

..

Ninth Line Illumination Plan

Environmental Assessment (EA) and Preliminary
Design for Ninth Line from Eglinton Avenue
West to Derry Road West

City of Mississauga
May 11, 2021



Disclaimer

The material in this report reflects HDR's professional judgment considering the scope, schedule and other limitations stated in the document and in the contract between HDR and the client. The opinions in the document are based on conditions and information existing at the time the document was published and do not consider any subsequent changes. In preparing the document, HDR did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that HDR shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party resulting from decisions made or actions taken based on this document.

In preparing this report, HDR relied, in whole or in part, on data and information provided by the Client and third parties that was current at the time of such usage, which information has not been independently verified by HDR and which HDR has assumed to be accurate, complete, reliable, and current. Therefore, while HDR has utilized its best efforts in preparing this report, HDR does not warrant or guarantee the conclusions set forth in this report which are dependent or based upon data, information or statements supplied by third parties or the client, or that the data and information have not changed since being provided in the report. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that HDR shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party resulting from decisions made or actions taken based on this document.

Contents

1.0	INTRODUCTION.....	3
2.0	EXISTING ILLUMINATION CONDITION	3
3.0	PROPOSED ILLUMINATION DESIGN.....	3
3.1	LIGHTING RECOMMENDATIONS AND BACKGROUND	3
3.1.1	Horizontal Luminance Level for Typical Mid-Block Roadway Lighting	3
3.1.2	Horizontal and Vertical Illuminance Level for Typical Sidewalks/Cycle Tracks	4
3.1.3	Horizontal Illuminance Level for Typical Intersections	5
4.0	ILLUMINATION PLAN.....	5
4.1	LUMINAIRE BACKGROUND	5
4.2	TYPICAL MID-BLOCK ROADWAY ILLUMINATION PLAN.....	6
4.3	TYPICAL INTERSECTION ILLUMINATION PLAN.....	6
4.4	TYPICAL SIDEWALKS/CYCLE TRACKS ILLUMINATION PLAN.....	7
4.5	CONSTRAINED LOCATIONS	7
5.0	CONCLUSION	7

Appendix A: Illumination Plans

1.0 INTRODUCTION

HDR has been retained by the City of Mississauga to carry out an Environmental Assessment (“EA”) and Preliminary Design for the proposed transportation improvements to Ninth Line from Eglinton Avenue West to Derry Road West in the City of Mississauga. This section of Ninth Line is proposed to be urbanized, widened from 2 to 4 lanes, accommodate Active Transportation improvements (sidewalks and cycle tracks) on both sides of Ninth Line, and streetscaping.

2.0 EXISTING ILLUMINATION CONDITION

Ninth Line is illuminated on the west side with a conventional streetlight system throughout the study area. From Derry Road West to Britannia Road West, lighting is mounted onto hydro poles that are serviced through aerial cables. From Britannia Road West to Eglinton Avenue West, standalone lighting poles (not mounted onto hydro poles) are serviced by buried secondary conductors. The lighting poles are spaced between approximately 48 and 50 metres apart and are set back a minimum of approximately 2 metres from the adjacent roadway. The east side of Ninth Line has no illumination poles. Milton Hydro and Alectra Utilities are the existing hydro providers along Ninth Line.

3.0 PROPOSED ILLUMINATION DESIGN

The proposed road improvements on Ninth Line include road widening from existing two (2) lanes to four (4) lanes and in-boulevard cycle track and sidewalks on both sides of Ninth Line. Due to the proposed road widening, many of the existing hydro poles, with mounted lighting fixtures, will require relocation. Therefore, a new illumination system is required.

In this report, three typical illumination plans are developed and analyzed based on City of Mississauga streetlighting standards. These standards were provided by the City of Mississauga’s (“City”) streetlighting coordinator with supplementary design standards provided by Alectra, City’s hydro service provider. The three typical illumination plans are:

- Ninth Line typical mid-block roadway illumination plan
- Ninth Line typical intersection illumination plan
- Ninth Line typical sidewalks/cycle tracks illumination plan

3.1 LIGHTING RECOMMENDATIONS AND BACKGROUND

The proposed illumination design follows the RP-8-18+Addendum 1 Recommended Practice for Design and Maintenance of Roadway and the TAC Guide for the Design of Roadway Lighting Volume 1, Fundamentals as the reference guidelines. The following are the salient points from those guidelines.

