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Noise Feasibility Study
Proposed Residential Development
1284 Main Street East
Hamilton, Ontario

Prepared for:

Delta Joint Venture Inc.
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Burlington, ON
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Prepared by

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November 11, 2022

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VERSION CONTROL

Noise Feasibility Study,

1284 Main Street East,

Hamilton, Ontario.

Ver.	Date	Version Description / Changelog	Prepared By
0	November 11, 2022	Noise Feasibility Study prepared as part of the planning and approvals process.	Y.Lo

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1 Introduction and Summary

HGC Engineering was retained by Delta Joint Venture Inc. to conduct a Noise Feasibility Study for their proposed residential development, to be located between Graham Avenue South and Wexford Avenue South, on the south side of Highway 8, specifically at 1284 Main Street East, in Hamilton, Ontario. The proposed development includes three 14-storey residential buildings, two 3-storey townhouse blocks, four 3- to 4- storey stacked townhouse blocks and three levels of underground parking. These buildings will be in addition to a three-storey residential retrofit of the existing school on site. The study is required by the municipality as part of the planning and approvals process.

The primary source of noise is road traffic on Highway 8. Traffic data was obtained from the City of Hamilton. This data was used to predict future traffic sound levels at the locations of the proposed building façades. The predicted sound levels were compared to the guidelines of the Ministry of Environment, Conservation and Parks (MECP) and the City of Hamilton.

The results of this study indicate that with suitable noise control measures integrated into the design of the buildings, it is feasible to achieve the indoor MECP guideline sound levels from road traffic sources. The recommended noise control measures include appropriate wall and window glazing assemblies, and an alternative means of ventilation to open windows. Warning clauses will need to be included in the property, tenancy and rental agreements to warn occupants of potentially audible transportation noise levels and of the nearby commercial uses.

2 Site Description and Noise Sources

Figure 1 is a key plan indicating the location of the subject site. The development is located between Graham Avenue South and Wexford Avenue South, south of Highway 8, specifically at 1284 Main Street East in Hamilton, Ontario. Figure 2 includes the proposed site plan, prepared by Graziani + Corazza Architects, dated October 21, 2022. The subject site includes an existing school which will be demolished with the exception of the portion of the building closest to Highway 8 which will be retrofitted to residential uses. The proposed development will consist of a 3-storey retrofitted residential building, three 14-storey residential buildings, two 3-storey townhouse blocks, four 4-storey stacked townhouse blocks and three levels of underground parking. Preliminary drawings are included in Appendix A.

HGC Engineering personnel visited the site in August 2022 in order to investigate the acoustic and topographic environment of the site. The acoustical environment surrounding the site is urban in nature. The primary source of transportation noise is road traffic noise from Highway 8. There are existing commercial uses along Highway 8. The remaining lands consist mostly of residential uses. Sounds from these uses were not observed during the site visit nevertheless, a noise warning clause is recommended for the existing commercial uses that they may be audible at times, as provided in Section 5.4. There are no other stationary noise sources within 500 m of the area.

3 Sound Level Criteria

3.1 Traffic Noise

Guidelines for acceptable levels of road traffic noise impacting residential developments are given in the MECP publication NPC-300, “Environmental Noise Guideline Stationary and Transportation Sources – Approval and Planning”, release date October 21, 2013 and are listed in Table I below. The values in Table I are energy equivalent (average) sound levels [L_{EQ}] in units of A-weighted decibels [dBA].

Table I: Road Traffic Noise Criteria

Space	Daytime $L_{EQ\ (16\ hour)}$ Road	Nighttime $L_{EQ\ (8\ hour)}$ Road
Outdoor Living Areas	55 dBA	--
Inside Living/Dining Rooms	45 dBA	45 dBA
Inside Bedrooms	45 dBA	40 dBA

Daytime refers to the period between 07:00 and 23:00, while nighttime refers to the period between 23:00 and 07:00. The term "Outdoor Living Area" (OLA) is used in reference to an outdoor patio, a backyard, a terrace or other area where passive recreation is expected to occur. Balconies that are less than 4 m in depth are not considered to be outdoor living areas under MECP guidelines.

The guidelines in the MECP publication allow the daytime sound levels in an Outdoor Living Area to be exceeded by up to 5 dBA, without mitigation, if warning clauses are placed in the purchase and rental agreements to the property.

A central air conditioning system as an alternative means of ventilation to open windows is required for dwellings where nighttime sound levels outside bedroom or living/dining room windows exceed 60 dBA or daytime sound levels outside bedroom or living/dining room windows exceed 65 dBA. Forced-air ventilation with ducts sized to accommodate the future installation of air conditioning by the occupant is required when nighttime sound levels at bedroom or living/dining room windows are in the range of 51 to 60 dBA or when daytime sound levels at bedroom or living/dining room windows are in the range of 56 to 65 dBA.

Building components such as walls, windows and doors must be designed to achieve indoor sound level criteria when the plane of window sound level is greater than 60 dBA or the daytime sound level is greater than 65 dBA due to road traffic noise.

Warning clauses to notify future residents of possible noise excesses are also required when nighttime sound levels exceed 50 dBA at the plane of the bedroom or living/dining room window and daytime sound levels exceed 55 dBA in the outdoor living area and at the plane of the bedroom or living/dining room window due to road traffic.

4 Traffic Noise Assessment

4.1 Road Traffic Data

Traffic data for Highway 8 was obtained from the City of Hamilton in the form of Turning Movement Counts (TMC) and projected to the year 2032 at a conservative growth rate of 2.5%/yr. A commercial vehicle percentage of 1.4% heavy trucks and 3.0% medium trucks and a speed limit of 50 km/h was applied. A day/night split of 90/10% was used.

Data obtained from the City of Hamilton indicate that the surrounding roadways have low traffic volumes and therefore have not been included in the analysis.

Table II summarizes the traffic volume data used in this study. Road traffic data used in the analysis is provided in Appendix B.

Table II: Projected Road Traffic Data to Year 2032

Road Name		Cars	Medium Trucks	Heavy Trucks	Total
Highway 8	Daytime	13 709	430	201	14 340
	Nighttime	1 523	48	22	1 593
	Total	**15 232**	**478**	**223**	**15 933**

4.2 Road Traffic Noise Predictions

To assess the levels of road traffic noise which will impact the study area in the future, sound level predictions were made using STAMSON version 5.04, a computer algorithm developed by the MECP. This modelling software was used to predict the future road traffic sound levels (L_{EQ}) at the building facades. Sample STAMSON output is included in Appendix C.

