periods of inclement weather was not included in the analysis. Inclement weather in the context of noise measurements was defined as wind speeds in excess of 20 kilometres per hour and/or precipitation of any kind.

The results of the ambient noise monitoring are presented in Table 2 below.

Table 2: Actual Noise Monitoring Results

Location	Time Period ¹	Minimum (1 hour L_{EQ} dBA)	Maximum (1 hour L_{EQ} dBA)	Average (1 hour L_{EQ} dBA)
Old Castlemore Road Noise Monitoring Location – 136 m from road centreline	Daytime	52	66	58
	Evening	52	61	57
	Night time	51	66	57

¹ Daytime is defined as the hours between 07:00 to 19:00 hours, evening is defined as the hours between 19:00 to 23:00 hours, night time is defined as the hours between 23:00 to 07:00 hours.

The ambient monitoring location was not directly representative of the noise sensitive points of reception. However, since the ambient background noise levels were dominated by the nearby roadway traffic noise, a line source distance correction was applied to the measured ambient noise to adjust the background noise levels to be representative of the noise sensitive points of reception. The adjusted noise monitoring results were calculated using Equation 1 and are presented in Table 3.

Equation 1: Line Source Distance Correction

$Lp_2 = Lp_1 + 10 \times \log\left(\frac{r_1}{r_2}\right)$	
Where:	
Lp ₁	- Sound Level at distance r ₁ from a line source
Lp ₂	- Sound Level at distance r ₂ from a line source

Table 3: Adjusted Noise Monitoring Results

Location	Time Period ²	Minimum (1 hour L _{EQ} dBA)	Maximum (1 hour L _{EQ} dBA)	Average (1 hour L _{EQ} dBA)
POR_1 – west side of Heritage Road – 67 m from road centreline	Daytime	55	69	61
	Evening	55	64	60
	Night time	54	69	60
POR_2 – east side of Heritage Road – 159 m from road centreline	Daytime	51	65	57
	Evening	51	60	56
	Night time	50	65	56

3.4 Results and Discussion

The results of the ambient noise monitoring are presented in Table 3. Complete records of the noise measurements are included in Appendix B.

The minimum one (1) hour equivalent sound level (L_{EQ}) ranged from:

- 51 dBA to 55 dBA during the daytime
- 51 dBA to 55 dBA during the evening
- 50 dBA to 54 dBA during the night time

The maximum one (1) hour L_{EQ} ranged from:

- 65 dBA to 69 dBA during the daytime
- 60 dBA to 64 dBA during the evening
- 65 dBA to 69 dBA during the night time

The average one (1) hour L_{EQ} ranged from:

² Daytime is defined as the hours between 07:00 to 19:00 hours, evening is defined as the hours between 19:00 to 23:00 hours, night time is defined as the hours between 23:00 to 07:00 hours.

- 57 dBA to 61 dBA during the daytime
- 56 dBA to 60 dBA during the evening
- 56 dBA to 60 dBA during the night time

The measured ambient noise levels are typical of an area near an arterial roadway. A site visit to the area indicated that the major contribution to the ambient background noise is the road traffic along County Road 50. General industrial noise was also audible.

4. Impact Assessment

This project involves the construction of a new works and transportation yard southwest of the intersection of County Road 50 and Cadetta Road in Brampton, Ontario. The yard will be a maintenance and storage depot for various equipments associated with the works and transportation department at the City of Brampton. Some equipment to be stored and maintained at the yard includes:

- Snow ploughs
- Dump trucks
- Street sweepers
- Various trailers
- Pickup trucks

Due to the stage of the project (preliminary design), this report specifically addresses the operational noise assessment of the Facility. A general qualitative noise and vibration assessment of the construction is also provided.

4.1 Construction

Due to the stage of the project (preliminary design), a detailed construction noise assessment cannot be conducted. Therefore a qualitative construction assessment has been completed. Provisions should be made for noise mitigation measures to minimize the construction noise impact. Noise mitigation could include, but is not limited to:

- Temporary wood hoarding barriers
- Operational duty cycles on construction equipment
- Noise emissions from construction equipment meeting NPC-115, or quieter
- Maximizing distance between the construction equipment operations and the residences
- Minimizing the concurrent use of construction equipment
- Use of equipment or construction methods with lower noise levels
- Operate during the daytime instead of night time periods where possible

The City of Brampton Noise By-Law 93-84 does not specifically mention construction noise. However, there is a general provision stating that “a person shall not, within the City of Brampton, make, create, cause, or cause to permit to be made, noises likely to disturb the inhabitants”. Therefore, a detailed construction noise assessment is recommended during the detailed design process to generate specific recommendations to minimize the construction noise impact on the surrounding noise sensitive receptors.

4.2 Operations

4.2.1 Operations – Assumptions

As the project is at the preliminary design stage, assumptions regarding the operations and equipment at the Facility were made such that a noise impact assessment could be completed. The assumptions in this section are required to be re-evaluated during detailed design. Assumptions in the operational noise assessment include:

- Worst case operations occur during the deployment and resupply of the snow ploughing equipment
- Worst case operations can occur at any time
- Maximum number of vehicles per hour deploying and/or resupplying from this Facility is fifty-four (54)
- Snow melter in operation during daytime only
 - Silencing equipment neglected for this assessment
- Two (2) backhoes will be operational on site
- Administration building
 - ~four and a half metre overall height (single story commercial building)
 - Two (2) five (5) ton cooling capacity HVAC units on the rooftop
- Maintenance Garage
 - Ten (10) metre overall height (to accommodate dump trucks in the salt and sand storage areas)
 - Two (2) five (5) ton cooling capacity HVAC units on the rooftop
 - Two (2) makeup air units on the rooftop
 - General exhaust fans on the rooftop
 - One (1) or two (2) fans per section – total of twelve (12)
 - Bay doors closed while not in use
- Snow ploughs and dump trucks would have the same noise emissions

AECOM understands that this Facility will likely be assessed against the MOE guidelines and policies for existing, new, and proposed facilities, and that a CofA (Air & Noise) may be required. It was determined, from area observations, that the area would be classified as a Class 2 area and should be assessed using MOE guideline NPC-205. As such, this assessment assesses the Facility generated noise levels against the noise level limits set out in MOE publication NPC-205 and the measured baseline ambient background noise levels.

4.2.2 Operations – Noise Modeling

Due to the stage of this project (preliminary design), the assessment of the operational noise impact of the Facility includes many assumptions that are required to be updated during the detailed design. The assumptions are detailed in Section 4.2.1 above.

Sound power levels were based upon manufacturer information, predictive methods, assumptions and capacities from another project with indoor vehicle maintenance bays. The sound power levels used in this assessment are presented in Table 4. Noise levels at the identified noise sensitive points of reception, due to the noise emissions from the proposed Facility, were predicted in accordance with the ISO 9613-2 (Reference #1) prediction algorithm.

Two (2) different worst case operational scenarios were modeled. The scenarios are labelled as Deployment Operation Scenario and Resupply Operation Scenario; the noise levels due to each scenario are presented in Table 5 and Table 6 respectively.

Table 4: Equipment Sound Power Levels

Equipment	Sound Power Level [dBA ref 10 ⁻¹² watts]	Source
Snow Melter	114	ASHRAE prediction based upon manufacturer information
Makeup Air Unit	93	ASHRAE prediction based upon capacity from a bus depot
General Exhaust Fan	71	ASHRAE prediction based upon capacity from a bus depot
HVAC Unit	84	Sample 5 ton unit from Carrier
Backhoes	100	FTA (reference #9)
Dump Truck	108	RCNM (reference #10)

Table 5: Point of Reception Noise Levels – Deployment Operation Scenario

Point of Reception	Time Period	Predicted Noise Level Due to Facility (L _{eq} , dBA)
POR_1	Daytime	54
	Evening	48
	Night	48
POR_2	Daytime	57
	Evening	49
	Night	49

Table 6: Point of Reception Noise Levels – Resupply Operation Scenario

Point of Reception	Time Period	Predicted Noise Level Due to Facility (L _{eq} , dBA)
POR_1	Daytime	54
	Evening	48
	Night	48
POR_2	Daytime	57
	Evening	48
	Night	48

4.2.3 Operations – Results and Discussion

The noise impact assessment was conducted from two (2) different standpoints, a subjective standpoint, and from a regulatory standpoint.

4.2.3.1 Subjective Assessment

The subjective noise impact assessment was conducted for the areas which were considered sensitive to noise. A comparison of the baseline and resultant (predicted Facility noise plus the existing ambient noise) noise levels was completed for each identified point of reception, and the results are presented in Table 8 and Table 9 below. The corresponding subjective community responses for a given numerical change in noise levels are presented in Table 7. The average ambient background noise levels, which are representative of the typical conditions, were used to assess the typical noise impact.

Table 7: Community Response to Increases in Noise Levels³

Increase in Sound Pressure Level (dB)	Subjective Effect
0-2	No Perception
3-5	Perceptible
5+	Clearly Perceptible

Table 8: Subjective Noise Impact – Deployment Operating Scenario

Location	Time Period	Average Measured Baseline Noise Levels (dBA)	Predicted Noise Level Due to Facility (L _{eq} , dBA)	Resultant Overall Noise Level ¹	Impact ² (dB)	Subjective Response
POR_1	Daytime	61	54	62	1	No Perception
	Evening	60	48	60	0	No Perception
	Night	60	48	60	0	No Perception
POR_2	Daytime	57	57	60	3	Perceptible
	Evening	56	49	57	1	No Perception
	Night	56	49	57	1	No Perception

Notes to Table 8:

- (1) Resultant overall noise level calculated by the logarithmic addition of the measured baseline level and the predicted noise level due to the Facility
- (2) Impact calculated as the increase of noise level over the measured baseline noise levels.

Table 9: Subjective Noise Impact – Resupply Operating Scenario

Location	Time Period	Average Measured Baseline Noise Levels (dBA)	Predicted Noise Level Due to Facility (L _{eq} , dBA)	Resultant Overall Noise Level ¹	Impact ² (dB)	Subjective Response
POR_1	Daytime	61	54	62	1	No Perception
	Evening	60	48	60	0	No Perception
	Night	60	48	60	0	No Perception
POR_2	Daytime	57	57	60	3	Perceptible
	Evening	56	48	57	1	No Perception
	Night	56	48	57	1	No Perception

Notes to Table 9:

- (1) Resultant overall noise level calculated by the logarithmic addition of the measured baseline level and the predicted noise level due to the Facility
- (2) Impact calculated as the increase of noise level over the measured baseline noise levels.

The noise impact from the Deployment Operating Scenario is expected to generate a perceptible noise impact at POR_2 during the daytime snow plough deployment and resupply operations. There may be noise complaints

³ J.R. Hassall, K. Zaveri, *Acoustic Noise Measurements 4th edition*, Bruel & Kjaer 1979

during the daytime while the snow ploughs are deploying and resupplying. The Facility is not expected to generate a noise impact during the evening and night time.

4.2.3.2 Regulatory Assessment

AECOM understands that this Facility will likely be assessed against the MOE guidelines and policies for existing, new, and proposed facilities, and that a CofA (Air & Noise) may be required. It was determined, from area observations, that the area would be classified as a Class 2 area and should be assessed using MOE guideline NPC-205.

The noise level limits in NPC-205 are defined as the greater of the existing minimum background noise levels⁴ or the minimum exclusionary limits which are reproduced from NPC-205 in Table 10. The resultant noise level limits are presented in Table 11. The assessment of the worst case operating scenarios is presented in Table 12 and Table 13.

Table 10: Minimum Exclusionary Limits for Class 2 Areas

Time Period	Minimum Exclusionary Limits (dBA)
Daytime	50
Evening	45
Night Time	45

Table 11: Resultant Noise Level Limits

Point of Reception	Daytime	Evening	Night Time
POR_1	55	55	54
POR_2	51	51	50

Table 12: Regulatory Assessment – Deployment Operating Scenario

Point of Reception ID	Time Period	Predicted Noise Level At Due to Facility (L_{eq} , dBA)	Noise Level Limit (L_{eq} , dBA)	Compliance with Noise Level Limit (Yes/No)
POR_1	Daytime	54	55	Yes
	Evening	48	55	Yes
	Night	48	54	Yes
POR_2	Daytime	57	51	No
	Evening	49	51	Yes
	Night	49	50	Yes

Table 13: Regulatory Assessment – Resupply Operating Scenario

Point of Reception ID	Time Period	Predicted Noise Level At Due to Facility (L_{eq} , dBA)	Noise Level Limit (L_{eq} , dBA)	Compliance with Noise Level Limit (Yes/No)
POR_1	Daytime	54	55	Yes
	Evening	48	55	Yes
	Night	48	54	Yes

⁴ Minimum background noise levels are presented in Table 3

Point of Reception ID	Time Period	Predicted Noise Level At Due to Facility (L_{eq} , dBA)	Noise Level Limit (L_{eq} , dBA)	Compliance with Noise Level Limit (Yes/No)
POR_2	Daytime	57	51	No
	Evening	48	51	Yes
	Night	48	50	Yes

The results in Table 12 and Table 13 show that the Facility is expected to be out of compliance with NPC-205 provided that the assumptions in Section 4.2.1 are valid. Noise mitigation will be required for the Facility to operate in compliance with NPC-205. At this stage of the project, not enough detailed information is available to recommend specific noise mitigation measures to be applied at the Facility.

The assumptions in Section 4.2.1 are required to be re-evaluated and the Facility is required to be reassessed during detailed design with more detailed information. Noise mitigation measures are likely required for this Facility to operate within compliance with NPC-205. Some noise mitigation measures to be considered include, but are not limited to the following:

- Noise barriers or berms
- Selection of equipment with lower sound emissions
- Installation of silencers on equipment – including the snow melter
- Installation of acoustical louvres
- Outdoor sound enclosures
- Layout of Equipment
 - Position ventilation louvers and fans on facade away from receptors
 - Position the snow melter further from the noise sensitive receptors
- Operational procedures
 - Reduce the maximum number of vehicles leaving the site per hour
 - Close bay doors while not in use for vehicle movements

5. Recommendations and Future Steps

The following is a summary of the recommendations and future steps to be taken as detailed in Section 4:

- Construction
 - Complete a detailed noise impact assessment during detailed design
 - Make provisions for noise mitigation measures
- Operations – Facility
 - Reassessment of the Facility during detailed design to meet NPC-205
 - Re-evaluate the assumptions in Section 4.2.1
 - Consider noise control/mitigation during the detailed design of the Facility, which may include, but is not limited to the following:
 - Selection of equipment with lower sound emissions
 - Provisions for the construction of noise barriers
 - Installation of silencers on equipment
 - Installation of acoustical louvres
 - Outdoor sound enclosures
 - Layout of Facility

6. Conclusions

The noise impact assessment indicates that the noise impact on identified PORs, by the operation of the Facility, will be negligible during the evening and night time. Complaints may be expected during the daytime deployment and resupplying of the snow ploughing vehicles if no noise mitigation is installed.

With the recommendations summarized in Section 5 and detailed in Section 4, and provided that the assumptions in Section 4.2.1 are valid, the noise impact on the surrounding PORs by the proposed Brampton Municipal Operation Centre Northeast Yard should be minimized.

7. References

1. International Organization for Standardization, ISO 9613-2: Acoustics - Attenuation of Sound during Propagation Outdoors Part 2: General Method of Calculation, Geneva, Switzerland, 1996.
2. Environment Canada, Environment Canada Climate Data Online.
http://www.climate.weatheroffice.ec.gc.ca/climateData/hourlydata_e.html
3. Government of Ontario, Environmental Protection Act, RSO.1990, Chapter E19. Consolidated 2008
4. Ontario Ministry of the Environment, Publication NPC-205: Sound Level Limits for Stationary Sources in Class 1 & 2 Areas (Urban), October 1995.
5. Ontario Ministry of the Environment, *Model Municipal Noise Control By-Law Publication NPC-103*. Queens Printer for Ontario. August 1978.
6. Ontario Ministry of the Environment, Ontario Road Noise Analysis Method for Environment and Transportation (ORNAMENT). Queen's Printer for Ontario, 1990
7. International Standards Organization, *Noise Assessment with Respect to Community Responses*, ISO/TC43 (New York: United Nations), November 1969
8. International Organization for Standardization, ISO 2631-2: Evaluation of Human Exposure to Whole-Body Vibration – Part 2: Vibration and Shock in Buildings (1 to 80 Hz), Geneva, Switzerland, 1985.
9. Federal Transit Administration, United States of America, *Transit Noise and Vibration Impact Assessment*, May 2006 (FTA-VA-90-1003-06)
10. Federal Transit Administration, United States of America, Road Construction Noise Model
11. City of Brampton, By-Law 93-84, *Noise By-Law*

Figures

Figure 1: Site Area



Figure 2: Ambient Monitor Location



Figure 3: Assessment Locations



Figure 4: Sample Equipment Setup



Appendices

Appendix A

Appendix A: Land Use Zoning Plan



[HOME](#) [RESIDENTS](#) [BUSINESS](#) [ARTS, CULTURE, TOURISM](#) [CITY HALL](#) [INFO CENTRE](#)

[Home](#) > [Info Centre](#) > [Interactive Maps](#)

The image shows a screenshot of an interactive zoning map. At the top, there are tabs for 'BING ROAD MAP' and 'BING AERIAL MAP'. A search bar labeled 'Address Search...' is present. Below the map, there are buttons for 'LEGEND', 'DETAILS', and 'HELP'. A legend on the right side lists various zoning categories with color-coded swatches: Agricultural (light green), Open Space (dark green), Floodplain (bright green), Institutional (purple), Industrial (dark blue), Commercial (red), Residential - Single/Semi (yellow), Residential - Medium Density (orange), Residential - High Density (dark red), Residential - Other (pink), and Roads/Public Ownership (grey). Below the legend, there are sections for 'In the Neighborhood', 'Arts, Culture, Tourism', and 'Emergency Measures'. The map itself shows a green area labeled 'Site' and a blue area labeled 'Industrial'. A pink area is also visible. The map includes a scale bar for 250m and coordinates: Lat: 43.81387 Lon: -79.67868. The Bing logo is visible in the bottom right corner of the map area.

