Supporting Document 3-10

Transportation Effects Assessment Report

Eastern Ontario Waste Handling Facility Future Development Environmental Assessment

GFL Environmental Inc.

Moose Creek, Ontario

October 14, 2022

Prepared by:

HDR Corporation
100 York Boulevard, Suite 300
Richmond Hill, ON L4B 1J8

Acknowledgements

This Report has been Prepared by:

HDR Corporation
100 York Boulevard, Suite 300
Richmond Hill, ON L4B 1J8

Executive Summary

HDR Corporation (HDR) was contracted by GFL Environmental Inc. (GFL) to conduct an assessment of the effects of the Eastern Ontario Waste Handling Facility (EOWHF) future development lands on the transportation component of the Built Environment as part of the EOWHF Future Development Environmental Assessment (EA).

The EA is being carried out in accordance with the requirements of the Environmental Assessment Act (EAA) and Terms of Reference (ToR), which was approved by the Ministry of the Environment, Conservation and Parks (MECP) on January 14, 2021.

The current Environmental Compliance Approval, issued by the MECP limits the EOWHF landfill to a maximum of 755,000 tonnes annually (equivalent to an average daily rate of 2,500 tonnes per day for the landfill), and a maximum of 4,000 tonnes per day of waste for the entire EOWHF. It is expected that the proposed future development will continue to operate at this maximum annual level. The development into the adjoining lands to the east would permit additional total volume which is expected to extend the current operating life of the site by approximately 20 years to 2045, but with no changes to the annual or daily tonnage restrictions.

For a conservative traffic operations analysis, this report assesses future conditions assuming the facility receives and processes up to its current allowable daily maximum tonnage limit of 4,000 tonnes per day of combined landfill and compost on the north side of Laflèche Road. This is unlikely to be realized on a typical Saturday during which the operating hours are reduced and less tonnage is consistently received when compared to weekdays. However, this may be realized on a weekday and specifically during the autumn months when contaminated soil jobs are being received at a high rate.

Compost and curing pads currently located north of Laflèche Road will be relocated to the area south of Laflèche Road and the relocation will not result in any changes to traffic volumes or patterns. There will be no changes to vehicle access for these relocated uses and they will continue to travel along Laflèche Road.

An existing sod farm is also currently located along Laflèche Road adjacent to the waste handling facility. The future development lands will likely displace the sod farm operations on the north side of Laflèche Road; however, for a more conservative analysis, traffic generated by the sod operations has been assumed to be negligible and was not removed from the existing traffic volumes.

This report projects traffic volumes for the 5-year and 15-year horizons, for weekday AM and PM, and Saturday midday peak hours, and assesses the impacts on the surrounding road network from an operational perspective. The 15-year horizon of 2035 (initially considered in the 2020 ToR) is 10 years before the end of the future facility operating period in 2045, but represents a typical and appropriate horizon year for long-term Transportation Impact Studies. The analysis is based on conservative background traffic growth assumptions (while the landfill site traffic remains consistent year to year) but do not include special considerations such as new development or major road network improvements that could occur beyond 2035. An environmental assessment is on-going

for the Highway 138 corridor, which is completely separate from the landfill EA, and has identified the potential for some improvements, such as passing lanes, to the south of this study area.

Two alternative methods for carrying out the undertaking were identified in the approved ToR and are developed to a preliminary conceptual design level in the Conceptual Design Report (CDR). Operations are expected to remain unchanged in terms of the origins and destinations of trucks and haul routes to/from the site. The expansion is not anticipated to generate additional measurable traffic related to construction. There will be no changes to employee traffic, on-site and weigh scale times, vehicle types and vehicle loads, and hourly, daily and seasonal traffic patterns.

A net effects assessment was carried out for the two alternative methods following the methods outlined in the approved ToR incorporating the information contained in the CDR along with the findings of the Transportation Impact Study. The results of the net effects assessment are used in a comparative evaluation of the two proposed alternative methods.

Site Traffic

Based on the theoretical maximum daily tonnage limits, up to 25 and 27 additional two-way trips are projected to enter the facility during the weekday AM, and PM peak hours, respectively[1]. These trips comprise trucks and light vehicle traffic destined to the landfill or composting facility. Relative to existing conditions, this is a 68%, and 69% increase in peak hour traffic volumes. Saturday trip generation may increase from 15 two-way trips per hour to a theoretical maximum of 113 trips per hour, which is also comprised of trucks and light vehicles.

The weekday projections represent a realistic and conservative estimate of traffic anticipated for the facility during the weekday AM and PM peak hours, since the observed tonnage received was 65% of the maximum daily limit, which is typical for a weekday. The site traffic volumes were therefore forecast by scaling up the observed site traffic (from the turning movement counts) by a factor of approximately 1.53 (100/65).

Since the observed tonnage received on Saturday was only 15% of the daily maximum tonnage, and this is representative of a typical Saturday, it is unlikely that the facility would receive over 6.67 times (100/15) the observed tonnage to reach 100% of the daily maximum. Therefore, the Saturday projections represent the highest theoretical level of trip generation for a conservative assessment of site impacts, with site traffic assessed in this study being much higher than would be expected on a typical Saturday.

The average daily facility traffic associated with the landfill is not anticipated to change from observed 2020 conditions. These projections are theoretical maximums and demonstrate that the facility will have minimal impacts on traffic capacity and operations even on atypical, high demand days. As no net effects are expected as a result of either alternative method, there is no substantial difference between the alternative methods with respect to the transportation component of the Built Environment, and no preferred

[1] This additional traffic is estimated to result from increasing the current operations up to the maximum daily tonnage limit and is not attributable directly to the future development.

alternative is identified. The same advantages and disadvantages apply to each of the alternative methods documented within this report.

