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Noise Feasibility Study
Proposed Mixed-Use Development
White Church Secondary Plan
Hamilton, Ontario

Prepared for:

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Prepared by

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Project No: 02300361

VERSION CONTROL

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01	December 7, 2023	Noise Feasibility Study	M. Chan

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1 Introduction and Summary

HGC Engineering was retained by UrbanSolutions Planning & Land Development Consultants Inc. to conduct a noise feasibility study for the proposed mixed-use development as part of the White Church Secondary Plan. The proposed uses include residential, mixed-use medium density, parklands and institutional. The lands are located east of Upper James Street, south of Airport Road West, west of Miles Road and north of White Church Road East in Hamilton, Ontario. The surrounding area consists of mainly residential uses. A noise study is required by the municipality as part of the planning and approvals process.

The primary noise sources which require analysis are: road traffic on Airport Road West, Upper James Street and White Church Road East and air traffic from the John C. Munro Hamilton International Airport.

Road traffic information was obtained from the City of Hamilton. The latest air traffic noise contours for the John C. Munro Hamilton International Airport were obtained and reviewed. The data was used to predict future traffic sound levels at the development and were compared to the guidelines of the Ministry of the Environment, Conservation and Parks (MECP).

Design considerations have been provided in the study with respect to traffic noise impact for the various blocks. The sound level predictions indicate that the future road traffic sound levels will exceed the MECP guidelines at blocks closest to Upper James Street, Airport Road and White Church Road. Central air conditioning and upgraded glazing constructions are required for the lots closest to Upper James Street. Forced air ventilation systems with ductwork sized for the future installation of central air conditioning by the occupant and upgraded building façade construction will be required for remaining blocks due to air traffic noise and proximity to the roadways. Noise barriers may be required depending on the location of the amenity spaces relative to the roadways. Warning clauses are required to inform future residents of the potential for road traffic sound level excesses.

When the detailed lotting plans and building locations are available, a Professional Engineer qualified to provide acoustical engineering services in Ontario shall conduct a detailed noise study to

review the plans to refine or determine if noise control measures are required (acoustic barriers, ventilation requirements and building façade constructions) for each specific residential block.

For the mixed-use blocks, a detailed noise study should be conducted when siting plans and architectural plans are available for these blocks to specify noise control measures. For the institutional and school blocks, detailed noise studies shall be completed when building details and rooftop equipment specifications are available to confirm that sound levels associated with these uses will meet the MECP guidelines at neighbouring off-site noise sensitive uses.

2 Site Description and Noise Sources

Figure 1 is a key plan of the site. Figure 2 is the White Church Secondary Plan dated November 2023 which shows the road traffic noise prediction locations [A] to [E].

The acoustical environment surrounding the site is semi-urban (Class 2) in nature. An aerial imagery is attached as Figure 3. The surrounding lands consist mainly of low rise residential dwellings. Some of those dwellings are also used for commercial purposes. There is a self-storage facility located at the southeast corner of Upper James Street and Airport Road. To the south of the storage facility is the Southern Pines Golf & Country Club.

To the northwest of the site is the John C. Munro Hamilton International Airport. The Noise Exposure Forecast map is attached as Figure 4. The northern portion of the subject lands are located within NEF contour 25 and 28. Traffic on Upper James Street, Airport Road and White Church Road and air traffic are the dominant noise sources. Due to low traffic volume, traffic on Miles Road is not considered a significant noise source.

3 Traffic Noise Criteria

3.1 Road Traffic Noise Criteria

Guidelines for acceptable levels of road and air traffic noise impacting new residential type 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: MECP Road Traffic Noise Criteria (dBA)

Area	Daytime L_{EQ} (16 hour) Road	Nighttime L_{EQ}(8 hour) Road
Outdoor Living Area	55 dBA	--
Inside Living/Dining Rooms	45 dBA	45 dBA
Inside Bedrooms	45 dBA	40 dBA
General offices, reception areas, retail stores, etc.	50 dBA	--
Hospitals, schools, nursing/retirement homes, daycare centres, theatres, places of worship, libraries, individual or semiprivate offices, conference rooms, reading rooms, etc.	45 dBA	--

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

The MECP guidelines 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. Where OLA sound levels exceed 60 dBA, physical mitigation is recommended to reduce the OLA sound level to below 60 dBA and as close to 55 dBA as technically, economically, and administratively feasible.

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 living/dining room/bedroom windows exceed 65 dBA. Forced-air ventilation with ducts sized to accommodate the future installation of air conditioning is required when nighttime sound levels at bedroom/living/dining room windows are in the range of 51 to 60 dBA or when daytime sound levels at living/dining room/bedroom 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 nighttime 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 excesses are also required when nighttime sound levels exceed 50 dBA at the plane of the bedroom/living/dining room window and daytime sound levels exceed 55 dBA in the outdoor living area and at the plane of the living/dining room/bedroom window due to road traffic.

The guidelines also provide acceptable indoor sound levels that are extended to land uses and developments which are not normally considered noise sensitive such as offices and schools, etc. The specified values are maximum sound levels and apply to the indicated indoor spaces with the windows and doors closed. The sound level limits in for offices and institutional uses are presented as information, for good-practice design objectives.

3.2 Air Traffic Noise

Indoor sound limits due to air traffic are also defined in the MECP in publication NPC -300. The maximum allowable Noise Exposure Forecast (NEF) limits are summarized in Table II.

Table II: Air Traffic Noise Criterion

Area	Daytime NEF	Nighttime NEF
Living/dining/den areas of residences, hospitals, schools, nursing/retirement homes, daycare centres, etc.	5	--
Sleep Quarters (bedrooms)	--	0

The living/dining/family rooms, dens and bedrooms of the proposed dwelling units are the sensitive receptor locations. Typically, washrooms and kitchens are considered noise insensitive areas. There are no outdoor noise criteria for aircraft noise because there is no effective means of mitigation.

For noise sensitive uses located between the NEF 25 and 30, the MECP requires that the dwelling be designed with the provision for central air conditioning. This requirement usually implies forced air ventilation systems with the ducts sized for future installation of central air conditioning. In addition, building components including windows, doors, walls and ceiling/roof must be designed to achieve

the indoor sound level criteria. A warning clause is also required in property and tenancy agreements.

For noise sensitive uses located between the NEF 30 and 35, the MECP requires that central air conditioning is mandatory with warning clauses in the property and tenancy agreements. In addition, building components including windows, doors, walls and ceiling/roof must be designed to achieve the indoor sound level criteria in Table II.

There are no specific requirements if the dwellings are located in the area where the NEF/NEP contours are less than 25.

4 Traffic Noise Predictions

4.1 Traffic Data

4.1.1 Air Traffic

The 2011 Composite Noise Contour Map for the Hamilton International Airport was obtained. This Map indicated that the northern portion of the site is located within NEF/NEP 25 and 28 contour lines, as shown in Figure 4.