Appendix B

Appendix B: Noise Monitoring Data

Project Name: Brampton Municipal Class EA for works and transportation satellite yards
 Project Number: 60160133

Equipment: Noise
 Monitor Type: Noise
 Designation:



Receptor Location: Northeast 2 site
 Logging Interval: 1:00:00 h:mm:ss

Period	Start Time	End Time
Day-time	7:00 AM	7:00 PM
Evening	7:00 PM	11:00 PM
Night-time	11:00 PM	7:00 AM

Daylight Savings: Yes

Date	Interval Ending (DST)	Interval Ending (LST)	Round +Hour (LST)	For Weather Lookup Date/Time (LST)	Time Period (DST)	Overload	Sound Pressure Levels					Enviro Canada Weather Station 1		Enviro Canada Weather Station 2		Wind Exclusion > 20kph	Condition Exclusion	Exclude Data due to Weather	Valid Measurements of Sound Pressure Levels			Plot Time Date/Time (DST)
							L _{eq} (dBA)	L _{max}	L ₁₀₋₁₀	L ₁₋₁₀ (dBA)	L ₅₋₁₀ (dBA)	Name: Distance:	Wind Speed (kph)	Weather Conditions	Wind Speed (kph)				Weather Conditions	L _{eq} (dBA)	L ₁₀ (dBA)	
05-Apr-2011	11:36:21 AM	10:36:21 AM	11	Tue 05-Apr-2011 11:00	Day-time	YES	66.9	80.5	140.6	69.7	59.60	44	Mostly Cloudy	44	Mostly Cloudy	Exclude	Include	Yes				05-Apr-2011 12:00 PM
05-Apr-2011	12:36:21 PM	11:36:21 AM	12	Tue 05-Apr-2011 12:00	Day-time	YES	65.7	74.8	140.6	69.0	59.6	56	Mostly Cloudy	56	Mostly Cloudy	Exclude	Include	Yes				05-Apr-2011 1:00 PM
05-Apr-2011	1:36:21 PM	12:36:21 PM	13	Tue 05-Apr-2011 13:00	Day-time	YES	65.9	75.0	140.6	69.0	60.0	44	Mostly Cloudy	44	Mostly Cloudy	Exclude	Include	Yes				05-Apr-2011 2:00 PM
05-Apr-2011	2:36:21 PM	1:36:21 PM	14	Tue 05-Apr-2011 14:00	Day-time	YES	65.9	75.1	140.6	69.3	60.2	39	Mostly Cloudy	39	Mostly Cloudy	Exclude	Include	Yes				05-Apr-2011 3:00 PM
05-Apr-2011	3:36:21 PM	2:36:21 PM	15	Tue 05-Apr-2011 15:00	Day-time	YES	64.2	74.5	140.6	67.4	58.9	48	Mostly Cloudy	48	Mostly Cloudy	Exclude	Include	Yes				05-Apr-2011 4:00 PM
05-Apr-2011	4:36:21 PM	3:36:21 PM	16	Tue 05-Apr-2011 16:00	Day-time	YES	63.8	74.9	140.6	67.2	58.2	44	Mostly Cloudy	44	Mostly Cloudy	Exclude	Include	Yes				05-Apr-2011 5:00 PM
05-Apr-2011	5:36:21 PM	4:36:21 PM	17	Tue 05-Apr-2011 17:00	Day-time	YES	64.3	74.3	140.6	68.0	57.9	50	Mainly Clear	50	Mainly Clear	Exclude	Include	Yes				05-Apr-2011 6:00 PM
05-Apr-2011	6:36:21 PM	5:36:21 PM	18	Tue 05-Apr-2011 18:00	Day-time	YES	61.9	73.9	140.6	65.2	56.1	32	Mainly Clear	32	Mainly Clear	Exclude	Include	Yes				05-Apr-2011 7:00 PM
05-Apr-2011	7:36:21 PM	6:36:21 PM	19	Tue 05-Apr-2011 19:00	Evening	YES	60.3	75.2	140.6	62.9	54.9	22	Mainly Clear	22	Mainly Clear	Exclude	Include	Yes				05-Apr-2011 8:00 PM
05-Apr-2011	8:36:21 PM	7:36:21 PM	20	Tue 05-Apr-2011 20:00	Evening	YES	55.8	64.2	140.6	58.9	50.1	17	Mainly Clear	17	Mainly Clear	Include	Include	No				05-Apr-2011 9:00 PM
05-Apr-2011	9:36:21 PM	8:36:21 PM	21	Tue 05-Apr-2011 21:00	Evening	YES	56.1	65.6	140.6	58.8	51.1	11	Mainly Clear	11	Mainly Clear	Include	Include	No	56.1	58.8	51.1	05-Apr-2011 10:00 PM
05-Apr-2011	10:36:21 PM	9:36:21 PM	22	Tue 05-Apr-2011 22:00	Evening	NO	55.2	63.8	140.6	57.9	50.1	9	Mainly Clear	9	Mainly Clear	Include	Include	No	55.2	57.9	50.1	05-Apr-2011 11:00 PM
05-Apr-2011	11:36:23 PM	10:36:23 PM	23	Tue 05-Apr-2011 23:00	Night-time	NO	57.1	72.4	140.6	63.2	51.2	6	Mainly Clear	6	Mainly Clear	Include	Include	No	57.1	63.2	51.2	06-Apr-2011 12:00 AM
06-Apr-2011	12:36:23 AM	11:36:23 PM	24	Wed 06-Apr-2011 0:00	Night-time	NO	55.5	69.1	140.6	58.4	48.2	9	Mainly Clear	9	Mainly Clear	Include	Include	No	55.5	58.4	48.2	06-Apr-2011 1:00 AM
06-Apr-2011	1:36:23 AM	12:36:23 AM	1	Wed 06-Apr-2011 1:00	Night-time	NO	52.4	64.4	140.6	56.1	44.0	15	Mainly Clear	15	Mainly Clear	Include	Include	No	52.4	56.1	44.0	06-Apr-2011 2:00 AM
06-Apr-2011	2:36:23 AM	1:36:23 AM	2	Wed 06-Apr-2011 2:00	Night-time	NO	52.6	63.4	140.6	56.1	44.3	19	Clear	19	Clear	Include	Include	No	52.6	56.1	44.3	06-Apr-2011 3:00 AM
06-Apr-2011	3:36:23 AM	2:36:23 AM	3	Wed 06-Apr-2011 3:00	Night-time	NO	51.3	62.7	140.6	54.9	43.3	20	Clear	20	Clear	Include	Include	No	51.3	54.9	43.3	06-Apr-2011 4:00 AM
06-Apr-2011	4:36:23 AM	3:36:23 AM	4	Wed 06-Apr-2011 4:00	Night-time	NO	53.7	62.3	140.6	57.1	46.8	15	Clear	15	Clear	Include	Include	No	53.7	57.1	46.8	06-Apr-2011 5:00 AM
06-Apr-2011	5:36:23 AM	4:36:23 AM	5	Wed 06-Apr-2011 5:00	Night-time	NO	59.8	67.6	140.6	63.5	53.0	20	Clear	20	Clear	Include	Include	No	59.8	63.5	53.0	06-Apr-2011 6:00 AM
06-Apr-2011	6:36:23 AM	5:36:23 AM	6	Wed 06-Apr-2011 6:00	Night-time	YES	58.6	66.7	140.6	61.7	54.2	17	Clear	17	Clear	Include	Include	No	58.6	61.7	54.2	06-Apr-2011 7:00 AM
06-Apr-2011	7:36:23 AM	6:36:23 AM	7	Wed 06-Apr-2011 7:00	Day-time	YES	58.2	66.8	140.6	60.9	54.5	15	Mostly Cloudy	15	Mostly Cloudy	Include	Include	No	58.2	60.9	54.5	06-Apr-2011 8:00 AM
06-Apr-2011	8:36:23 AM	7:36:23 AM	8	Wed 06-Apr-2011 8:00	Day-time	NO	59.6	68.1	140.6	62.4	54.6	13	Mostly Cloudy	13	Mostly Cloudy	Include	Include	No	59.6	62.4	54.6	06-Apr-2011 9:00 AM
06-Apr-2011	9:36:23 AM	8:36:23 AM	9	Wed 06-Apr-2011 9:00	Day-time	NO	60.3	74.5	140.6	63.7	52.6	15	Mostly Cloudy	15	Mostly Cloudy	Include	Include	No	60.3	63.7	52.6	06-Apr-2011 10:00 AM
06-Apr-2011	10:36:23 AM	9:36:23 AM	10	Wed 06-Apr-2011 10:00	Day-time	YES	61.8	75.0	140.6	64.6	55.1	20	Mostly Cloudy	20	Mostly Cloudy	Include	Include	No	61.8	64.6	55.1	06-Apr-2011 11:00 AM
06-Apr-2011	11:36:25 AM	10:36:25 AM	11	Wed 06-Apr-2011 11:00	Day-time	NO	57.3	66.4	140.6	60.7	50.1	15	Cloudy	15	Cloudy	Include	Include	No	57.3	60.7	50.1	06-Apr-2011 12:00 PM
06-Apr-2011	12:36:25 PM	11:36:25 AM	12	Wed 06-Apr-2011 12:00	Day-time	YES	54.0	64.5	140.6	56.8	48.7	13	Cloudy	13	Cloudy	Include	Include	No	54.0	56.8	48.7	06-Apr-2011 1:00 PM
06-Apr-2011	1:36:25 PM	12:36:25 PM	13	Wed 06-Apr-2011 13:00	Day-time	YES	53.7	69.7	140.6	56.3	48.0	17	Cloudy	17	Cloudy	Include	Include	No	53.7	56.3	48.0	06-Apr-2011 2:00 PM
06-Apr-2011	2:36:25 PM	1:36:25 PM	14	Wed 06-Apr-2011 14:00	Day-time	YES	52.3	74.1	140.6	54.3	47.0	17	Cloudy	17	Cloudy	Include	Include	No	52.3	54.3	47.0	06-Apr-2011 3:00 PM
06-Apr-2011	3:36:25 PM	2:36:25 PM	15	Wed 06-Apr-2011 15:00	Day-time	YES	55.1	75.7	140.6	56.9	48.4	7	Cloudy	7	Cloudy	Include	Include	No	55.1	56.9	48.4	06-Apr-2011 4:00 PM
06-Apr-2011	4:36:25 PM	3:36:25 PM	16	Wed 06-Apr-2011 16:00	Day-time	YES	55.2	75.7	140.6	57.4	48.8	15	Mostly Cloudy	15	Mostly Cloudy	Include	Include	No	55.2	57.4	48.8	06-Apr-2011 5:00 PM
06-Apr-2011	5:36:25 PM	4:36:25 PM	17	Wed 06-Apr-2011 17:00	Day-time	NO	60.8	72.0	140.6	63.6	54.9	13	Mostly Cloudy	13	Mostly Cloudy	Include	Include	No	60.8	63.6	54.9	06-Apr-2011 6:00 PM
06-Apr-2011	6:36:25 PM	5:36:25 PM	18	Wed 06-Apr-2011 18:00	Day-time	YES	54.3	69.1	140.6	57.3	48.1	11	Mostly Cloudy	11	Mostly Cloudy	Include	Include	No	54.3	57.3	48.1	06-Apr-2011 7:00 PM
06-Apr-2011	7:36:25 PM	6:36:25 PM	19	Wed 06-Apr-2011 19:00	Evening	YES	52.3	64.5	140.6	54.9	47.0	15	Mostly Cloudy	15	Mostly Cloudy	Include	Include	No	52.3	54.9	47.0	06-Apr-2011 8:00 PM
06-Apr-2011	8:36:25 PM	7:36:25 PM	20	Wed 06-Apr-2011 20:00	Evening	NO	54.2	69.9	140.6	57.2	48.6	9	Mostly Cloudy	9	Mostly Cloudy	Include	Include	No	54.2	57.2	48.6	06-Apr-2011 9:00 PM
06-Apr-2011	9:36:25 PM	8:36:25 PM	21	Wed 06-Apr-2011 21:00	Evening	NO	57.2	65.0	140.6	60.0	51.8	0	Mainly Clear	0	Mainly Clear	Include	Include	No	57.2	60.0	51.8	06-Apr-2011 10:00 PM
06-Apr-2011	10:36:25 PM	9:36:25 PM	22	Wed 06-Apr-2011 22:00	Evening	NO	59.6	69.7	140.6	62.5	53.1	0	Mostly Cloudy	0	Mostly Cloudy	Include	Include	No	59.6	62.5	53.1	06-Apr-2011 11:00 PM
06-Apr-2011	11:36:27 PM	10:36:27 PM	23	Wed 06-Apr-2011 23:00	Night-time	NO	59.7	68.5	140.6	63.2	52.9	11	Mostly Cloudy	11	Mostly Cloudy	Include	Include	No	59.7	63.2	52.9	07-Apr-2011 12:00 AM
07-Apr-2011	12:36:27 AM	11:36:27 PM	24	Thu 07-Apr-2011 0:00	Night-time	NO	58.1	70.7	140.6	61.5	50.7	9	Mostly Cloudy	9	Mostly Cloudy	Include	Include	No	58.1	61.5	50.7	07-Apr-2011 1:00 AM
07-Apr-2011	1:36:27 AM	12:36:27 AM	1	Thu 07-Apr-2011 1:00	Night-time	NO	55.1	72.6	140.6	58.6	46.8	9	Mostly Cloudy	9	Mostly Cloudy	Include	Include	No	55.1	58.6	46.8	07-Apr-2011 2:00 AM
07-Apr-2011	2:36:27 AM	1:36:27 AM	2	Thu 07-Apr-2011 2:00	Night-time	NO	54.9	67.4	140.6	58.8	47.0	15	Mostly Cloudy	15	Mostly Cloudy	Include	Include	No	54.9	58.8	47.0	07-Apr-2011 3:00 AM
07-Apr-2011	3:36:27 AM	2:36:27 AM	3	Thu 07-Apr-2011 3:00	Night-time	NO	55.9	66.2	140.6	59.5	47.4	9	Mostly Cloudy	9	Mostly Cloudy	Include	Include	No	55.9	59.5	47.4	07-Apr-2011 4:00 AM
07-Apr-2011	4:36:27 AM	3:36:27 AM	4	Thu 07-Apr-2011 4:00	Night-time	NO	59.0	68.7	140.6	62.9	49.8	13	Mostly Cloudy	13	Mostly Cloudy	Include	Include	No	59.0	62.9	49.8	07-Apr-2011 5:00 AM
07-Apr-2011	5:36:27 AM	4:36:27 AM	5	Thu 07-Apr-2011 5:00	Night-time	NO	61.3	69.5	140.6	64.4	56.0	4	Mostly Cloudy	4	Mostly Cloudy	Include	Include	No	61.3	64.4	56.0	07-Apr-2011 6:00 AM
07-Apr-2011	6:36:27 AM	5:36:27 AM	6	Thu 07-Apr-2011 6:00	Night-time	NO	65.2	70.9	140.6	67.5	61.0	4	Mostly Cloudy	4	Mostly Cloudy	Include	Include	No	65.2	67.5	61.0	07-Apr-2011 7:00 AM
07-Apr-2011	7:36:27 AM	6:36:27 AM	7	Thu 07-Apr-2011 7:00	Day-time	NO	65.1	71.1	140.6	67.2	61.4	0	Mostly Cloudy	0	Mostly Cloudy	Include	Include	No	65.1	67.2	61.4	07-Apr-2011 8:00 AM
07-Apr-2011	8:36:27 AM	7:36:27 AM	8	Thu 07-Apr-2011 8:00	Day-time	YES	62.4	76.3	140.6	64.3	58.4	4	Fog	4	Fog	Include	Include	No	62.4	64.3	58.4	07-Apr-2011 9:00 AM
07-Apr-2011	9:36:27 AM	8:36:27 AM	9	Thu 07-Apr-2011 9:00	Day-time	NO	60.9	70.4	140.6	63.8	54.4	6	Fog	6	Fog	Include	Include	No	60.9	63.8	54.4	07-Apr-2011 10:00 AM
07-Apr-2011	10:36:27 AM	9:36:27 AM	10	Thu 07-Apr-2011 10:00	Day-time	NO	58.4	71.0	140.6	61.5	51.7	7	Fog	7	Fog	Include	Include	No	58.4	61.5	51.7	07-Apr-2011 11:00 AM
07-Apr-2011	11:36:29 AM	10:36:29 AM	11	Thu 07-Apr-2011 11:00	Day-time	YES	58.9	71.4	140.6	62.3	50.8	6	Mostly Cloudy	6	Mostly Cloudy	Include	Include	No	58.9	62.3	50.8	07-Apr-2011 12:00 PM
07-Apr-2011	12:36:29 PM	11:36:29 AM	12	Thu 07-Apr-2011 12:00	Day-time	YES	59.5	67.1	140.6	61.7	51.5	9	Mainly Clear	9	Mainly Clear	Include	Include	No	59.5	61.7	51.5	07-Apr-2011 1:00 PM
07-Apr-2011	1:36:29 PM	12:36:29 PM	13	Thu 07-Apr-2011 13:00	Day-time	YES	56.9	66.2	140.6	60.2	50.0	11	Mainly Clear	11	Mainly Clear	Include	Include	No	56.9	60.2	50.0	07-Apr-2011 2:00 PM
07-Apr-2011	2:36:29 PM	1:36:29 PM	14	Thu 07-Apr-2011 14:00	Day-time	YES	57.4	73.9	140.6	60.7	49.7	13	Mostly Cloudy	13	Mostly Cloudy	Include	Include	No	57.4	60.7	49.7	07-Apr-2011 3:00 PM