The forecast maximum hourly one-way trip generation on a weekday is 58 vehicles occurring during the weekday PM peak hour, with 58 outbound trips, or one vehicle every 62 seconds on average. The maximum hourly one-way trip generation for the Saturday is 68 outbound trips, or one vehicle every 52 seconds. This estimate is comprised of trucks and light vehicles for the landfill and compost facility.

Safety

Based on the Ministry of Transportation of Ontario (MTO) left-turn lane warrants (from the MTO Design Supplement for TAC Geometric Design Guide (GDG) for Canadian Roads), a southbound left-turn lane is warranted at the Highway 138 and Laflèche Road intersection under 2025 background traffic conditions, and a northbound left-turn lane is warranted under future 2035 background traffic conditions. A northbound left-turn lane is also warranted at the Highway 417 eastbound off-ramp intersection with Highway 138, under 2035 background traffic conditions. These left-turn lanes are not required operationally and traffic operations under future background and total conditions will be within acceptable limits.

A review of publicly available segment collision rates along Highway 138 in the vicinity of the study area does not indicate any major safety concerns when comparing the collisions rates with the provincial average for similar highways. The provincial average collision rate over the past 5 years of available data was 1.51 for all roadways in the province of Ontario based on the MTO collision rates for 2-lane King's Highways available online. This was compared to the collision rate for the Highway 138 segment in the off-site study area which had an average collision rate of 0.78. This segment of Highway 138 within the study area has a rate that is nearly half that of the provincial average, which suggests that this segment is not collision-prone under existing conditions and that there is no significant safety concern.

Detailed collision analysis at the intersection level was not performed based on the segment average being significantly less than the provincial average. Accordingly, the review did not identify the need for a more detailed safety review.

The traffic associated with existing uses on the north side of Laflèche Road (i.e., the existing EOWHF) is expected to remain unchanged, and the study is based on data that is expected to be representative of typical average daily traffic volumes for the existing uses. However, there is a potential for site traffic associated with the existing uses to increase if the site receives the maximum daily tonnage (comprising compost and landfill) – this scenario was assessed for the existing facility for a more conservative operational analysis. Overall, two-way truck trips may increase by 22, 16 and 42 one-way truck trips during the weekday AM, PM, and Saturday peak hours, respectively, but this increase has not been correlated to any safety impacts.

The collisions rates involving trucks were not available for review as part of this study, and therefore, truck activity was not correlated to collision rates. However, as previously mentioned, the adjacent section of Highway 138 has an average collision rate that is nearly half of the provincial average. Although any increases in traffic volumes will

theoretically increase the frequency of collisions, based on the data reviewed there is no indication that the increase in facility site traffic will result in any increases to collision rates (expressed as collisions per vehicle-kilometres).

Mitigation

Mitigation measures and monitoring are not proposed for the transportation component of the Built Environment as no effects are predicted to result from the EOWHF future development. The commitments associated with the transportation component of the Built Environment include:

- no changes to landfill haul routes;
- no additional measurable traffic related to construction;
- no changes to on-site times and weigh scale times, employee traffic volumes or patterns, or the breakdown of vehicle types and average vehicle loads; and
- GFL's continued support of the minimization of environmental impacts associated with GHG emissions through reducing the number of waste related trucks hauling material long distances.

Acronyms, Units and Glossary

Acronyms

Acronym	Definition
AADT	Average Annual Daily Traffic
CAGR	Compound Annual Growth Rate
CDR	Conceptual Design Report
EAA	Environmental Assessment Act
EOWHF	Eastern Ontario Waste Handling Facility
GFL	GFL Environmental Inc.
GHG	Greenhouse Gas
HDR	HDR Corporation
LOS	Level of Service
MECP	Ministry of Environment, Conservation and Parks
MTO	Ministry of Transportation of Ontario
OES	Ontario Electronic Stewardship
ToR	Terms of Reference

Units

Unit	Definition
km	kilometre
km/h	kilometres per hour
m	metre
v/c	volume to capacity ratio

Glossary

Term	Definition
Active Transportation	Any form of human-powered transportation, e.g., walking, cycling, etc.
Approval	Permission granted by an authorized individual or organization for an undertaking to proceed. This may be in the form of program approval, certificate of approval or provisional certificate of approval
Bulking Material	Material such as woodchips added to high nitrogen materials like food scraps to provide a carbon source and increase the porosity of the compost.
CAGR	Compound Annual Growth Rate is the year-to-year growth rate applied to traffic volumes to estimate future traffic volumes while taking into account general background growth, and excludes traffic generated by specific developments.