The NEF contour map was used to determine the building constructions required for the building components for residential blocks. The MECP indoor noise criteria for aircraft traffic noise was used as a guideline.

4.1.2 Road Traffic Data

Road traffic data for Airport Road West was obtained from the City of Hamilton and is provided in Appendix A. Commercial vehicle percentages for Airport Road and Upper James Street were calculated from 8-hour intersection turning counts. Table III summarizes the parameters and assumptions that are applied to each roadway for assessment.

Table III: Roadway Parameters & Assumptions

Road Name	Day / Night Split (% / %)	Commercial Vehicle Percentages		Posted Speed Limit (km/h)
		Medium Truck %	Heavy Truck %	
Airport Road	90 / 10	3.0	2.0	50
Upper James Street	90 / 10	2.8	1.7	80
White Church Road East	90 / 10	2.0	2.0	60

The prediction considered traffic that will exist in 10 years (2034), assuming annual traffic growth of 2.5% on all roadways, as required by the MECP. The higher of the AADT from the turning counts or from the Hamilton online database were used. Table IV summarizes the traffic volume data used in the traffic noise assessment.

Table IV: Projected Road Traffic Data

Road Name		Cars	Medium Trucks	Heavy Trucks	Total
Airport Road West	Daytime	7 202	227	144	7 573
	Nighttime	800	25	16	841
	Total	**8 002**	**252**	**160**	**8 415**
Upper James Street	Daytime	28 069	823	500	29 392
	Nighttime	3 119	91	56	3 266
	Total	**31 188**	**914**	**555**	**32 658**
White Church Road East	Daytime	5 002	104	104	5 210
	Nighttime	556	12	12	579
	Total	**5 557**	**116**	**116**	**5 789**

4.2 Road Traffic Noise Predictions

To assess the levels of the 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. STAMSON outputs are included in Appendix B.

Sound levels were predicted at ground level in the rear yards (OLA's) during daytime hours to investigate the need for noise barriers. Sound levels were also predicted in the plane of the second or

third storey windows during daytime and nighttime hours to investigate ventilation requirements. Since building envelope locations are not yet known, typical building setbacks were used in the analysis. A typical rear yard setback of 7 m, front yard setback of 7 m, exterior side yard setback of 4.5 m and interior side yard setback of 1.2 m were used in the analysis. For the mixed-use block, a 4-storey building is assumed to be located 20 m from the centre line of Upper James Street.

The acoustic requirements may change when siting information is known and if orientation/use of the blocks are changed. Table V summarizes the predicted sound levels at each of the sound level prediction locations.

Table v: Predicted Road Traffic Sound Levels [dBA] Without Mitigation

Location	Description	Daytime – OLA $L_{EQ(16)}$	Daytime – Façade $L_{EQ(16)}$	Nighttime – Façade $L_{EQ(8)}$
A	Mixed-Use Block adjacent to Upper James Street	--	70	64
B	Residential Block with Exposure to Upper James Street and Airport Road	55	57	50
C	Residential Block adjacent to Airport Road	60	60	54
D	Residential Block adjacent to White Church Road East	60	60	53
E	Institutional Block with exposure to Upper James Street	<55*	58	--

Note: * Amenity assumed to be on shieled side of dwelling, away from White Church Road

4.3 Air Traffic

The 2011 Composite Noise Contour Map for the John C. Munro Hamilton International Airport was obtained. This Map indicated that some residential portions of the proposed site are located between the 25 and 28 NEF/NEP contour. The south portion of the lands are outside of the NEF 25 noise contour.

5 Discussion and Recommendations

The sound level predictions indicate that road traffic sound levels exceed MECP criteria during the daytime and nighttime at facades of dwellings with exposure to Airport Road, Upper James Street and White Church Road East. Recommendations for traffic noise are provided below.

5.1 Noise Barrier Requirements

Mixed-Use Blocks

Details for these blocks are not currently available. Multi-storey buildings on these blocks will likely include balconies or terraces that are less than 4 m in depth. These balconies and terraces are not considered as outdoor living areas under MECP guidelines and therefore physical mitigation will not be required. If the buildings are to have dedicated outdoor amenity areas, they should be located on the shielded side of the building, away from the roadways.

Residential Lots adjacent to Airport Road

The predicted sound level in the rear yard adjacent to Airport Road, assuming reverse frontage, will be 60 dBA. MECP Guidelines do not require physical mitigation if sound levels are equal to or less than 60 dBA with the inclusion of a warning clause. As required by the City of Hamilton, to reduce the sound level in the rear yards with full exposure to Airport Road to 55 dBA, a 2.0 m high noise barrier will be required. Warning clauses are also required to inform future residents of the traffic noise impact.

Residential Lots adjacent to White Church Road

The predicted sound level in the rear yard adjacent to White Church Road, assuming reverse frontage, will be 59 dBA. MECP Guidelines do not require physical mitigation if sound levels are less than 60 dBA with the inclusion of a warning clause. As required by the City of Hamilton, to reduce the sound level in the rear yards with full exposure to White Church Road to 55 dBA, a 2.0 m high noise barrier will be required. Warning clauses are also required to inform future residents of the traffic noise impact.

Institutional & School Blocks adjacent to White Church Road and Airport Road

If the buildings are to have dedicated outdoor amenity areas, they should be located on the shielded side of the building, away from the roadways to avoid noise barrier requirements.

When siting and grading plan is available, the noise barrier location and height shall be confirmed. The wall component of the barrier should be of a solid construction with a surface density of no less than 20 kg/m2. The walls may be constructed from a variety of materials such as glass, wood, brick, pre-cast concrete or other concrete/wood composite systems provided that it is free of gaps or cracks.

5.2 Ventilation Requirements

Central Air Conditioning

For the Mixed-Use Blocks, adjacent to Upper James Street, the predicted nighttime sound levels outside the windows will be greater than 65 dBA during the daytime hours and greater than 60 dB during the nighttime hours. Central air conditioning will be required for dwellings with direct exposure to Upper James Street.

Provision for the Future Installation of Air Conditioning

The predicted nighttime sound levels outside the second storey bedroom windows of the lots/blocks with exposure to Upper James Street, Airport Road and White Church Road have nighttime sound levels at the plane of the bedroom/living/dining room windows are between 51 and 60 dBA and the daytime sound levels at the plane of the bedroom/living/dining room window are between 56 and 65 dBA. These lots/blocks will require the provision for the future installation of central air conditioning systems. This requirement is typically satisfied through the installation of forced air ventilation systems with the ductwork sized for the future installation of central air conditioning by the occupant.

The future residential lots/blocks between NEF 25 to 28 will also require the provision for the future installation of central air conditionings by the occupant. Since the location of the NEF contours are approximate, it is recommended that all residential lots include forced air ventilation systems with ductwork sized for the future installation of central air conditioning by the occupant.