3.1.1 Horizontal Luminance Level for Typical Mid-Block Roadway Lighting

The values in Table 1 are the recommended luminance levels for streets based on street classifications from RP-8-18+Addendum 1. The lighting recommendations given in Table 1 are the recommended minimum average maintained luminance levels for fully lighted roadways (or maximum for uniformity and veiling luminance ratios).

Table 1: Lighting Design Criteria for Mid-block Roadway

Street Classification	Pedestrian Activity Classification*	Average Luminance L_{avg} (cd/m ²)	Average Uniformity Ratio L_{avg}/L_{min}	Maximum Uniformity Ratio L_{max}/L_{min}	Maximum Veiling Luminance Ratio $L_{v,max}/L_{avg}$
Major	High	1.2	3.0	5.0	0.3
	Medium	0.9	3.0	5.0	0.3
	Low	0.6	3.5	6.0	0.3
Collector	High	0.8	3.0	5.0	0.4
	Medium	0.6	3.5	6.0	0.4
	Low	0.4	4.0	8.0	0.4
Local	High	0.6	6.0	10.0	0.4
	Medium	0.5	6.0	10.0	0.4
	Low	0.3	6.0	10.0	0.4

Ninth Line Road is considered as a “Major” street classification with Pedestrian Activity classification of “Medium”. According to the values shown in Table 1, the horizontal luminance design criteria for streets is as follows:

- Maintained Average Pavement Luminance (L_{avg}): $L_{avg} \geq 0.9$ cd/m²
- Average Uniformity Ratio (L_{avg}/L_{min}): $L_{avg}/L_{min} \leq 3.0$
- Maximum Uniformity Ratio (L_{max}/L_{min}): $L_{max}/L_{min} \leq 5.0$
- Maximum Veiling Luminance ratio ($L_{v,max}/L_{avg}$): $L_{v,max}/L_{avg} \leq 0.3$

3.1.2 Horizontal and Vertical Illuminance Level for Typical Sidewalks/Cycle Tracks

The values in Table 2 are the recommended minimum average maintained illuminance levels (or maximum for uniformity) for walkways/bikeways based on medium pedestrian activity areas from RP-8-18+Addendum 1.

Table 2: Recommended Illuminance Values for Sidewalks/Cycle Tracks

Maintained Illuminance Values for Walkways/Bikeways			
	E_{avg} (lux/ft)	$E_{v,min}$ (lux/ft)	E_{avg}/E_{min}^*
Pedestrian Only	5/0.5	2/0.2	4.0

According to the values shown in Table 2, the horizontal and vertical illuminance design criteria for walkways/bikeways is as follows:

- Minimum maintained average horizontal illuminance at pavement (E_{avg}): $E_{avg} \geq 5$ lux
- Minimum vertical illuminance at 1.5m above the pavement in both directions and parallel to the main pedestrian flow ($E_{v,min}$): $E_{v,min} \geq 2$ lux

- Horizontal illuminance uniformity ratio (E_{avg}/E_{min}) = $E_{avg}/E_{min} \leq 4.0$

3.1.3 Horizontal Illuminance Level for Typical Intersections

The values in Table 3 are the recommended minimum average maintained illuminance levels for fully lighted intersections based on road functional classifications and pedestrian activity level classifications from RP-8-18+Addendum 1. The table assumes an R2 or R3 pavement type.

Table 3: Pavement Illuminance Criteria for Full Intersection Lighting

Illuminance for Intersections				
Functional Classification	Pedestrian Activity Level Classification			E_{avg}/E_{min}
	High	Medium	Low	
Major/Major	34/3.2	26/2.4	18/1.7	3.0
Major/Collector	29/2.7	22/2.0	15/1.4	3.0
Major/Local	26/2.4	20/1.9	13/1.2	3.0
Collector/Collector	24/2.2	18/1.7	12/1.1	4.0
Collector/Local	21/2.0	16/1.5	10/0.9	4.0
Local/Local	18/1.7	14/1.3	8/0.7	6.0

Ninth Line and Derry Road West intersection has been studied as a typical example. Both, Ninth Line and Derry Road West have a “Major/Major” functional classification and a pedestrian activity level classification of medium. According to the values shown in Table 3, the horizontal illuminance design criteria for intersections is as follows:

- Recommended average illumination level (E_{avg}): $E_{avg} \geq 26$ lux
- Uniformity ratio (E_{avg}/E_{min}): $E_{avg}/E_{min} \leq 3.0$

4.0 ILLUMINATION PLAN

4.1 LUMINAIRE BACKGROUND

The “LRL4 LED Roadway Light” is used throughout the proposed illumination plan based on the approved luminaire supplier and ies lighting files provided by the City. The lighting fixture has a mounting height of 8 metres and an arm length of 3.66 metres. Additional technical specification regarding this product is presented in Table 4.

Table 4: Luminaire Information

Symbol	Label	LLF	Description	Lum. Watts	Lum. Lumens
	LRL4-L	0.720	CNX-LRL4-P1-2M-40-048-L-1500	231.9	23099

4.2 TYPICAL MID-BLOCK ROADWAY ILLUMINATION PLAN

The proposed streetlighting fixtures will be mounted onto hydro poles to reduce “pole pollution” as instructed by the City. The spacing between two hydro poles will be 50 metres and the mounting height of street lighting fixture arms will be 7 metres as instructed by Alectra. The mid-block roadway illumination plan is presented in **Appendix A**. In illumination plan, four lighting fixtures are placed in an aligned configuration and the horizontal distance between each fixture is 50 metres. The results for this illumination plan are summarized in Table 5.

Table 5: Typical Street Illumination Plan

	Average Luminance L_{avg} (cd/m ²)	Average Uniformity Ratio (L_{avg}/L_{min})	Maximum Uniformity Ratio (L_{max}/L_{min})	Maximum Veiling Luminance ratio ($L_{v,max}/L_{avg}$)
East of Ninth Line	1.34	1.61	4.28	0.19
West of Ninth Line	1.53	1.65	4.11	0.17

4.3 TYPICAL INTERSECTION ILLUMINATION PLAN

At signalized intersections, the luminaires are generally mounted on traffic signal poles to reduce clutter and capital cost. The typical intersection illumination plan shows eight preliminary lighting fixtures (two at each corner) at Ninth Line and Derry Road. Final locations of traffic signal poles and electrical details will be confirmed during Detailed Design. The intersection illumination plan is presented in **Appendix A**. The results for this illumination plan are summarized in Table 6.

Table 6: Typical Intersection Illumination Plan - Calculation Summary

Average Illumination (E_{avg}) (lux)	Uniformity Ratio (E_{avg}/E_{min})
27.61	3.00

4.4 TYPICAL SIDEWALKS/CYCLE TRACKS ILLUMINATION PLAN

The walkway/bikeway illumination plan is presented in **Appendix A**. The illumination plan shows four lighting fixtures that are placed in an aligned configuration and the space between hydro poles are 50 metres. The results for this typical illumination plan are summarized in Table 7.