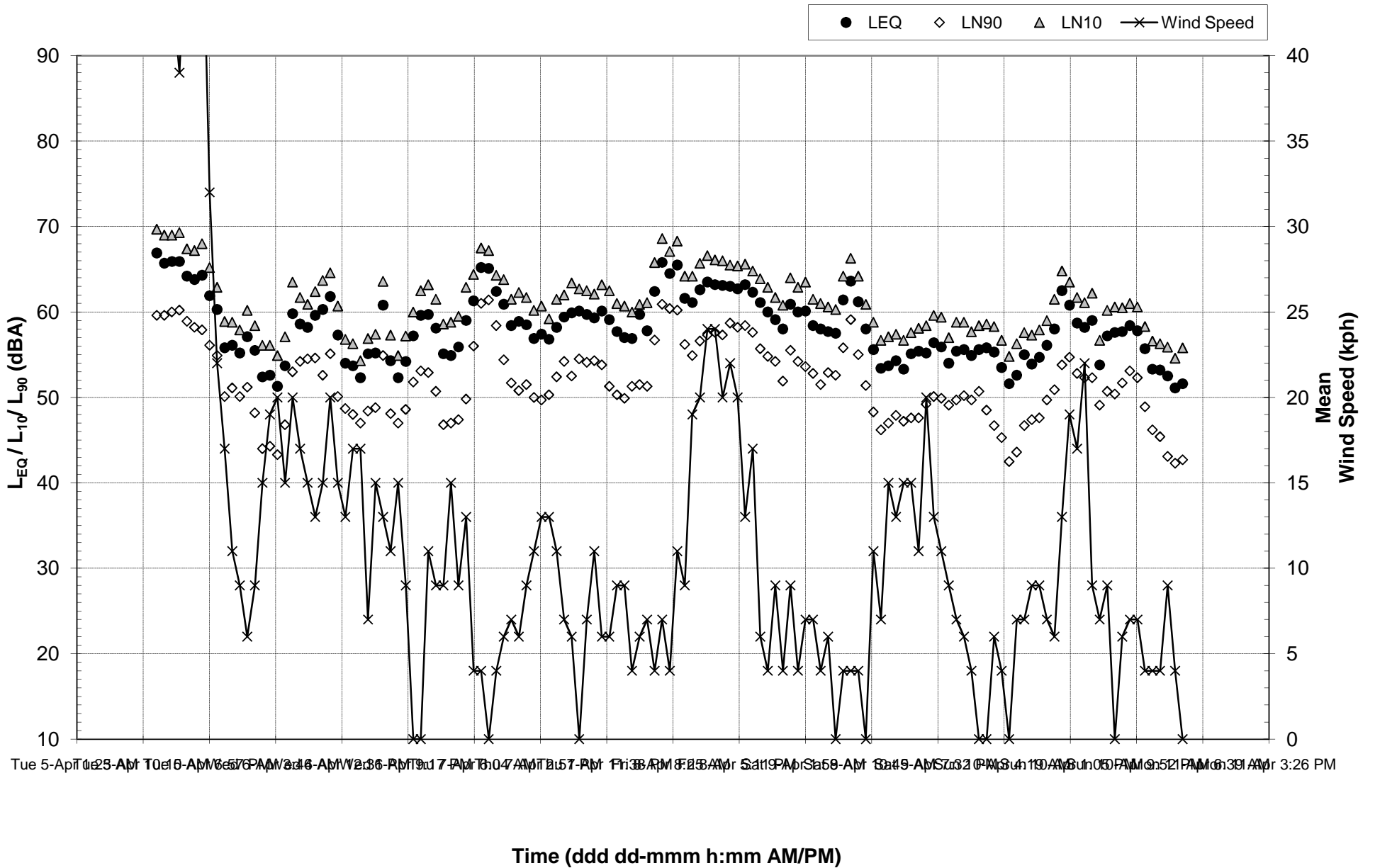
Date	Interval Ending (DST)	Interval Ending (LST)	Round +Hour (LST)	For Weather Lookup Date/Time (LST)	Time Period (DST)	Overload	Sound Pressure Levels					Enviro Canada Weather Station 1		Enviro Canada Weather Station 2		Wind Exclusion > 20kph	Condition Exclusion	Exclude Data due to Weather	Valid Measurements of Sound Pressure Levels			Plot Time Date/Time (DST)		
							L _{eq} (dBA)	L _{max}	L _{max}	L ₁₀ (dBA)	L ₅₀ (dBA)	Name : Distance:	Wind Speed (kph)	Weather Conditions	Name : Distance:				Wind Speed (kph)	Weather Conditions	L _{eq} (dBA)		L ₁₀ (dBA)	L ₅₀ (dBA)
08-Apr-2011	7:36:31 AM	6:36:31 AM	7	Fri 08-Apr-2011 7:00	Day-time	NO	64.5	71.6	140.6	67.1	60.4	4	Cloudy	4	Cloudy	Include	Include	No	64.5	67.1	60.4	08-Apr-2011 8:00 AM		
08-Apr-2011	8:36:31 AM	7:36:31 AM	8	Fri 08-Apr-2011 8:00	Day-time	YES	65.5	74.9	140.6	68.3	60.2	11	Cloudy	11	Cloudy	Include	Include	No	65.5	68.3	60.2	08-Apr-2011 9:00 AM		
08-Apr-2011	9:36:31 AM	8:36:31 AM	9	Fri 08-Apr-2011 9:00	Day-time	NO	61.6	68.8	140.6	64.2	56.2	9	Cloudy	9	Cloudy	Include	Include	No	61.6	64.2	56.2	08-Apr-2011 10:00 AM		
08-Apr-2011	10:36:31 AM	9:36:31 AM	10	Fri 08-Apr-2011 10:00	Day-time	YES	61.1	71.2	140.6	64.2	54.9	19	Cloudy	19	Cloudy	Include	Include	No	61.1	64.2	54.9	08-Apr-2011 11:00 AM		
08-Apr-2011	11:36:33 AM	10:36:33 AM	11	Fri 08-Apr-2011 11:00	Day-time	YES	62.6	70.7	140.6	65.7	56.6	20	Cloudy	20	Cloudy	Include	Include	No				08-Apr-2011 12:00 PM		
08-Apr-2011	12:36:33 PM	11:36:33 AM	12	Fri 08-Apr-2011 12:00	Day-time	YES	63.5	74.1	140.6	66.6	57.3	24	Cloudy	24	Cloudy	Include	Include	Yes				08-Apr-2011 1:00 PM		
08-Apr-2011	1:36:33 PM	12:36:33 PM	13	Fri 08-Apr-2011 13:00	Day-time	YES	63.2	73.9	140.6	66.1	57.6	24	Cloudy	24	Cloudy	Include	Include	Yes				08-Apr-2011 2:00 PM		
08-Apr-2011	2:36:33 PM	1:36:33 PM	14	Fri 08-Apr-2011 14:00	Day-time	YES	63.1	69.9	140.6	66.0	57.3	20	Cloudy	20	Cloudy	Include	Include	No				08-Apr-2011 3:00 PM		
08-Apr-2011	3:36:33 PM	2:36:33 PM	15	Fri 08-Apr-2011 15:00	Day-time	YES	63.0	71.6	140.6	65.5	58.7	22	Cloudy	22	Cloudy	Exclude	Include	Yes				08-Apr-2011 4:00 PM		
08-Apr-2011	4:36:33 PM	3:36:33 PM	16	Fri 08-Apr-2011 16:00	Day-time	YES	62.7	70.4	140.6	65.4	58.2	20	Mostly Cloudy	20	Mostly Cloudy	Include	Include	No				08-Apr-2011 5:00 PM		
08-Apr-2011	5:36:33 PM	4:36:33 PM	17	Fri 08-Apr-2011 17:00	Day-time	YES	63.2	74.7	140.6	65.6	58.4	13	Mostly Cloudy	13	Mostly Cloudy	Include	Include	No	63.2	65.6	58.4	08-Apr-2011 6:00 PM		
08-Apr-2011	6:36:33 PM	5:36:33 PM	18	Fri 08-Apr-2011 18:00	Day-time	YES	62.3	68.6	140.6	64.8	57.6	17	Mostly Cloudy	17	Mostly Cloudy	Include	Include	No	62.3	64.8	57.6	08-Apr-2011 7:00 PM		
08-Apr-2011	7:36:33 PM	6:36:33 PM	19	Fri 08-Apr-2011 19:00	Evening	NO	61.1	71.5	140.6	63.9	55.7	6	Cloudy	6	Cloudy	Include	Include	No	61.1	63.9	55.7	08-Apr-2011 8:00 PM		
08-Apr-2011	8:36:33 PM	7:36:33 PM	20	Fri 08-Apr-2011 20:00	Evening	NO	60.0	68.3	140.6	62.9	54.8	4	Mostly Cloudy	4	Mostly Cloudy	Include	Include	No	60.0	62.9	54.8	08-Apr-2011 9:00 PM		
08-Apr-2011	9:36:33 PM	8:36:33 PM	21	Fri 08-Apr-2011 21:00	Evening	NO	59.1	66.4	140.6	61.7	54.2	9	Mainly Clear	9	Mainly Clear	Include	Include	No	59.1	61.7	54.2	08-Apr-2011 10:00 PM		
08-Apr-2011	10:36:33 PM	9:36:33 PM	22	Fri 08-Apr-2011 22:00	Evening	YES	58.0	74.7	140.6	60.8	51.9	4	Mainly Clear	4	Mainly Clear	Include	Include	No	58.0	60.8	51.9	08-Apr-2011 11:00 PM		
08-Apr-2011	11:36:35 PM	10:36:35 PM	23	Fri 08-Apr-2011 23:00	Night-time	NO	60.9	69.4	140.6	64.0	55.5	9	Mostly Cloudy	9	Mostly Cloudy	Include	Include	No	60.9	64.0	55.5	09-Apr-2011 12:00 AM		
09-Apr-2011	12:36:35 AM	11:36:35 PM	24	Sat 09-Apr-2011 0:00	Night-time	NO	60.0	69.2	140.6	62.9	54.2	4	Mostly Cloudy	4	Mostly Cloudy	Include	Include	No	60.0	62.9	54.2	09-Apr-2011 1:00 AM		
09-Apr-2011	1:36:35 AM	12:36:35 AM	1	Sat 09-Apr-2011 1:00	Night-time	YES	60.1	77.1	140.6	63.5	53.6	7	Fog	7	Fog	Include	Include	No	60.1	63.5	53.6	09-Apr-2011 2:00 AM		
09-Apr-2011	2:36:35 AM	1:36:35 AM	2	Sat 09-Apr-2011 2:00	Night-time	NO	58.4	69.7	140.6	61.5	52.8	7	Mainly Clear	7	Mainly Clear	Include	Include	No	58.4	61.5	52.8	09-Apr-2011 3:00 AM		
09-Apr-2011	3:36:35 AM	2:36:35 AM	3	Sat 09-Apr-2011 3:00	Night-time	YES	58.0	74.2	140.6	61.0	51.5	4	Mainly Clear	4	Mainly Clear	Include	Include	No	58.0	61.0	51.5	09-Apr-2011 4:00 AM		
09-Apr-2011	4:36:35 AM	3:36:35 AM	4	Sat 09-Apr-2011 4:00	Night-time	NO	57.7	69.5	140.6	60.6	52.9	6	Clear	6	Clear	Include	Include	No	57.7	60.6	52.9	09-Apr-2011 5:00 AM		
09-Apr-2011	5:36:35 AM	4:36:35 AM	5	Sat 09-Apr-2011 5:00	Night-time	NO	57.5	67.7	140.6	60.3	52.6	0	Mainly Clear	0	Mainly Clear	Include	Include	No	57.5	60.3	52.6	09-Apr-2011 6:00 AM		
09-Apr-2011	6:36:35 AM	5:36:35 AM	6	Sat 09-Apr-2011 6:00	Night-time	NO	61.4	69.9	140.6	63.2	55.8	4	Mostly Cloudy	4	Mostly Cloudy	Include	Include	No	61.4	63.2	55.8	09-Apr-2011 7:00 AM		
09-Apr-2011	7:36:35 AM	6:36:35 AM	7	Sat 09-Apr-2011 7:00	Day-time	NO	63.6	71.6	140.6	66.3	59.1	4	Mainly Clear	4	Mainly Clear	Include	Include	No	63.6	66.3	59.1	09-Apr-2011 8:00 AM		
09-Apr-2011	8:36:35 AM	7:36:35 AM	8	Sat 09-Apr-2011 8:00	Day-time	YES	61.2	79.8	140.6	64.2	55.0	4	Mainly Clear	4	Mainly Clear	Include	Include	No	61.2	64.2	55.0	09-Apr-2011 9:00 AM		
09-Apr-2011	9:36:35 AM	8:36:35 AM	9	Sat 09-Apr-2011 9:00	Day-time	NO	58.0	68.7	140.6	60.9	51.4	0	Mainly Clear	0	Mainly Clear	Include	Include	No	58.0	60.9	51.4	09-Apr-2011 10:00 AM		
09-Apr-2011	10:36:35 AM	9:36:35 AM	10	Sat 09-Apr-2011 10:00	Day-time	NO	55.6	66.8	140.6	58.8	48.3	11	Mainly Clear	11	Mainly Clear	Include	Include	No	55.6	58.8	48.3	09-Apr-2011 11:00 AM		
09-Apr-2011	11:36:37 AM	10:36:37 AM	11	Sat 09-Apr-2011 11:00	Day-time	YES	53.4	67.2	140.6	56.7	46.2	7	Mainly Clear	7	Mainly Clear	Include	Include	No	53.4	56.7	46.2	09-Apr-2011 12:00 PM		
09-Apr-2011	12:36:37 PM	11:36:37 AM	12	Sat 09-Apr-2011 12:00	Day-time	YES	53.7	66.4	140.6	57.1	47.0	15	Mainly Clear	15	Mainly Clear	Include	Include	No	53.7	57.1	47.0	09-Apr-2011 1:00 PM		
09-Apr-2011	1:36:37 PM	12:36:37 PM	13	Sat 09-Apr-2011 13:00	Day-time	YES	54.3	68.1	140.6	57.4	47.9	13	Mainly Clear	13	Mainly Clear	Include	Include	No	54.3	57.4	47.9	09-Apr-2011 2:00 PM		
09-Apr-2011	2:36:37 PM	1:36:37 PM	14	Sat 09-Apr-2011 14:00	Day-time	YES	53.3	64.2	140.6	56.7	47.2	15	Mainly Clear	15	Mainly Clear	Include	Include	No	53.3	56.7	47.2	09-Apr-2011 3:00 PM		
09-Apr-2011	3:36:37 PM	2:36:37 PM	15	Sat 09-Apr-2011 15:00	Day-time	YES	55.1	76.7	140.6	57.6	47.8	15	Mainly Clear	15	Mainly Clear	Include	Include	No	55.1	57.6	47.8	09-Apr-2011 4:00 PM		
09-Apr-2011	4:36:37 PM	3:36:37 PM	16	Sat 09-Apr-2011 16:00	Day-time	YES	55.4	76.4	140.6	58.1	47.6	11	Mainly Clear	11	Mainly Clear	Include	Include	No	55.4	58.1	47.6	09-Apr-2011 5:00 PM		
09-Apr-2011	5:36:37 PM	4:36:37 PM	17	Sat 09-Apr-2011 17:00	Day-time	YES	55.2	69.7	140.6	58.4	49.2	20	Mainly Clear	20	Mainly Clear	Include	Include	No	55.2	58.4	49.2	09-Apr-2011 6:00 PM		
09-Apr-2011	6:36:37 PM	5:36:37 PM	18	Sat 09-Apr-2011 18:00	Day-time	YES	56.4	69.2	140.6	59.6	50.1	13	Mainly Clear	13	Mainly Clear	Include	Include	No	56.4	59.6	50.1	09-Apr-2011 7:00 PM		
09-Apr-2011	7:36:37 PM	6:36:37 PM	19	Sat 09-Apr-2011 19:00	Evening	YES	55.9	67.7	140.6	59.4	49.9	11	Clear	11	Clear	Include	Include	No	55.9	59.4	49.9	09-Apr-2011 8:00 PM		
09-Apr-2011	8:36:37 PM	7:36:37 PM	20	Sat 09-Apr-2011 20:00	Evening	YES	54.0	61.4	140.6	57.0	49.1	9	Clear	9	Clear	Include	Include	No	54.0	57.0	49.1	09-Apr-2011 9:00 PM		
09-Apr-2011	9:36:37 PM	8:36:37 PM	21	Sat 09-Apr-2011 21:00	Evening	NO	55.4	65.9	140.6	58.8	49.7	7	Mainly Clear	7	Mainly Clear	Include	Include	No	55.4	58.8	49.7	09-Apr-2011 10:00 PM		
09-Apr-2011	10:36:37 PM	9:36:37 PM	22	Sat 09-Apr-2011 22:00	Evening	NO	55.6	62.7	140.6	58.8	50.2	6	Mostly Cloudy	6	Mostly Cloudy	Include	Include	No	55.6	58.8	50.2	09-Apr-2011 11:00 PM		
09-Apr-2011	11:36:39 PM	10:36:39 PM	23	Sat 09-Apr-2011 23:00	Night-time	NO	54.9	64.9	140.6	57.7	49.7	4	Cloudy	4	Cloudy	Include	Include	No	54.9	57.7	49.7	10-Apr-2011 12:00 AM		
10-Apr-2011	12:36:39 AM	11:36:39 PM	24	Sun 10-Apr-2011 0:00	Night-time	NO	55.6	64.4	140.6	58.4	50.7	0	Cloudy	0	Cloudy	Include	Include	No	55.6	58.4	50.7	10-Apr-2011 1:00 AM		
10-Apr-2011	1:36:39 AM	12:36:39 AM	1	Sun 10-Apr-2011 1:00	Night-time	NO	55.8	69.9	140.6	58.6	48.5	0	Mostly Cloudy	0	Mostly Cloudy	Include	Include	No	55.8	58.6	48.5	10-Apr-2011 2:00 AM		
10-Apr-2011	2:36:39 AM	1:36:39 AM	2	Sun 10-Apr-2011 2:00	Night-time	NO	55.3	74.1	140.6	58.3	46.7	6	Cloudy	6	Cloudy	Include	Include	No	55.3	58.3	46.7	10-Apr-2011 3:00 AM		
10-Apr-2011	3:36:39 AM	2:36:39 AM	3	Sun 10-Apr-2011 3:00	Night-time	NO	53.5	68.1	140.6	56.7	45.3	4	Mostly Cloudy	4	Mostly Cloudy	Include	Include	No	53.5	56.7	45.3	10-Apr-2011 4:00 AM		
10-Apr-2011	4:36:39 AM	3:36:39 AM	4	Sun 10-Apr-2011 4:00	Night-time	NO	51.6	69.4	140.6	54.8	42.5	0	Mainly Clear	0	Mainly Clear	Include	Include	No	51.6	54.8	42.5	10-Apr-2011 5:00 AM		
10-Apr-2011	5:36:39 AM	4:36:39 AM	5	Sun 10-Apr-2011 5:00	Night-time	NO	52.6	68.1	140.6	56.3	43.6	7	Cloudy	7	Cloudy	Include	Include	No	52.6	56.3	43.6	10-Apr-2011 6:00 AM		
10-Apr-2011	6:36:39 AM	5:36:39 AM	6	Sun 10-Apr-2011 6:00	Night-time	NO	55.0	69.1	140.6	57.6	46.7	7	Cloudy	7	Cloudy	Include	Include	No	55.0	57.6	46.7	10-Apr-2011 7:00 AM		
10-Apr-2011	7:36:39 AM	6:36:39 AM	7	Sun 10-Apr-2011 7:00	Day-time	YES	53.9	63.0	140.6	57.3	47.4	9	Cloudy	9	Cloudy	Include	Include	No	53.9	57.3	47.4	10-Apr-2011 8:00 AM		
10-Apr-2011	8:36:39 AM	7:36:39 AM	8	Sun 10-Apr-2011 8:00	Day-time	YES	54.7	69.8	140.6	57.9	47.6	9	Cloudy	9	Cloudy	Include	Include	No				10-Apr-2011 9:00 AM		
10-Apr-2011	9:36:39 AM	8:36:39 AM	9	Sun 10-Apr-2011 9:00	Day-time	YES	56.1	66.9	140.6	59.0	49.7	7	Rain	7	Rain	Include	Exclude	Yes				10-Apr-2011 10:00 AM		
10-Apr-2011	10:36:39 AM	9:36:39 AM	10	Sun 10-Apr-2011 10:00	Day-time	YES	58.0	68.0	140.6	61.5	50.9	6	Intermittent Rain Show	6	Intermittent Rain Show	Include	Exclude	Yes				10-Apr-2011 11:00 AM		
10-Apr-2011	11:36:41 AM	10:36:41 AM	11	Sun 10-Apr-2011 11:00	Day-time	YES	62.5	81.8	140.6	64.8	53.8	13	Intermittent Rain Show	13	Intermittent Rain Show	Include	Exclude	Yes				10-Apr-2011 12:00 PM		
10-Apr-2011	12:36:41 PM	11:36:41 AM	12	Sun 10-Apr-2011 12:00	Day-time	YES	60.8	75.9	140.6	63.5	54.7	19	Rain Showers Fog	19	Rain Showers Fog	Include	Exclude	Yes				10-Apr-2011 1:00 PM		
10-Apr-2011	1:36:41 PM	12:36:4																						