5.3 Building Facade Constructions

Future road traffic sound levels for the mixed-use blocks will exceed 65 dBA during the daytime hours and 60 dBA during the nighttime hours, upgraded exterior building façade constructions will be required. The acoustic insulation factors (AIF) required for road traffic and air traffic must be combined to obtain an overall AIF for some of the lots that also have exposure to the roadways. The required building components are selected based on the overall AIF value.

To do so, calculations were performed to determine the acoustical insulation factors to maintain indoor sound levels within MECP guidelines. The calculation methods were developed by the National Research Council (NRC). They are based on the predicted future sound levels at the building facades, and the anticipated area ratios of the facade components (walls, windows, roofs and doors) and the floor area of the adjacent room.

a) Mixed-Use Blocks

Glazing Requirements

The minimum specification for the walls, windows, roofs and doors is Acoustical Insulation Factor, AIF-32 for bedrooms and living/dining/family rooms. Based on a window to floor area ratio of 25% for bedrooms and 40% for living/dining rooms, minimum STC-33 glazing constructions are required.

Exterior Wall Construction

Any exterior wall construction meeting the Ontario Building Code (OBC) will be acceptable for the dwellings as long as the exterior wall area to room floor area ratio does not exceed 80% for living/dining rooms.

Exterior Doors

Any insulated metal exterior door meeting OBC requirements will be sufficient to provide noise insulation. If patio doors are to be used in the dwellings, they must be included in the window area.

Ceiling/Roof System

A typical ceiling/roof construction consisting of a concrete slab, rigid insulation and built up roofing would provide adequate sound insulation for the buildings.

b) Lots/Blocks between NEF 25-28

Since a portion of the site is located between the 25 to 28 NEF/NEP contours for the John C. Munro Hamilton International Airport, air traffic noise must be considered in the building designs over the remainder of the site.

Glazing Requirements

The minimum specification for the walls, windows, roofs and doors is Acoustical Insulation Factor, AIF-30 for bedrooms and living/dining/family rooms. As a minimum, STC-32 window glazing constructions are recommended.

Exterior Wall Construction

Any exterior wall construction meeting the Ontario Building Code (OBC) will be acceptable for the dwellings on lots in the remainder of the development, as long as the exterior wall area to room floor area ratio does not exceed 120%.

Exterior Doors

Any insulated metal exterior door meeting OBC requirements will be sufficient to provide noise insulation. If patio doors are to be used in the dwellings, they must be included in the window area.

Ceiling/Roof System

Sloped roofs with ventilated attics are recommended above all noise sensitive rooms in the dwelling units. Cathedral ceilings or vaulted ceilings are not recommended. If such constructions are desirable, HGC Engineering should be contacted to provide recommendations.

Further Analysis

An acoustical consultant should review the plans for the different types of dwellings to be located in the development to ensure that these components will provide adequate sound insulation for the dwelling units. As a general note, if brick exterior facades are used and sloped roofs with ventilated attics are located above all rooms in the dwelling units, the window requirements will be less stringent.

5.4 Warning Clauses

The MECP guidelines recommend that the following warning clauses be included in the property agreements and/or purchase and sale agreements for the dwellings with anticipated traffic sound level excesses.

Type A:

Purchasers/tenants are advised that sound levels due to increasing road traffic and air traffic may occasionally interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the Municipality and the Ministry of the Environment.

Type B:

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 traffic and air traffic may on occasions interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the Municipality and the Ministry of the Environment."

Type C:

This dwelling unit has been designed with the provision for adding central air conditioning at the occupant's discretion. Installation of central air conditioning by the occupant in low and medium density developments will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment."

Type D:

This dwelling unit has been supplied with a central air conditioning system which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment.

Type E:

Purchasers/tenants are advised that due to the proximity of the adjacent commercial uses, noise from the facilities may at times be audible.

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

6 Summary of Noise Control Recommendations

The following recommendations are provided in regard to noise mitigation for traffic noise.

1. Noise barriers may be required for the rear yards of lots/blocks with backing exposure to Airport Road and White Church Road. When detailed lotting information and grading information is available, the acoustic barrier heights and locations should be refined.

2. Central air conditioning is required for the mixed-use blocks adjacent to Upper James Street. Forced air ventilation with ducts sized to accommodate the future installation of central air conditioning is recommended for all remaining dwelling units in the development.

3. Upgraded building constructions are required for blocks between NEF 25 to NEF 28. When architectural drawings are available, an acoustical consultant should review the drawings and provide revised glazing recommendations based on actual window to floor area ratios.

4. Warning clauses should be used to inform future residents of the traffic noise issues.

5. When siting information is available for the mixed-use and institutional blocks, a detailed noise study should be performed to determine any acoustic requirements in accordance with NPC-300.

The reader is referred to the previous sections of this report where these recommendations are discussed in more detail. The following table summarizes the recommendations made in this report.

Table VI: Summary of Preliminary Noise Control Requirements and Noise Warning

Prediction Location or Area	Location	Acoustic Barrier◇	Ventilation	Type of Warning Clause	Minimum Glazing Constructions[1]
A	Mixed-Use Block	--	Central A/C	A, D, E	STC-33
B	Residential Block with Exposure to Upper James Street and Airport Road	--	Forced Air Ventilation	A, C, E	STC-32
C	Residential Block adjacent to Airport Road	✓	Forced Air Ventilation	A, B, C	STC-33
D	Residential Block adjacent to White Church Road East	✓	Forced Air Ventilation	A, B, C, E	STC-32
Institutional Blocks	All Elementary School Blocks	--	Alternative to Open Windows	A, C (D)	STC-32
All other lands within NEF-25 and NEF-28		--	Forced Air Ventilation	A, C	STC-32
All remaining lands outside of NEF-25, away from White Church Road		--	Forced Air Ventilation*	A, C*	STC-32*

Notes:
-- no specific requirement
OBC – Ontario Building Code Requirements
◇ Barrier heights should reduce the sound level to less than 60 dBA, as close to 55 dBA as possible depending on the requirements of the municipality. When detailed grading information is available, the acoustic barrier heights should be refined.
* – Recommended due to proximity of the airport and roadways
1 – Preliminary STC requirements, subject to refinement

The reader is referred to the previous sections of this report where these recommendations are discussed in more detail.

6.1 Implementation

To ensure that the noise control recommendations outlined above are properly implemented prior to registration, it is recommended that:

1. When the detailed lot plans are available, a Professional Engineer qualified to provide acoustical engineering services in Ontario shall review them to refine or determine if noise control measures are required (acoustic barriers, ventilation requirements, building façade constructions and warning clauses).

2. When the site plans and architectural plans (elevations and floor plans) are available for the mixed-use blocks, a Professional Engineer qualified to provide acoustical engineering services in Ontario shall review them to determine if noise control measures are required (acoustic barriers, ventilation requirements and building façade constructions).

