

Final

The Rapids Parkway Extension / Nature Trail Environmental Assessment – Schedule ‘C’ Environmental Noise Study

City of Sarnia



Prepared for City of Sarnia
by IBI Group
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1 Introduction

The City of Sarnia retained IBI Group to undertake the Class EA Schedule ‘C’ for proposed extension of the Rapids Parkway from Sandpiper Drive south to Exmouth Street in the City of Sarnia. The proposed improvements are required to meet the needs of the City to 2027, including satisfying travel demand to and across the study area. The study area extends approximately 1.1 kilometres, and the roadway will cross under Highway 402.

The proposed section of the Rapids Parkway is designed as a two-lane arterial road. Adjacent land use is primarily residential, with commercial lands located along the east road alignment, south of Highway 402. Construction is anticipated to occur in 2021.

The purpose of this subject Environmental Noise Study is to forecast future noise levels under the proposed extension of The Rapids Parkway, in order to identify if noise mitigation measures are required, and if so to recommend these measures.

2 Noise Criteria

Environmental noise assessments for road improvement projects typically consider noise levels at Outdoor Living Areas (OLAs) since noise mitigation at existing buildings is not typically practical given the building exists and its receiver locations are typically elevated.

The City of Sarnia does not have a specific policy for noise mitigation on municipal roads. Therefore, the Ontario MOE/MTO, “Joint Protocol”, A Protocol for Dealing with Noise concerns during the Preparation, Review and Evaluation of Provincial Highway’s Environmental Assessments (MTO & MOE, 1986) policy has been adopted for use in this study (refer to Appendix A for MTO criteria). Noise attenuation using noise walls will be considered for OLAs for existing residential properties under the following conditions:

- Since there is no existing road present, the ‘existing’ noise level is assumed to be 55 dBA as per the policy;
- If the outdoor living area (OLA) for each residential lot has side-yard and rear-yard exposure to The Rapids Parkway;
- Where the projected noise levels are predicted to exceed 65 dBA (0700 to 2300 16-hour LEQ) or where the projected noise levels are predicted to be above 60 dBA (0700 to 2300 16-hour LEQ) and the difference between the existing and projected noise levels is 5 dBA or more; and
- The proposed mitigation measures must provide a minimum reduction of 5 dBA, or be mitigated to as close to ambient as technically feasible over the 0700 to 2300 time period in order to warrant construction.

3 Noise Prediction Methods

The MECP's noise modeling software, STAMSON v5.04 which incorporates 'Ontario Road Noise Analysis Method for Environment and Transportation (ORNAMENT)', was used to determine the noise levels generated for existing and future conditions. This software is recognized for the purposes of traffic (vehicular and rail) noise modelling in Ontario.

STAMSON output for the scenarios modelled in this study is included in **Appendix B**.

4 Traffic Data

Year 2017 traffic data provided by the City of Sarnia were used as input to this Environmental Noise Study. The data contained detailed information on 2017 annual average daily traffic (AADT) for the Rapids Parkway and other associated data. The traffic data are summarized in Table 1.

Table 1 – Traffic Data

ITEM	Section 1
2017 Average Annual Daily Traffic (AADT)	9,500
Annual Growth Rate (%)	2.0
Years of Growth (2017-2031)	14
Medium Trucks (%)	2.5
Heavy Trucks (%)	2.5
Road Grade (%)	< 2
Posted Speed Limit (km/h)	50
Day / Night Split (%)	90/10

5 Noise Sensitive Points of Reception

For this study, noise sensitive “points of reception” were identified along the proposed corridor of the Rapids Parkway using aerial photographs and property information provided by the City of Sarnia.

A “worst-case” representative Outdoor Living Area (OLA) receiver location was identified within Section 3. This OLA receiver is located 3.0m from the face of the residential building as per MECP guidelines. This receiver location is considered to be ‘worst-case’ location as it is closest and most exposed to The Rapids Parkway, and experiences the highest traffic volume. This receiver location will represent all receiver locations and be used to determine the effectiveness of a noise wall in reducing future noise levels at the OLA (refer to Section 6.2).

