



Unintended Consequences of SLRs in Ontario

November 14, 2023

Good Roads



Summary

- LRPs
- GR/MTO LRP Calculator
- Case Study:
 - Overview
 - Construction Dates
 - Allowed Loads
 - SLR period during construction
- GR/MTO SLR calculator
 - Evidence-based dates
- Unintended Consequences of SLRs

Good Roads

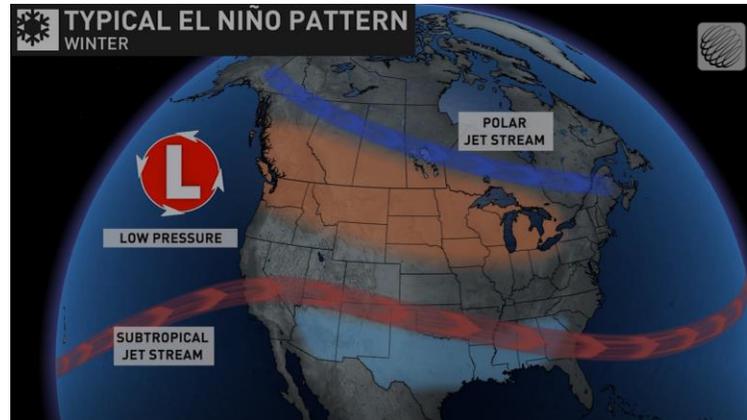
Background.

2023-24 Winter Season

- El Niño
- Polar Vortex

Reduced Load Periods (RLPs)

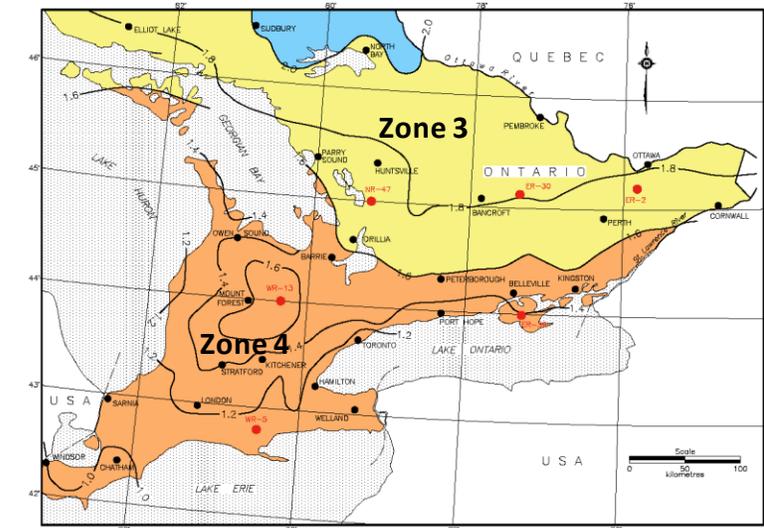
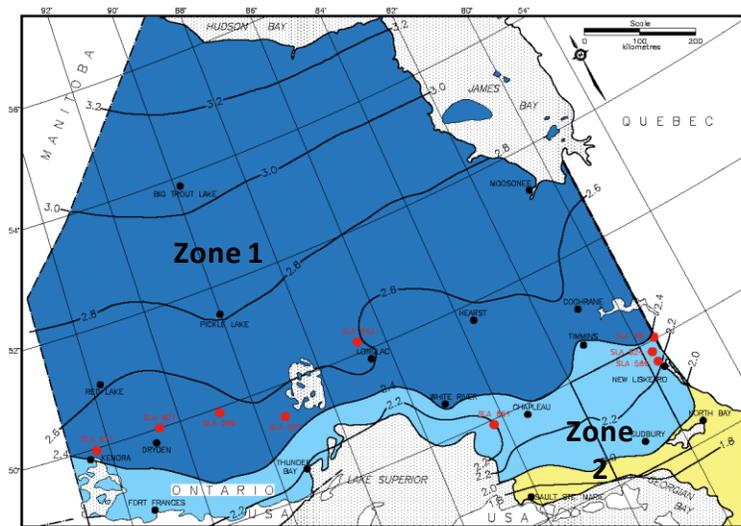
- Protect weakened pavement
- Fixed dates
- Municipal MTO requests



Ontario Ministry of Transportation (MTO).