3. When the site plans and architectural plans (elevations and floor/roof plans) are available for the institutional and school blocks, a Professional Engineer qualified to provide acoustical engineering services in Ontario shall conduct a detailed noise study to confirm that that stationary noise sources associated with these uses can meet MECP limits at off-site noise sensitive receptors.

4. Prior to final approval, when dwelling locations and final grades are available, a Professional Engineer qualified to perform acoustical services in the province of Ontario to review the lot plan and grading plans to confirm that the noise barriers as approved have been incorporated for the lots/blocks.

5. Prior to the issuance of occupancy permits for lots/blocks with noise control requirements, or a Professional Engineer qualified to perform acoustical engineer services in the province of Ontario should certify that the noise control measures have been properly incorporated, installed, and constructed, as required.

7 Conclusions

In summary, HGC Engineering has reviewed the White Church Secondary Plan and performed calculations to determine the traffic noise impact in accordance with MECP guidelines.

The development is feasible from a noise perspective. The results of the road and air traffic noise assessment indicate that noise sensitive land uses will require central air conditioning systems or forced air ventilation systems, noise warning clauses, and upgraded building constructions (exterior walls and windows) as specified in this report. Noise barriers may also be required depending on the location of the amenity spaces with respect to the roadways.

When the detailed lotting plans and building locations are available, a Professional Engineer qualified to provide acoustical engineering services in Ontario shall conduct a detailed noise study to review the plans to refine or determine if noise control measures are required (acoustic barriers, ventilation requirements, building façade constructions and warning clauses) for each specific block.

Figure 1: Key Plan

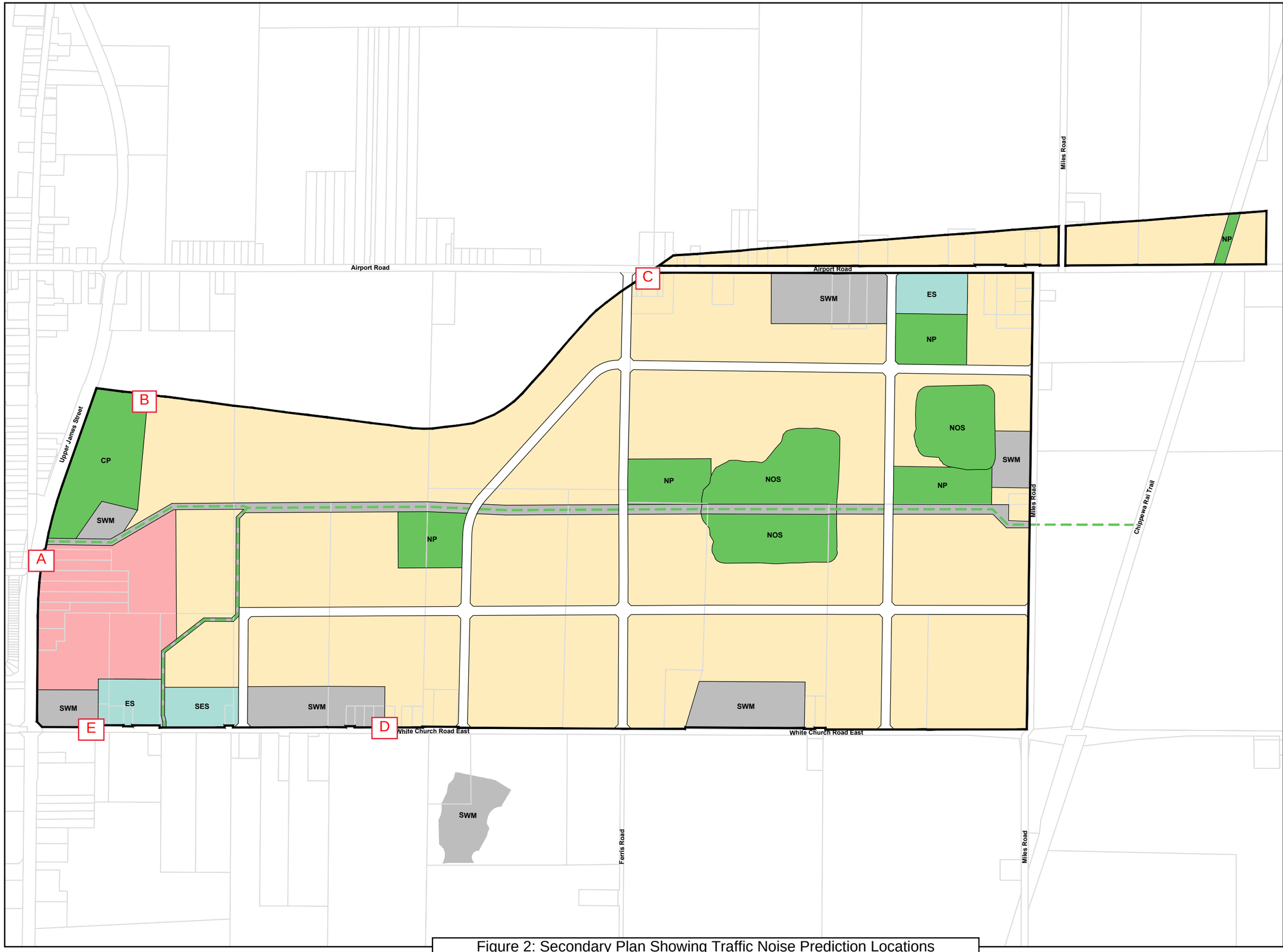
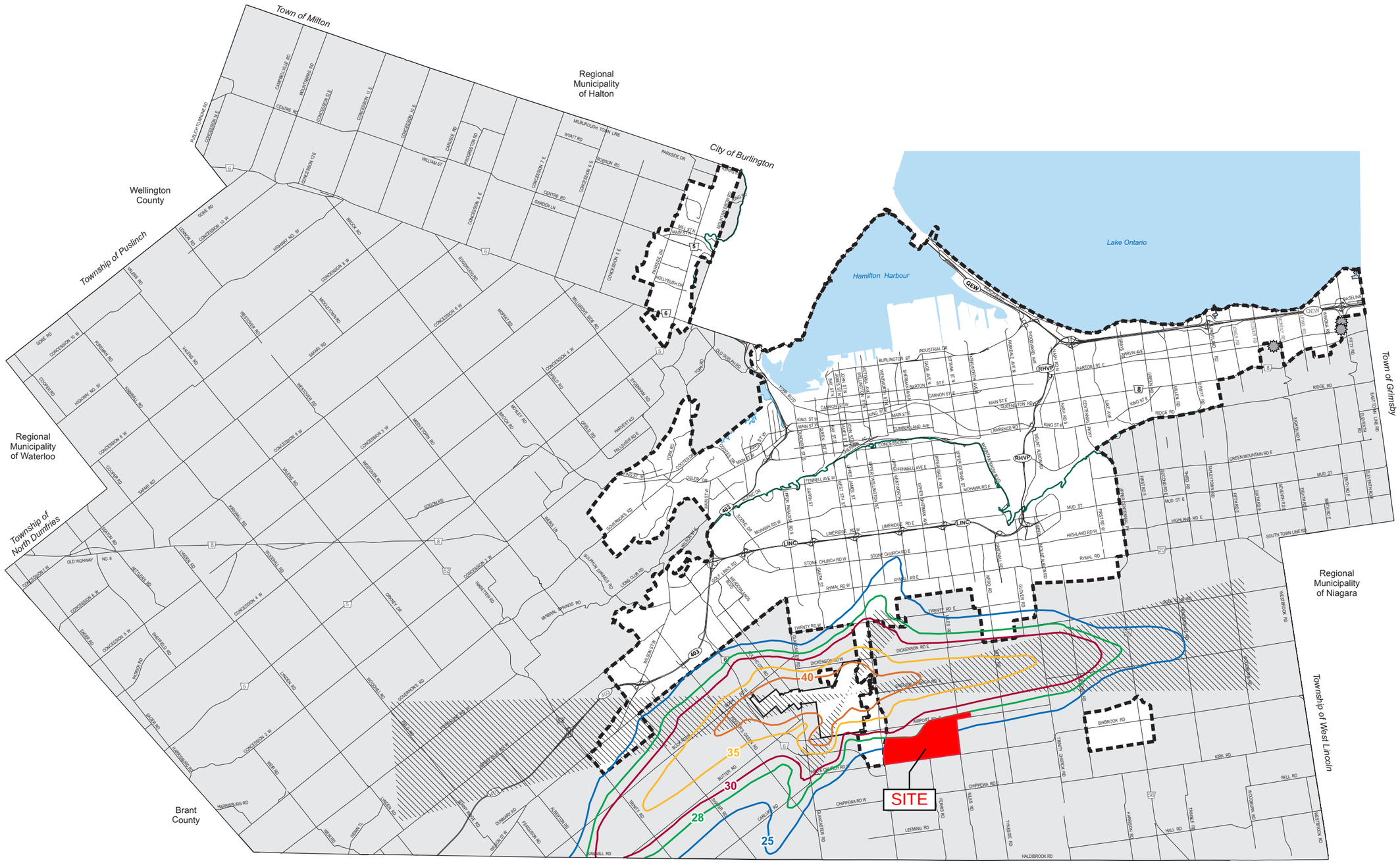
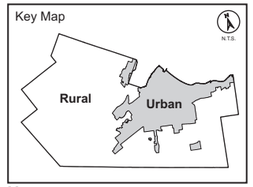