Glossary

Term	Definition
Capacity (Disposal Volume)	The total volume of air space available for disposal of waste at a landfill site for a particular design (typically in m^3); includes both waste and daily cover materials, but excludes the final cover.
Composting	The controlled microbial decomposition of organic matter, such as food and yard wastes, in the presence of oxygen, into finished compost (humus), a soil-like material. Humus can be used in vegetable and flower gardens, hedges, etc.
Composting facility	A facility designed to compost organic matter either in the presence of oxygen (aerobic) or absence of oxygen (anaerobic).
Control Delay	The amount of delay (typically in seconds) experienced by a vehicle at a controlled movement.
Critical Movement	Critical movements are vehicle movements which are operating beyond acceptable thresholds, which are typically based on control delay or volume to capacity ratios.
Environment	As defined by the Environmental Assessment Act, environment means: • air, land or water; • plant and animal life, including human life; • the social, economic and cultural conditions that influence the life of humans or a community; • any building, structure, machine or other device or thing made by humans; • any solid, liquid, gas, odour, heat, sound, vibration or radiation resulting directly or indirectly from human activities; or • any part or combination of the foregoing and the interrelationships between any two or more of them (ecosystem approach).
Environmental Assessment	A systematic planning process that is conducted in accordance with applicable laws or regulations aimed at assessing the effects of a proposed undertaking on the environment
Evaluation criteria	Evaluation criteria are considerations or factors taken into account in assessing the advantages and disadvantages of various alternatives being considered
Greenhouse gas	Any of the gases whose absorption of solar radiation is responsible for the greenhouse effect, including carbon dioxide, methane, ozone, and the fluorocarbons.
Indicators	Indicators are specific characteristics of the evaluation criteria that can be measured or determined in some way, as opposed to the actual criteria, which are fairly general
Landfill gas	The gases produced from the wastes disposed in a landfill; the main constituents are typically carbon dioxide and methane, with small amounts of other organic and odour-causing compounds
Landfill site	An approved engineered site/facility used for the final disposal of waste. Landfills are waste disposal sites where waste is spread in layers, compacted to the smallest practical volume, and typically covered by soil.
Leachate	Liquid that drains from solid waste in a landfill and which contains dissolved, suspended and/or microbial contaminants from the breakdown of this waste.
Level of Service (LOS)	A qualitative measure used to describe the operating conditions of a roadway (i.e., the quality of traffic service) based on factors such as vehicle speed, travel time, etc. The level of service (LOS) of a roadway is designated with a letter, A to F, with A representing the best operating conditions and F representing the worst operating conditions as follows: • LOS A – C: free-flow, very little to moderate delay; • LOS D-E: approaching or at capacity, users experience delays and queuing; and • LOS F: over capacity, severe delays and queuing.
Methane gas	A colourless, odourless highly combustible gas often produced by the decomposition of decomposable waste at a landfill site. Methane is explosive in concentrations between 5% and 15% volume in air.
Mitigation	Measures taken to reduce adverse impacts on the environment.

Glossary

Term	Definition
Proponent	A person who: • carries out or proposes to carry out an undertaking; or • is the owner or person having charge, management or control of an undertaking.
Signalized	A form of intersection control in which vehicle movements are controlled by traffic signals which indicate right-of-way.
Stop Control	A form of intersection control in which vehicle movements are controlled by a stop sign. Stop control us an unsignalized form of traffic control.
Receptor	The person, plant or wildlife species that may be affected due to exposure to a contaminant.
Terms of Reference	A terms of reference is a document that sets out detailed requirements for the preparation of an Environmental Assessment.
Undertaking	Is defined in the Environmental Assessment Act as follows: • An enterprise or activity or a proposal, plan or program in respect of an enterprise or activity by or on behalf of Her Majesty in right of Ontario, by a public body or public bodies or by a municipality or municipalities; • A major commercial or business enterprise or activity or a proposal, plan or program in respect of a major commercial or business enterprise or activity of a person or persons other than a person or persons referred to in clause (1) that is designated by the regulations; or • An enterprise or activity or a proposal, plan or program in respect of an enterprise or activity of a person or persons, other than a person or persons referred to in clause (a), if an agreement is entered into under section 3.0.1 in respect of the enterprise, activity, proposal, plan or program ("enterprise").
Unsignalized	This refers to intersections which are not controlled by traffic signals. The most common mode of unsignalized traffic control is stop-control (stop signs).
Volume to Capacity Ratio (v/c Ratio)	A ratio of the demand for an intersection of for a specific traffic movement, divided into the theoretical capacity.
Waste	Refuse from places of human or animal habitation; unwanted materials left over from a manufacturing process.
95th	95th Percentile Queue reported from Synchro

Contents

Executive Summary i

Acronyms, Units and Glossary v

1 Introduction 1

2 Effects Assessment Methods 5

2.1 Predict Potential Environmental Effects for Alternative Methods 5

2.1.1 Study Areas 5
2.1.2 Evaluation Criteria, Indicators and Data Sources 7
2.1.3 Key Design Considerations and Assumptions 7

2.2 Comparative Evaluation and Identification of the Preferred Alternative 13

2.3 Effects Assessment of the Preferred Alternative 13

3 Net Effects Assessment 13

3.1 Alternative Method 1 17

3.2 Alternative Method 2 24

4 Comparative Evaluation of Net Effects and Identification of the Preferred Alternative 24

4.1 Comparative Evaluation Results 24

4.2 Advantages and Disadvantages of the Preferred Alternative 24

5 Commitments and Monitoring 25

5.1 Transportation Commitments 25

6 References 26

Tables

Table 1-1. Environmental Aspects, Components and Evaluation Criteria 1
Table 2-1. Evaluation Criteria, Indicators and Data Sources for Transportation Component of Built Environment 7
Table 2-2. Observed Peak Hourly Traffic Volumes for the EOWHF 8
Table 2-3. Existing Traffic Conditions (2020) 11
Table 3-1. Future Background Traffic Conditions (2025) 15
Table 3-2. Future Background Traffic Conditions (2035) 16
Table 3-3. Projected Peak Hourly Traffic Volumes for the EOWHF 18
Table 3-6. Future Total Traffic Conditions (2025) 19
Table 3-7. Future Total Traffic Conditions (2035) 20
Table 3-8. Net Effects Assessment – Alternative Method 1 22
Table 4-1. Comparative Evaluation of Net Effects for the Transportation Component of the Built Environment 24
Table 4-2. Advantages and Disadvantages of Alternative Methods 25

Figures

Figure 1-1. Alternative Method 1 3
Figure 1-2. Alternative Method 2 4
Figure 2-1. Off-site Study Area for the Transportation Component of the Built Environment 6
Figure 2-2. Existing Road Network 10

Appendices

Appendix A. GFL Environmental Inc. Eastern Ontario Waste Handling Facility Future Development Transportation Impact Study. February 16, 2021 ..... A-1

Appendix B. Updated Synchro Reports (2025 and 2035 Horizon Year Total Traffic Operations) B-1

Appendix C. Updated Forecast Traffic Volumes (2025 and 2035 Horizon Year Total Traffic) C-1

1 Introduction

HDR Corporation (HDR) was contracted by GFL Environmental Inc. (GFL) to conduct an assessment of the effects of the future development of the Eastern Ontario Waste Handling Facility (EOWHF) on the transportation component of the Built Environment as part of the EOWHF Future Development Environmental Assessment (EA).