Location: **Northeast 2 site** Project: **Brampton Municipal Class EA for works and transportation satellite yards**
 PN: **60160133**

Daily Statistics	#	Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
			Tue 05-Apr-11	Tue 05-Apr-11	Wed 06-Apr-11	Wed 06-Apr-11	Wed 06-Apr-11	Thu 07-Apr-11	Thu 07-Apr-11	Thu 07-Apr-11	Fri 08-Apr-11	Fri 08-Apr-11	Fri 08-Apr-11	Sat 09-Apr-11	Sat 09-Apr-11	Sat 09-Apr-11	Sun 10-Apr-11	Sun 10-Apr-11	Sun 10-Apr-11	Mon 11-Apr-11	Mon 11-Apr-11
		Time Period	Day-time	Evening	Night-time	Day-time	Evening	Night-time	Day-time	Evening	Night-time	Day-time	Evening	Night-time	Day-time	Evening	Night-time	Day-time	Evening	Night-time	Day-time
L _{EQ} (dBA)		Minimum Value	-	55.2	51.3	52.3	52.3	54.9	56.8	59.3	56.9	61.1	58.0	57.5	53.3	54.0	51.6	53.8	55.7	51.1	-
		Maximum Value	-	56.1	59.8	61.8	59.6	65.2	65.1	60.1	65.8	65.5	61.1	61.4	63.6	55.9	55.8	57.6	58.4	63.3	-
		Mean Value	-	55.7	55.1	56.9	55.8	58.7	59.4	59.8	59.6	63.0	59.6	59.3	56.3	55.2	54.3	55.6	57.4	54.7	-
		Standard Deviation	-	0.6	3.1	3.2	3.2	3.5	2.4	0.4	3.1	1.7	1.3	1.5	3.2	0.8	1.5	2.1	1.2	4.3	-
		Number of Samples	0.0	2.0	8.0	12.0	4.0	8.0	12.0	4.0	8.0	6.0	4.0	8.0	12.0	4.0	8.0	4.0	4.0	8.0	0.0
		95% Confidence Interval	-	0.9	2.2	1.8	3.2	2.4	1.4	0.4	2.2	1.4	1.3	1.1	1.8	0.8	1.1	2.0	1.2	3.0	-
L ₁₀ (dBA)		Minimum Value	-	57.9	54.9	54.3	54.9	58.6	59.2	62.1	60.0	64.2	60.8	60.3	56.7	57.0	54.8	56.7	58.3	54.6	-
		Maximum Value	-	58.8	63.5	64.6	62.5	67.5	67.2	63.2	68.6	68.3	63.9	64.2	66.3	59.4	58.6	60.6	61.0	65.6	-
		Mean Value	-	58.4	58.5	59.6	58.7	62.1	62.3	62.6	65.7	62.3	62.3	59.3	58.5	57.3	58.7	60.1	58.1	58.1	-
		Standard Deviation	-	0.6	3.0	3.5	3.3	3.1	2.1	0.5	3.0	1.7	1.4	1.6	3.1	1.0	1.3	2.0	1.2	4.0	-
		Number of Samples	0.0	2.0	8.0	12.0	4.0	8.0	12.0	4.0	8.0	6.0	4.0	8.0	12.0	4.0	8.0	4.0	4.0	8.0	0.0
		95% Confidence Interval	-	0.9	2.1	2.0	3.2	2.1	1.2	0.4	2.1	1.3	1.1	1.7	1.0	0.9	1.9	1.2	2.8	-	
L ₉₀ (dBA)		Minimum Value	-	50.1	43.3	47.0	47.0	46.8	49.7	53.8	49.9	54.9	51.9	51.5	46.2	49.1	42.5	47.4	48.9	42.3	-
		Maximum Value	-	51.1	54.2	55.1	53.1	61.0	61.4	54.5	60.9	60.4	55.7	55.8	59.1	50.2	50.7	53.1	59.3	-	
		Mean Value	-	50.6	48.1	50.9	50.1	51.5	53.1	54.2	52.9	58.0	54.2	53.6	49.7	49.7	46.7	49.4	51.5	46.9	-
		Standard Deviation	-	0.7	4.3	3.2	2.8	5.0	3.6	0.3	3.9	2.2	1.6	1.5	3.8	0.5	2.9	1.5	1.8	5.8	-
		Number of Samples	0.0	2.0	8.0	12.0	4.0	8.0	12.0	4.0	8.0	6.0	4.0	8.0	12.0	4.0	8.0	4.0	4.0	8.0	0.0
		95% Confidence Interval	-	1.0	2.9	1.8	2.8	3.5	2.0	0.3	2.7	1.7	1.6	1.0	2.2	0.5	2.0	1.5	1.8	4.0	-

Period Statistics	All Valid Data					All Valid Weekday Data					All Valid Weekend Data				
	Time Period	Day-time	Evening	Night	ALL	Time Period	Day-time	Evening	Night	ALL	Time Period	Day-time	Evening	Night	ALL
L _{EQ} (dBA)	Minimum Value	52.3	52.3	51.1	51.1	Minimum Value	52.3	52.3	51.1	51.1	Minimum Value	53.3	54.0	51.6	51.6
	Maximum Value	65.5	61.1	65.8	65.8	Maximum Value	65.5	61.1	65.8	65.8	Maximum Value	63.6	58.4	61.4	63.6
	Mean Value	58.1	57.4	56.9	57.5	Mean Value	59.1	58.0	57.0	58.0	Mean Value	56.1	56.3	56.8	56.4
	Standard Deviation	3.5	2.4	3.7	3.4	Standard Deviation	3.4	2.6	4.0	3.7	Standard Deviation	2.9	1.5	3.0	2.7
	Number of Samples	46.0	22.0	48.0	116.0	Number of Samples	30.0	14.0	32.0	76.0	Number of Samples	16.0	8.0	16.0	40.0
	95% Confidence Interval	1.0	1.0	1.0	0.6	95% Confidence Interval	1.2	1.4	1.4	0.8	95% Confidence Interval	1.4	1.0	1.5	0.8
L ₁₀ (dBA)	Minimum Value	54.3	54.9	54.6	54.3	Minimum Value	54.3	54.9	54.6	54.3	Minimum Value	56.7	57.0	54.8	54.8
	Maximum Value	68.3	63.9	68.6	68.6	Maximum Value	68.3	63.9	68.6	68.6	Maximum Value	66.3	61.0	64.2	66.3
	Mean Value	60.9	60.3	60.1	60.5	Mean Value	61.9	60.8	60.3	61.0	Mean Value	59.2	59.3	59.8	59.4
	Standard Deviation	3.5	2.4	3.5	3.3	Standard Deviation	3.5	2.7	3.8	3.5	Standard Deviation	2.8	1.4	2.9	2.6
	Number of Samples	46.0	22.0	48.0	116.0	Number of Samples	30.0	14.0	32.0	76.0	Number of Samples	16.0	8.0	16.0	40.0
	95% Confidence Interval	1.0	1.0	1.0	0.6	95% Confidence Interval	1.2	1.4	1.3	0.8	95% Confidence Interval	1.4	0.9	1.4	0.8
L ₉₀ (dBA)	Minimum Value	46.2	47.0	42.3	42.3	Minimum Value	47.0	47.0	42.3	42.3	Minimum Value	46.2	48.9	42.5	42.5
	Maximum Value	61.4	55.7	61.0	61.4	Maximum Value	61.4	55.7	61.0	61.4	Maximum Value	59.1	53.1	55.8	59.1
	Mean Value	52.0	51.8	50.0	51.1	Mean Value	53.2	52.5	49.9	51.7	Mean Value	49.6	50.6	50.2	50.0
	Standard Deviation	4.1	2.4	4.8	4.3	Standard Deviation	4.0	2.5	5.2	4.6	Standard Deviation	3.3	1.6	4.2	3.4
	Number of Samples	46.0	22.0	48.0	116.0	Number of Samples	30.0	14.0	32.0	76.0	Number of Samples	16.0	8.0	16.0	40.0
	95% Confidence Interval	1.2	1.0	1.4	0.8	95% Confidence Interval	1.4	1.3	1.8	1.0	95% Confidence Interval	1.6	1.1	2.1	1.1

POR4 (Farmer's Market) - Noise Monitoring Results



Job Name: Brampton Works EA
Job Number: 60160133
Date: 9-Jun-11

Title: Northeast site ambient monitoring distance adjustment

Description: Northeast site ambient monitoring distance adjustment

Line Source Distance Adjustment

$$L_2 = L_1 + 10 \times \log\left(\frac{r_1}{r_2}\right)$$

Measured Values - 136 m from road centre line

Time Period	Day-time	Evening	Night
Minimum Value	52	52	51
Maximum Value	66	61	66
Mean Value	58	57	57

POR_1 Distance Adjustment

Line source distance adjustment to 67 m

Time Period	Day-time	Evening	Night
Minimum Value	55	55	54
Maximum Value	69	64	69
Mean Value	61	60	60

POR_2 Distance Adjustment

Line source distance adjustment to 159 m

Time Period	Day-time	Evening	Night
Minimum Value	51	51	50
Maximum Value	65	60	65
Mean Value	57	56	56

Appendix C

Appendix C: Manufacturer Information

48PD05-06

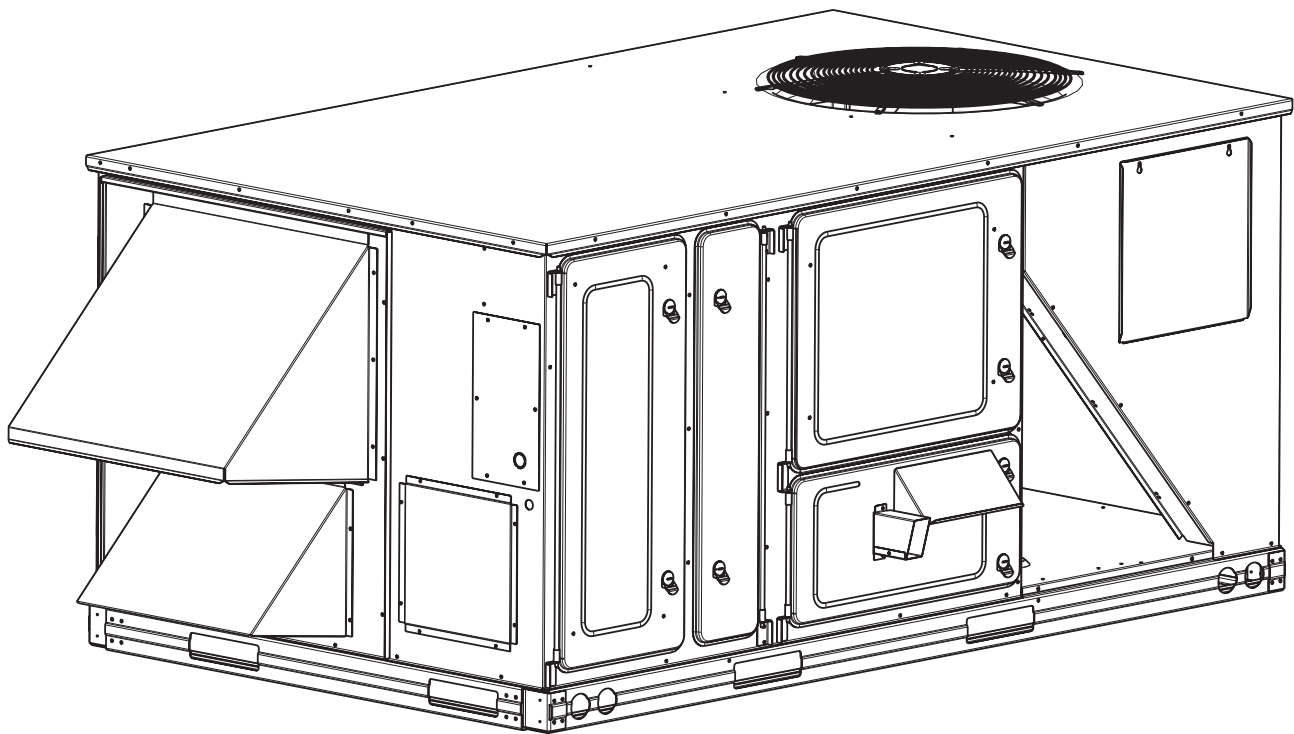
Displacement Ventilation or Single Zone Variable Airflow
Rooftop Units Single Package, Electric Cool, Gas Heating
with PURON® (R-410A) Refrigerant and COMFORTLink™ Controls