Predictions of the traffic sound levels were made at the various building facades. Sound levels were predicted at the top storey of the proposed buildings to investigate ventilation and building façade construction requirements. Prediction locations are indicated in Figure 2. The results of these predictions are summarized in Table III. The distance setbacks of the buildings indicated on the site plan were used in the analysis.

Table III: Predicted Future Sound Levels, L_{EQ} [dBA], Without Mitigation

Prediction Location	Building	Description	Daytime $L_{EQ\ (16)}$	Nighttime $L_{EQ\ (8)}$
[A]	Residential Retrofit	North façade	63	56
[B]		East façade	60	53
[C]		South façade	<55	<50
[D]		West façade	60	53
[E]	Building A, B (14-storey)	North façade	59	52
[F]		East façade	56	<50
[G]		South façade	<55	<50
[H]		West façade	56	<50
[I]	Stacked Townhouse	North façade	59	52
[J]		East façade	56	<50
[K]		South façade	<55	<50
[L]		West façade	56	<50
[M]	Building C (14-storey)	North façade	55	<50

The preliminary plans indicate that there will be residential outdoor amenity spaces on the ground floor and on the 14th floors of the podiums. Figure 2 shows the locations of the receptors in the outdoor living areas used to evaluate the predicted future noise levels in these areas. The results are summarized in Table IV.

Table IV: Future Sound Levels at OLA's, [dBA]

Receiver	Location	Daytime $L_{EQ\text{-}16\ hr}$
R1	G/F	<55
R2	Bldg A Podium - 14/F *	<55
R3	Bldg B Podium - 14/F *	<55
R4	Bldg C Podium - 14/F *	<55

Note:
* Assuming a standard 1.07 m high parapet or solid railing.

5 Discussion and Recommendations

The predictions indicate that the traffic sound levels will exceed the outdoor MECP guidelines listed in Table I at the façades of the proposed buildings closest to Highway 8. Recommendations to meet the indoor MECP guidelines are discussed below.

5.1 Outdoor Living Areas

The proposed residential units within the proposed development may have balconies and patios that are less than 4 m in depth. These areas are not considered to be outdoor amenity areas under MECP guidelines and no noise mitigation measures are required.

The predicted sound levels in the outdoor amenity areas on the ground floor and 14th floors of the podium will be less than 55 dBA. Physical mitigation in the form of acoustic barriers will not require for these areas.

5.2 Indoor Living Areas

Provision for the Future Installation of Air Conditioning by the Occupant

The predicted sound levels outside the top storey bedroom and/or living/dining room of the proposed buildings closest to Highway 8 (residential retrofit, Buildings A and B and stacked townhouses) will be between 55 dBA and 65 dBA during the daytime, or 50 dBA and 60 dBA during the nighttime. To address these excesses, the MECP guidelines recommend that these units be equipped with forced air ventilation systems, with ducts large enough to allow future installment of air conditioning at the occupant's discretion. Inclusion of central air conditioning will meet and exceed these requirements. These buildings are indicated in Figure 3.

Window or through-the-wall air conditioning units are not recommended because of the noise they produce and because the units penetrate through the exterior wall which degrades the overall sound insulating properties of the envelope. Acceptable units are those housed in a separate closet with an access door for maintenance. The location, installation and sound ratings of the outdoor air conditioning devices should minimize noise impacts and comply with criteria of MECP publication NPC-300, as applicable.

5.3 Building Façade Constructions

Since the future road traffic sound levels outside all the buildings within the development will be less than 60 dBA at night and less than 65 dBA during the daytime, any exterior wall, insulated metal exterior door and double glazed window construction meeting the minimum requirements of the Ontario Building Code (OBC) will provide adequate sound insulation.

5.4 Warning Clauses

The MECP guidelines recommend that warning clauses be included in the property and tenancy agreements for all units with anticipated road traffic sound levels. Examples are provided below.

Suggested wording for buildings with sound level excesses the MECP criteria is given below:

Type A:

> Purchasers/tenants are advised that despite the inclusion of noise control features in the development and within the building units, sound levels due to increasing road may occasionally interfere with some activities of the dwelling occupants as the sound levels exceed the noise criteria of the Municipality and the Ministry of the Environment, Conservation and Parks.

Suitable wording for future dwellings requiring forced air ventilation systems is given below.

Type B:

> This dwelling unit has been fitted with a forced air heating system and the ducting etc., was sized to accommodate central air conditioning. Installation of central air conditioning will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the Municipality's and the Ministry of the Environment, Conservation and Parks' noise criteria. (Note: The location and installation of the outdoor air conditioning device should be done so as to minimize the noise impacts and comply with criteria of MECP publication NPC-300.)

Suitable wording for informing future residents of the adjacent commercial facilities and that sounds from these facilities may at times be audible.

Type C:

> Purchasers are advised of the proximity of adjacent commercial facilities, the sounds from which may at times be audible.

The sample clauses are provided by the MECP as an example and can be modified by the Municipality as required.

6 Impact of the Development on the Environment

Sound levels from noise sources such as rooftop air-conditioners, cooling towers, exhaust fans, etc. should not exceed the minimum one-hour L_{EQ} ambient (background) sound level from road traffic, at any potentially impacted residential point of reception, to comply with MECP guidelines. Based on the levels observed during our site visit, the typical minimum ambient sound levels in the area are expected to be 50 dBA during the day and 45 dBA at night. Thus, any electro-mechanical equipment associated with this development (e.g. emergency generator testing, fresh-air handling equipment, etc.) should be designed such that they do not result in noise impact beyond these ranges.

7 Impact of the Development on Itself

Section 5.8.1.1 of the Ontario Building Code (OBC), released on January 1, 2020, specifies the minimum required sound insulation characteristics for demising partitions, in terms of Sound Transmission Class (STC) or Apparent Sound Transmission Class (ASTC) values. In order to maintain adequate acoustical privacy between separate suites in a multi-tenant building, inter-suite walls must meet or exceed STC-50 or ASTC-47. Suite separation from a refuse chute or elevator shaft must meet or exceed STC-55. In addition, it is recommended that the floor/ceiling constructions separating suites from any amenity or commercial spaces also meet or exceed STC-55. Tables 1 and 2 in Section SB-3 of the Supplementary Guideline to the OBC provide a comprehensive list of constructions that will meet the above requirements.