The EA is being carried out in accordance with the requirements of the *Environmental Assessment Act* (EAA) and Terms of Reference (ToR), which was approved by the Ministry of Environment, Conservation and Parks (MECP) on January 14, 2021.

The environment was divided into environmental aspects, components and evaluation criteria as listed in **Table 1-1**. Existing conditions reports and effects assessment reports have been prepared to address the environmental components.

Table 1-1. Environmental Aspects, Components and Evaluation Criteria

Environmental Aspect	Environmental Component	Evaluation Criteria
Natural Environment	Atmospheric Environment	• Air Quality • Noise • Odour
	Geology and Hydrogeology	• Groundwater Quality • Groundwater Quantity
	Surface Water Environment	• Surface Water Quality • Surface Water Quantity
	Ecological Environment	• Terrestrial Ecosystems • Aquatic Ecosystems
Socio-Economic Environment	Economic	• Economic Effects on / Benefits to Local Community
	Social	• Effects on Local Community • Visual Impact of Facility
Cultural Environment	Cultural Environment	• Cultural Heritage Resources • Archaeological Resources
Built Environment	Transportation	• Effects from Truck Transportation along Access Roads
	Current and Planned Future Land Use	• Effects on Current and Planned Future Land Uses
	Aggregate Extraction and Agricultural	• Aggregate Resources • Effects on Agricultural Land

The purpose of the proposed undertaking is to provide approximately 15.1 million cubic metres (m^3) of additional landfill disposal capacity at the existing EOWHF over a 20-year planning period, with operations anticipated to begin in 2025 and closure anticipated in 2045. The undertaking will enable GFL to continue to provide disposal services for residual non-hazardous solid waste to their customers once the landfill reaches its currently approved disposal capacity and continue to provide economic support to the

local community over the long term. No changes to the approved fill rates or site access routes are proposed.

Two alternative methods for carrying out the undertaking were identified in the approved ToR and are developed to a preliminary conceptual design level in the Conceptual Design Report (CDR). Both alternatives provide a landfill volume of approximately 15.1 million m^3 based on the approved fill rate of 755,000 tonnes per year over a 20 -year planning period. Studies completed for the EOWHF have indicated that, based on the underlying soils, the design alternatives are limited to varying lateral configurations with a consistent height. Both alternative methods will continue to use established operating procedures currently in place at the EOWHF and would maximize the use of existing site infrastructure.

Alternative Method 1 (**Figure 1-1**) consists of implementing the future development through five stages: one stage adjacent to and north of the existing landfill (Stage 5); and four stages oriented east-west within the future development lands (Stages 6 through 9). Stages 6 through 8 will be identical in size, while Stages 5 and 9 will be smaller. A stormwater management system will be constructed consisting of conveyance ditches around the perimeter of each stage and a retention pond located northwest of Stage 8. The existing pond located northeast of Stage 5 will be modified to attenuate peak flows if required.

Alternative Method 2 (**Figure 1-2**) consists of implementing the future development through four stages: one stage adjacent to and north of the existing landfill (Stage 5); and three stages oriented north-south within the future development lands (Stages 6 through 8). Stages 6 and 7 will be identical in size, while Stages 5 and 8 will be smaller. A stormwater management system will be constructed consisting of conveyance ditches around the perimeter of each stage and a retention pond located north of Stages 6 and 7. The existing pond located northeast of Stage 5 will be modified to attenuate peak flows if required.

For both alternative methods, the design of the stages will be consistent with the existing landfill design. Visual screening will be constructed along the north and east perimeters and a portion of the south perimeter consisting of earthen berms and/or vegetation plantings. A new road entrance will be constructed from Laflèche Road, which will include a new scale facility.

The purpose of this Effects Assessment Report is to present the potential environmental effects of the alternative methods on the transportation component of the Built Environment, a comparison of the net effects of each alternative method, the selection of a preferred alternative, an assessment of the environmental effects of the preferred alternative, commitments and monitoring, and approvals. The results from this study will be documented in an EA Study Report in accordance with the approved ToR, which will be submitted to the MECP for review.

Figure 1-1. Alternative Method 1

Figure 1-2. Alternative Method 2

2 Effects Assessment Methods

Using the evaluation criteria, indicators, rationale and data sources from the approved ToR and the existing conditions from the Transportation Impact Study Report, the effects assessment is carried out as follows:

- predict the potential environmental effects for each alternative method (Section 3);
- identify the preferred alternative based on a comparative evaluation of the potential environmental effects of each alternative method (Section 4); and
- conduct an effects assessment on the preferred alternative, including the identification of mitigation measures and monitoring programs (Sections 4 and 5).

2.1 Predict Potential Environmental Effects for Alternative Methods

The potential environmental effects for each alternative method are identified based on the application of the evaluation criteria, indicators and data sources in the approved ToR and based on the maximum allowable waste receipt level for the EOWHF landfill. The potential effects can be positive or negative, direct or indirect, and short- or long-term. Mitigation measures are identified to minimize or mitigate the potential effects and then the net effects are evaluated taking into consideration the application of mitigation measures.