Table 7: Typical Walkway/Bikeway Illumination Plan - Calculation Summary

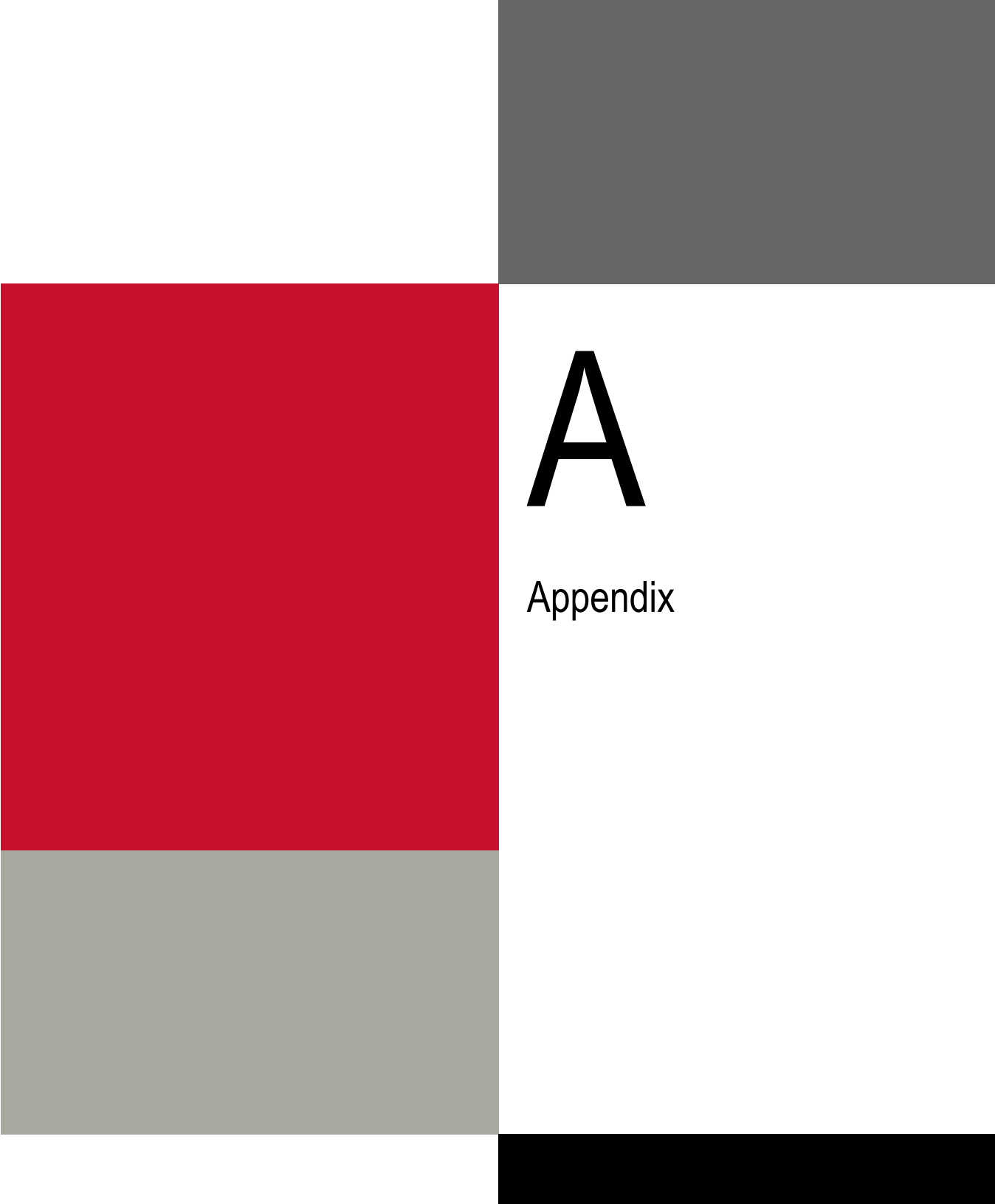
	Average Horizontal Illuminance (E_{avg})	Minimum Vertical Illuminance ($E_{V,min}$)	Horizontal Illuminance Uniformity ratio (E_{avg}/E_{min})
Sidewalk (East)	8.34 lux	2.9 lux	2.19
Cycle Track (East)	18.43 lux	2.3 lux	3.02
Sidewalk (West)	6.96 lux	2.9 lux	1.93
Cycle Track (West)	16.46 lux	2.0 lux	2.79

4.5 CONSTRAINED LOCATIONS

There are certain locations along Ninth Line where the roadway improvements may not have sufficient spacing between the cycle track and sidewalk to install hydro poles. Based on correspondences with Alectra, hydro poles are permitted to be installed within the grading areas given that on slopes or hillsides, the depth of setting shall be measured from the lowest side of the opening. When butt treated western red cedar poles are set in such locations, additional Pentachlorophenol treatment shall be applied as required, to bring the treatment to 300mm (12") above the highest ground level. On steep slopes, near ditches, or where the stability of the earth is questionable, it is desirable to increase the standard setting depth by one third in order to provide adequate foundation strength. If hydro poles with mounted light fixtures are required to be installed in certain grading slopes areas, the proposed light fixtures would adequately illuminate the roadway and sidewalk/cycle tracks under RP-8-18+Addendum 1 Recommended Practice for Design and Maintenance of Roadway requirements