Tarion's Builder Bulletin B19R requires the internal design of condominium projects to integrate suitable acoustic features to insulate the suites from noise from each other and amenities in accordance with the OBC, and limit the potential intrusions of mechanical and electrical services of the building on its residents. If B19R certification is needed, an acoustical consultant is required to review the mechanical and electrical drawings and details of demising constructions and mechanical/electrical equipment, when available, to help ensure that the noise impact of the development on itself is maintained within acceptable levels.

8 Summary of Recommendations

In summary, HGC Engineering has reviewed the site plan and performed calculations to determine the potential road traffic noise impact on the proposed development with respect to MECP guidelines. The sound level predictions indicate that feasible means exist to reduce sound levels to ensure MECP guidelines are satisfied inside the closest proposed buildings to Highway 8. The following are the recommendations.

For transportation noise sources

1. Forced air ventilation systems with ductwork sized for the future installation of central air conditioning are required for the proposed residential retrofit building, Buildings A and B, and the stacked townhouses. Inclusion of central air conditioning will meet and exceed these requirements. The location, installation and sound ratings of the air conditioning devices should comply with NPC-300, as applicable. There are no specific ventilation requirements for the remaining buildings.
2. Any building construction meeting the minimum requirements of the Ontario Building Code will provide adequate acoustical insulation for all units within the development.
3. Warning clauses should be used to inform future owners of the road traffic noise excesses and the proximity to existing commercial uses.

Table V: Summary of Noise Control Requirements and Noise Warning Clauses

Description	Acoustic Barrier	Ventilation Requirements *	Warning Clause	Upgraded Building Constructions
Residential Retrofit	--	Forced Air	A, B, C	OBC
Building A and B	--	Forced Air	A, B, C	OBC
Stacked Townhouse	--	Forced Air	A, B, C	OBC
Remaining Buildings	--	--	C	OBC

Notes:
-- no specific requirement
OBC – meeting the minimum requirements of the Ontario Building Code
* The location, installation and sound rating of the air conditioning condensers must be compliant with MECP Guideline NPC-300.

8.1 Implementation

To ensure that the noise control recommendations outlined above are fully implemented, it is recommended that:

1. Prior to the issuance of occupancy permits for this development, the Municipality's building inspector or a Professional Engineer qualified to provide acoustical engineering services in the Province of Ontario to certify that the suggested noise control measures have been properly installed and constructed.