2.1.1 Study Areas

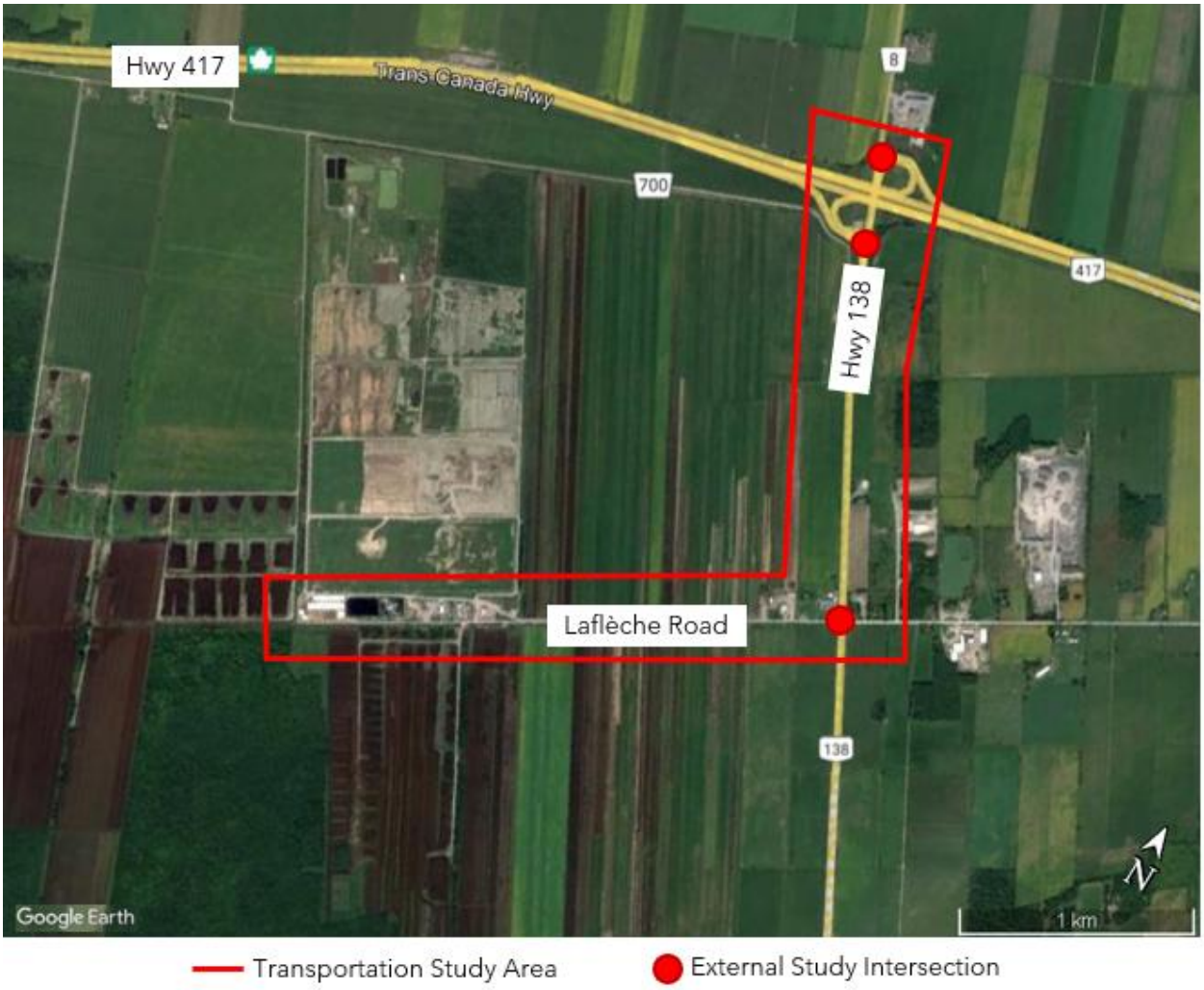
The existing EOWHF is located within the Township of North Stormont, approximately 5 km north-northwest of the village of Moose Creek, Ontario, and 5 km east of the village of Casselman, Ontario, on the western half of Lot 16 and Lots 17 and 18, Concession 10, Township of North Stormont, United Counties of Stormont, Dundas and Glengarry, near the intersection of Highway 417 and Highway 138. The municipal street address for the facility is 17125 Laflèche Road, Moose Creek, Ontario. The lands to the east of the existing EOWHF being considered for the future development include the eastern half of Lot 16, Lots 14 and 15, and the majority of Lot 13 of Concession 10. The existing EOWHF encompasses a site area of 189 hectares, while the lands to the east of the existing EOWHF being considered for future development include approximately 240 hectares.

The study areas include the existing site as well as potentially effected surrounding areas. The on-site and off-site study areas identified for the EA in the approved ToR are as follows (**Figure 2-1**):

- On-site Study Area – the existing EOWHF, and the future development area comprising the eastern half of Lot 16, Lots 14 and 15, and the majority of Lot 13 of Concession 10 east of the EOWHF; and
- Off-site Study Area – the lands in the vicinity of the future development extending approximately 1 kilometre from the on-site study area.

For the Transportation effects assessment, the potentially-affected areas include the existing local road network. The general Off-site Study Area has been modified for the purposes of the Transportation effects assessment to include the intersection of Highway 417 with Highway 138, and the intersection of Highway 138 with Laflèche Road. Three intersections were included in the external study area transportation effects assessment, including the off-ramps at the Highway 417/138 interchange. On-ramps are free-flow and were therefore not analyzed for traffic operations but were considered for the purposes of forecasting site traffic volumes.

Figure 2-1. Off-site Study Area for the Transportation Component of the Built Environment



2.1.2 Evaluation Criteria, Indicators and Data Sources

The evaluation criteria, rationale, indicators and data sources used for the Transportation effects assessment as per the approved ToR are provided in **Table 2-1**.