6 Results

6.1 Free-Field Analysis

A free-field analysis was completed using STAMSON to determine the maximum limits (distance) of impact from The Rapids Parkway on adjacent residential properties. This analysis is an assessment of noise impacts without consideration for any physical mitigation that would provide for reduction of noise. All residential properties found within the free-field area with daytime noise level in excess of 60 dBA would be further investigated to determine if they should be considered for the implementation of noise mitigation measures.

The existing and future conditions 60dBA free-field limits for each of the six sections of The Rapids Parkway are provided in Table 2 and shown on Figures N1 to N3 (included in Appendix C).

Table 2 – Free-Field Limits (60 dBA)

Location	Future (2031) 65 dBA Free-Field Limit (m)	Future (2031) 60 dBA Free-Field Limit (m)
Rapids Parkway	13.0	25.1

From these results, and based on the criteria, all OLAs on rear-facing and side-facing residential lots within the free-field limits should be considered for noise wall attenuation.

6.2 Receivers

In order to facilitate investigation, a typical worst-case receiver location was established to represent the OLA for the residential properties along The Rapids Parkway. The worst case location was established to be 15.0m from the centreline of The Rapids Parkway. The distance from the OLA receiver location to a potential noise wall at the rear property line (the road right-of-way limit) is 3.0m. The representative receiver location is shown on Figure N2.

The existing and future conditions of the typical receiver location were modelled in STAMSON. Results are summarized in Table 3 and shows the difference between the current and future noise levels for the worst case OLA receiver location.

Table 3 – OLA Sound Levels for Unmitigated Conditions

POINT OF RECEPTION	SOUND LEVEL (DBA)		DIFFERENCE (dBA)
	EXISTING (2017)	FUTURE (2031)	
OLA	55	63	8

The use of noise walls for noise mitigation at the OLAs was modelled in STAMSON for future conditions. Table 4 provides the results of using a 3.0m high noise wall to reduce the noise levels at the representative OLA.

Table 4 – OLA Sound Levels for Future Unmitigated and Mitigated Conditions

POINT OF RECEPTION	SOUND LEVEL (DBA)		DIFFERENCE (DBA)
	FUTURE (2031)	FUTURE (2031) – WITH BARRIER	
OLA	63	53	10

Given noise levels at the OLA locations are above 60 dBA, and as the noise level reduction utilizing a 3.0m noise wall is greater than 5 dBA, based on the criteria, noise mitigation in the form of a noise wall is warranted.

7 Noise Wall Locations

7.1 Proposed

As demonstrated in the preceding discussion, noise mitigation is warranted in the form of a noise wall constructed along the right-of-way limit for residential lots north of Highway 402.

Noise barriers are proposed for residential properties with rear- or side-yards facing The Rapids Parkway. On residential properties which front The Rapids Parkway, noise barriers are not proposed as the OLA is in the rear yard and thus the building would act as a noise barrier. Further, on these fronting properties, the barrier would not be practical as it would block access to the existing driveway, and a gap for the driveway would make the barrier ineffective.

We understand that a 1.5m high privacy fence is proposed for the rear yards of the future lots on the east side of the Rapids Parkway corridor north of Highway 402. This type of fence will not satisfy the requirements for noise attenuation, therefore an alternative design should be considered to meet the noise criteria outlined in this report.

On the west/north side of the road extension north of Highway 402, an existing solid wooden privacy fence with brick columns exists for abutting Bluebird Court lots. A chain link fence is in place for abutting Winchester Crescent lots. Neither of these fences meet current noise reduction standards. However, for the Winchester Crescent lots, space is available for the City to include a landscaped noise berm as part of the extension construction. This could use a combination of a maximum of 2.4 m (8 feet) fence height on a 0.6 m (2 foot) height earthen berm. This will be confirmed in the detailed design of the extension.

The locations for the proposed noise walls are shown on Figure N1 to N3.

8 Construction Noise

The construction of the proposed extension of the Rapids Parkway will cause construction noise. This noise is temporary in nature and typically difficult to control. Accordingly, MECP does not require mitigation of construction and instead imposes noise emission standards on the construction equipment. The MECP NPC-115 guidelines provide noise emission standards as summarized in Table 5.