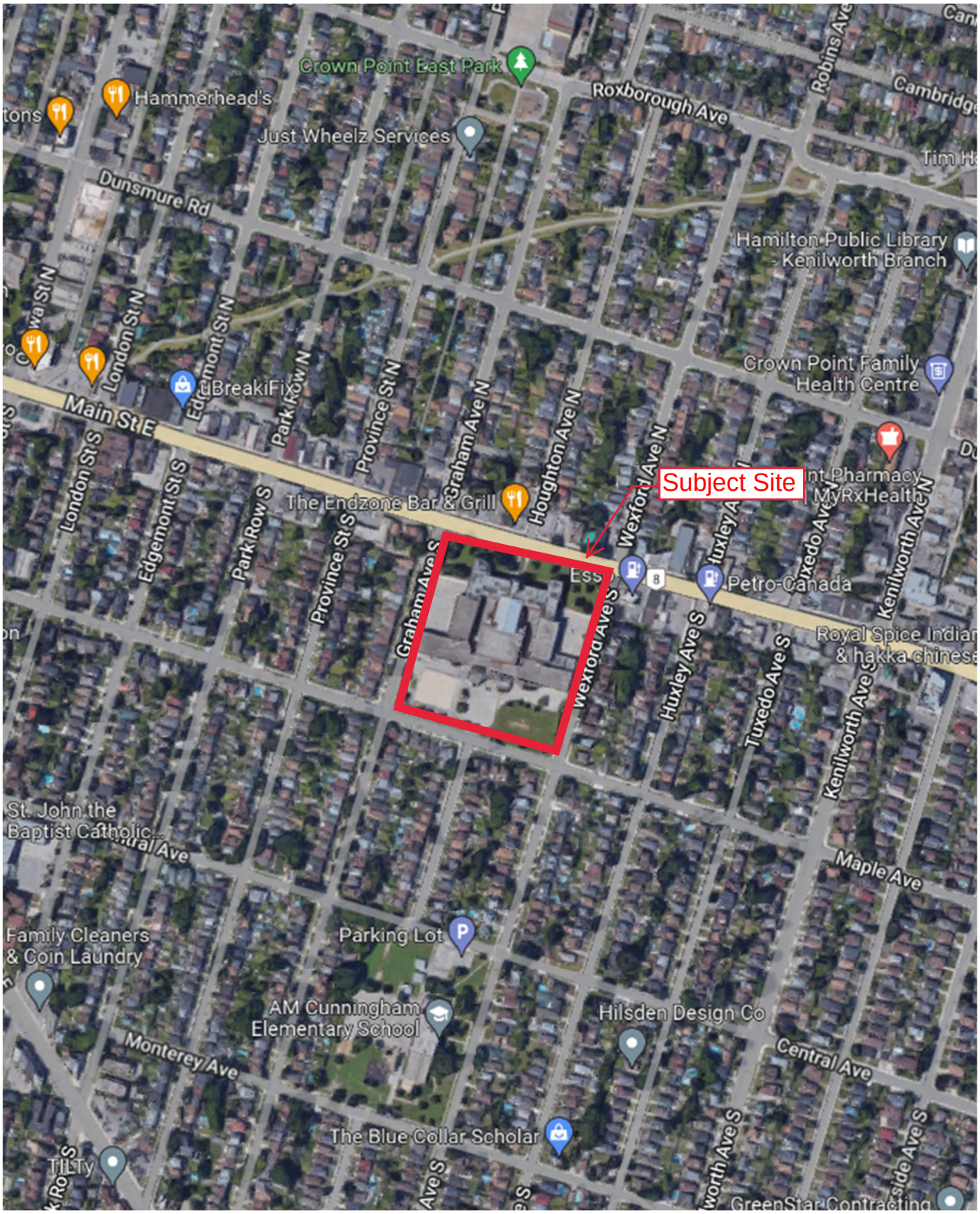
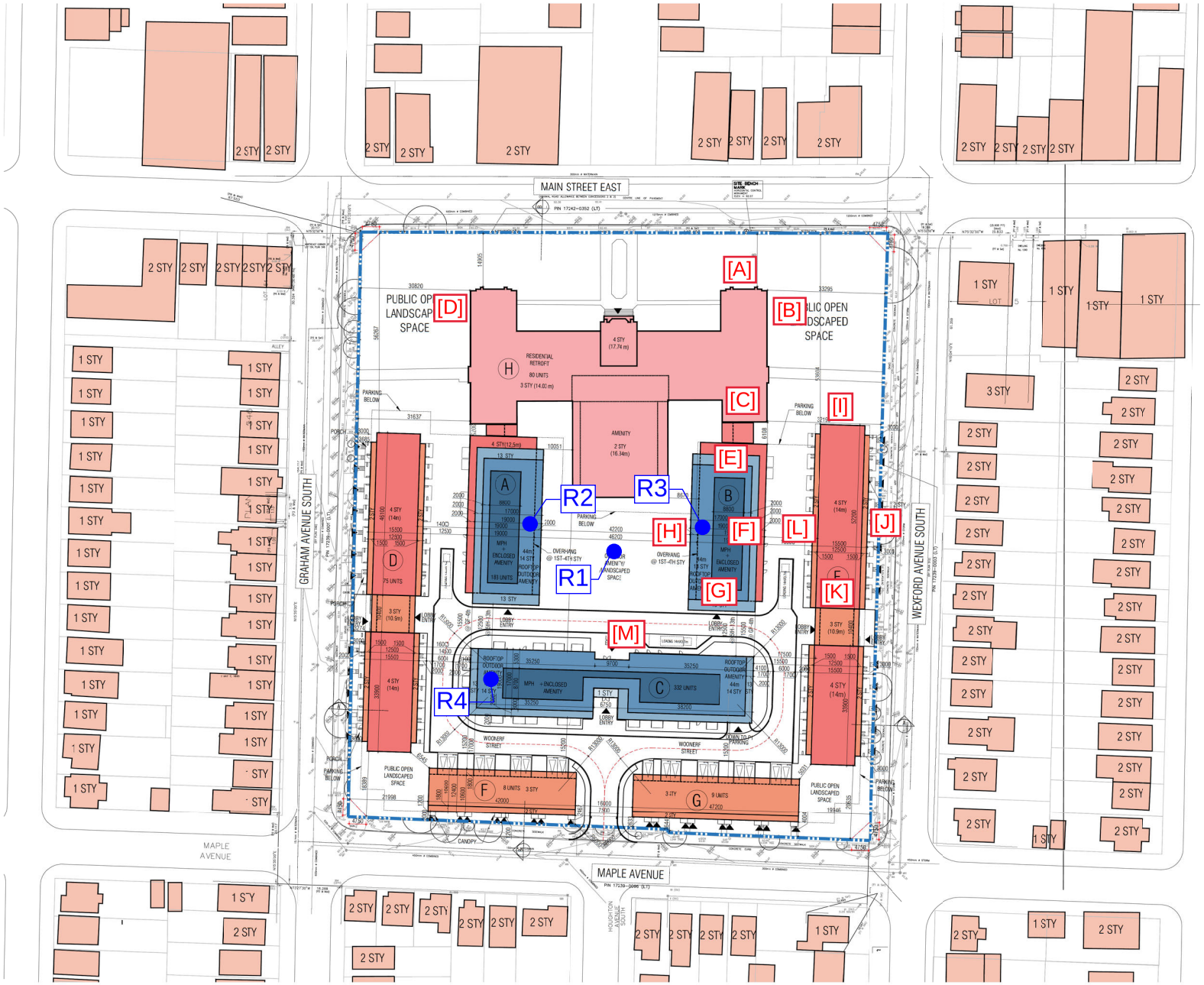


Figure 1: Key Plan



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PROPOSED RESIDENTIAL DEVELOPMENT

DELTA

1284 MAIN STREET EAST

Hamilton Ontario

PROJECT ARCHITECT:	B.G.
ASSISTANT DESIGNER:	A.G
DRAWN BY:	A.G./ A.F.
CHECKED BY:	D.B
PLOT DATE:	OCT.21.2022
JOB #	1939.21