Table 2-1. Evaluation Criteria, Indicators and Data Sources for Transportation Component of Built Environment

Evaluation Criteria	Rationale	Indicators	Data Sources
Built Environment			
Effects from truck traffic/transportation along access roads.	Truck traffic associated with continued operations of the landfill may adversely affect residents, businesses, institutions and movement of farm vehicles in the site vicinity.	• Disturbance to traffic operations.	• Existing information and traffic data • Proposed facility characteristics • Landfill design and operations data

2.1.3 Key Design Considerations and Assumptions

The alternative methods of carrying out the undertaking are described in detail in the CDR. Regarding the alternative methods, the key design considerations and assumptions as they relate to transportation component of the built environment are described below.

Key design considerations for the transportation component of the Built Environment include any construction or operation activities that could affect traffic volumes, distribution, level of service (LOS), and truck transportation along access roads.

Summary of Existing Conditions

The facility is located on Laflèche Road, a private road, which is accessed from Highway 138. Highway 138 intersects with Highway 417 approximately 2 km north of Laflèche Road. The surrounding area is predominantly rural and undeveloped.

The current Environmental Compliance Approval, issued by the Ministry of the Environment, Conservation and Parks (MECP) limits the EOWHF to a maximum of 755,000 tonnes annually for the landfill (equivalent to an average daily rate of 2,500 tonnes per day). It is expected that with the future development the landfill will continue to operate at this level. The expansion into the adjoining lands to the east would permit additional total volume which is expected to extend the current operating life of the site by approximately 20 years to 2045, but with no changes to the annual or daily tonnage restrictions.

The current haul route to the EOWHF is via Highway 417, Highway 138, and Laflèche Road. Weigh scale data was collected on the same dates as the April 2020 turning movement counts that were collected at the weigh scale driveway, to determine the trip generation characteristics of the waste handling facility. The existing peak hourly landfill traffic volumes entering the landfill are presented in **Table 2-2**.

Table 2-2. Observed Peak Hourly Traffic Volumes for the EOWHF

Component	Observed 2020 Site Trip Generation[a]		
	AM	PM	Saturday
Compost Waste			
Tonnage Received	884		474
Light Vehicle Trips			
Inbound Trips	0	0	2
Outbound Trips	0	7	3
Inbound Trip Rate (per 1000 tonnes)	0.31	0.31	4.82
Outbound Trip Rate (per 1000 tonnes)	0.00	8.30	6.43
Heavy Vehicle Trips			
Inbound Trips	7	1	3
Outbound Trips	3	2	3
Inbound Trip Rate (per 1000 tonnes)	7.38	0.92	6.43
Outbound Trip Rate (per 1000 tonnes)	3.69	2.46	6.43
Landfill Waste			
Tonnage Received	1,717		106
Light Vehicle Trips			
Inbound Trips	1	1	1
Outbound Trips	0	20	1
Inbound Trip Rate (per 1000 tonnes)	0.42	0.42	6.72
Outbound Trip Rate (per 1000 tonnes)	0.00	11.45	8.96
Heavy Vehicle Trips			
Inbound Trips	17	2	1
Outbound Trips	9	6	1
Inbound Trip Rate (per 1000 tonnes)	10.17	1.27	8.96
Outbound Trip Rate (per 1000 tonnes)	5.09	3.39	8.96

[a] Due to the data processing and assumptions required to separate trips by vehicle type, there may be some minor rounding discrepancies in the final trips or trips rates.

Weigh scale data was provided to HDR and was used to correlate the trip generation characteristics of the waste handling facility with the tonnage received. The weigh scale data provides a daily summary of all vehicles entering the facility's weigh scale, as well as the total landfill and total compost tonnage received. This data was collected on the same dates as the April 2020 turning movement counts that were collected at the weigh scale driveway during the study peak periods. Traffic not passing through the weigh

scale is typically comprised of employee traffic, or traffic associated with the peat extraction operation on the south side of Laflèche Road. These vehicles are not captured in the weigh scale data. The data was disaggregated into two sets (weekday and Saturday) and was separated for waste types (waste and compost).

The facility is expected to receive comparable levels of waste and compost as it currently does on a typical day. On average, the facility accepts 2,500 tonnes per day of landfill which is calculated by taking the annual limit of 755,000 tonnes and dividing by 302 working days per year. On average, the facility accepts 797 tonnes per day of compost which is calculated by taking the annual limit of 240,800 tonnes (120,000 tonnes of feedstock and 120,800 tonnes of bulking agent) and dividing by 302 working days per year. The average of both compost and landfill is therefore 3,297 tonnes per day.

On the weekday for which weigh scale data was provided, the facility received approximately 2,600 tonnes of waste and compost combined, which means the observed site traffic should be representative of, or slightly lower than, average daily operations. Furthermore, the observed weekday traffic volumes represent approximately 65% of the daily maximum capacity. On the Saturday for which weigh scale data was provided, the facility received only 15% of the daily maximum. Saturdays consistently receive less tonnage and observe less activity than weekdays, partly as a result of having shorter operating hours (6 hours) compared to weekdays (10 hours).

Larger trucks generally travel to/from Ottawa or to/from the south via Highway 138. The smaller personal vehicles and pick-up trucks likely serve the surrounding local communities.