Table 5 – NPC-115 Noise Emission Limits for Construction Equipment

EQUIPMENT TYPE	MAXIMUM SOUND POWER LEVEL (DBA)	POWER RATING (KW)
Excavators, loaders, bulldozers, backhoes	83	< 75
	85	> 75
Pneumatic Pavement Breakers	85	-
Portable Air Compressors	70	-

Further, City of Sarnia noise bylaws will have further restrictions on noise generation, typically including time periods for when construction can occur.

The Contractor should follow the MECP and City of Sarnia requirements for construction noise.

9 Recommendations

Based on the results of this study, mitigation measures are warranted for noise sensitive Outdoor Living Areas per the City of Sarnia construction noise guidelines. The following recommendations are made:

1. Noise walls should be constructed at the limits of the Rapids Parkway right-of-way for those residential properties backing onto The Rapids Parkway. Refer to Figures N1 to N13 for the proposed noise wall locations.
2. At time of final road design, the location of the noise walls should be verified.
3. An alternative rear yard fence design should be considered for the proposed lots on the east side of the Rapids Parkway corridor north of Highway 40, which meet the noise criteria outlined in this report.
4. On the west/north side of the road extension north of Highway 402, space is available for the City to include a landscaped noise berm as part of the extension construction using a combination of a maximum of 2.4 m (8 feet) fence height on a 0.6 m (2 foot) height earthen berm.
5. Construction noise should adhere to the City of Sarnia noise by-law requirements, and the Construction Equipment should adhere to MECP's NPC-115.

All of which is respectfully submitted.

IBI GROUP



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Appendix A – Noise Policies

Table 2.1 Mitigation Effort Required for the Projected Noise Level with the Proposed Improvements above the Ambient

Change in Noise Level Above Ambient / Projected Noise Levels with Proposed Improvements	Mitigation Effort Required
< 5 dBA change & < 65 dBA	- None
≥ 5 dBA change OR ≥ 65 dBA	<ul style="list-style-type: none">- Investigate noise control measures on right-of-way.- Introduce noise control measures within right-of-way and mitigate to ambient if technically, economically and administratively feasible.- Noise control measures, where introduced, should achieve a minimum of 5 dBA attenuation, over first row receivers.

On right-of-way mitigation measures must be identified, considered and implemented where warranted. Mitigation measures within the right-of-way include:

- acoustical barriers;
- berms;
- vertical and horizontal alignments; and
- pavement surfaces.

Mitigation must attempt to achieve levels as close to, or lower than, the objective level (i.e., future predicted ambient without the proposed improvements) as is technically, economically, and administratively feasible.

Appendix B – STAMSON Model Output

FREE FIELD ANALYSIS

STAMSON 5.0 NORMAL REPORT

Date: 13-02-2020 15:32:07

MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: rapids.te Time Period:
Day/Night 16/8 hours
Description: Free Field Daytime 65 dBA

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

Car traffic volume : 10717/1191
veh/TimePeriod *
Medium truck volume : 282/31
veh/TimePeriod *
Heavy truck volume : 282/31 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): 9500
Percentage of Annual Growth : 2.00
Number of Years of Growth : 14.00
Medium Truck % of Total Volume : 2.50
Heavy Truck % of Total Volume : 2.50
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Rapids Pkwy (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 : 15.00 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle
slope; no barrier)
Reference angle : 0.00

Results segment # 1: Rapids Pkwy (day)

Source height = 1.26 m

ROAD (0.00 + 63.72 + 0.00) = 63.72 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj
F.Adj W.Adj H.Adj B.Adj SubLeq

-90 90 0.66 65.18 0.00 0.00 -1.46
0.00 0.00 0.00 63.72

Segment Leq : 63.72 dBA

Total Leq All Segments: 63.72 dBA

Results segment # 1: Rapids Pkwy (night)

Source height = 1.25 m

ROAD (0.00 + 57.30 + 0.00) = 57.30 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj
F.Adj W.Adj H.Adj B.Adj SubLeq