Figure 2: Secondary Plan Showing Traffic Noise Prediction Locations

Figure 3: Aerial Plan



Key Map



Note: For Rural Noise Exposure Forecast Contours and Primary Zoning Regulation Area Designations, refer to Appendix D of the Rural Hamilton Official Plan.

Legend

- 25 — 2010 NEF Contour
- 28 — 2010 NEF Contour
- 30 — 2010 NEF Contour
- 35 — 2010 NEF Contour
- 40 — 2010 NEF Contour
- Primary Airport Zoning Regulation Area

Other Features

- Rural Area
- John C. Munro Hamilton International Airport
- Niagara Escarpment
- Urban Boundary
- Municipal Boundary
- **Subject to Future OMB Hearing**

Urban Hamilton Official Plan Appendix D

Noise Exposure Forecast Contours and Primary Zoning Regulation Area

Not To Scale

Date: July 9, 2009

Hamilton

PLANNING & ECONOMIC DEVELOPMENT DEPARTMENT

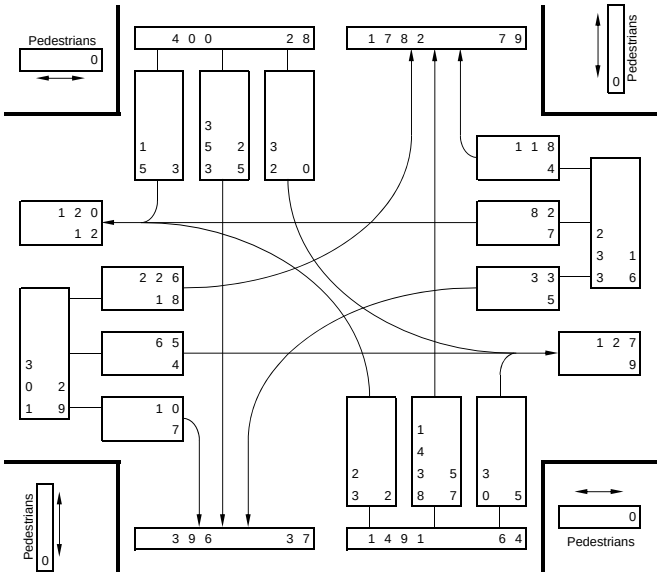
Figure 4: NEF Contour Map

Appendix A

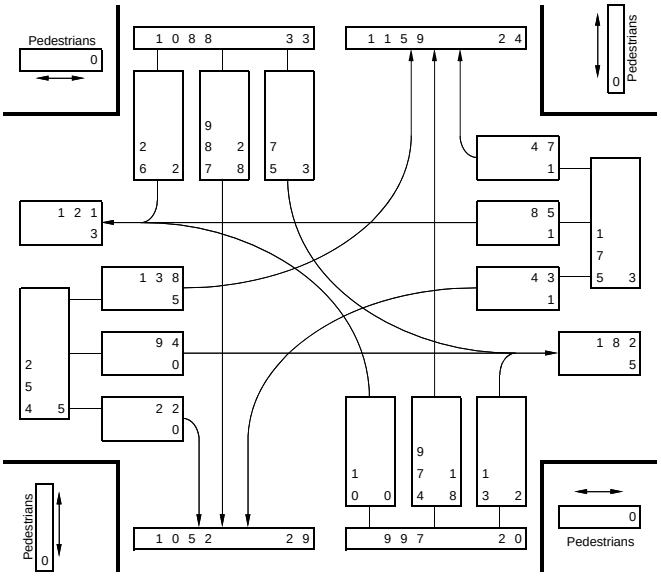
Road Traffic Data

City of Hamilton **TURNING MOVEMENT FLOW CHART** Loc. Code: 89

Intersection: **Airport Rd** **at** **Upper James St** Total Vehicles: 13,454 Date: Monday
Direction: (East/West) (North/South) M.V.E./Year: 9.560 May 16, 2016
Road Condition: Dry Weather: Clear AWDT Factor: 2.09 Period: 7 hours
Comments:

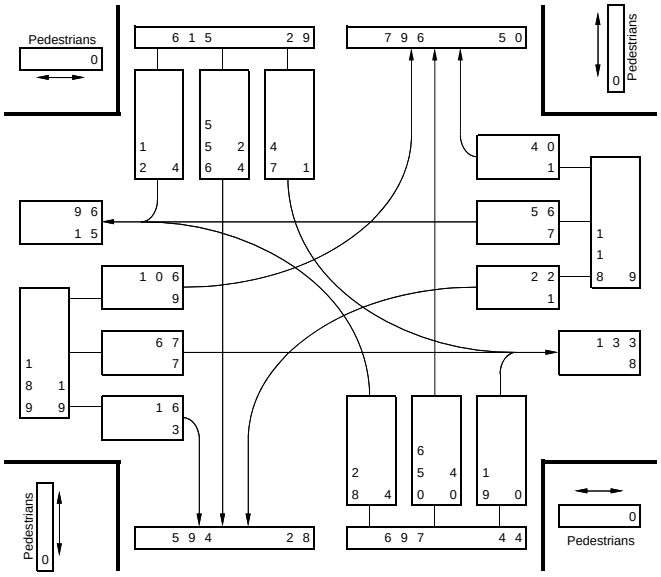


A.M. PEAK HOUR = 7:30 AM - 8:30 AM

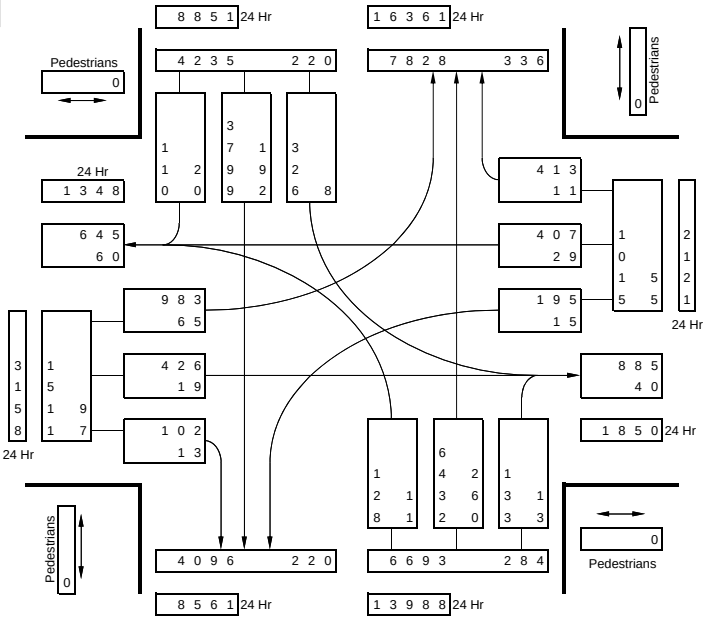


P.M. PEAK HOUR = 5:00 PM - 6:00 PM

N



NORMAL HOUR = 2:30 PM - 3:30 PM



7 Hr & 24 Hr TOTAL VOLUMES

7-Hr Traffic

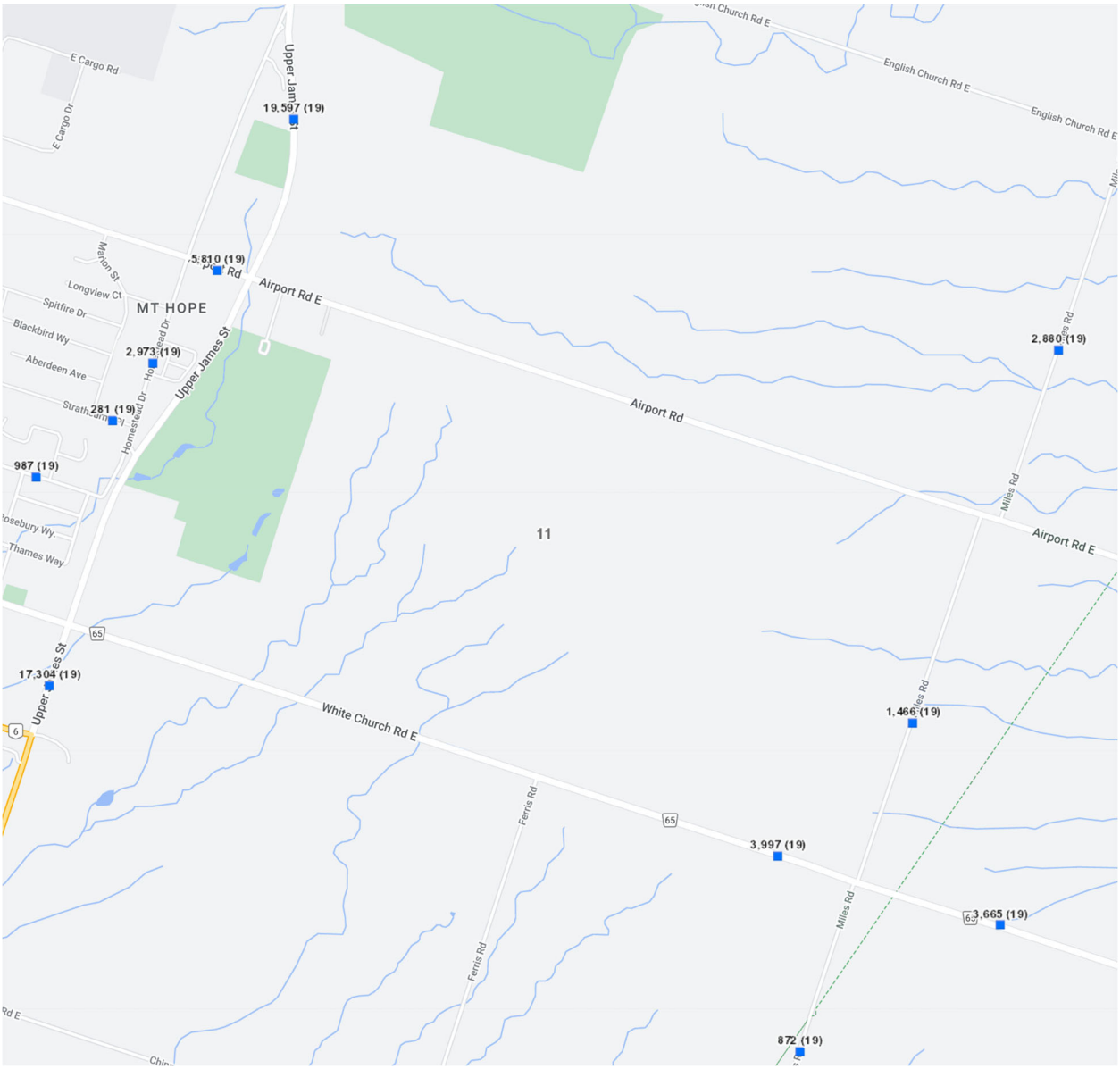
Upper James(South of Airport)
Cars: 4096+6693=10789
Trucks: 220+284=504 4.5%