MTO Approach and Solution

- Jurisdictional scan
- Cumulative Thawing Index (CTI)
- 2022 data collection
 - RWIS, borehole, and FWD
- Model
 - 4 zones and 15 sites
 - Trigger values based on zones



Good Roads (GR).

Project Involvement and Links

- Access to the RLP Calculator
<https://goodroads.ca/technical-solutions/reduced-load-periods/>
- Online training course
<https://goodroads.ca/courses/reduced-load-period-model-overview-training/>

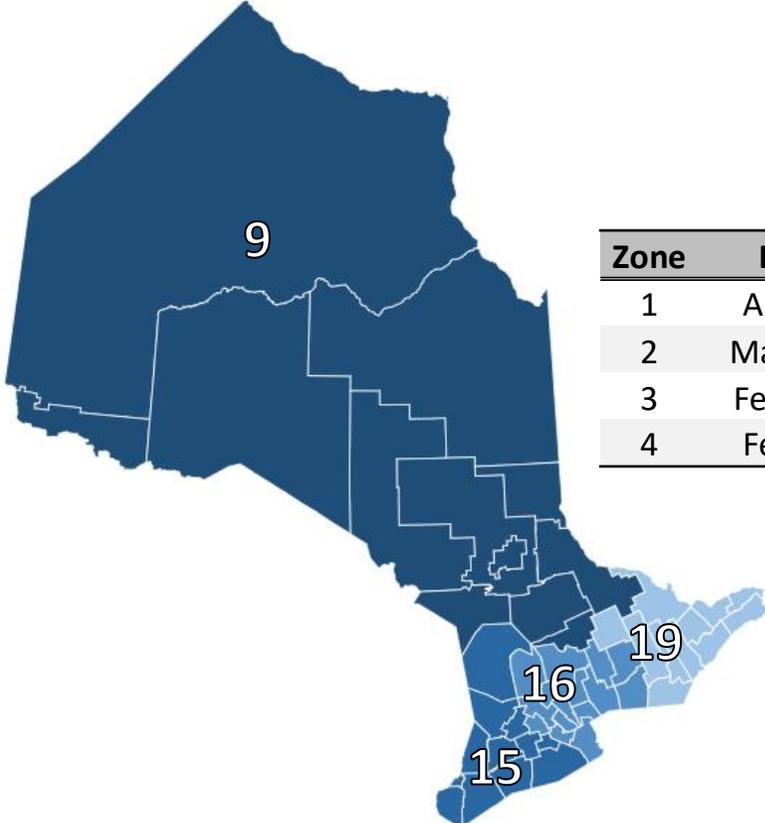
MTO SLA Site Table 1									
Enter Weather Station ID:		SLA ER-39 Bloomfield							
Enter GPS Coordinates:		43.988056, -77.250556							
Enter Weather Data Source:		Measured: MTO RWIS - ER-39 Bloomfield; Forecast: Weather Network - Bloomfield, Ontario							
Other Information:		One of the MTO SLA sites to predict Zone 4 RLP Start and End Dates							
Day	Date	Daily Air Temperatures			Reference Temperature	Calculated Thawing Index	Calculated Cumulative Thawing	> CTI Start Date Threshold for consecutive days	> CTI End Date Threshold for 1 day
		Enter Measured or Forecast	Max	Min					
Always Day 0 = Feb		(°C)	(°C)	(°C)	Tref (°C)	TI (°C)	CTI (°C-Days)	11-Feb-2023	15-Apr-2023
69	11-Apr-2023	16.0	1.3	8.7	4.20	12.9	218.8	Yes	No
70	12-Apr-2023	16.3	4.6	10.5	4.26	14.7	233.5	Yes	No
71	13-Apr-2023	23.3	8.4	15.9	4.32	20.2	253.7	Yes	No
72	14-Apr-2023	24.6	9.6	17.1	4.38	21.5	275.2	Yes	No
73	15-Apr-2023	27.3	9.6	18.5	4.44	22.9	298.0	Yes	Yes
74	16-Apr-2023	27.3	8.0	17.7	4.50	22.2	320.2	Yes	Yes
75	17-Apr-2023	26.2	3.8	15.0	4.56	19.6	339.8	Yes	Yes
76	18-Apr-2023	13.3	0.9	7.1	4.62	11.7	351.5	Yes	Yes
77	19-Apr-2023	6.5	0.9	3.7	4.68	8.4	359.9	Yes	Yes
78	20-Apr-2023	11.2	1.2	6.2	4.74	10.9	370.8	Yes	Yes
79	21-Apr-2023	23.9	1.2	12.6	4.80	17.4	388.1	Yes	Yes
80	22-Apr-2023	23.9	6.3	15.1	4.86	20.0	408.1	Yes	Yes
81	23-Apr-2023	19.2	4.5	11.9	4.92	16.8	424.9	Yes	Yes
82	24-Apr-2023	9.9	4.3	7.1	4.98	12.1	437.0	Yes	Yes
83	25-Apr-2023	9.5	1.1	5.3	5.04	10.3	447.3	Yes	Yes
84	26-Apr-2023	7.8	1.1	4.5	5.10	9.6	456.8	Yes	Yes
85	27-Apr-2023	13.3	2.7	8.0	5.16	13.2	470.0	Yes	Yes