The following intersections are considered in the effects assessment:

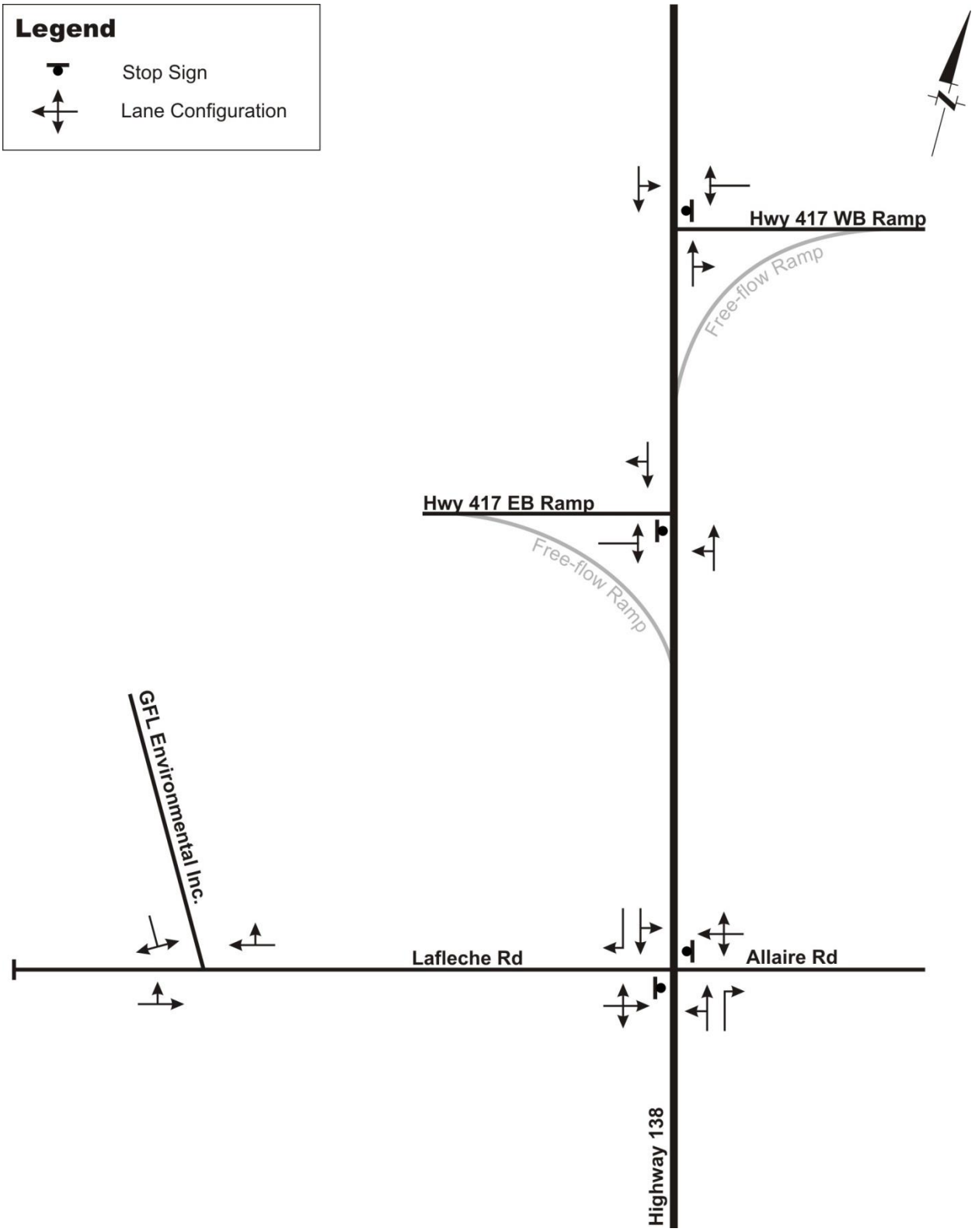
- Highway 138 at Highway 417 westbound off-ramp;
- Highway 138 at Highway 417 eastbound off-ramp;
- Highway 138 at Laflèche Road; and
- Laflèche Road at GFL Driveway.

The following time periods are considered in the effects assessment:

- Weekday AM peak hour (between 7:00am and 9:00am)
- Weekday PM peak hour (between 4:00pm and 6:00pm)
- Saturday midday peak hour (between 10:00am and 1:00pm)

The existing road network is shown in **Figure 2-2**.

Figure 2-2. Existing Road Network



The existing (2020) traffic conditions at these intersections are presented in **Table 2-3**.

Table 2-3. Existing Traffic Conditions (2020)

Intersection and Critical Movement	Weekday AM Peak Hour			Weekday PM Peak Hour			Saturday Peak Hour		
	LOS	v/c	95th	LOS	v/c	95th	LOS	v/c	95th
Hwy 138 / Hwy 417 WB Off-Ramp									
Westbound Approach	A	0.06	1.5	A	0.05	1.2	A	0.04	0.9
Northbound Approach	-	0.03	-	-	0.04	-	-	0.02	-
Southbound Approach	A	0.01	0.1	A	0.01	0.2	A	0.01	0.2
Hwy 138 / Hwy 417 EB Off-Ramp									
Eastbound Approach	B	0.01	0.2	B	0.03	0.6	B	0.01	0.2
Northbound Approach	A	0.02	0.5	A	0.02	0.5	A	0.01	0.3
Southbound Approach	-	0.04	-	-	0.05	-	-	0.05	-
Hwy 138 / Laflèche Rd									
Eastbound Approach	B	0.07	1.6	B	0.09	2.3	B	0.03	0.7
Westbound Approach	B	0.10	2.4	B	0.07	1.7	B	0.01	0.2
Northbound Left-through	A	0.01	0.3	A	0.01	0.2	A	0.00	0.1
Northbound Right-turn	-	0.01	-	-	0.00	-	-	0.00	-
Southbound Left-through	A	0.01	0.3	A	0.01	0.2	A	0.00	0.0
Southbound Right-turn	-	0.01	-	-	-	-	-	0.01	-
Laflèche Rd / GFL Driveway									
Eastbound Approach	-	0.00	-	-	0.00	-	-	0.00	-
Westbound Approach	-	0.03	-	-	0.01	-	-	0.01	-
Southbound Approach	A	0.02	0.4	A	0.07	1.8	A	0.01	0.3

Under existing conditions all movements at all study intersections are operating well with level of service ("LOS") ‘A’ or ‘B’ and with volume to capacity ratios of 0.10 or lower indicating that the intersection is operating well with residual capacity.