Airport Rd
Cars: 1015+885=1900
Trucks: 55+40=94 4.9%

24-Hr Traffic

Upper James (South of Airport)
Total: 8561+13988= 22,549

Airport Rd (East of Upper James)
Total: 2121+1850 = 3,971



https://open.hamilton.ca/pages/mapping

Appendix B

STAMSON 5.04 Output

```
STAMSON 5.0        NORMAL REPORT        Date: 07-12-2023 17:04:39
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: a.te                  Time Period: Day/Night 16/8 hours
Description: Predicted daytime and nighttime sound levels at upper storey windows for
Mixed-Use block, location [A]

Road data, segment # 1: UpperJames (day/night)
-----------------------------------------------
Car traffic volume  : 28069/3119  veh/TimePeriod  *
Medium truck volume :   823/91    veh/TimePeriod  *
Heavy truck volume  :   500/56    veh/TimePeriod  *
Posted speed limit  :    80 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):  22549
    Percentage of Annual Growth        :   2.50
    Number of Years of Growth          :  15.00
    Medium Truck % of Total Volume     :   2.80
    Heavy Truck  % of Total Volume     :   1.70
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: UpperJames (day/night)
---------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  20.00 / 20.00  m
Receiver height           :  10.50 / 10.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: UpperJames (day)
-------------------------------------

Source height = 1.14 m

ROAD (0.00 + 70.43 + 0.00) = 70.43 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.40  73.17   0.00  -1.75  -0.98   0.00   0.00   0.00  70.43
-------------------------------------------------------------------------------

Segment Leq : 70.43 dBA

Total Leq All Segments: 70.43 dBA
```

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

Source height = 1.14 m

ROAD (0.00 + 63.91 + 0.00) = 63.91 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.40  66.64   0.00  -1.75  -0.98   0.00   0.00   0.00  63.91
-------------------------------------------------------------------------------

Segment Leq : 63.91 dBA

Total Leq All Segments: 63.91 dBA


TOTAL Leq FROM ALL SOURCES (DAY): 70.43
                           (NIGHT): 63.91
```

```
STAMSON 5.0        NORMAL REPORT        Date: 07-12-2023 17:05:12
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: b.te                  Time Period: Day/Night 16/8 hours
Description: Predicted daytime and nighttime sound levels at upper storey windows,
location [B]

Road data, segment # 1: Airport (day/night)
-------------------------------------------
Car traffic volume  :  7202/800   veh/TimePeriod  *
Medium truck volume :   227/25    veh/TimePeriod  *
Heavy truck volume  :   144/16    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):   5810
    Percentage of Annual Growth        :   2.50
    Number of Years of Growth          :  15.00
    Medium Truck % of Total Volume     :   3.00
    Heavy Truck  % of Total Volume     :   1.90
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: Airport (day/night)
-----------------------------------------
Angle1   Angle2           :   0.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 375.00 / 375.00 m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Road data, segment # 2: UpperJames (day/night)
----------------------------------------------
Car traffic volume  : 28069/3119  veh/TimePeriod  *
Medium truck volume :   823/91    veh/TimePeriod  *
Heavy truck volume  :   500/56    veh/TimePeriod  *
Posted speed limit  :    80 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):  22549
    Percentage of Annual Growth        :   2.50
    Number of Years of Growth          :  15.00
    Medium Truck % of Total Volume     :   2.80
    Heavy Truck  % of Total Volume     :   1.70
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 2: UpperJames (day/night)
--------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 160.00 / 160.00 m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
```

```
Reference angle           :   0.00

Results segment # 1: Airport (day)
-----------------------------------

Source height = 1.17 m

ROAD (0.00 + 37.98 + 0.00) = 37.98 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     90   0.49  62.97   0.00 -20.83  -4.17   0.00   0.00   0.00  37.98
-------------------------------------------------------------------------------

Segment Leq : 37.98 dBA

Results segment # 2: UpperJames (day)
-------------------------------------

Source height = 1.14 m

ROAD (0.00 + 56.68 + 0.00) = 56.68 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.49  73.17   0.00 -15.33  -1.16   0.00   0.00   0.00  56.68
-------------------------------------------------------------------------------

Segment Leq : 56.68 dBA

Total Leq All Segments: 56.74 dBA

Results segment # 1: Airport (night)
-----------------------------------

Source height = 1.17 m

ROAD (0.00 + 31.44 + 0.00) = 31.44 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     90   0.49  56.43   0.00 -20.83  -4.17   0.00   0.00   0.00  31.44
-------------------------------------------------------------------------------

Segment Leq : 31.44 dBA

Results segment # 2: UpperJames (night)
---------------------------------------

Source height = 1.14 m

ROAD (0.00 + 50.16 + 0.00) = 50.16 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.49  66.64   0.00 -15.32  -1.16   0.00   0.00   0.00  50.16
-------------------------------------------------------------------------------

Segment Leq : 50.16 dBA

Total Leq All Segments: 50.22 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 56.74
                           (NIGHT): 50.22
```

```
STAMSON 5.0        NORMAL REPORT        Date: 07-12-2023 18:48:28
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: c.te                  Time Period: Day/Night 16/8 hours
Description: Predicted daytime and nighttime sound levels at upper storey windows,
location [C]

Road data, segment # 1: Airport (day/night)
-------------------------------------------
Car traffic volume  :  7194/799   veh/TimePeriod  *
Medium truck volume :   227/25    veh/TimePeriod  *
Heavy truck volume  :   151/17    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):   5810
    Percentage of Annual Growth        :   2.50
    Number of Years of Growth          :  15.00
    Medium Truck % of Total Volume     :   3.00
    Heavy Truck  % of Total Volume     :   2.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: Airport (day/night)
-----------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  23.00 / 23.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: Airport (day)
----------------------------------
Source height = 1.19 m

ROAD (0.00 + 59.15 + 0.00) = 59.15 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.49  63.07   0.00  -2.76  -1.15   0.00   0.00   0.00  59.15
-------------------------------------------------------------------------------
Segment Leq : 59.15 dBA

Total Leq All Segments: 59.15 dBA

Results segment # 1: Airport (night)
------------------------------------
Source height = 1.19 m

ROAD (0.00 + 52.63 + 0.00) = 52.63 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.49  56.55   0.00  -2.76  -1.15   0.00   0.00   0.00  52.63
-------------------------------------------------------------------------------
Segment Leq : 52.63 dBA

Total Leq All Segments: 52.63 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.15
                           (NIGHT): 52.63
```

```
STAMSON 5.0        NORMAL REPORT        Date: 07-12-2023 18:48:00
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: c_ola.te             Time Period: 16 hours
Description: Predicted daytime sound level in the rear yard, reverse frontage to
Airport Road, Location [C]