-90 90 0.58 58.62 0.00 0.00 -1.32
0.00 0.00 0.00 57.30

Segment Leq : 57.30 dBA

Total Leq All Segments: 57.30 dBA

TOTAL Leq FROM ALL SOURCES (DAY):
63.72

(NIGHT): 57.30

STAMSON 5.0 NORMAL REPORT
Date: 13-02-2020 15:32:38
MINISTRY OF ENVIRONMENT AND ENERGY /
NOISE ASSESSMENT

Filename: rapids.te Time Period:
Day/Night 16/8 hours
Description: Free Field Daytime 60 dBA

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

Car traffic volume : 10717/1191
veh/TimePeriod *
Medium truck volume : 282/31
veh/TimePeriod *
Heavy truck volume : 282/31 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): 9500
Percentage of Annual Growth : 2.00
Number of Years of Growth : 14.00
Medium Truck % of Total Volume : 2.50
Heavy Truck % of Total Volume : 2.50
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Rapids Pkwy (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 : 25.10 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle
slope; no barrier)
Reference angle : 0.00

Results segment # 1: Rapids Pkwy (day)

Source height = 1.26 m

ROAD (0.00 + 60.01 + 0.00) = 60.01 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj
F.Adj W.Adj H.Adj B.Adj SubLeq

-90 90 0.66 65.18 0.00 -3.71 -1.46
0.00 0.00 0.00 60.01

Segment Leq : 60.01 dBA

Total Leq All Segments: 60.01 dBA

Results segment # 1: Rapids Pkwy (night)

Source height = 1.25 m

ROAD (0.00 + 57.30 + 0.00) = 57.30 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj
F.Adj W.Adj H.Adj B.Adj SubLeq

-90 90 0.58 58.62 0.00 0.00 -1.32
0.00 0.00 0.00 57.30

Segment Leq : 57.30 dBA

Total Leq All Segments: 57.30 dBA

TOTAL Leq FROM ALL SOURCES (DAY):
60.01
(NIGHT): 57.30

RECEIVER WITH NOISE WALL

STAMSON 5.0 NORMAL REPORT

Date: 13-02-2020 15:41:34

MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: recawall.te Time Period:
Day/Night 16/8 hours
Description: Receiver with Noise Wall

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

Car traffic volume : 10717/1191
veh/TimePeriod *
Medium truck volume : 282/31
veh/TimePeriod *
Heavy truck volume : 282/31 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): 9500
Percentage of Annual Growth : 2.00
Number of Years of Growth : 14.00
Medium Truck % of Total Volume : 2.50
Heavy Truck % of Total Volume : 2.50
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Rapids Pkwy (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 : 15.00 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 2 (Flat/gentle
slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 :
90.00 deg
Barrier height : 3.00 m
Barrier receiver distance : 3.00 / 10.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

Results segment # 1: Rapids Pkwy (day)

Source height = 1.26 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
----------------------	------------------------	-----------------------	------------------------------------

1.26 !	1.50 !	1.45 !	1.45
--------	--------	--------	------

ROAD (0.00 + 52.78 + 0.00) = 52.78 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj
F.Adj W.Adj H.Adj B.Adj SubLeq

-90	90	0.49	65.18	0.00	0.00	-1.15
0.00	0.00	-11.25	52.78			

Segment Leq : 52.78 dBA

Total Leq All Segments: 52.78 dBA

Results segment # 1: Rapids Pkwy (night)

Source height = 1.25 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
----------------------	------------------------	-----------------------	------------------------------------

1.25 !	4.50 !	2.34 !	2.34
--------	--------	--------	------

ROAD (0.00 + 50.99 + 0.00) = 50.99 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj
F.Adj W.Adj H.Adj B.Adj SubLeq