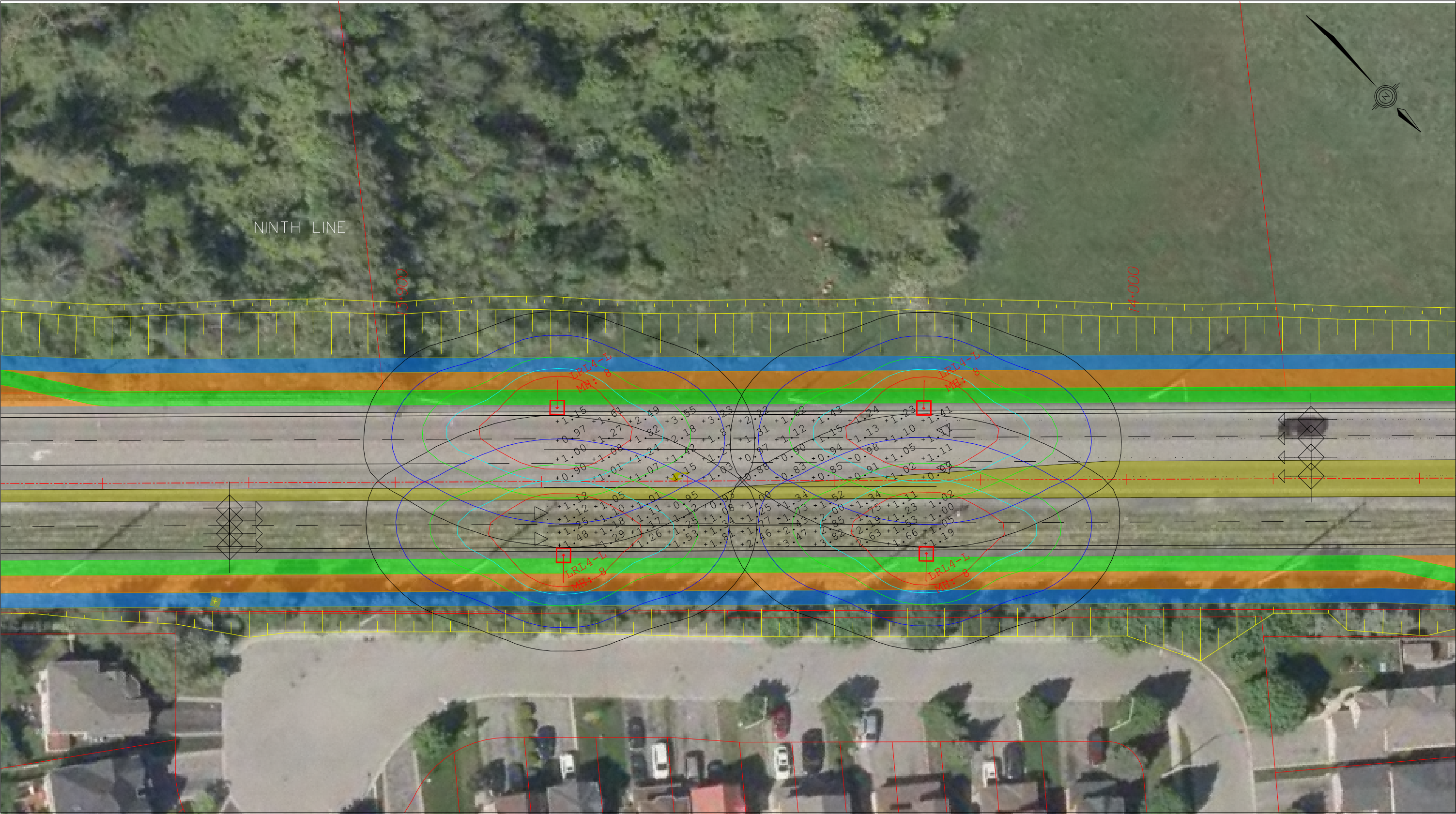
5.0 CONCLUSION

Based on the illumination calculations presented in this report, hydro poles (with mounted light fixtures) that are spaced 50 metres apart would adequately illuminate the roadway, intersection and sidewalks/cycle track facilities as per the RP-8-18+Addendum 1 Recommended Practice for Design and Maintenance of Roadway requirements. Details will be confirmed during Detailed Design, at which the location of poles and luminaires will be confirmed and finalized. Hydro pole locations at Regional intersections, such as Britannia Road West and Derry Road West, will be confirmed during detailed design in consultation with Region of Peel staff.