SITE PLAN

1:500 A102

TITLEBLOCK SIZE: 610 x 900

Figure 2: Proposed Site Plan Showing Prediction Locations

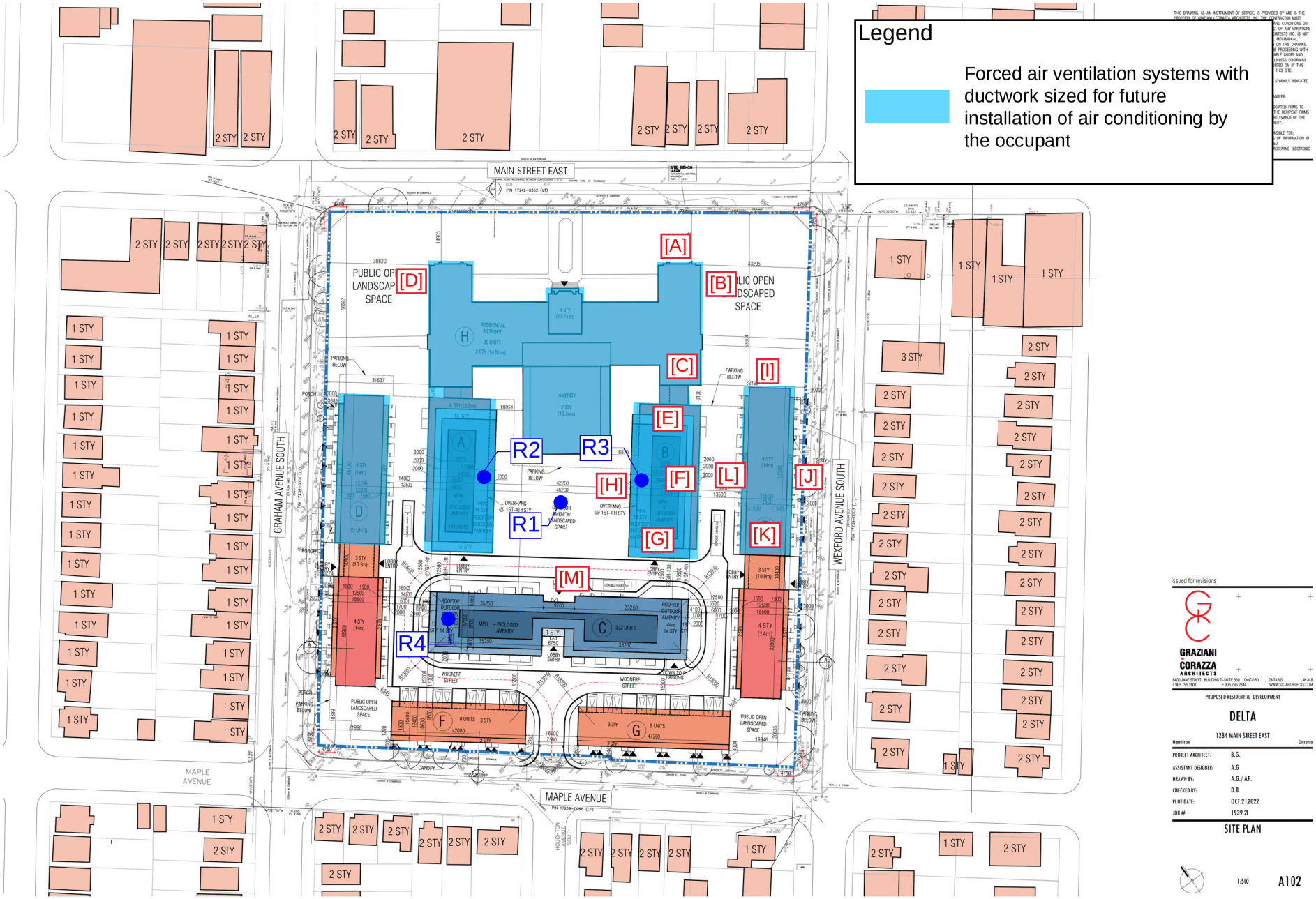
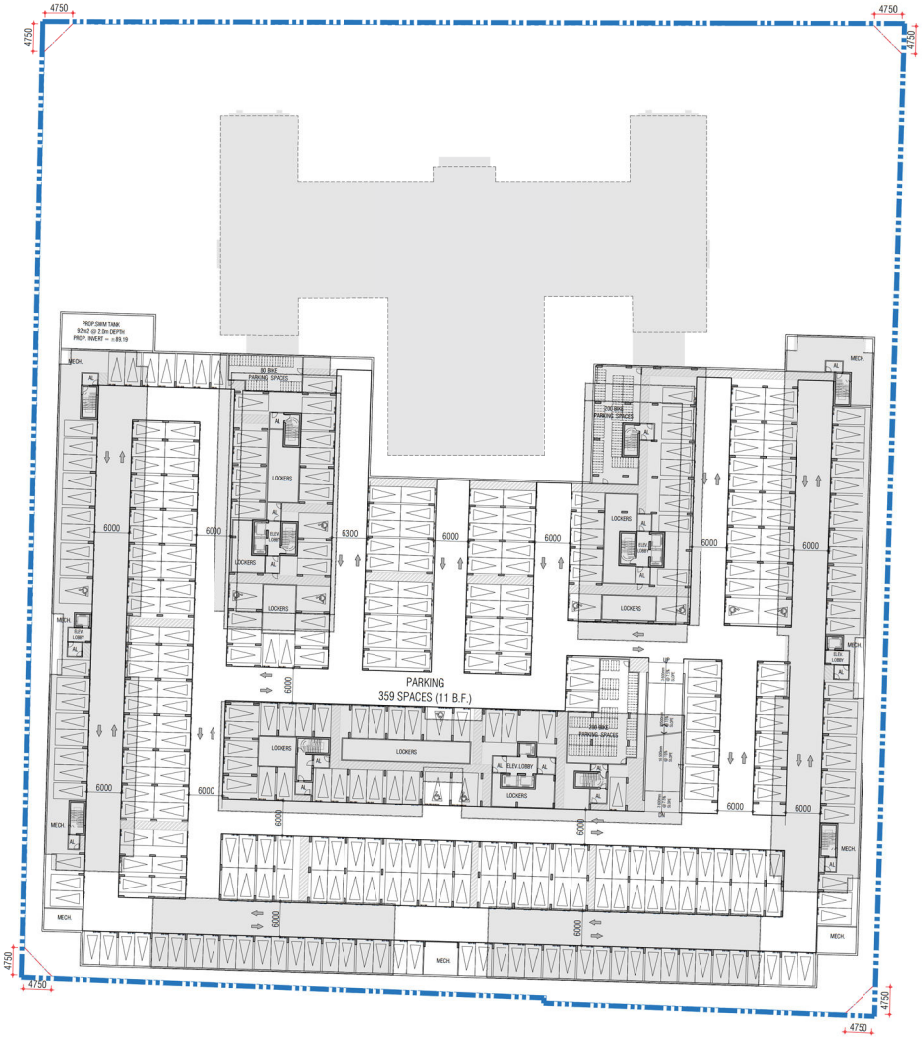


Figure 3: Proposed Site Plan Showing Ventilation Requirements

APPENDIX A

Supporting Information



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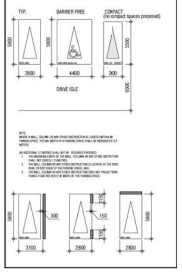
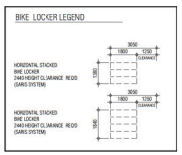
PARKING LEGEND