-90	90	0.40	58.62	0.00	0.00	-0.97
0.00	0.00	-6.65	50.99			

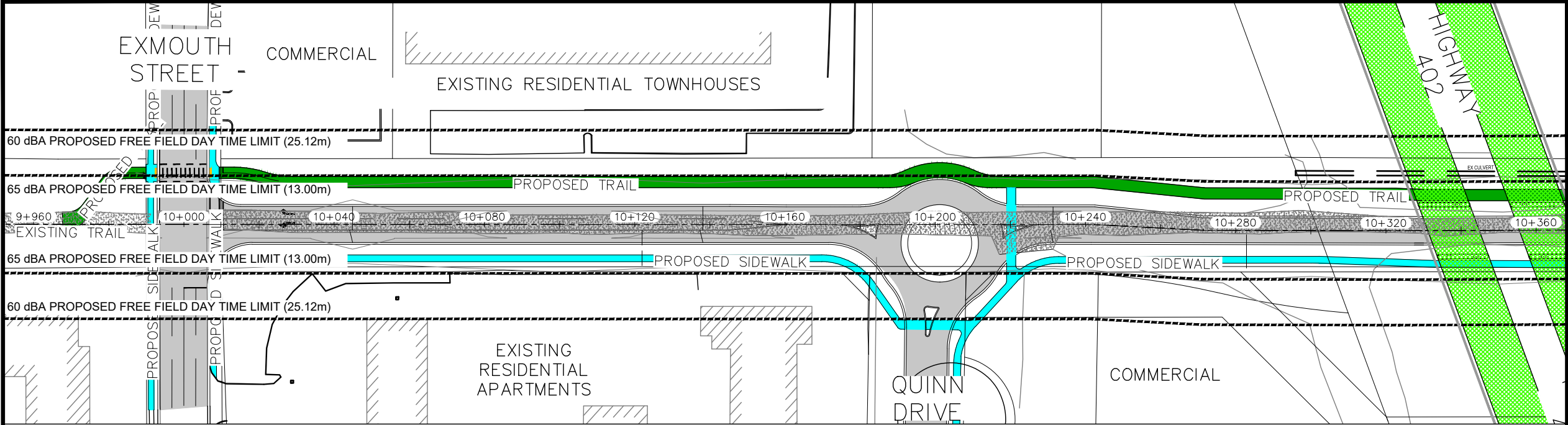
Segment Leq : 50.99 dBA

Total Leq All Segments: 50.99 dBA

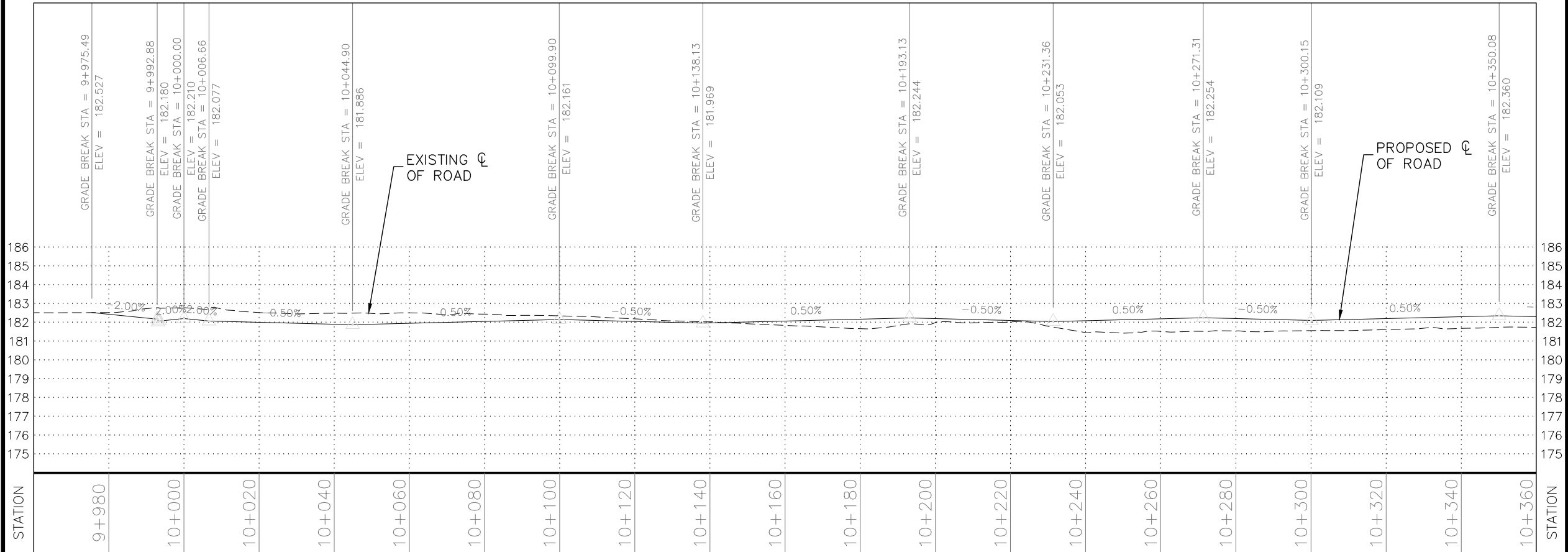
TOTAL Leq FROM ALL SOURCES (DAY):
52.78

(NIGHT): 50.99

Appendix C – Noise Wall Locations



RAPIDS PARKWAY



KEY MAP N.T.S.