A

Appendix



MISSISSAUGA

NINTH LINE IMPROVEMENTS
(EGLINTON AVE W TO DERRY RD W)
ENVIRONMENTAL ASSESSMENT
ILLUMINATION PLAN

PLAN NO.

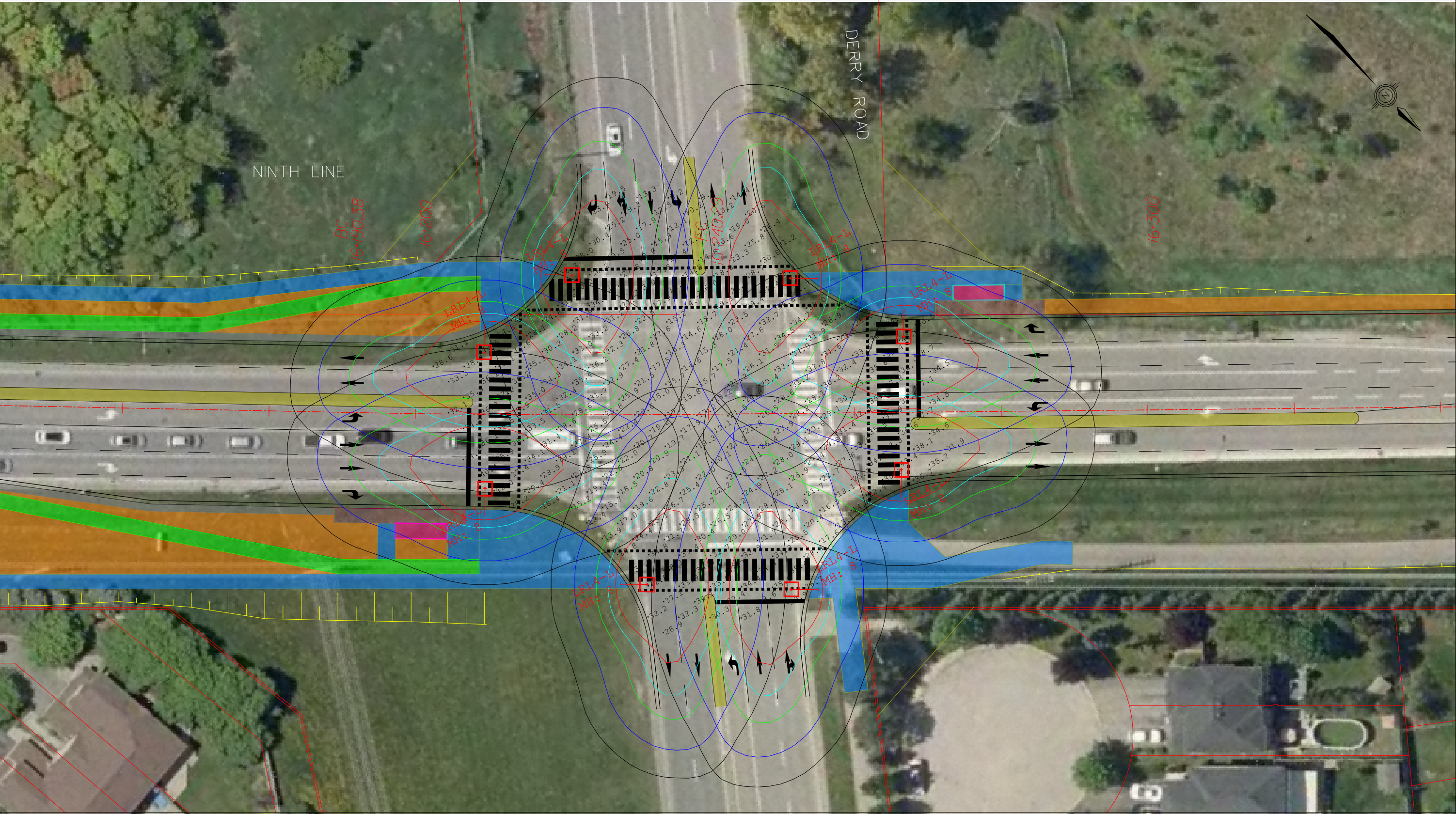
IL-01

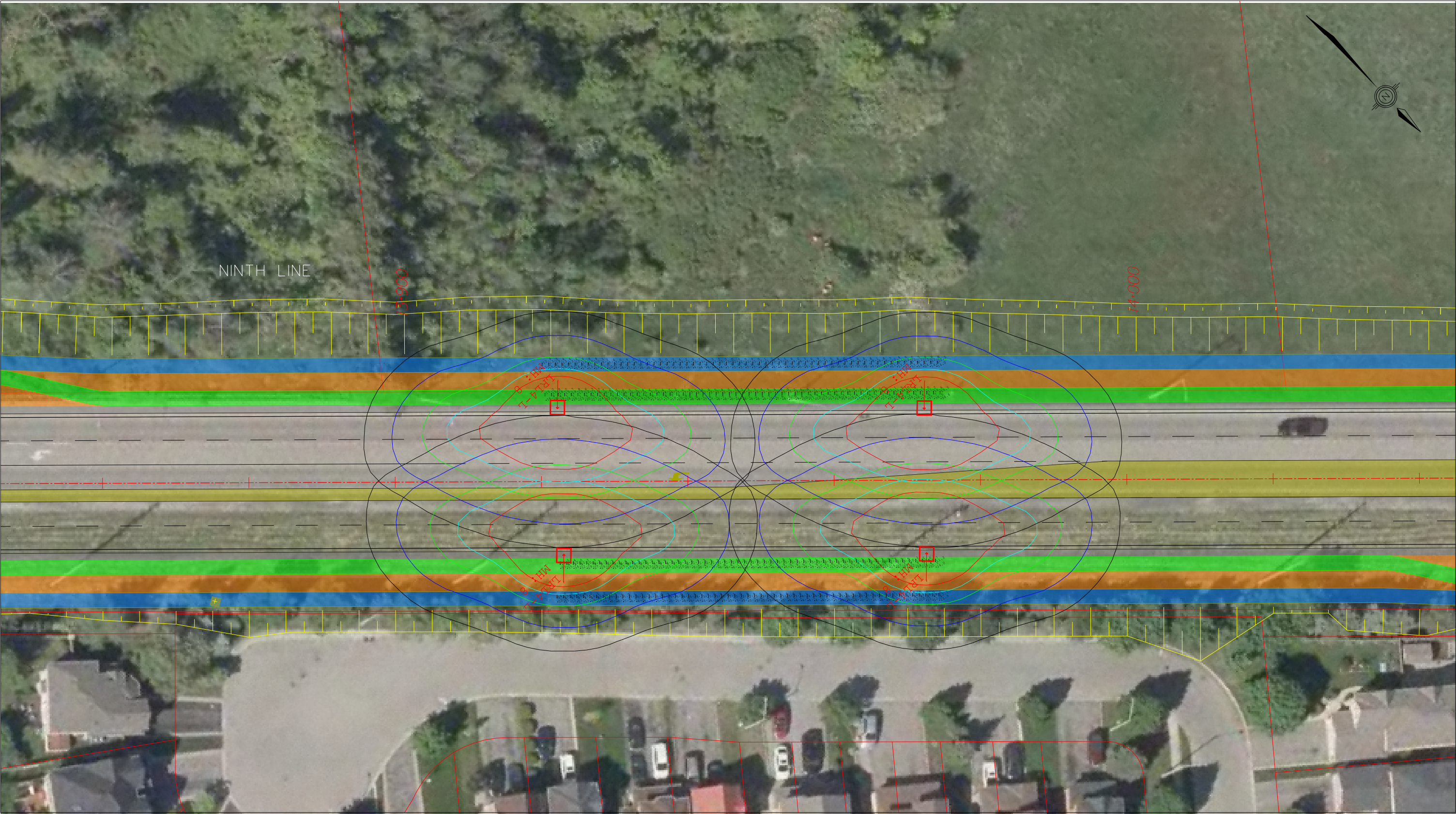
SCALE

H 1:500

DATE

APRIL 2021





MISSISSAUGA

NINTH LINE IMPROVEMENTS
(EGLINTON AVE W TO DERRY RD W)
ENVIRONMENTAL ASSESSMENT
ILLUMINATION PLAN

PLAN NO.

IL-03

SCALE

H 1:500

DATE

APRIL 2021