Carrier

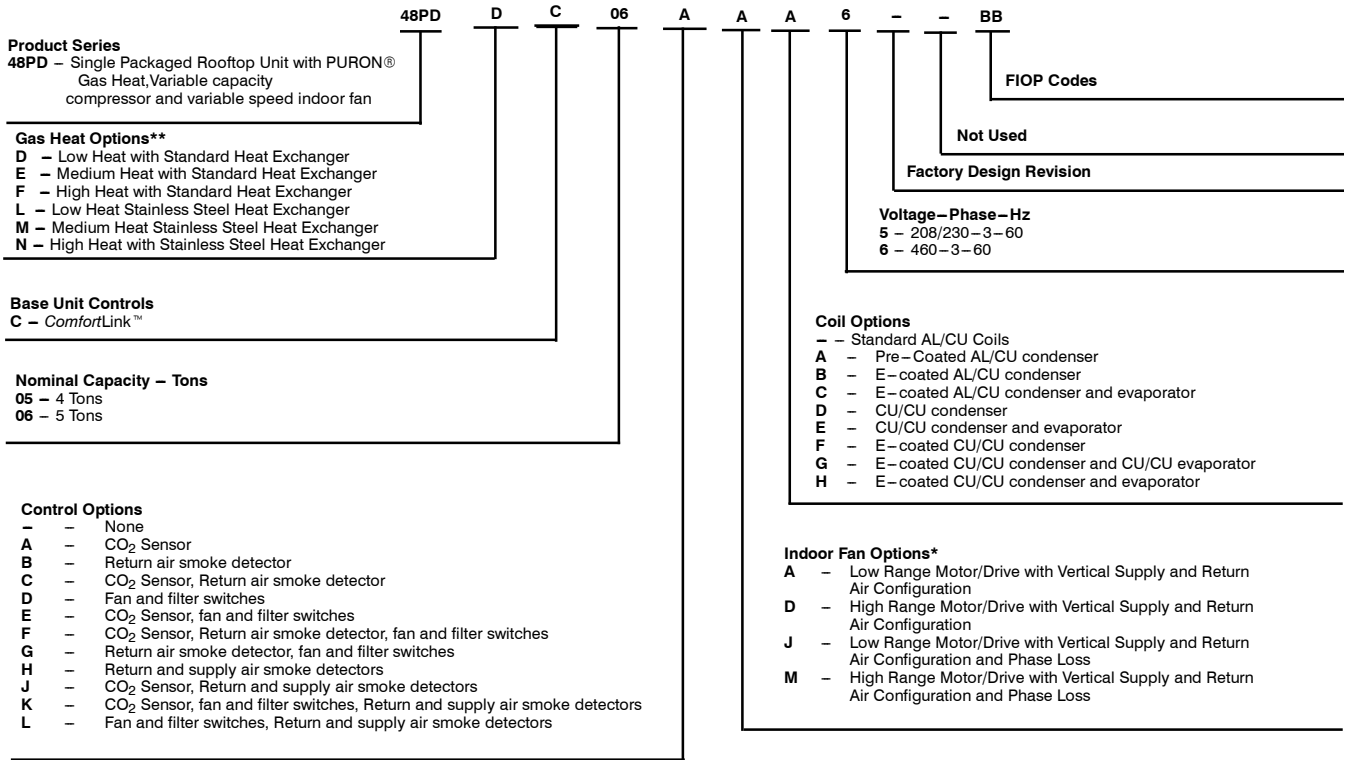
turn to the experts



Product Data



MODEL NUMBER NOMENCLATURE



* Units are field convertible to horizontal supply and/or return air configuration. Horizontal conversion may require different accessory devices.

** Gas heat options L, M, and N are compliant with the California Low NOx requirements.

Quality Assurance
Certified to ISO 9001:2000



This product has been designed and manufactured to meet Energy Star® criteria for energy efficiency. However, proper refrigerant charge and proper air flow are critical to achieve rated capacity and efficiency. Installation of this product should follow all manufacturer's refrigerant charging and air flow instructions. **Failure to confirm proper charge and air flow may reduce energy efficiency and shorten equipment life.**



Well exceeds
ASHRAE 90.1 and
Energy Star Standards

AHRI CAPACITY RATINGS

UNIT 48PD	NOMINAL CAPACITY (Tons)*	COOLING CAPACITY (MBtuh)	SEER	EER	RATED CFM	SOUND RATING (dB)
05	4	47,500	15.2	12.55	1,600	72
06	5	58,500	14.65	12.25	1,750	78

* Nominal cooling tons shown is the maximum design capacity value.

LEGEND

- AHRI** – Air Conditioning, Heating and Refrigeration Institute Test Standard
dB – Decibel
EER – Energy Efficiency Ratio
SEER – Seasonal Energy Efficiency Ratio

NOTES:

1. Tested in accordance with AHRI Standards 210/240.
2. Ratings are net values, reflecting the effects of circulating fan heat.
3. Ratings are based on:
Cooling Standard: 80 F db, 67 F wb indoor entering—air temperature and 95 F db air entering outdoor unit.
4. All 48PD units are in compliance with ENERGY STAR® and ASHRAE 90.1 2004 Energy Standard for minimum SEER and EER requirements.
5. Units are rated in accordance with AHRI sound standards 270 or 370.



Use of the AHRI Certified TM Mark indicates a manufacturer's participation in the program. For verification of certification for individual products, go to www.ahridirectory.org.

Outdoor Sound Power (Total Unit)

UNIT 48PD	AHRI RATING (dB)	A-WEIGHTED (dB)	OCTAVE BAND LEVELS dB							
			63	125	250	500	1000	2000	4000	8000
05	72	82.6	80.1	81.1	78.8	77.2	77.4	76.4	72.4	70
06	78	83.8	82.4	83.4	81.6	79.1	78.8	76.9	72.9	70.2

LEGEND

AHRI – Air Conditioning, Heating and Refrigeration Institute Test Standard

dB – Decibel

NOTE:

- Indoor sound power is available via Carrier's Electronic Catalog Program for specific operating parameters.
- Because Centurion PD units utilize a variable speed indoor fan system, the resulting indoor sound values are 6–8 dB below a similar unit with constant volume airflow.

TBA

Turbo Blowers



Features

- Integral molded scroll design
- Turbine bladed impeller
- Steel inlet guard
- Precisely balanced impellers eliminate vibration
- Complete line of available accessories for adapting to any piping condition or operational requirement
- More abrasion resistant than steel blower housing

Benefits

- Efficiencies of up to 50% over conventional blowers
- Meets air volume and pressure requirements with smaller horsepower
- Reduced power consumption
- Easily rotated to any of 14 available positions
- Corrosion resistant for longer life



The Hauck direct drive Turbo Blower is available in six pressure ranges from 12–36 osig (5.2–15.5 kPa) and 63 different sizes ranging from 240 to 13,000 scfm (6.4–348 nm³/min) for providing large or small volumes of air at constant pressures. The Turbo Blower is designed to supply air for combustion or for any low pressure air application.

HAUCK MANUFACTURING COMPANY

P.O. Box 90
Lebanon, PA 17042
Phone: 717-272-3051
Fax: 717-273-9882
www.hauckburner.com

Combustion Excellence Since 1888

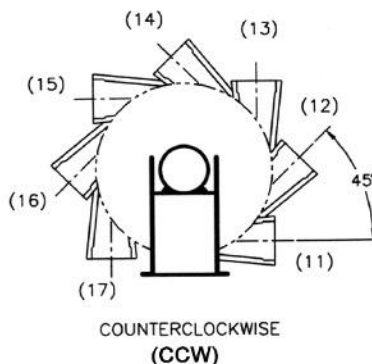
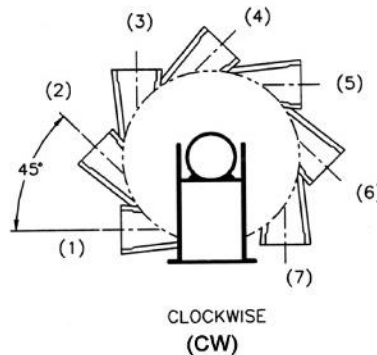
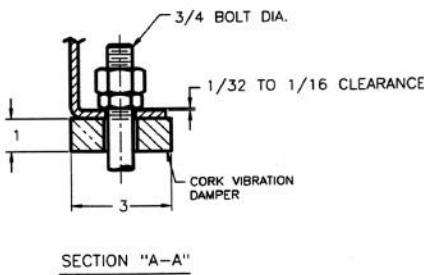
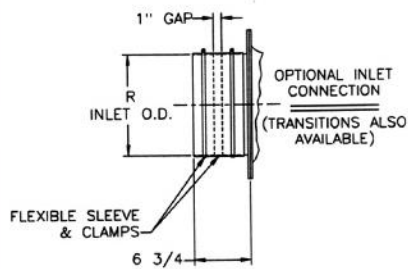
Hauck manufactures an extensive line of fiberglass turbo blowers. Originally designed to provide combustion air, TBA blowers can be used on any application requiring low pressure air, such as: aerating, cooling, cleaning, conveying, fluidizing, exhausting, spraying, drying, ventilating, and agitating. The larger units provide both the increased capacity needed for larger furnaces as well as the higher pressures necessary for recuperation and flame shaping. Maximum inlet temperature is 200 °F (93 °C).

All Hauck Turbo Blowers have the integral molded scroll design and turbine bladed impeller that has proven itself so well over the years. The blowers produce efficiencies up to 50% over conventional blowers—efficiencies that mean savings in both initial and operating costs. Hauck TBA units can frequently meet your air volume and pressure requirements with a smaller horsepower than conventional blower equipment. Because of the increased efficiency, power consumption is reduced by several horsepower, reducing operating costs. TBA blowers are available with high efficiency or special duty motors.

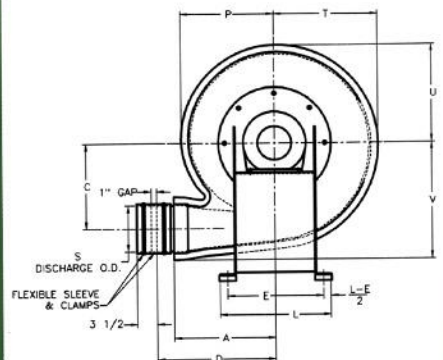
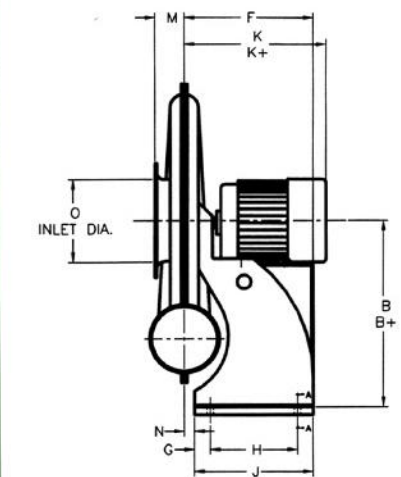
The simple removal of eight bolts allows the casing and discharge to be rotated to any of seven positions. The rotation can easily be completed without disassembly of the casing. A steel inlet guard is furnished as standard equipment. If a motor replacement is ever necessary, standard shaft 'T' frame motors can be purchased locally, eliminating down time awaiting a special motor. Impellers balanced to ISO 1940 balancing standards minimize vibration to significantly increase the operational life of the blower. All Hauck Turbo Blowers are thoroughly tested prior to shipment.

A complete line of accessories is available which can adapt the Hauck Turbo Blower to almost any piping condition or operational requirement: inlet filters, silencers, combination filter-silencers, blast gates, transitions, starters, adapters, and more. Hauck Anti-Surge Control Systems (ASC) are available for new or existing installations where piping length or other conditions induce blower surge.

DIMENSIONS



AVAILABLE STANDARD DISCHARGE POSITIONS - MOTOR END





Pressure Range (OSI)	Catalog Number	1.0 S.F. Motor Rating (TEFC)				1.15 S.F. Motor Rating (ODP)			
		SCFM	SCFH	Total Pressure (OSIG)	BHP	SCFM	SCFH	Total Pressure (OSIG)	BHP
12	TBA-12-1.5	240	14,400	12.0	1.5	305	18,300	11.4	1.8
	TBA-12-2	310	18,600	12.6	2	440	26,400	11.6	2.4
	TBA-12-3	500	30,000	12.7	3	-	-	-	-
	TBA-12-5	1,080	64,800	12.4	5	1,280	76,800	11.7	5.75
	TBA-12-7.5	1,600	96,000	12.4	7.5	2,040	122,400	11.5	8.6
	TBA-12-10	2,200	132,000	12.5	10	2,740	164,400	10.8	11.5
	TBA-12-15	3,050	183,000	12.6	15	3,750	225,000	11.9	17.25
	TBA-12-20	4,550	273,000	12.1	20	5,140	308,400	11.7	23
	TBA-12-25	5,050	303,000	12.1	25	5,775	346,500	11.0	28.75
TBA-12-30	5,775	346,500	12.0	30	6,575	394,500	11.0	34.5	
16	TBA-16-3	380	22,800	16.5	3	-	-	-	-
	TBA-16-5	740	44,400	16.0	5	900	54,000	15.2	5.75
	TBA-16-7.5	1,220	73,200	16.5	7.5	1,460	87,600	15.6	8.6
	TBA-16-10	1,620	97,200	16.6	10	1,920	115,200	15.5	11.5
	TBA-16-15	2,500	150,000	16.7	15	3,050	183,000	15.5	17.25
	TBA-16-20	3,250	195,000	16.7	20	3,750	225,000	15.0	23
	TBA-16-25	3,850	231,000	16.5	25	4,700	282,000	15.7	28.75
	TBA-16-30	4,600	276,000	16.3	30	5,600	336,000	15.0	34.5
TBA-16-40	6,900	414,000	16.7	40	7,950	447,000	15.3	46	
20	TBA-20-5	450	27,000	20.0	5	550	33,000	19.5	5.75
	TBA-20-7.5	850	51,000	20.0	7.5	1,040	62,400	18.9	8.6
	TBA-20-10	1,200	72,000	20.0	10	1,470	88,200	18.2	11.5
	TBA-20-15	2,100	126,000	20.8	15	2,500	150,000	19.4	17.25
	TBA-20-20	2,650	159,000	20.9	20	3,125	187,500	20.0	23
	TBA-20-25	3,380	202,800	20.8	25	3,975	238,500	19.5	28.75
	TBA-20-30	3,850	231,000	20.8	30	4,550	273,000	19.7	34.5
	TBA-20-40	5,000	300,000	20.8	40	5,650	339,000	19.5	44
	TBA-20-50	6,620	397,200	19.5	50	7,850	471,000	17.8	57.5
TBA-20-60	7,700	462,000	19.5	60	9,150	549,000	17.0	69	
24	TBA-24-5	235	14,100	22.8	5	350	21,000	23.4	5.75
	TBA-24-7.5	600	36,000	23.5	7.5	760	45,600	22.8	8.6
	TBA-24-10	1,000	60,000	24.0	10	1,200	72,000	23.7	11.5
	TBA-24-15	1,550	93,000	24.0	15	1,800	108,000	22.1	16.5
	TBA-24-20	2,350	141,000	24.9	20	2,760	165,600	23.9	23
	TBA-24-25	2,875	172,500	25.0	25	3,400	204,000	23.5	28.75
	TBA-24-30	3,350	201,000	25.8	30	3,925	235,500	25.1	34.5
	TBA-24-40	4,350	261,000	25.5	40	5,000	300,000	24.0	46
	TBA-24-50	5,600	336,000	25.4	50	6,650	399,000	24.0	57.5
TBA-24-60	6,500	390,000	24.8	60	7,700	462,000	23.0	69	
32	TBA-32-7.5	460	27,600	32.6	7.5	570	34,200	32.0	8.6
	TBA-32-10	625	37,500	32.3	10	760	45,600	29.5	11.5
	TBA-32-15	870	52,200	32.9	15	1,050	63,000	27.9	17.25
	TBA-32-20	1,100	66,000	32.3	20	1,310	78,600	27.0	23
	TBA-32-25	2,180	130,800	32.6	25	2,510	150,600	31.6	28.75
	TBA-32-30	2,620	157,200	33.1	30	3,100	186,000	31.5	34.5
	TBA-32-40	3,540	212,400	32.9	40	4,140	248,400	30.6	46
	TBA-32-50	4,300	258,000	31.6	50	5,050	303,000	27.6	57.5
	TBA-32-60	4,750	285,000	34.5	60	5,600	336,000	29.9	69
	TBA-32-75	6,050	363,000	32.2	75	7,050	424,200	29.8	86.25
	TBA-32-100	8,350	501,000	31.9	100	10,000	600,000	30.2	115
TBA-32-125	10,300	618,000	31.8	125	11,700	672,000	31.1	143.75	
TBA-32-150	12,050	723,000	32.5	150	14,200	852,000	30.2	172.5	
36	TBA-36-10	550	33,000	36.1	10	675	40,500	35.4	11.5
	TBA-36-15	850	51,000	35.8	15	1,010	60,600	31.9	17.25
	TBA-36-20	1,035	62,100	36.6	20	1,250	75,000	30.7	23
	TBA-36-25	1,940	116,400	35.8	25	2,360	141,000	34.9	28.75
	TBA-36-30	2,380	142,800	36.4	30	2,820	169,200	35.4	34.5
	TBA-36-40	3,300	198,000	35.7	40	3,875	232,500	33.9	46
	TBA-36-50	3,950	237,000	36.4	50	4,650	279,000	33.9	57.5
	TBA-36-60	4,600	276,000	36.7	60	5,425	325,500	33.2	69
	TBA-36-75	5,650	339,000	36.6	75	6,600	396,000	35.1	86.25
	TBA-36-100	7,275	436,500	35.8	100	8,125	487,500	34.1	115
	TBA-36-125	8,500	510,000	40.2	125	10,800	648,000	38.3	143.75
TBA-36-150	11,500	690,000	37.2	150	14,500	870,000	32.6	172.5	

NOTE: 1. Capacities at 29.92" Hg inlet pressure and 70°F inlet temperature.
 2. All motors 60 Hz, 3600 rpm., standard shaft.