LEGEND

- ROAD CENTRELINE
- PROPERTY LINE
- PROPOSED FREE FIELD ANALYSIS LIMITS (ROAD - DAYTIME)
- EXISTING NOISE WALL
- PROPOSED NOISE MITIGATION FEATURE
- REPRESENTATIVE RECIEVER LOCATION

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Waterloo ON N2L 3V3 Canada
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ibigroup.com

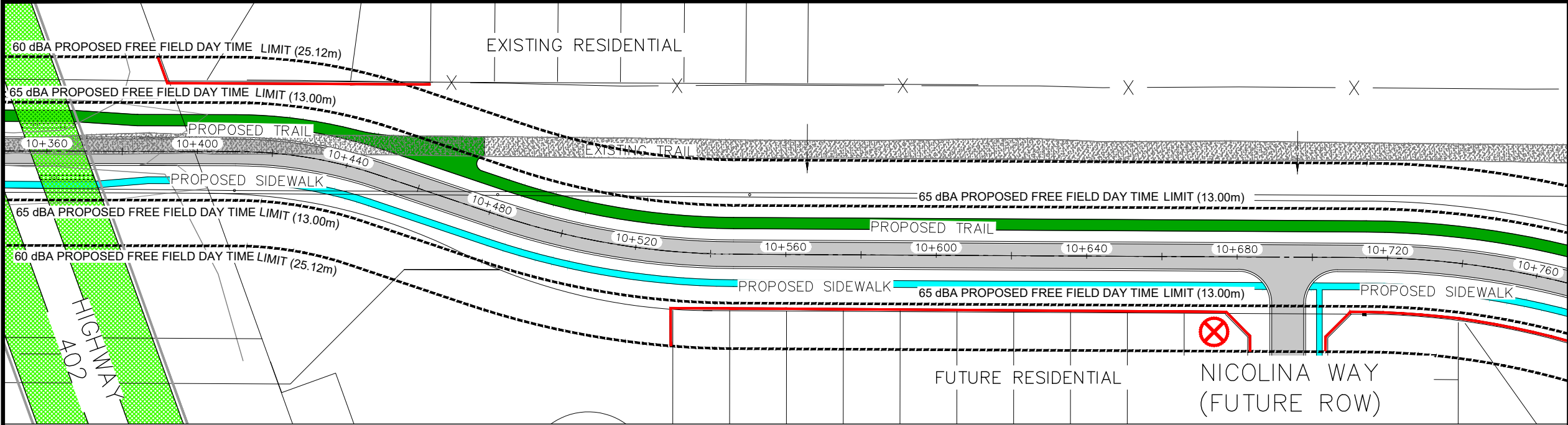
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DATE DECEMBER 2019
PROJECT No. 120368