MTO - Reduced Load Period (RLP) Recommendation Table			
RLP Zone 4		Enter RLP Year: 2023	
CTI Thresholds		Start	End
Zone 4 (RLP Start/End Dates)		8	290
MTO SLA Sites ID		9-Feb-2023	19-Apr-2023
Watch List ID	Start	End	
1	SLA ER-39 Bloomfield	11-Feb-2023	15-Apr-2023
2	SLA WR-5 Ostrander	9-Feb-2023	12-Apr-2023
3	SLA WR-13 Mount Forest	15-Feb-2023	19-Apr-2023
4		--	--
5		--	--
6		--	--
7		--	--

Program Statistics.

2023 Successes

- Training
 - 78 enrolled
 - 59 municipalities
 - 2 consultants
- RLP Calculator
 - 125+ downloads/week
- RLP Recommendations



Zone	RLP Onset	RLP Removal	Total RLP Days
1	Apr. 2, 2023	Jun. 4, 2023	64
2	Mar. 27, 2023	Jun. 1, 2023	67
3	Feb. 15, 2023	May 12, 2023	87
4	Feb. 9, 2023	Apr. 19, 2023	70

Next Steps.

MTO and GR Next Steps

- 2024
 - Additional weather stations
 - Refinement of the CTI model
 - Automation of input weather data
- Beyond 2024
 - Winter Weight Premium (WWP) model





Seasonal Load Restrictions



Seasonal Load Restrictions

- **Regional and municipal traffic by-laws**
 - Preserve roads from damage during freeze-thaw periods
 - Spring thaw saturates road base
 - Integrity compromised



Highway Traffic Act

- Section 122 of the Highway Traffic Act grants municipalities to enforce SLR via municipal by-law
- Start and End of restricted period is up to each municipality

Section 122 of the HTA

“ Subject to section 110, during a reduced load period no commercial motor vehicle or trailer, other than a public vehicle or a vehicle referred to in subsection (2), shall be operated or drawn upon any designated highway where the weight upon an axle exceeds 5,000 kilograms. R.S.O. 1990, c. H.8, s. 122 (1) ”



Case Study



Overview:

Muskoka Bay Resort

- **Construction between Spring 2018 – Summer 2019**
 - Tilt-up construction
- **Restriction period**
 - March 22 – May 31, 2019
 - 1540m³ shipped in small loads