Hauck Manufacturing Company

DIMENSIONAL DATA

Pressure Range (OSIG)	Catalog Number	Volume (CFM)		HP	Motor Frame		Dimensions (Inches)						
		1.00 S.F.	1.15 S.F.		TEFC	ODP	A	B	B+	C	D	E	F
12	TBA-12-1.5	240	305	1.5	143T	143T	12 7/8	22	22	13	15 1/8	17	16 1/4
	TBA-12-2	310	440	2	145T	145T	17	22	22	13 3/8	20	17	16 1/4
	TBA-12-3	500	-	3	182T	-	17	-	23	13 3/8	20	17	16 1/4
	TBA-12-5	1,080	1,280	5	184T	182T	18	23	23	15 1/4	21	17	16 1/4
	TBA-12-7.5	1,600	2,040	7.5	213T	184T	20 1/4	23	23 3/4	16 3/8	23 1/4	17	16 3/8
	TBA-12-10	2,200	2,740	10	215T	213T	20 1/4	23 3/4	23 3/4	16 3/8	23 1/4	17	16 3/8
	TBA-12-15	3,050	3,750	15	254T	215T	20 1/2	25 1/4	26 1/4	17 1/4	23 1/2	21	23 1/8
	TBA-12-20	4,550	5,140	20	256T	254T	20 1/2	26 1/4	26 1/4	17 1/4	23 1/2	21	23 1/8
	TBA-12-25*	5,050	5,775	25	284TS	256T	20 1/2	26 1/4	27	17 1/4	23 1/2	21	24
TBA-12-30*	5,775	6,575	30	286TS	284TS	20 1/2	27	27	17 1/4	23 1/2	21	24	
16	TBA-16-3	380	-	3	182T	-	12 7/8	-	23	13	15 1/8	17	16 1/4
	TBA-16-5	740	900	5	184T	182T	17	23	23	13 3/8	20	17	16 1/4
	TBA-16-7.5	1,220	1,460	7.5	213T	184T	18	23	23 3/4	15 1/4	21	17	16 1/4
	TBA-16-10	1,620	1,920	10	215T	213T	18	23 3/4	23 3/4	15 1/4	21	17	16 1/4
	TBA-16-15	2,500	3,050	15	254T	215T	20 1/4	25 1/4	26 1/4	16 3/8	23 1/4	21	22 7/8
	TBA-16-20	3,250	3,750	20	256T	254T	20 1/4	26 1/4	26 1/4	16 3/8	23 1/4	21	22 7/8
	TBA-16-25	3,850	4,700	25	284TS	256T	20 1/2	26 1/4	27	17 1/4	23 1/2	21	23 1/8
	TBA-16-30	4,600	5,600	30	286TS	284TS	20 1/2	27	27	17 1/4	23 1/2	21	23 1/8
	TBA-16-40*	6,900	7,950	40	324TS	286TS	20 1/2	27	28	17 1/4	23 1/2	21	24
20	TBA-20-5	450	550	5	184T	182T	18	23	23	15 1/8	21	17	16 1/4
	TBA-20-7.5	850	1,040	7.5	213T	184T	20	23	23 3/4	16 1/4	23	17	16 1/4
	TBA-20-10	1,200	1,470	10	215T	213T	20	23 3/4	23 3/4	16 1/4	23	17	16 1/4
	TBA-20-15	2,100	2,500	15	254T	215T	22 3/4	25 1/4	26 1/4	18 1/4	25 3/4	21	22 3/8
	TBA-20-20	2,650	3,125	20	256T	254T	20 1/4	26 1/4	26 1/4	19	23 1/4	21	22 7/8
	TBA-20-25	3,380	3,975	25	284TS	256T	20 1/4	26 1/4	27	19	23 1/4	21	22 7/8
	TBA-20-30	3,850	4,550	30	286TS	284TS	20 1/4	28 1/2	28 1/2	19 3/8	23 1/4	22 1/2	25 1/8
	TBA-20-40	5,000	5,650	40	324TS	286TS	20 1/4	28 1/2	29 1/2	19 3/8	23 1/4	22 1/2	25 1/8
	TBA-20-50	6,620	7,850	50	326TS	324TS	20 1/4	29 1/2	29 1/2	19 3/8	23 1/4	22 1/2	25 1/8
TBA-20-60	7,700	9,150	60	364TS	326TS	20 1/4	29 1/2	30 1/2	19 3/8	23 1/4	22 1/2	25 1/8	
24	TBA-24-5	235	350	5	184T	182T	18	23	23	15 1/8	21	17	16 1/4
	TBA-24-7.5	600	760	7.5	213T	184T	18	23	23 3/4	15 1/8	21	17	16 1/4
	TBA-24-10	1,000	1,200	10	215T	213T	20	23 3/4	23 3/4	16 1/4	23	17	16 1/4
	TBA-24-15	1,550	1,800	15	254T	215T	20	25 1/4	26 1/4	16 1/4	23	21	22 1/2
	TBA-24-20	2,350	2,760	20	256T	254T	22 3/4	26 1/4	26 1/4	18 1/4	25 3/4	21	22 3/8
	TBA-24-25	2,875	3,400	25	284TS	256T	22 3/4	26 1/4	27	18 1/4	25 3/4	21	22 3/8
	TBA-24-30	3,350	3,925	30	286TS	284TS	20 1/4	27	27	19	23 1/4	21	22 7/8
	TBA-24-40	4,350	5,000	40	324TS	286TS	20 1/4	27	28	19	23 1/4	21	22 7/8
	TBA-24-50	5,600	6,650	50	326TS	324TS	20 1/4	29 1/2	29 1/2	19 3/8	23 1/4	22 1/2	25 1/8
TBA-24-60	6,500	7,700	60	364TS	326TS	20 1/4	29 1/2	30 1/2	19 3/8	23 1/4	22 1/2	25 1/8	
32	TBA-32-7.5	460	570	7.5	213T	184T	19	28 1/8	28 1/8	19	21 1/2	27 1/8	18 1/16
	TBA-32-10	625	760	10	215T	213T	19	28 1/8	28 1/8	19	21 1/2	27 1/8	18 1/16
	TBA-32-15	870	1,050	15	254T	215T	19	31 9/16	32 9/16	19	21 1/2	27 1/8	23 15/16
	TBA-32-20	1,100	1,310	20	256T	254T	19	32 9/16	32 9/16	19	21 1/2	27 1/8	23 15/16
	TBA-32-25	2,180	2,510	25	284TS	256T	21 1/8	32 9/16	33 5/16	22 1/8	24 3/8	27 1/8	23 15/16
	TBA-32-30	2,620	3,100	30	286TS	284TS	21 1/8	33 5/16	33 5/16	22 1/8	24 3/8	27 1/8	23 15/16
	TBA-32-40	3,540	4,140	40	324TS	286TS	24	33 5/16	34 5/16	22 1/8	26 1/2	27 1/8	24 1/8
	TBA-32-50	4,300	5,050	50	326TS	324TS	24	36 3/8	36 3/8	22 1/8	26 1/2	27 1/8	29 3/8
	TBA-32-60	4,750	5,600	60	364TS	326TS	24	36 3/8	37 3/8	22 1/8	26 1/2	27 1/8	29 3/8
	TBA-32-75	6,050	7,050	75	365TS	364TS	23 1/8	37 3/8	37 3/8	23 5/16	25 3/8	27 1/8	29 3/8
	TBA-32-100	8,350	10,000	100	405TS	365TS	25	38	39	24 1/2	27	28 3/8	35 3/8
	TBA-32-125	10,300	11,700	125	444TS	404TS	25	39	40	24 1/2	27	28 3/8	35 3/8
TBA-32-150	12,050	14,200	150	445TS	405TS	25	39	40	24 1/2	27	28 3/8	35 3/8	
36	TBA-36-10	550	675	10	215T	213T	19	28 1/8	28 1/8	19	21 1/2	27 1/8	18 1/16
	TBA-36-15	850	1,010	15	254T	215T	19	31 9/16	32 9/16	19	21 1/2	27 1/8	23 15/16
	TBA-36-20	1,035	1,250	20	256T	254T	19	32 9/16	32 9/16	19	21 1/2	27 1/8	23 15/16
	TBA-36-25	1,940	2,360	25	284TS	256T	21 1/8	32 9/16	33 5/16	22 1/8	24 3/8	27 1/8	23 15/16
	TBA-36-30	2,380	2,820	30	286TS	284TS	21 1/8	33 5/16	33 5/16	22 1/8	24 3/8	27 1/8	23 15/16
	TBA-36-40	3,300	3,875	40	324TS	286TS	24	33 5/16	34 5/16	22 1/8	26 1/2	27 1/8	24 1/8
	TBA-36-50	3,950	4,650	50	326TS	324TS	24	36 3/8	36 3/8	22 1/8	26 1/2	27 1/8	29 3/8
	TBA-36-60	4,600	5,425	60	364TS	326TS	24	36 3/8	37 3/8	22 1/8	26 1/2	27 1/8	29 3/8
	TBA-36-75	5,650	6,600	75	365TS	364TS	23 1/8	37 3/8	37 3/8	23 5/16	25 3/8	27 1/8	29 3/8
	TBA-36-100	7,275	8,125	100	405TS	365TS	23 1/8	38	39	23 5/16	25 3/8	28 3/8	35 3/8
	TBA-36-125	8,500	10,800	125	444TS	404TS	25	39	40	24 1/2	27	28 3/8	35 3/8
	TBA-36-150	11,500	14,500	150	445TS	405TS	25	39	40	24 1/2	27	28 3/8	35 3/8

NOTE: + Indicates TEFC motor
 *TBA-12-25, TBA-12-30, and TBA-16-40 available with CLOCKWISE (CW) discharge positions only.
 Do not use for construction purposes. Certified dimensions available at time of order.



Dimensions (Inches)															Approx. Net Weight (LB.)	
G	H	J	K	K+	L	M	N	O	P	R	S	T	U	V	ODP	TEFC
2	11	15	13	13 3/8	19 1/2	3	1 1/4	8	14	8 1/4	4 1/4	15	14 1/2	16 1/8	210	210
2	11	15	13 1/2	13 3/8	19 1/2	3	1 1/4	8	14 3/4	8 1/4	6 1/4	15 7/8	15 3/8	17 7/8	220	220
2	11	15	-	14 1/8	19 1/2	3	1 1/4	8	14 3/4	8 1/4	6 1/4	15 5/8	15 5/8	17 7/8	-	255
2	11	15	13 1/4	15 3/4	19 1/2	3 3/4	1 1/4	10	16 1/8	10 1/4	8 1/4	18 3/8	17 5/8	20 3/4	265	280
2	11	15	14	17 1/8	19 1/2	4 7/8	1 1/8	12	17 1/2	12 1/4	10 1/4	20	19	23	235	350
2	11	15	15 3/4	19 1/4	19 1/2	4 7/8	1 1/8	12	17 1/2	12 1/4	10 1/4	20	19	23	385	365
2 1/8	17	21 1/4	17 1/2	23 1/4	23 1/2	5 3/4	1 7/8	14	18 3/8	14 1/4	12 1/4	21 5/8	20 1/8	25	430	515
2 1/8	17	21 1/4	21 1/8	25 1/8	23 1/2	5 3/4	1 7/8	14	18 1/2	14 1/4	12 1/4	21 5/8	20 1/8	25		
2 1/8	17	21 1/4	23 1/4	25 1/4	23 1/2	6 1/2	2 1/8	14	18 1/2	14 1/4	14 1/4	21 5/8	20 1/8	25		
2 1/8	17	21 1/4	22 3/4	26 3/4	23 1/2	6 1/2	2 1/8	14	18 1/2	14 1/4	14 1/4	21 5/8	20 1/8	25		
2	11	15	-	14 1/8	19 1/2	3	1 1/4	8	14	8 1/4	4 1/4	15	14 1/2	16 1/8		255
2	11	15	13 1/8	15 1/8	19 1/2	3	1 1/4	8	14 3/4	8 1/4	6 1/4	15 7/8	15 3/8	17 7/8	250	270
2	11	15	14 1/4	18 1/8	19 1/2	3 3/4	1 1/4	10	16 1/8	10 1/4	8 1/4	18 3/8	17 5/8	20 3/4	275	340
2	11	15	16 1/8	19 1/8	19 1/2	3 3/4	1 1/4	10	16 1/8	10 1/4	8 1/4	18 3/8	17 5/8	20 3/4	325	355
2 1/8	17	21 1/4	17 1/4	23	23 1/2	4 7/8	1 1/8	12	17 1/2	12 1/4	10 1/4	20	19	23	415	500
2 1/2	17	21 1/4	20 3/4	24 3/4	23 1/2	4 7/8	1 1/8	12	17 1/2	12 1/4	10 1/4	20	19	23	490	520
2 1/2	17	21 1/4	22 3/4	24 3/4	23 1/2	5 3/4	1 7/8	14	18 3/8	14 1/4	12 1/4	21 5/8	20 1/8	25	525	640
2 1/8	17	21 1/4	22 3/8	26 3/8	23 1/2	5 3/4	1 7/8	14	18 3/8	14 1/4	12 1/4	21 5/8	20 1/8	25	615	675
2 1/8	17	21 1/4	23 1/4	27 1/4	23 1/2	6 1/8	2 1/4	14	18 3/8	14 1/4	14 1/4	21 5/8	20 1/8	25		
2	11	15	13	15 1/8	19 1/2	3	1 1/4	10	17 1/8	10 1/4	6 1/4	18 1/8	17 1/8	20 1/8	270	285
2	11	15	14 1/8	18	19 1/2	3 3/4	1 1/4	12	17 1/2	12 1/4	8 1/4	19 1/8	18 1/2	21 1/4	235	350
2	11	15	16	19 1/2	19 1/2	3 3/4	1 1/4	12	17 1/2	12 1/4	8 1/4	19 1/8	18 1/2	21 1/4	335	385
2 1/8	17	21 1/4	17 1/8	23 1/4	23 1/2	4 3/8	1 1/8	12	19 1/2	12 1/4	10 1/4	21 5/8	20 3/4	24 3/4	425	510
2 1/8	17	21 1/4	20 3/4	24 3/4	23 1/2	5	1 1/8	12	20 3/8	12 1/4	10 1/4	22 7/8	21 3/4	25 3/4	515	545
2 1/8	17	21 1/4	22 3/4	24 1/2	23 1/2	5	1 1/8	12	20 3/8	12 1/4	10 1/4	22 7/8	21 3/4	25 3/4	535	630
2 1/2	19	24	22 1/4	26 1/4	25	6 1/8	1 7/8	14	21 1/8	14 1/4	12 1/4	24	22 1/2	27 1/2	610	750
2 1/2	19	24	23 3/4	27 1/2	25	6 1/8	1 7/8	14	21 1/8	14 1/4	12 1/4	24	22 1/2	27 1/2	735	915
2 1/8	19	24	24 3/4	28 3/4	25	6 1/8	1 3/4	14	21 1/8	14 1/4	12 1/4	24	22 1/2	27 1/2		
2 1/2	19	24	25 1/8	30 3/8	25	6 1/8	1 3/4	14	21 1/8	14 1/4	12 1/4	24	22 1/2	27 1/2		
2	11	15	13	15	19 1/2	3	1 1/4	10	17 1/8	10 1/4	6 1/4	18 1/8	17 5/8	20 1/8	270	290
2	11	15	14	17 1/8	19 1/2	3	1 1/4	10	17 1/8	10 1/4	6 1/4	18 1/8	17 5/8	20 1/8	280	345
2	11	15	16	19 1/4	19 1/2	3 3/4	1 1/4	12	17 1/2	12 1/4	8 1/4	19 1/8	18 1/2	21 3/4	335	365
2 1/8	17	21 1/4	17 1/2	23 1/8	23 1/2	3 3/4	1 1/4	12	17 1/2	12 1/4	8 1/4	19 1/8	18 1/2	21 3/4	415	500
2 1/8	17	21 1/4	21	25	23 1/2	4 3/8	1 1/8	12	19 1/2	12 1/4	10 1/4	21 5/8	20 3/4	24 3/4	500	530
2 1/8	17	21 1/4	22 3/4	24 3/8	23 1/2	4 3/8	1 1/8	12	19 1/2	12 1/4	10 1/4	21 5/8	20 3/4	24 3/4	520	635
2 1/8	17	21 1/4	22 1/8	26 1/8	23 1/2	5	1 1/8	12	20 3/8	12 1/4	10 1/4	22 7/8	21 3/4	25 3/4	630	680
2 1/8	17	21 1/4	23 3/8	27 3/8	23 1/2	5	1 1/8	12	20 3/8	12 1/4	10 1/4	22 7/8	21 3/4	25 3/4	670	850
2 1/2	19	24	24 3/8	28 3/8	25	6 1/8	1 7/8	14	21 1/8	14 1/4	12 1/4	24	22 1/2	27 1/2	840	975
2 1/2	19	24	25 1/8	30 3/4	25	6 1/8	1 7/8	14	21 1/8	14 1/4	12 1/4	24	22 1/2	27 1/2	890	1200
2	11 13/16	15 3/4	14 3/8	18 1/4	29 1/8	4 1/4	2	8	20 3/4	8 1/4	4 1/4	21 1/2	21 1/8	23		
2	11 13/16	15 3/4	16 1/4	19 1/4	29 1/8	4 1/4	2	8	20 3/4	8 1/4	4 1/4	21 1/2	21 1/8	23		
1 7/8	17 3/4	21 1/2	17 3/4	23 7/16	29 1/8	4 1/4	2 1/8	8	20 3/4	8 1/4	4 1/4	21 1/2	21 1/8	23		
1 7/8	17 3/4	21 1/2	21 1/8	25 3/16	29 1/8	4 1/4	2 1/8	8	20 3/4	8 1/4	4 1/4	21 1/2	21 1/8	23		
1 7/8	17 3/4	21 1/2	22 7/8	25	29 1/8	4 1/4	2 1/8	8	23 3/8	8 1/4	8 1/4	25 3/8	24 5/8	28 1/8		
1 7/8	17 3/4	21 1/2	22 9/16	26 9/16	29 1/8	4 1/4	2 1/8	8	23 3/8	8 1/4	8 1/4	25 3/8	24 5/8	28 1/8		
1 7/8	17 3/4	21 1/2	23 1/4	27 1/16	29 1/8	5 3/8	2 5/16	10	24 1/4	10 1/4	10 1/4	26 1/2	25 1/2	29 1/8		
2 3/4	21 11/16	27 9/16	24 5/16	28 9/16	29 1/8	5 3/8	1 7/8	10	24 1/4	10 1/4	10 1/4	26 1/2	25 1/2	29 1/8		
2 3/4	21 11/16	27 9/16	25 13/16	30 3/16	29 1/8	5 3/8	1 7/8	10	24 1/4	10 1/4	10 1/4	26 1/2	25 1/2	29 1/8		
2 3/4	21 11/16	27 9/16	26 7/16	31 5/16	29 1/8	6 3/8	2	12	25	12 1/4	12 1/4	27 3/4	26 7/16	31 1/8		
3	27	33	28 1/2	36	30 3/8	7 3/4	2 7/8	18	26 1/8	18 1/4	18 1/4	30 3/8	28 3/8	35 1/2		
3	27	33	30 1/2	39 3/8	30 3/8	7 3/4	2 7/8	18	26 1/8	18 1/4	18 1/4	30 3/8	28 3/8	35 1/2		
3	27	33	32	41 3/8	30 3/8	7 3/4	2 7/8	18	26 1/8	18 1/4	18 1/4	30 3/8	28 3/8	35 1/2		
2	11 13/16	15 3/4	16 1/4	19 1/4	29 1/8	4 1/4	2	8	20 3/4	8 1/4	4 1/4	21 1/2	21 1/8	23		
1 7/8	17 3/4	21 1/2	17 3/4	23 7/16	29 1/8	4 1/4	2 1/8	8	20 3/4	8 1/4	4 1/4	21 1/2	21 1/8	23		
1 7/8	17 3/4	21 1/2	21 1/8	25 3/16	29 1/8	4 1/4	2 1/8	8	20 3/4	8 1/4	4 1/4	21 1/2	21 1/8	23		
1 7/8	17 3/4	21 1/2	22 7/8	25	29 1/8	4 1/4	2 1/8	8	23 3/8	8 1/4	8 1/4	25 3/8	24 5/8	28 1/8		
1 7/8	17 3/4	21 1/2	22 9/16	26 9/16	29 1/8	4 1/4	2 1/8	8	23 3/8	8 1/4	8 1/4	25 3/8	24 5/8	28 1/8		
1 7/8	17 3/4	21 1/2	23 1/4	27 1/16	29 1/8	5 3/8	2 5/16	10	24 1/4	10 1/4	10 1/4	26 1/2	25 1/2	29 1/8		
2 3/4	21 11/16	27 9/16	24 5/16	28 9/16	29 1/8	5 3/8	1 7/8	10	24 1/4	10 1/4	10 1/4	26 1/2	25 1/2	29 1/8		
2 3/4	21 11/16	27 9/16	25 13/16	30 3/16	29 1/8	5 3/8	1 7/8	10	24 1/4	10 1/4	10 1/4	26 1/2	25 1/2	29 1/8		
2 3/4	21 11/16	27 9/16	26 7/16	31 5/16	29 1/8	6 3/8	2	12	25	12 1/4	12 1/4	27 3/4	26 7/16	31 1/8		
3	27	33	27 1/2	35 1/4	30 3/8	7 3/4	2 7/8	18	26 1/8	18 1/4	18 1/4	30 3/8	28 3/8	35 1/2		
3	27	33	30 1/2	39 3/8	30 3/8	7 3/4	2 7/8	18	26 1/8	18 1/4	18 1/4	30 3/8	28 3/8	35 1/2		
3	27	33	32	41 3/8	30 3/8	7 3/4	2 7/8	18	26 1/8	18 1/4	18 1/4	30 3/8	28 3/8	35 1/2		