BIKE LOCKER LEGEND



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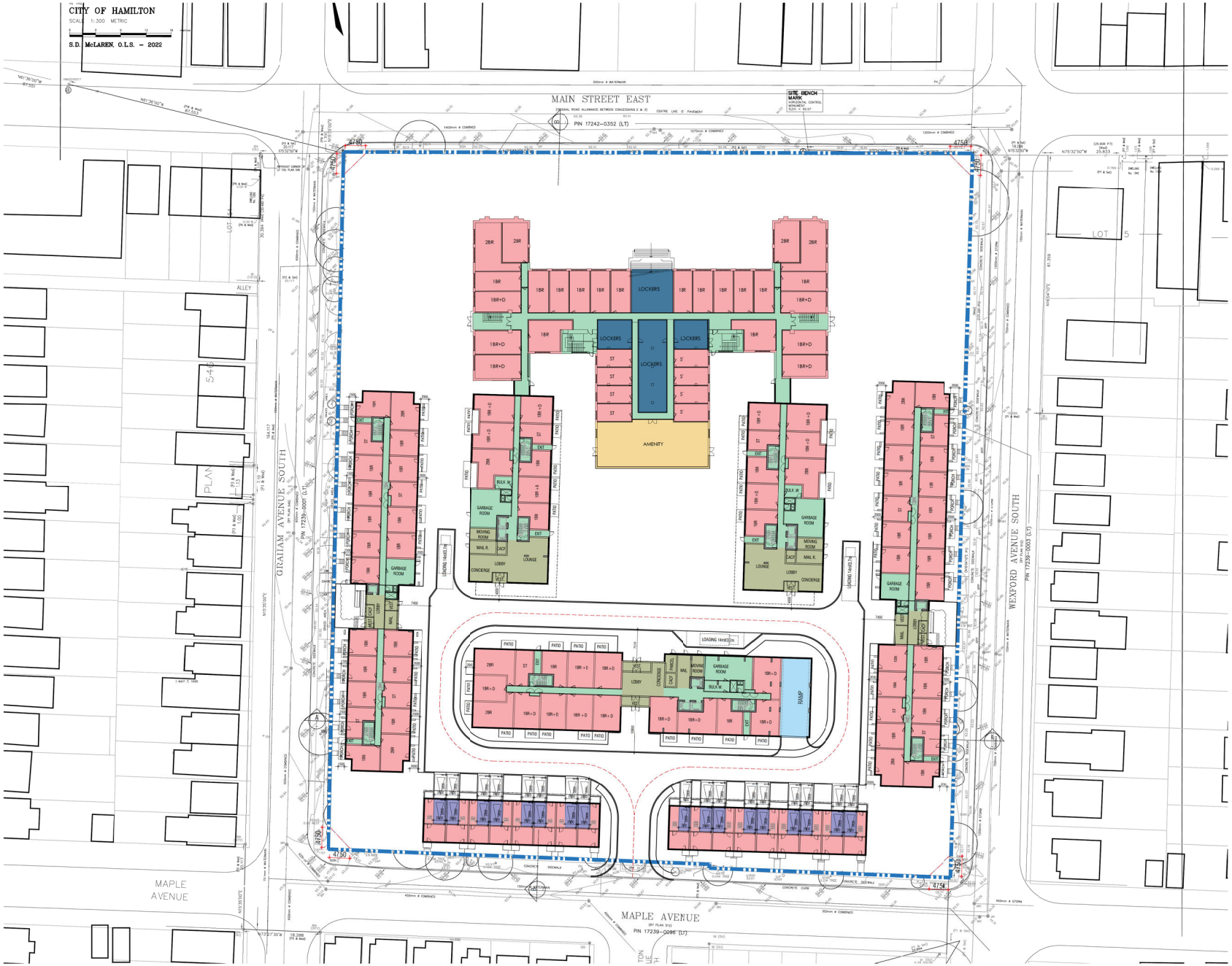
P1 - LEVEL PLAN

1:400 A202

TITLEBLOCK SIZE: 610 x 900



LEGEND

- AMENITY
- RESIDENTIAL UNITS
- RESIDENTIAL LOBBY
- RESIDENTIAL CORRIDOR
- LOCKERS & MECH
- PARKING
- INDIVIDUAL PARKING GARAGES

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GROUND FLOOR PLAN

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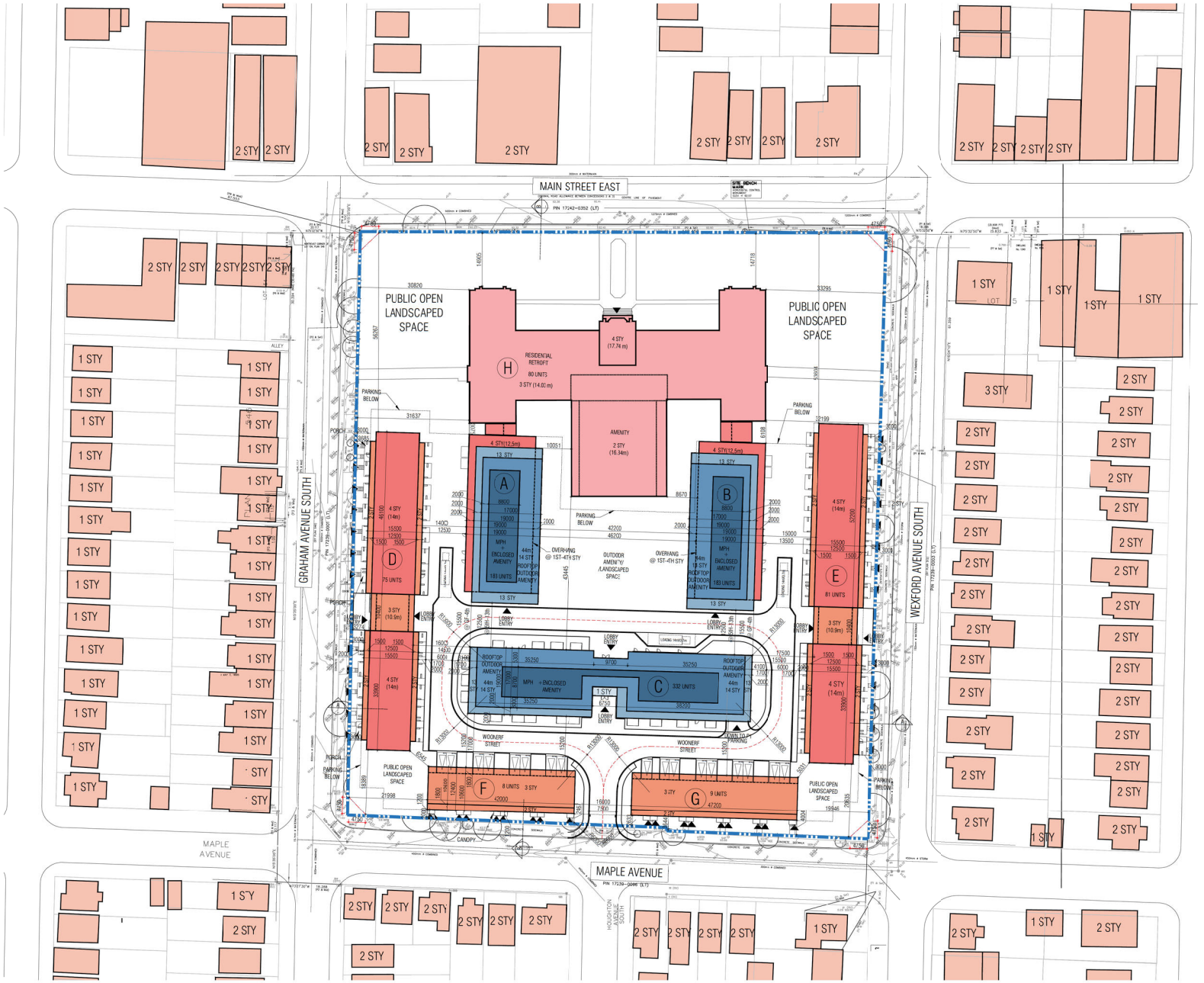
TITLEBLOCK SIZE: 610 x 900