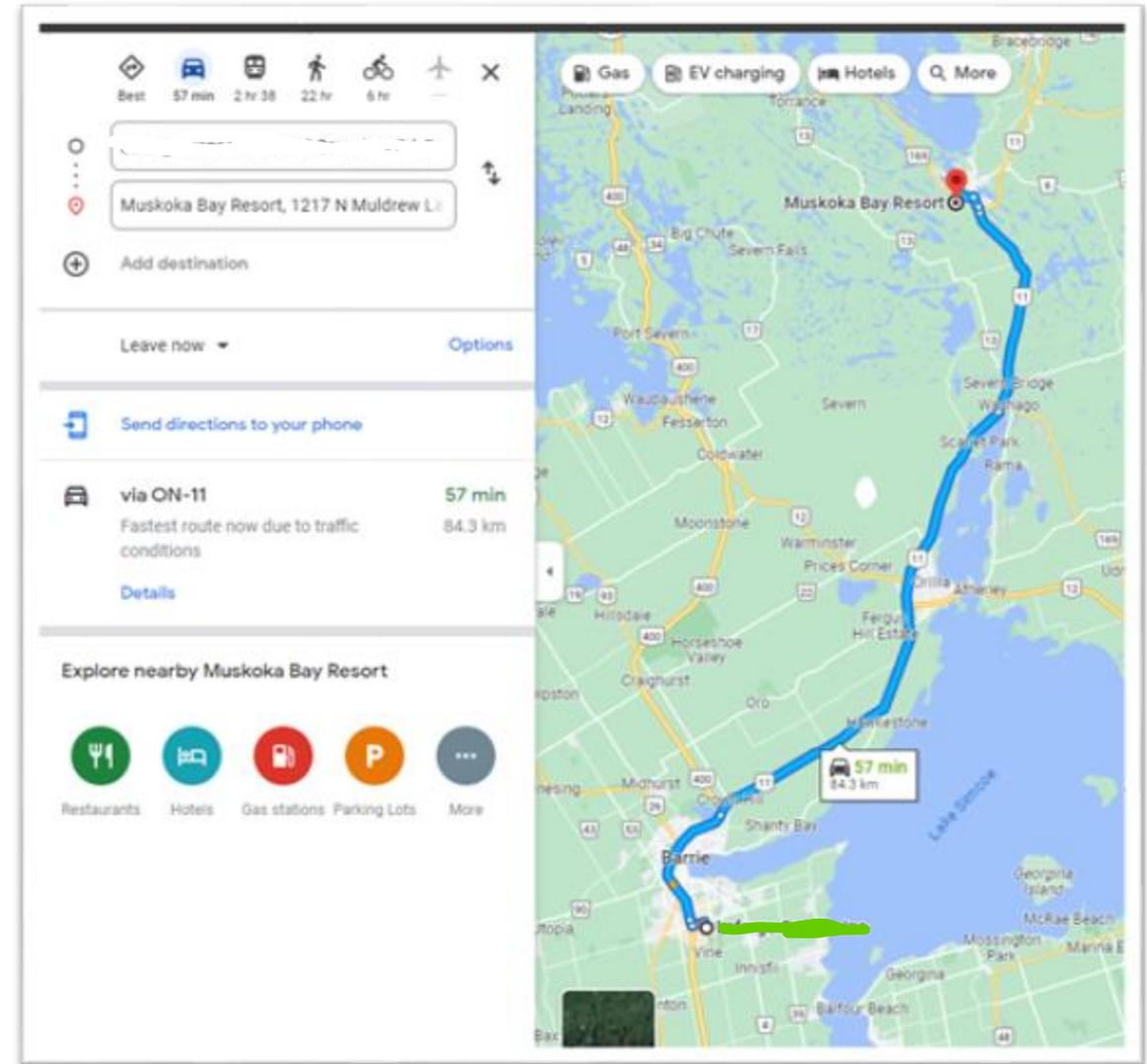
MUSKOKA BAY RESORT



Overview:

Muskoka Bay Resort

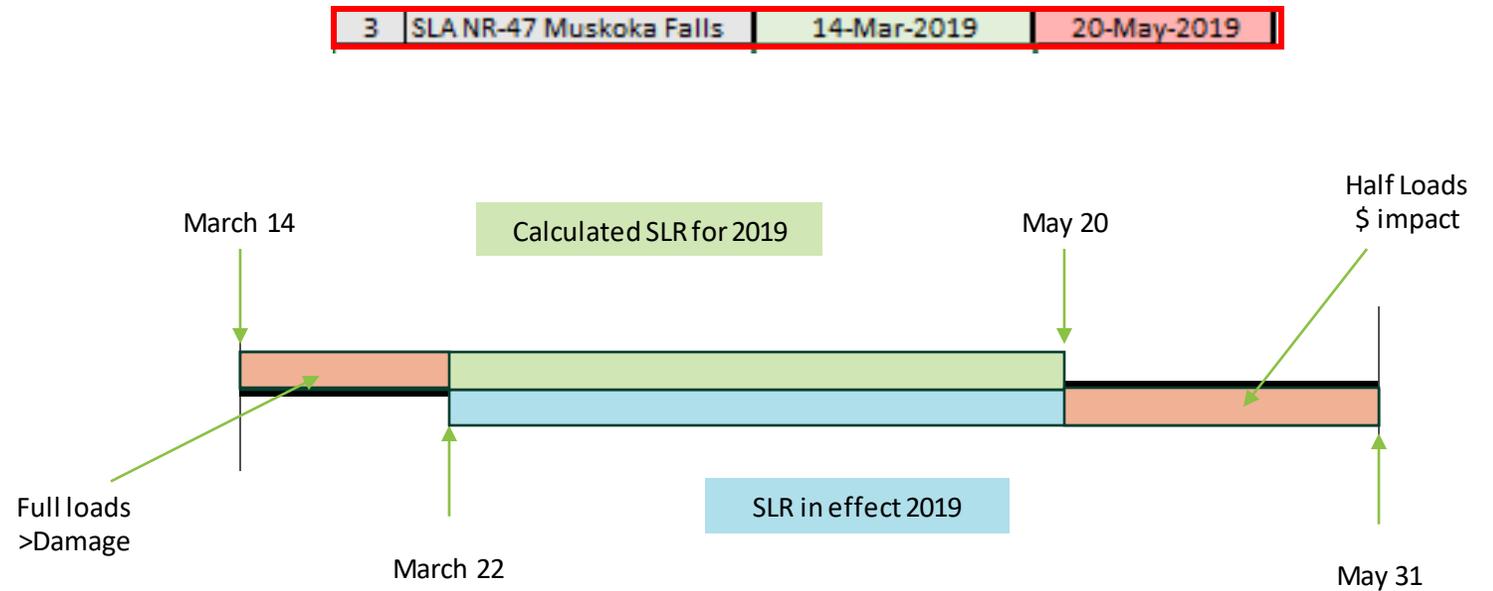
- **776 small loads**
- 49 business days in total
- ~ 16 loads per day
 - 2680 km
- Outside of SLR period:
 - 4 loads
 - 672 km