CORRECTION FACTOR TABLE

AIR TEMP (°F)	ALTITUDE (FT ABOVE SEA LEVEL)																			
	0	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	7500	8000	8500	9000	10000
-60	.75	.77	.78	.80	.81	.83	.84	.86	.87	.89	.90	.92	.94	.96	.98	1.00	1.02	1.03	1.06	1.09
-40	.79	.81	.82	.84	.85	.87	.89	.90	.92	.93	.95	.97	.99	1.00	1.03	1.05	1.07	1.08	1.11	1.15
-20	.83	.85	.86	.88	.90	.91	.93	.95	.96	.98	1.00	1.01	1.04	1.05	1.08	1.09	1.12	1.14	1.16	1.20
0	.87	.89	.91	.92	.94	.96	.98	.99	1.01	1.03	1.05	1.06	1.09	1.10	1.13	1.15	1.17	1.19	1.22	1.26
40	.94	.96	.98	1.00	1.02	1.04	1.06	1.08	1.10	1.12	1.14	1.16	1.19	1.21	1.23	1.26	1.28	1.30	1.32	1.36
70	1.00	1.02	1.04	1.06	1.08	1.10	1.12	1.14	1.16	1.18	1.20	1.22	1.25	1.27	1.30	1.32	1.35	1.37	1.40	1.45
80	1.02	1.04	1.06	1.08	1.10	1.12	1.14	1.16	1.19	1.21	1.23	1.26	1.28	1.30	1.33	1.36	1.38	1.41	1.43	1.48
100	1.06	1.08	1.10	1.12	1.14	1.16	1.19	1.21	1.23	1.25	1.28	1.30	1.33	1.35	1.38	1.41	1.43	1.46	1.48	1.54
120	1.09	1.12	1.14	1.16	1.18	1.20	1.23	1.25	1.28	1.30	1.32	1.35	1.38	1.40	1.43	1.46	1.48	1.51	1.53	1.58
140	1.13	1.15	1.18	1.20	1.22	1.25	1.27	1.29	1.32	1.34	1.37	1.40	1.42	1.45	1.48	1.51	1.54	1.57	1.58	1.65
160	1.17	1.19	1.22	1.24	1.26	1.29	1.31	1.34	1.36	1.39	1.42	1.44	1.47	1.50	1.53	1.56	1.59	1.62	1.64	1.70
180	1.21	1.23	1.26	1.28	1.30	1.33	1.36	1.38	1.41	1.43	1.46	1.49	1.52	1.55	1.58	1.61	1.64	1.67	1.70	1.75
200	1.25	1.27	1.29	1.32	1.34	1.37	1.40	1.42	1.45	1.48	1.51	1.54	1.57	1.60	1.63	1.66	1.69	1.72	1.75	1.81

The above composite table shows density correction factors for temperature and altitude. Performance ratings shown in this bulletin have been calculated for standard air density of .075 lb./cu. ft. (70 °F @ 29.92 in. Hg barometric pressure). When density is other than standard, corrections for pressure and horsepower must be made.

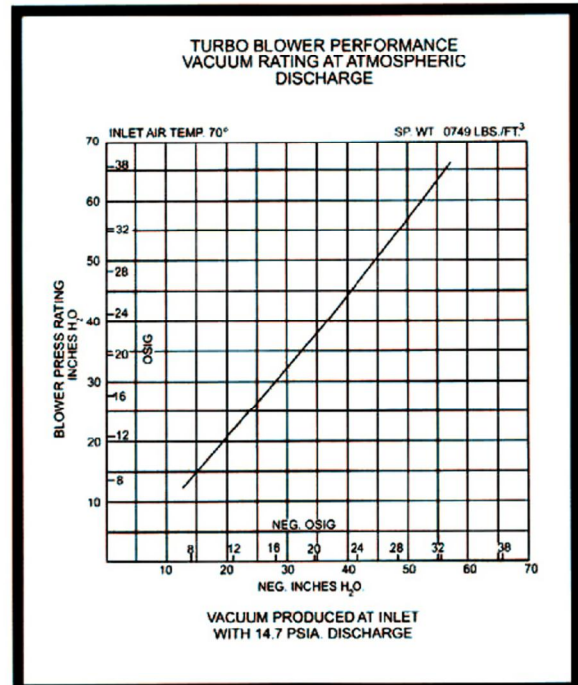
Example: Requirement—a blower to deliver 3850 cfm at 16 osi pressure at 120 °F and 2500 ft. altitude.

1. Density Correction table indicates a factor of 1.20 for 120 °F and 2500 ft. altitude.

2. 16 osi x 1.20 = 19.2 osi.
3. From capacity table on Page 3, select model TBA-20-30 (1.0 S.F.) showing a capacity of 3850 cfm @ 20.8 osi requiring a 30 HP motor at standard air.
4. Divide pressure and HP shown by 1.20 for performance at elevated temperature and altitude. Correct selection will deliver 3850 cfm at 17.3 osi at 120 °F and 2500 ft. altitude with a 25 HP motor. Select a TBA-20-30 with a 25 HP motor unless unit must start up cold, in which case use of a 30 HP motor is required.

PRESSURE CONVERSION TABLE

OSI to IN. WC				IN. WC to OSI			
OSI	" WC	OSI	" WC	" WC	OSI	" WC	OSI
1	1.73	36	62.28	1	.57	36	20.81
2	3.46	38	65.74	2	1.16	38	21.97
4	6.92	40	69.20	4	2.31	40	23.12
6	10.38	42	72.66	6	3.47	42	24.28
8	13.84	44	76.12	8	4.62	44	25.43
10	17.30	46	79.58	10	5.78	46	26.59
12	20.76	48	83.04	12	6.94	48	27.75
14	24.22	50	86.50	14	8.09	50	28.90
16	27.68	52	89.96	16	9.25	52	30.06
18	31.14	54	93.42	18	10.40	54	31.21
20	34.60	56	96.88	20	11.56	56	32.27
22	38.06	58	100.34	22	12.72	58	33.53
24	41.52	60	103.80	24	13.84	60	34.68
26	44.98	62	107.26	26	15.03	62	35.84
28	48.44	64	110.72	28	16.18	64	36.99
30	51.90	66	114.18	30	17.34	66	38.15
32	55.36	68	117.64	32	18.50	68	39.31
34	58.82	70	121.10	34	19.65	70	40.46



Appendix D

Appendix D: Weather Data

Station Name TORONTO LESTER B. PEARSON INT'L A
 Province ONTARIO
 Latitude 43.68
 Longitude -79.62
 Elevation 173.4
 Census Identifier 6167573
 WMO Identifier 71624
 TC Identifier YYZ
 All times are specified in Local Standard Time (LST). Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Legend
 M Missing
 E Estimated
 NA Not Available

Date/Time	Year	Month	Day	Time	Temp (C)	Temp (F)	Dew Point	Temp (C)	Dew Point	Temp (C)	Rel Hum (%)	Wind Dir (C)	Wind Dir (F)	Wind Spd (km/h)	Wind Spd (mi/h)	Visibility (km)	Visibility (mi)	Sea Press (hPa)	Sea Press (in)	Wind Chill	Wind Chill (F)	Weather
05042011 2300	2011	4	5	23:00	5.4	41.7	2.0	34.7	2.0	34.7	79	217	217	35	21.7	19.3						Cloudy
05042011 0000	2011	4	5	00:00	5.2	41.4	1.8	34.4	1.8	34.4	79	217	217	35	21.7	19.3						Cloudy
05042011 1000	2011	4	5	1:00	4.9	40.8	1.6	34.0	1.6	34.0	78	216	216	34	21.6	19.3						Cloudy
05042011 2000	2011	4	5	2:00	3.9	39.0	1.2	33.0	1.2	33.0	69	205	205	29	20.5	18.1						Cloudy
05042011 3000	2011	4	5	3:00	3.8	38.8	1.1	32.9	1.1	32.9	71	207	207	30	20.7	18.1						Cloudy
05042011 4000	2011	4	5	4:00	3.8	38.8	1.1	32.9	1.1	32.9	71	207	207	30	20.7	18.1						Cloudy
05042011 5000	2011	4	5	5:00	2.8	37.0	1.2	32.9	1.2	32.9	73	209	209	28	20.8	18.1						Mainly Cloudy
05042011 6000	2011	4	5	6:00	2.8	37.0	1.2	32.9	1.2	32.9	73	209	209	28	20.8	18.1						Mainly Cloudy
05042011 7000	2011	4	5	7:00	2.1	33.8	1.1	32.7	1.1	32.7	69	205	205	27	20.5	18.1						Mainly Cloudy
05042011 8000	2011	4	5	8:00	2.1	33.8	1.1	32.7	1.1	32.7	69	205	205	27	20.5	18.1						Mainly Cloudy
05042011 9000	2011	4	5	9:00	3.1	37.6	1.3	33.3	1.3	33.3	69	205	205	27	20.5	18.1						Cloudy
05042011 1000	2011	4	5	10:00	3.3	37.9	1.4	33.5	1.4	33.5	67	203	203	27	20.3	18.1						Cloudy
05042011 1100	2011	4	5	11:00	3.4	38.1	1.4	33.6	1.4	33.6	64	200	200	27	20.0	18.1						Mainly Cloudy
05042011 1200	2011	4	5	12:00	3.4	38.1	1.4	33.6	1.4	33.6	64	200	200	27	20.0	18.1						Mainly Cloudy
05042011 1300	2011	4	5	13:00	4.4	40.0	1.7	34.3	1.7	34.3	63	199	199	26	19.9	18.1						Mainly Cloudy
05042011 1400	2011	4	5	14:00	4.4	40.0	1.7	34.3	1.7	34.3	63	199	199	26	19.9	18.1						Mainly Cloudy
05042011 1500	2011	4	5	15:00	4.4	40.0	1.7	34.3	1.7	34.3	63	199	199	26	19.9	18.1						Mainly Cloudy
05042011 1600	2011	4	5	16:00	4.4	40.0	1.7	34.3	1.7	34.3	63	199	199	26	19.9	18.1						Mainly Cloudy
05042011 1700	2011	4	5	17:00	4.2	39.6	1.6	34.1	1.6	34.1	64	200	200	26	20.0	18.1						Mainly Cloudy
05042011 1800	2011	4	5	18:00	4.2	39.6	1.6	34.1	1.6	34.1	64	200	200	26	20.0	18.1						Mainly Cloudy
05042011 1900	2011	4	5	19:00	3.7	38.7	1.5	33.8	1.5	33.8	63	199	199	25	19.9	18.1						Mainly Clear
05042011 2000	2011	4	5	20:00	3.7	38.7	1.5	33.8	1.5	33.8	63	199	199	25	19.9	18.1						Mainly Clear
05042011 2100	2011	4	5	21:00	3.3	37.9	1.4	33.5	1.4	33.5	63	199	199	25	19.9	18.1						Mainly Clear
05042011 2200	2011	4	5	22:00	3.3	37.9	1.4	33.5	1.4	33.5	63	199	199	25	19.9	18.1						Mainly Clear
05042011 2300	2011	4	5	23:00	3.3	37.9	1.4	33.5	1.4	33.5	63	199	199	25	19.9	18.1						Mainly Clear
05042011 0000	2011	4	6	0:00	3.4	38.1	1.5	33.6	1.5	33.6	60	196	196	25	19.6	18.1						Mainly Clear
05042011 0100	2011	4	6	1:00	3.9	39.0	1.6	34.1	1.6	34.1	58	194	194	24	19.4	18.1						Clear
05042011 2000	2011	4	6	2:00	3.2	37.8	1.5	33.5	1.5	33.5	59	195	195	24	19.5	18.1						Clear
05042011 3000	2011	4	6	3:00	2.2	35.9	1.4	33.2	1.4	33.2	59	195	195	23	19.5	18.1						Clear
05042011 4000	2011	4	6	4:00	3.5	38.3	1.6	34.2	1.6	34.2	57	193	193	23	19.3	18.1						Clear
05042011 5000	2011	4	6	5:00	4.1	39.4	1.7	34.7	1.7	34.7	56	192	192	22	19.2	18.1						Clear
05042011 6000	2011	4	6	6:00	4.1	39.4	1.7	34.7	1.7	34.7	56	192	192	22	19.2	18.1						Clear
05042011 7000	2011	4	6	7:00	3.1	37.6	1.6	34.2	1.6	34.2	57	193	193	22	19.3	18.1						Clear
05042011 8000	2011	4	6	8:00	3.1	37.6	1.6	34.2	1.6	34.2	57	193	193	22	19.3	18.1						Clear
05042011 9000	2011	4	6	9:00	4.1	39.4	1.7	34.7	1.7	34.7	56	192	192	22	19.2	18.1						Mainly Cloudy
05042011 1000	2011	4	6	10:00	4.4	40.0	1.8	35.0	1.8	35.0	54	190	190	21	19.0	18.1						Mainly Cloudy
05042011 1100	2011	4	6	11:00	4.4	40.0	1.8	35.0	1.8	35.0	54	190	190	21	19.0	18.1						Mainly Cloudy
05042011 1200	2011	4	6	12:00	4.4	40.0	1.8	35.0	1.8	35.0	54	190	190	21	19.0	18.1						Mainly Cloudy
05042011 1300	2011	4	6	13:00	4.4	40.0	1.8	35.0	1.8	35.0	54	190	190	21	19.0	18.1						Mainly Cloudy
05042011 1400	2011	4	6	14:00	4.4	40.0	1.8	35.0	1.8	35.0	54	190	190	21	19.0	18.1						Mainly Cloudy
05042011 1500	2011	4	6	15:00	4.4	40.0	1.8	35.0	1.8	35.0	54	190	190	21	19.0	18.1						Mainly Cloudy
05042011 1600	2011	4	6	16:00	4.4	40.0	1.8	35.0	1.8	35.0	54	190	190	21	19.0	18.1						Mainly Cloudy
05042011 1700	2011	4	6	17:00	4.4	40.0	1.8	35.0	1.8	35.0	54	190	190	21	19.0	18.1						Mainly Cloudy
05042011 1800	2011	4	6	18:00	4.4	40.0	1.8	35.0	1.8	35.0	54	190	190	21	19.0	18.1						Mainly Cloudy
05042011 1900	2011	4	6	19:00	3.4	39.1	1.7	34.5	1.7	34.5	53	189	189	20	18.9	18.1						Clear
05042011 2000	2011	4	6	20:00	3.4	39.1	1.7	34.5	1.7	34.5	53	189	189	20	18.9	18.1						Clear
05042011 2100	2011	4	6	21:00	3.4	39.1	1.7	34.5	1.7	34.5	53	189	189	20	18.9	18.1						Mainly Clear
05042011 2200	2011	4	6	22:00	3.4	39.1	1.7	34.5	1.7	34.5	53	189	189	20	18.9	18.1						Mainly Clear
05042011 2300	2011	4	6	23:00	3.4	39.1	1.7	34.5	1.7	34.5	53	189	189	20	18.9	18.1						Mainly Clear
05042011 0000	2011	4	6	0:00	3.4	39.1	1.7	34.5	1.7	34.5	53	189	189	20	18.9	18.1						Mainly Clear
05042011 0100	2011	4	6	1:00	3.9	39.0	1.8	35.0	1.8	35.0	51	187	187	19	18.7	18.1						Mainly Clear
05042011 2000	2011	4	6	2:00	3.9	39.0	1.8	35.0	1.8	35.0	51	187	187	19	18.7	18.1						Mainly Clear
05042011 3000	2011	4	6	3:00	2.9	38.0	1.7	34.5	1.7	34.5	50	186	186	18	18.6	18.1						Mainly Clear
05042011 4000	2011	4	6	4:00	2.5	36.5	1.6	34.2	1.6	34.2	49	185	185	17	18.5	18.1						Mainly Clear
05042011 5000	2011	4	6	5:00	2.5	36.5	1.6	34.2	1.6	34.2	49	185	185	17	18.5	18.1						Mainly Clear
05042011 6000	2011	4	6	6:00	3.5	38.5	1.7	34.7	1.7	34.7	48	184	184	16	18.4	18.1						Mainly Clear
05042011 7000	2011	4	6	7:00	3.5	38.5	1.7	34.7	1.7	34.7	48	184	184	16	18.4	18.1						Mainly Clear
05042011 8000	2011	4	6	8:00	4.5	42.1	2.0	35.4	2.0	35.4	47	183	183	15	18.3	18.1						Mainly Clear
05042011 9000	2011	4	6	9:00	4.5	42.1	2.0	35.4	2.0	35.4	47	183	183	15	18.3	18.1						Mainly Clear
05042011 1000	2011	4	6	10:00	4.5	42.1	2.0	35.4	2.0	35.4	47	183	183	15	18.3	18.1						Mainly Clear
05042011 1100	2011	4	6	11:00	4.5	42.1	2.0	35.4	2.0	35.4	47	183	183	15	18.3	18.1						Mainly Clear
05042011 1200	2011	4	6	12:00	4.5	42.1	2.0	35.4	2.0	35.4	47	183	183	15	18.3	18.1						Mainly Clear
05042011 1300	2011	4	6	13:00	4.5	42.1	2.0	35.4	2.0	35.4	47	183	183	15	18.3	18.1						Mainly Clear
05042011 1400	2011	4	6	14:00	4.5	42.1	2.0	35.4	2.0	35.4	47	183	183	15	18.3	18.1						Mainly Clear
05042011 1500	2011	4	6	15:00	4.5	42.1	2.0	35.4	2.0	35.4	47	183	183	15	18.3	18.1						Mainly Clear
05042011 1600	2011	4	6	16:00	4.5	42.1	2.0	35.4	2.0	35.4	47	183	183	15	18.3	18.1						Mainly Clear
05042011 1700	2011	4																				