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PROPOSED RESIDENTIL DEVELOPMENT

DELTA

1284 MAIN STREET EAST

Hamilton Ontario

PROJECT ARCHITECT:	B.G.
ASSISTANT DESIGNER:	A.G
DRAWN BY:	A.G./ A.F.
CHECKED BY:	D.B
PLOT DATE:	OCT.21.2022
JOB #	1939.21

SITE PLAN

1:500

A102

TITLEBLOCK SIZE: 610 x 900

APPENDIX B

Road Traffic Data

City of Hamilton **TURNING MOVEMENT COUNT** Loc. Code: 3672

Intersection: **Main St E** **at** **Graham Ave** Total Vehicles: 11,618 Date: Wednesday
Direction: (East/West) (North/South) Nov 27, 2019
Road Condition: Wet Weather: Overcast Period: 8 hours
Comments:

TOTAL VEHICLES

15 mins. Ending	North Bd. on N/S			East Bd. on E/W			South Bd. on N/S			West Bd. on E/W			Total	Pedestrians			
	L	S	R	L	S	R	L	S	R	L	S	R	Veh's	N side	E side	S side	W side
7:15	3	1	3	1	96	0	0	0	3	0	120	0	227	0	0	0	0
7:30	1	0	2	1	150	4	1	1	0	1	132	0	293	0	0	0	0
7:45	3	1	1	1	156	2	3	1	0	1	162	0	331	2	0	0	0
8:00	4	2	1	1	152	1	7	1	1	1	183	1	355	4	1	2	0
8:15	8	1	2	2	140	7	1	0	3	0	170	3	337	1	1	2	0
8:30	4	0	5	0	153	2	2	1	1	1	171	2	342	1	5	5	1
8:45	15	1	1	1	178	3	4	2	2	1	168	2	378	6	9	2	3
9:00	14	3	5	0	174	4	3	2	1	3	170	1	380	4	2	2	0
9:15	1	1	5	1	162	2	7	1	6	0	146	3	335	2	1	1	2
9:30	5	2	1	2	167	1	3	1	0	2	107	0	291	2	4	2	4
9:45	3	0	4	0	178	0	0	0	1	1	146	1	334	2	1	3	1
10:00	2	0	3	0	147	1	3	1	2	1	130	0	290	2	1	0	2
13:45	6	1	1	2	170	0	6	0	0	3	139	1	329	4	0	2	0
14:00	1	2	2	0	164	1	2	3	1	2	142	2	322	3	1	1	0
14:15	3	0	3	0	196	1	3	1	2	0	156	2	367	3	1	1	1
14:30	1	1	3	0	180	5	2	3	2	1	135	0	333	5	0	4	2
14:45	2	4	3	0	191	1	3	2	1	0	137	2	346	1	2	1	0
15:00	3	2	2	2	222	2	0	3	2	0	150	3	391	1	2	1	0
15:15	3	2	2	3	189	4	2	4	2	2	132	1	346	4	2	2	1
15:30	20	1	6	2	219	4	6	4	1	2	193	3	461	3	12	2	2
16:15	3	2	1	0	274	5	4	6	0	1	159	1	456	6	2	2	1
16:30	4	5	3	1	269	4	5	1	0	3	151	1	447	2	7	2	1
16:45	4	1	5	3	266	6	6	4	4	2	151	0	452	3	2	2	1
17:00	5	1	2	2	247	3	1	4	4	2	173	2	446	3	2	1	1
17:15	4	2	4	1	254	2	4	4	1	5	143	2	426	6	4	3	0
17:30	4	0	2	0	275	7	5	3	3	1	150	3	453	3	1	0	0
17:45	1	0	0	1	229	2	4	2	4	3	155	4	405	1	2	1	0
18:00	1	2	5	1	225	5	1	0	1	0	163	3	407	5	4	1	0
18:15	5	2	2	3	193	1	2	4	3	2	163	4	384	1	4	3	2
18:30	4	2	1	0	168	3	2	0	5	0	138	5	328	3	0	2	0
18:45	3	1	1	1	164	3	4	2	3	1	141	1	325	1	1	0	0
19:00	1	2	2	1	160	3	2	0	2	1	126	1	301	5	4	0	1
TOTAL	141	45	83	33	6,108	89	98	61	61	43	4,802	54		89	78	50	26
APPR.		269			6,230			220			4,899		11,618			243	