Calculated Seasonal Load Restriction Period

- In effect during 2019:
 - March 22 – May 31, 2019

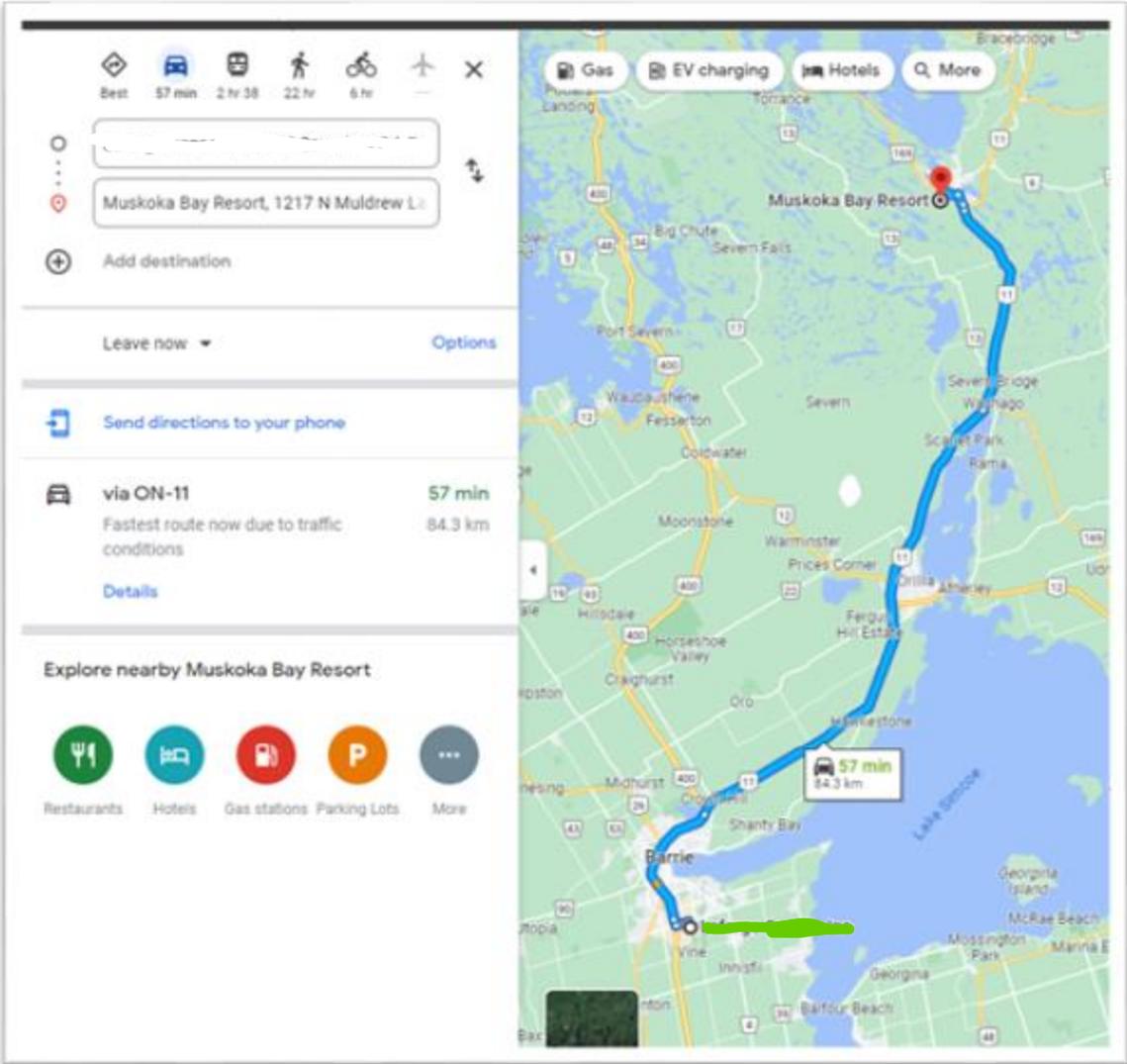
- **Calculated:**
 - **March 14 – May 20 2019**



Environmental Impacts

	Assumptions:		Source
Truck Consumption	5.5	mpg	Geotab
Diesel emissions	2.34	km/L	
	2.7	kg of CO2 per L	NRC Canada

	Per load	
	168.6	Km round-trip
	72.1	L of Diesel
	194.7	Kg of CO2



Environmental Impacts

Per load	
168.6	Km round-trip
72.1	L of Diesel
194.7	Kg of CO2

Summer	181	loads
GR/MTO Calculator	729	Loads
SLR in Effect 2019	776	loads

- **9.1 tons of CO2** reduced with the GR/MTO calculator.