THE RAPIDS PARKWAY EXTENSION
ENVIRONMENTAL ASSESSMENT
CITY OF SARNIA

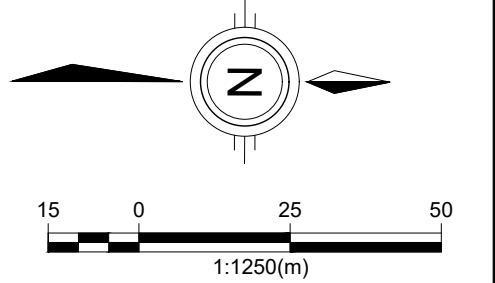
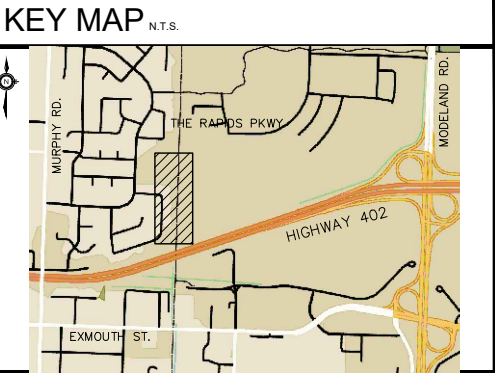
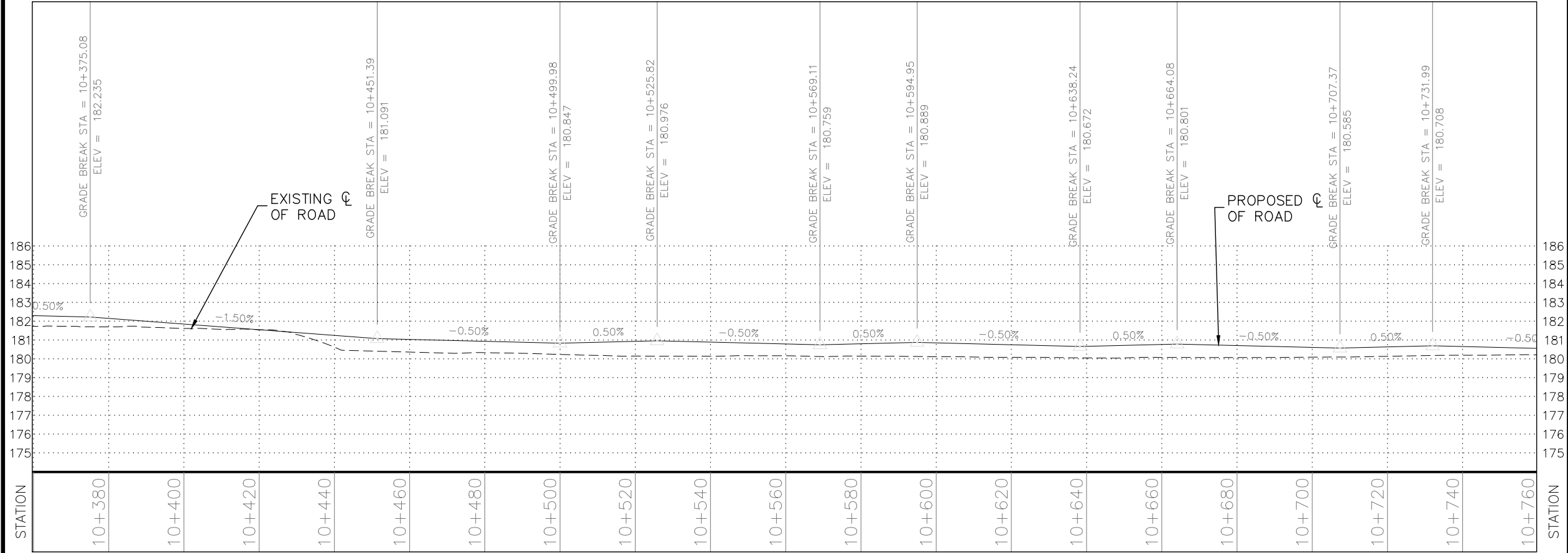
CITY OF SARNIA
255 CHRISTINA ST. N., SARNIA

NOISE INFORMATION PLAN
ROAD TRAFFIC
STA 9+960 TO STA 10+360

FIGURE N1



RAPIDS PARKWAY



- LEGEND**
- ROAD CENTRELINE
 - PROPERTY LINE
 - PROPOSED FREE FIELD ANALYSIS LIMITS (ROAD - DAYTIME)
 - EXISTING NOISE WALL
 - PROPOSED NOISE MITIGATION FEATURE
 - ⊗ REPRESENTATIVE RECIEVER LOCATION