TRUCKS & BUSES

15 mins. Ending	North Bd. on N/S			East Bd. on E/W			South Bd. on N/S			West Bd. on E/W			Total
	L	S	R	L	S	R	L	S	R	L	S	R	
7:15	1	0	0	0	6	0	0	0	0	0	6	0	13
7:30	0	0	0	0	6	0	0	0	0	0	7	0	13
7:45	0	0	0	0	8	0	0	0	0	0	8	0	16
8:00	0	0	0	0	11	0	0	0	0	0	9	0	20
8:15	0	0	0	0	6	0	0	0	0	0	8	0	14
8:30	0	0	0	0	7	0	0	0	0	0	13	0	20
8:45	1	0	0	0	10	0	0	0	0	0	12	1	24
9:00	0	0	0	0	11	1	0	0	0	0	11	0	23
9:15	0	0	0	0	11	1	0	0	1	0	11	0	24
9:30	0	0	0	1	12	0	0	0	0	0	7	0	20
9:45	0	0	0	0	15	0	0	0	0	0	5	0	20
10:00	0	0	0	0	8	1	0	0	0	0	6	0	15
13:45	0	0	0	0	6	0	0	0	0	0	10	0	16
14:00	0	0	0	0	4	0	0	0	0	0	7	0	11
14:15	0	0	0	0	11	0	0	0	0	0	11	0	22
14:30	0	0	0	0	11	0	0	0	0	0	8	0	19
14:45	0	0	0	0	5	0	0	0	0	0	9	0	14
15:00	0	0	0	0	7	0	0	0	1	0	7	0	15
15:15	0	0	0	0	5	0	0	0	0	0	5	0	10
15:30	2	0	0	0	10	0	1	0	0	0	8	0	21
16:15	0	0	1	0	8	0	0	0	0	0	8	0	17
16:30	0	0	0	0	5	0	0	0	0	0	7	0	12
16:45	0	0	0	0	10	0	0	0	0	0	7	0	17
17:00	0	0	0	0	10	0	0	0	0	0	3	0	13
17:15	0	0	0	0	6	0	0	0	0	0	5	0	11
17:30	0	0	0	0	8	0	0	0	0	0	4	0	12
17:45	0	0	0	0	4	0	0	0	0	0	7	0	11
18:00	0	0	0	0	4	0	0	0	0	0	6	0	10
18:15	0	0	0	0	8	0	0	0	0	0	5	0	13
18:30	0	0	0	0	4	0	0	0	0	0	5	0	9
18:45	0	0	0	0	5	0	0	0	0	0	5	0	10
19:00	0	0	0	0	3	0	0	0	0	0	5	0	8
TOTAL	4	0	1	1	245	3	1	0	2	0	235	1	
APPR.		5			249			3			236		493

TRUCKS

7:15	0	0	0	0	1	0	0	0	0	0	0	0	1
7:30	0	0	0	0	2	0	0	0	0	0	1	0	3
7:45	0	0	0	0	1	0	0	0	0	0	1	0	2
8:00	0	0	0	0	4	0	0	0	0	0	1	0	5
8:15	0	0	0	0	2	0	0	0	0	0	1	0	3
8:30	0	0	0	0	2	0	0	0	0	0	8	0	10
8:45	0	0	0	0	5	0	0	0	0	0	4	1	10
9:00	0	0	0	0	3	1	0	0	0	0	5	0	9
9:15	0	0	0	0	4	0	0	0	0	0	5	0	9
9:30	0	0	0	1	5	0	0	0	0	0	2	0	8
9:45	0	0	0	0	10	0	0	0	0	0	2	0	12
10:00	0	0	0	0	5	1	0	0	0	0	2	0	8
13:45	0	0	0	0	2	0	0	0	0	0	6	0	8
14:00	0	0	0	0	2	0	0	0	0	0	3	0	5
14:15	0	0	0	0	4	0	0	0	0	0	2	0	6
14:30	0	0	0	0	5	0	0	0	0	0	0	0	5
14:45	0	0	0	0	0	0	0	0	0	0	2	0	2
15:00	0	0	0	0	1	0	0	0	0	0	1	0	2
15:15	0	0	0	0	2	0	0	0	0	0	1	0	3
15:30	0	0	0	0	3	0	1	0	0	0	0	0	4
16:15	0	0	1	0	1	0	0	0	0	0	3	0	5
16:30	0	0	0	0	2	0	0	0	0	0	2	0	4
16:45	0	0	0	0	4	0	0	0	0	0	2	0	6
17:00	0	0	0	0	3	0	0	0	0	0	0	0	3
17:15	0	0	0	0	4	0	0	0	0	0	0	0	4
17:30	0	0	0	0	1	0	0	0	0	0	0	0	1
17:45	0	0	0	0	0	0	0	0	0	0	3	0	3
18:00	0	0	0	0	0	0	0	0	0	0	1	0	1
18:15	0	0	0	0	3	0	0	0	0	0	1	0	4
18:30	0	0	0	0	1	0	0	0	0	0	2	0	3
18:45	0	0	0	0	1	0	0	0	0	0	1	0	2
19:00	0	0	0	0	0	0	0	0	0	0	2	0	2
TOTAL	0	0	1	1	83	2	1	0	0	0	64	1	
APPR.		1			86			1			65		153

Total = 6230+4899 = 11129
MT = 334/11129 = 0.03
HT = 151/11129=0.014

Med Trucks = 249
+236-86-65= 334

Heavy Trucks = 86
+65=151

APPENDIX C

Sample STAMSON 5.04 Output

STAMSON 5.0 NORMAL REPORT Date: 10-11-2022 15:43:56
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: a.te Time Period: Day/Night 16/8 hours
Description: ***Predicted sound levels at the north façade of the proposed residential retrofit, prediction location [A]***

Road data, segment # 1: HWY8 (day/night)

Car traffic volume : 13709/1523 veh/TimePeriod *
Medium truck volume : 430/48 veh/TimePeriod *
Heavy truck volume : 201/22 veh/TimePeriod *
Posted speed limit : 50 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 11558
Percentage of Annual Growth : 2.50
Number of Years of Growth : 13.00
Medium Truck % of Total Volume : 3.00
Heavy Truck % of Total Volume : 1.40
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: HWY8 (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 25.00 / 25.00 m
Receiver height : 7.50 / 7.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: HWY8 (day)

Source height = 1.09 m

ROAD (0.00 + 62.97 + 0.00) = 62.97 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	65.19	0.00	-2.22	0.00	0.00	0.00	0.00	62.97

Segment Leq : 62.97 dBA

Total Leq All Segments: 62.97 dBA

```
Results segment # 1: HWY8 (night)
---------------------------------

Source height = 1.08 m

ROAD (0.00 + 56.42 + 0.00) = 56.42 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
---
   -90     90   0.00  58.64   0.00  -2.22   0.00   0.00   0.00   0.00
56.42
-------------------------------------------------------------------------
---

Segment Leq : 56.42 dBA

Total Leq All Segments: 56.42 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 62.97
                           (NIGHT): 56.42
```