Road data, segment # 1: Airport
-------------------------------
Car traffic volume  :  7194 veh/TimePeriod  *
Medium truck volume :   227 veh/TimePeriod  *
Heavy truck volume  :   151 veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: Airport
------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  20.00 m
Receiver height           :   1.50 m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: Airport
----------------------------

Source height = 1.19 m

ROAD (0.00 + 59.53 + 0.00) = 59.53 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.66  63.07   0.00  -2.07  -1.46   0.00   0.00   0.00  59.53
-------------------------------------------------------------------------------

Segment Leq : 59.53 dBA

Total Leq All Segments: 59.53 dBA

TOTAL Leq FROM ALL SOURCES:       59.53
```

```
STAMSON 5.0        NORMAL REPORT        Date: 07-12-2023 18:49:11
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: d.te                  Time Period: Day/Night 16/8 hours
Description: Predicted daytime and nighttime sound levels at upper storey windows,
location [D]

Road data, segment # 1: WhiteChurch (day/night)
-----------------------------------------------
Car traffic volume  :  5002/556   veh/TimePeriod  *
Medium truck volume :   104/12    veh/TimePeriod  *
Heavy truck volume  :   104/12    veh/TimePeriod  *
Posted speed limit  :    60 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):   3997
    Percentage of Annual Growth        :   2.50
    Number of Years of Growth          :  15.00
    Medium Truck % of Total Volume     :   2.00
    Heavy Truck  % of Total Volume     :   2.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: WhiteChurch (day/night)
---------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  23.00 / 23.00  m
Receiver height           :   4.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: WhiteChurch (day)
--------------------------------------
Source height = 1.19 m

ROAD (0.00 + 58.64 + 0.00) = 58.64 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.58  62.89   0.00  -2.93  -1.32   0.00   0.00   0.00  58.64
-------------------------------------------------------------------------------
Segment Leq : 58.64 dBA

Total Leq All Segments: 58.64 dBA

Results segment # 1: WhiteChurch (night)
----------------------------------------
Source height = 1.20 m

ROAD (0.00 + 52.21 + 0.00) = 52.21 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.58  56.46   0.00  -2.93  -1.32   0.00   0.00   0.00  52.21
-------------------------------------------------------------------------------
Segment Leq : 52.21 dBA

Total Leq All Segments: 52.21 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 58.64
                           (NIGHT): 52.21
```

```
STAMSON 5.0        NORMAL REPORT        Date: 07-12-2023 18:49:35
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: dola.te              Time Period: 16 hours
Description: Predicted daytime sound level in the rear yard, reverse frontage to
White Church Road, Location [D]

Road data, segment # 1: WhiteChurch
----------------------------------
Car traffic volume  :  5002 veh/TimePeriod  *
Medium truck volume :   104 veh/TimePeriod  *
Heavy truck volume  :   104 veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: WhiteChurch
---------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  20.00 m
Receiver height           :   1.50 m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: WhiteChurch
---------------------------------

Source height = 1.19 m

ROAD (0.00 + 59.36 + 0.00) = 59.36 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.66  62.89   0.00  -2.07  -1.46   0.00   0.00   0.00  59.36
-------------------------------------------------------------------------------

Segment Leq : 59.36 dBA

Total Leq All Segments: 59.36 dBA


TOTAL Leq FROM ALL SOURCES:       59.36
```

```
STAMSON 5.0        NORMAL REPORT        Date: 07-12-2023 18:52:19
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: e.te                 Time Period: 16 hours
Description: Predicted daytime sound levels at upper storey windows of Institutional
Block, location [E]

Road data, segment # 1: WhiteChurch
----------------------------------
Car traffic volume  :  5002 veh/TimePeriod  *
Medium truck volume :   104 veh/TimePeriod  *
Heavy truck volume  :   104 veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: WhiteChurch
---------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  20.00 m
Receiver height           :   7.50 m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Road data, segment # 2: Upper James
----------------------------------
Car traffic volume  : 28069 veh/TimePeriod  *
Medium truck volume :   823 veh/TimePeriod  *
Heavy truck volume  :   500 veh/TimePeriod  *
Posted speed limit  :    80 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 2: Upper James
---------------------------------
Angle1   Angle2           :   0.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 200.00 m
Receiver height           :   7.50 m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: WhiteChurch
---------------------------------

Source height = 1.19 m

ROAD (0.00 + 59.88 + 0.00) = 59.88 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.49  62.89   0.00  -1.86  -1.15   0.00   0.00   0.00  59.88
-------------------------------------------------------------------------------

Segment Leq : 59.88 dBA
```

```
Results segment # 2: Upper James
--------------------------------

Source height = 1.14 m

ROAD (0.00 + 52.23 + 0.00) = 52.23 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     90   0.49  73.17   0.00 -16.77  -4.17   0.00   0.00   0.00  52.23
-------------------------------------------------------------------------------

Segment Leq : 52.23 dBA

Total Leq All Segments: 60.57 dBA

TOTAL Leq FROM ALL SOURCES:       60.57
```

```
STAMSON 5.0        NORMAL REPORT        Date: 07-12-2023 18:52:40
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: eola.te              Time Period: 16 hours
Description: Predicted daytime sound level in the amenity space, shielded by building
from White Church Road, Location [E]

Road data, segment # 1: WhiteChurch
----------------------------------
Car traffic volume  :  5002 veh/TimePeriod  *
Medium truck volume :   104 veh/TimePeriod  *
Heavy truck volume  :   104 veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: WhiteChurch
----------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  40.00 m
Receiver height           :   1.50 m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :   8.00 m
Barrier receiver distance :   5.00 m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Road data, segment # 2: Upper James
----------------------------------
Car traffic volume  : 28069 veh/TimePeriod  *
Medium truck volume :   823 veh/TimePeriod  *
Heavy truck volume  :   500 veh/TimePeriod  *
Posted speed limit  :    80 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 2: Upper James
----------------------------------
Angle1   Angle2           :   0.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 200.00 m
Receiver height           :   1.50 m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Results segment # 1: WhiteChurch
---------------------------------

Source height = 1.19 m

Barrier height for grazing incidence
-------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.19 !        1.50 !        1.46 !         1.46

ROAD (0.00 + 39.92 + 0.00) = 39.92 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.19  62.89   0.00  -5.07  -0.51   0.00   0.00 -17.39  39.92
-------------------------------------------------------------------------------

Segment Leq : 39.92 dBA

Results segment # 2: Upper James
---------------------------------

Source height = 1.14 m

ROAD (0.00 + 50.02 + 0.00) = 50.02 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     90   0.66  73.17   0.00 -18.67  -4.47   0.00   0.00   0.00  50.02
-------------------------------------------------------------------------------

Segment Leq : 50.02 dBA

Total Leq All Segments: 50.42 dBA

TOTAL Leq FROM ALL SOURCES:       50.42
```