100420111400	2011	A	10	11.00	7	6.2	50	10	10	4.8	59.28				Thunderstorms Moderate Rain Showers Exp
100420111420	2011	A	10	12.00	7.4	6.3	52	10	10	6.2	59.08				Rain Showers Exp
100420111430	2011	A	10	13.00	8.3	7.0	57	10	17	6.4	58.92				Fog
100420111440	2011	A	10	14.00	9.3	8	62	10	21	6.1	58.68				Fog
100420111450	2011	A	10	15.00	10.4	10.6	66	10	24	10.4	58.45				Mainly Clear
100420111500	2011	A	10	16.00	13.0	11.4	70	10	27	16.1	58.20				Clear
100420111700	2011	A	10	17.00	16	11.4	74	10	31	16.1	58.20				Clear
100420111800	2011	A	10	18.00	18.7	10.4	76	10	34	16.1	58.30				Mainly Clear
100420111900	2011	A	10	19.00	14.0	11	77	10	34	16.1	58.31				Mainly Clear
100420112000	2011	A	10	20.00	10	10	78	10	34	16.1	58.30				Mainly Cloudy
100420112100	2011	A	10	21.00	10.8	10.4	79	10	34	14.2	58.20				Mainly Cloudy
100420112200	2011	A	10	22.00	10.8	7.4	80	10	34	14.2	58.20				Mainly Cloudy
100420112300	2011	A	10	23.00	11.8	8	80	10	34	14.2	58.20				Mainly Cloudy
100420112400	2011	A	10	24.00	11.4	8	80	10	34	14.2	58.20				Mainly Cloudy
110420111000	2011	A	11	8.00	11.4	8.4	80	10	34	17.1	58.10				Cloudy
110420111100	2011	A	11	9.00	10.4	8	81	10	34	17.1	57.90				Cloudy
110420111200	2011	A	11	1.00	10.4	8	81	10	34	17.1	57.90				Cloudy
110420111300	2011	A	11	2.00	9	7.2	80	10	34	19.3	57.80				Cloudy
110420111400	2011	A	11	3.00	8.3	7.4	80	10	34	19.3	57.8				Cloudy
110420111400	2011	A	11	4.00	8.6	7.6	80	10	34	19.3	57.77				Cloudy
110420111500	2011	A	11	5.00	11	8	80	10	34	19.3	57.77				Mainly Cloudy
110420111600	2011	A	11	6.00	13.8	11.3	80	10	34	19.3	57.74				Cloudy
110420111700	2011	A	11	7.00	16.5	15.1	81	10	34	24.1	57.60				Cloudy
110420111800	2011	A	11	8.00	18.7	18.0	82	10	34	24.1	57.54				Rain Showers
110420111900	2011	A	11	9.00	19.4	18.4	82	10	34	24.1	57.46				Cloudy
110420111900	2011	A	11	10.00	20.8	18.6	82	10	34	24.1	57.46				Mainly Cloudy
110420111100	2011	A	11	11.00	20.0	18.4	82	10	34	24.1	57.47				Mainly Cloudy
110420111200	2011	A	11	12.00	22.2	18.1	82	10	34	24.1	57.44				Mainly Cloudy
110420111300	2011	A	11	13.00	22.2	18.2	82	10	34	24.1	57.44				Mainly Cloudy
110420111400	2011	A	11	14.00	21.8	18.0	81	10	34	24.1	57.5				Mainly Cloudy
110420111500	2011	A	11	15.00	18.8	18.2	82	10	34	24.1	57.46				Mainly Cloudy
110420111600	2011	A	11	16.00	18.4	18.4	82	10	34	24.1	57.46				Mainly Cloudy
110420111700	2011	A	11	17.00	18.7	18.4	82	10	34	24.1	57.46				Mainly Cloudy
110420111800	2011	A	11	18.00	19.4	18.4	82	10	34	24.1	58.08				Mainly Cloudy
110420111900	2011	A	11	19.00	19.4	18.4	82	10	34	24.1	58.1				Mainly Cloudy
110420112000	2011	A	11	20.00	19.0	18	81	10	34	24.1	58.34				Mainly Cloudy
110420112100	2011	A	11	21.00	17.8	17.8	80	10	34	24.1	58.15				Mainly Cloudy
110420112200	2011	A	11	22.00	17.8	17.8	80	10	34	24.1	58.11				Mainly Cloudy
110420112300	2011	A	11	23.00	17	17	77	10	34	24.1	58.74				Cloudy
120420111000	2011	A	12	8.00	8.7	8.2	80	10	34	24.1	58.04				Cloudy
120420111100	2011	A	12	9.00	8.4	8.4	80	10	34	24.1	58.07				Mainly Cloudy
120420111200	2011	A	12	1.00	8.1	8.1	80	10	34	24.1	58.03				Mainly Clear
120420111300	2011	A	12	2.00	8.2	8	80	10	34	24.1	58.11				Mainly Cloudy
120420111400	2011	A	12	3.00	8.4	8.4	80	10	34	24.1	58.18				Mainly Clear
120420111500	2011	A	12	4.00	8.8	8.7	80	10	34	24.1	58.31				Mainly Clear
120420111600	2011	A	12	5.00	9.8	9.8	80	10	34	24.1	58.31				Mainly Clear
120420111700	2011	A	12	6.00	4.2	4.2	72	10	34	24.1	58.47				Mainly Clear
120420111800	2011	A	12	8.00	5.1	5.1	75	10	34	24.1	58.55				Mainly Cloudy
120420111900	2011	A	12	9.00	8.5	8.5	80	10	34	24.1	58.84				Mainly Clear
120420112000	2011	A	12	10.00	8.1	8.1	81	10	34	24.1	58.84				Mainly Cloudy

Appendix E

Appendix E: Instrumentation

Acoustic Instrumentation:

Noise Monitor: Quest Technologies Model 1900 (S/N CCA060008)
Microphone: Brüel & Kjaer 4936 ½ inch. Free Field (S/N: 2129324)
Calibrator: Quest Technologies Model CA-12B (S/N: U8030039)

Acoustic Modelling Software:

Modelling Software: Cadna/A for Windows by DataKustik
Version 3.72.131 with 'BMP' Extension

Appendix F

Appendix F: Glossary of Terms and Acronyms

Glossary of Terms and Acronyms:

<i>A-Weighting Network</i>	A frequency weighting network intended to approximate the relative response of the healthy human ear to sounds of different frequencies. Overall sound levels calculated or measured using the A-weighting network are indicated by dBA rather than dB.
<i>Acoustically Shielded</i>	A noise emission source from which the sound path to the noise sensitive receptor is blocked by a solid object of sufficient size and mass to consider the noise impact of that source negligible.
<i>Acoustics, Noise and Vibration (ANV)</i>	A unified field of study. Each sub-field is described in a specific context briefly below.
<i>Acoustics</i>	The study of problems where sound is desirable and the quality of the sound is the focus of attention. Examples include conference halls, theatres, classrooms and recording studios.
<i>Noise</i>	The study of problems where sound is undesirable and the reduction of sound is the focus of attention. Examples include noise emissions from industrial facilities and transportation corridors.
<i>Vibration</i>	The study of problems where excessive vibration is undesirable and the reduction of vibration amplitudes or vibration transmission is the focus of attention. Examples include vibration impact of equipment on building structures and the vibration impact of transportation corridors on the occupants of residential dwellings.
<i>Audible</i>	Can be heard with the healthy human ear. The audibility of a noise emission source can vary with ambient noise and distance from the source. When close to a noise source the characteristics of that source are easily distinguishable. If at a practical distance that noise source is masked by other louder sources or is simply quieter than the ambient noise levels then that source is considered to not be audible at the referenced location. This can at times be used as justification for neglecting the noise impact of a specific noise source.
<i>Frequency</i>	Typically the rate in Hertz (Hz) - previously denoted cycles per second, at which an event is repeated. <i>Normal human hearing extends over a range of frequencies from about 15 Hz to about 15 kHz.</i>
<i>Grade/Height References</i>	AG – Above Grade, AR – Above Roof, BG – Below Grade, Grade – Ground level
<i>L_{EQ} - “Equivalent sound level”</i>	The value of a constant sound pressure level which would result in the same total sound energy as would the measured time-varying sound pressure level if the constant sound pressure level persisted over an equal time duration.
<i>L_N - “Nth Exceedance level”</i> <i>where N = 0 to 100</i>	Is the Sound Pressure Level which is exceeded N percent of the time. For a given data sample the N th exceedance value is equal to the (100-N) th percentile of the data sample.
<i>Noise Emissions</i>	The sound energy radiating away from a noise source.
<i>Noise Exposures</i>	The sound pressure generated at a receptor.
<i>Noise Impact</i>	The contribution of a specific sound emission source or group of sound emission sources to the resultant SPL or L _{EQ} as measured or predicted at a nearby noise sensitive receptor.

Glossary of Terms and Acronyms:

<i>Non-Negligible Noise Source</i> <i>or equivalently</i>	A noise emission source which is determined to have a significant influence on the resultant noise exposures at a noise sensitive receptor. This is typically determined from a combination of site observations, measurements and available sound pressure or power data. Acoustical shielding effects or distance attenuation are often used as justification for excluding sources from this category.
<i>Significant Noise Source</i>	
<i>Octave Band</i>	A band of frequencies where the upper limiting frequency (u.l.f.) is twice the lower limiting frequency (l.l.f.). <i>Octave bands are identified by their centre-frequencies. The octave bands standardized for acoustic measurements include those centered at 31.5, 63, 125, 250, 500, 1000, 2000, 4000, & 8000 Hz.</i>
<i>1/N Octave Band</i>	A band of frequencies integrally divided from an Octave Band. The u.l.f. equals $2^{1/N}$ times the l.l.f. <i>The most commonly used frequency band is the 1/3 octave band.</i>
<i>Peak Particle Velocity (PPV)</i>	The maximum instantaneous velocity experienced by the particles of a medium when set into transient vibratory motion.
<i>Point of Reception</i> <i>or</i> <i>Noise Sensitive Receptor</i>	Locations where excessive noise may disrupt the lives or activities of occupants/residents or in general where excessive noise would interfere with the intended use of the location under consideration.
<i>Sound Pressure</i>	The instantaneous difference between the actual pressure and the average barometric pressure at a given location.
<i>Sound Pressure Level (SPL)</i>	A measurement of instantaneous sound pressure and equal to 20 times the logarithm (base 10) of the ratio of the instantaneous sound pressure of a sound divided by the reference sound pressure of 20 µPa (0 dB). Reported and measured in decibels (dB or dBA).
<i>Sound Quality or Characteristic</i>	A descriptive qualifier which describes a sound's variation with either time or frequency. Specific qualifiers are described briefly below.
<i>Cyclic Variation</i>	A sound which has an audible cyclic variation in sound level such as beating or other amplitude modulation.
<i>Tonal</i>	A sound which has a pronounced audible tonal quality such as a whine, screech, buzz, or hum. A majority of the acoustic energy is present in a relatively narrow frequency band.
<i>Quasi-Steady Impulsive</i>	A sequence of impulsive sounds emitted from the same source, having a time interval of less than one half second (1/2-sec) between successive impulsive sounds.
<i>Steady</i>	A sound does not vary significantly with time and therefore the measured Sound Pressure Level does not vary significantly with time.
<i>Impulsive</i>	A single pressure pulse or a single burst of pressure pulses, as defined by IEC 179A, First supplement to IEC 179, Sections 3.1 and 3.2.
<i>Transmission Loss (TL)</i>	The measure of the airborne sound reduction provided by a partition. <i>Expressed in decibels (dB) it is a measure of ratio of the acoustic energy striking the partition relative to the energy which is transmitted through it.</i>
<i>Root Mean Square (RMS) Vibration Velocity</i>	Vibration velocity value obtained when the instantaneous velocity is exponentially averaged in a RMS network with a time constant of one second.

Glossary of Terms and Acronyms:

Vibration Sensitive Receptor

Locations where excessive vibration may disrupt the lives or activities of occupants/residents or in general where excessive vibration would interfere with the intended use of the location under consideration.