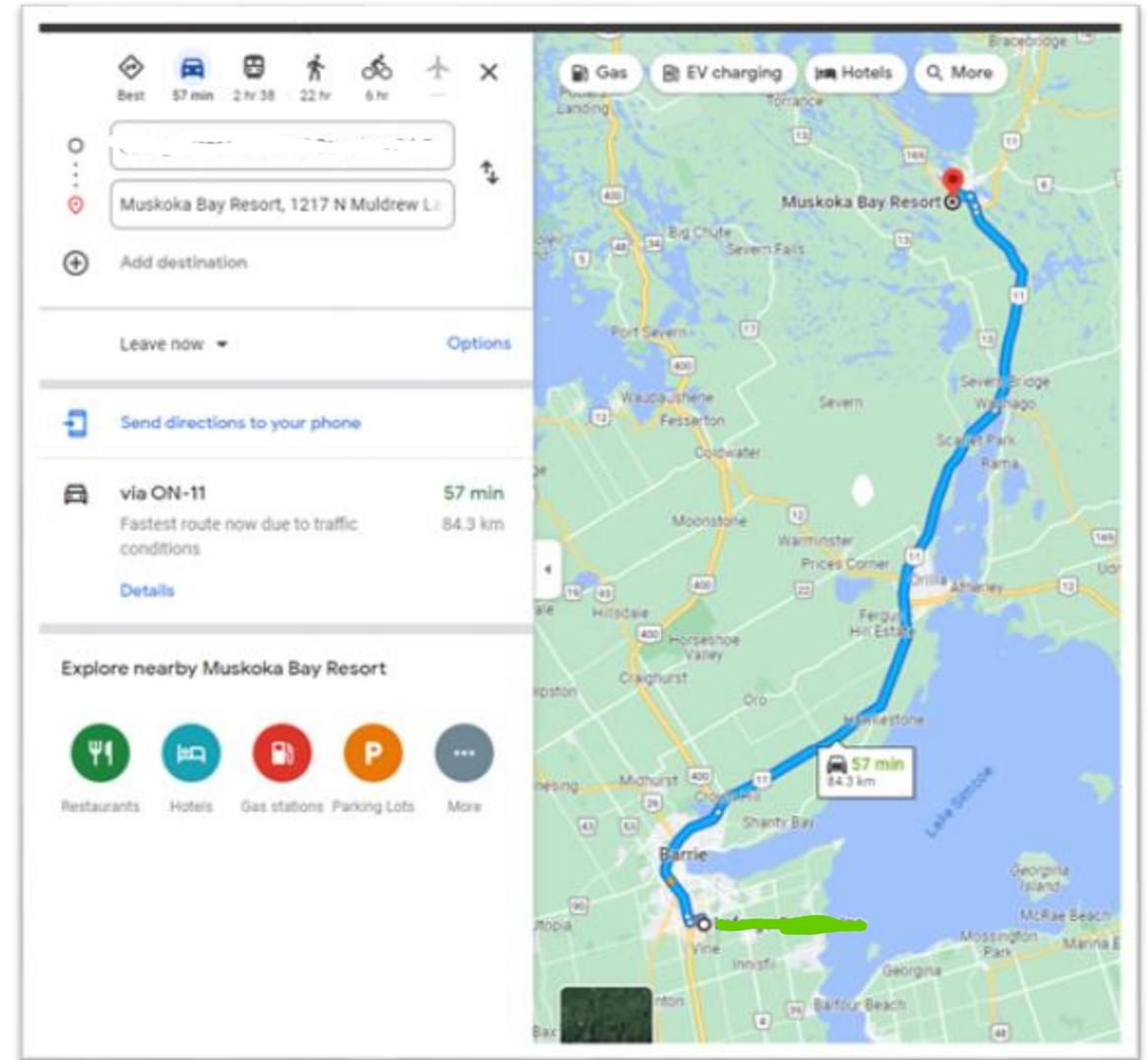
	Distance travelled (Km)	CO2 emitted	Increase
No Restriction	30,516.6	35.2 tons	-
GR/MTO Calculated	122,909.4	141 .9 tons	70.62%
SLR In effect 2019	130,833.6	151 tons	76.68%