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ibigroup.com

SCALE	1:1250
DATE	DECEMBER 2019
PROJECT No.	120368

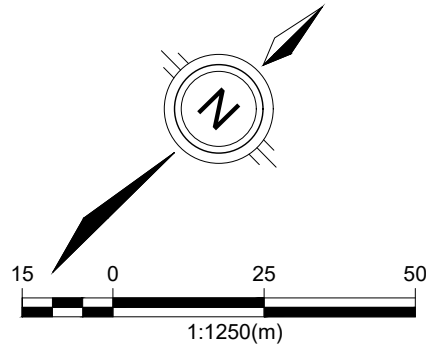
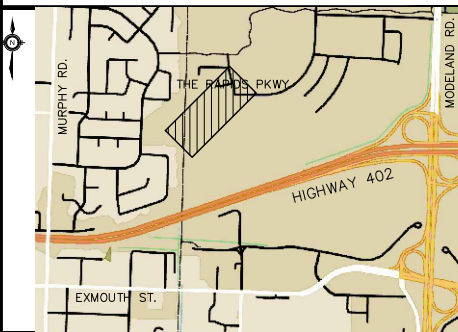
THE RAPIDS PARKWAY EXTENSION
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CITY OF SARNIA

CITY OF SARNIA
255 CHRISTINA ST. N., SARNIA

NOISE INFORMATION PLAN
ROAD TRAFFIC
STA 10+360 TO STA 10+760

FIGURE N2

KEY MAP N.T.S.



LEGEND

- ROAD CENTRELINE
- PROPERTY LINE
- PROPOSED FREE FIELD ANALYSIS LIMITS (ROAD - DAYTIME)
- EXISTING NOISE WALL
- PROPOSED NOISE MITIGATION FEATURE
- REPRESENTATIVE RECIEVER LOCATION



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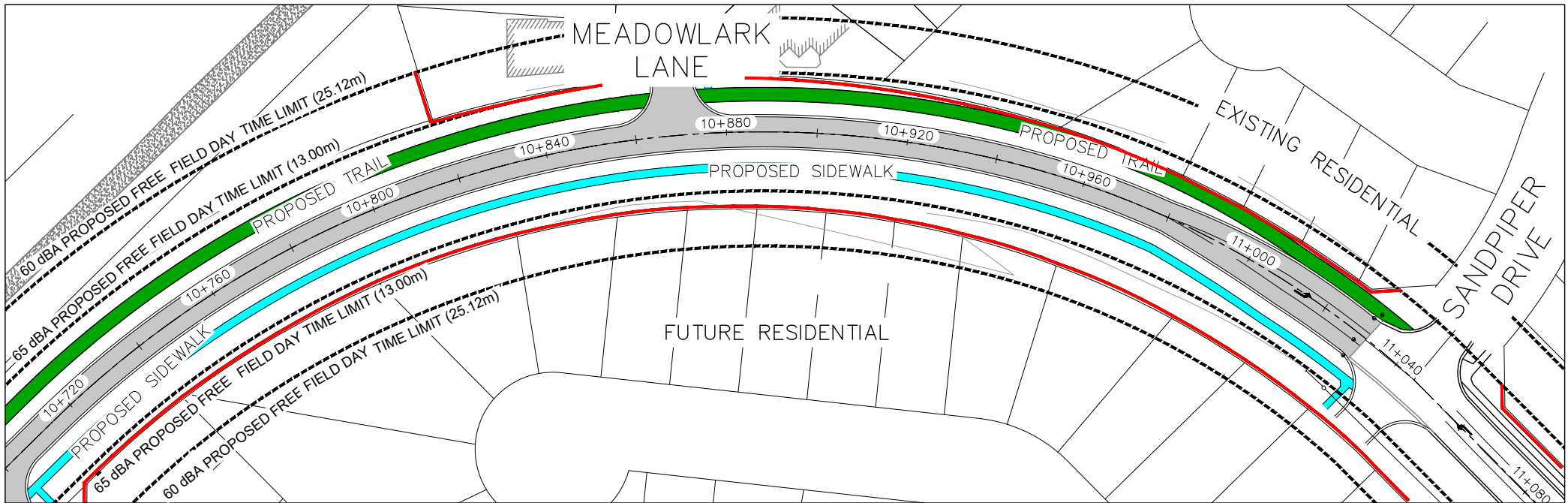
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DATE DECEMBER 2019
PROJECT No. 120368

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NOISE INFORMATION PLAN
ROAD TRAFFIC
STA 10+760 TO STA 11+080

FIGURE N3



RAPIDS PARKWAY