Financial Impacts

Assuming:

- 2 hour round-trip
- 15 minutes discharge time

	Man-hours (h)	Increase (h)
No Restriction	407	-
Gr/MTO Calculated	1640	1233
In effect 2019	1746	1339



Unintended Consequences of SRLs



Road Damage

- Late start to SRLs



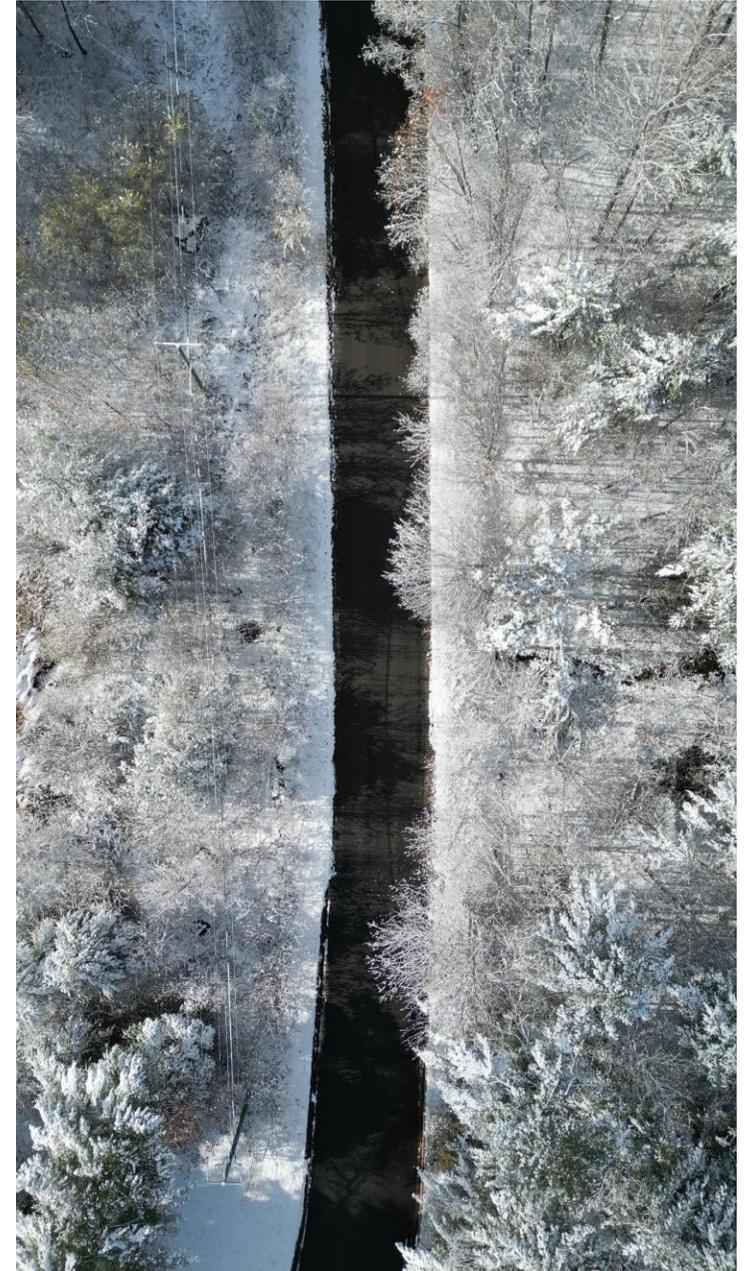
Environmental Impact

- Increased fuel usage
- Increase CO2 emissions



Economical Impact

- Increased man-hours
- Equipment time increased



Questions?



Thank you.

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