All 95th percentile queues are less than one standard vehicle length (7 metres). Due to low traffic volumes on minor approaches, there is on average less than one vehicle arriving per minute and no vehicle stacking, which is why Synchro reports the queue (in metres) as being less than 1 vehicle length. There are no operational concerns at any study intersections. Further details are provided in **Appendix A**.

Design Considerations and Assumptions

For the purposes of the effects assessment, the following assumptions have been made:

- Operations are expected to remain unchanged in terms of origins and destinations of trucks as well as haul routes (no changes to waste haul routes are anticipated as a result of the EOWHF future development lands or expanded landfill).
- Site traffic generation is expected to increase nominally considering the site has accepted 90.0%, 97.4%, and 99.9% of the annual tonnage limit (755,000 tonnes) over the past three years from 2019 to 2021, inclusive.
- Theoretical maximum peak hour trips were calculated by dividing the tonnage received on the day of the traffic counts into the daily maximum of 4,000 tonnes, and multiplying that factor by the observed trip generation.
- The expansion is not anticipated to generate additional measurable traffic related to construction due to the nature of the on-site soil materials and their suitability for utilization as the base liner and for cover material. Additional soil requirements for cover are included in the projected vehicle trips presented in the table.
- Employee traffic volumes remain unchanged and do not occur during peak hours.
- The proportion of inbound and outbound traffic volumes will remain steady, along with the proportion of trucks to light vehicles.
- There will be no changes to typical on-site times (less than 30 minutes) and weigh scale times (less than 3 minutes).
- Hourly, daily, and seasonal patterns remain stable.
- The breakdown of vehicle types and average vehicle loads remain stable.
- GFL will continue to support the minimization of environmental impacts associated with greenhouse gas (GHG) emissions through reducing the number of waste related trucks hauling material long distances.
- No planned road network improvements are identified within the study area. The Ministry of Transportation of Ontario (MTO) is currently undertaking an EA for Highway 138 from Highway 417 southward, which is currently on-going; however, the MTO indicated that there are no impacts expected to the study areas.
- No background developments were identified for inclusion in the effects assessment by the MTO, the United Counties of Prescott and Russell, or the United Counties of Stormont, Dundas, and Glengarry.
- For a conservative approach, a 2.0% compound annual growth rate was applied to all turning movement volumes, with the exception of turning movements in to and out of Laflèche Road and Allaire Road since these are local roadways.

2.2 Comparative Evaluation and Identification of the Preferred Alternative

The two alternative methods are comparatively assessed and evaluated using the criteria and indicators to determine the preferred alternative. The differences in the potential environmental effects remaining following the implementation of potential mitigation/management measures (i.e., net effects) are used to identify and compare the advantages and disadvantages of each alternative method.

The net environmental effects are utilized in a comparison of the two alternative methods to one another at the criteria and indicator level for each discipline. The following -two-step method was applied to carry out the comparative evaluation for the transportation component of the Built Environment:

1. Identify the predicted net effect(s) associated with each alternative for each indicator and assign a preference rating (i.e., Preferred, Not Preferred, No Substantial Difference); and
2. Rate each alternative at the criteria level (i.e., Preferred, Not Preferred, No Substantial Difference) based on the identified preference rating for each indicator and provide a rationale.

2.3 Effects Assessment of the Preferred Alternative

An assessment of the environmental effects of the preferred alternative is carried out considering the same criteria, indicators and data sources, taking into account potential mitigation/management measures and cumulative effects. The effects assessment of the preferred alternative will be presented in the EA Study Report.

3 Net Effects Assessment

The potential effects of the EOWHF expanded landfill and future development lands on the transportation component of the Built Environment are assessed based on guidelines from the MTO (2014). The scope of work for the Transportation Impact Study (Appendix A) was presented to the MTO, the United Counties of Prescott and Russell, and the United Counties of Stormont, Dundas, and Glengarry, in early 2020. All three agencies confirmed the scope of work with no comment.

It should be noted that the Transportation Impact Study included potential future uses on the south side of Laflèche Road. This report does not include those uses and the analysis has been modified to reflect removal of those potential future uses which may result in slight differences between the Transportation Impact Study and the forecasts and traffic operations in this report. Operations in this report would be better than reported in the Transportation Impact Study as a result of there being less future traffic demand.

In order to predict the potential effects of the EOWHF expanded landfill and future development lands on the transportation component of the Built Environment, the following scenarios are considered:

- Existing 2020 Traffic Conditions (provided in **Table 1** in the Transportation Impact Study (HDR, 2021);
- 2025 (5-year) Background Traffic Conditions
- 2035 (15-year) Background Traffic Conditions
- 2025 (5-year) Total Traffic Conditions
- 2035 (15-year) Total Traffic Conditions

The following intersections are considered in the effects assessment:

- Highway 138 at Highway 417 westbound off-ramp;
- Highway 138 at Highway 417 eastbound off-ramp;
- Highway 138 at Laflèche Road; and
- Laflèche Road at GFL Driveway.

The following time periods are considered in the effects assessment:

- Weekday AM peak hour (between 7:00am and 9:00am)
- Weekday PM peak hour (between 4:00pm and 6:00pm)
- Saturday midday peak hour (between 10:00am and 1:00pm)

Intersection operations were assessed for the site driveways and study intersections using the software program Synchro 9, Traffic Signal Coordination Software Version 10, which employs methodology from the Highway Capacity Manual (HCM2000) published by the Transportation Research Board National Research Council.

The signalized intersection analysis considers two separate measures of performance:

- the capacity of all intersection movements, which is based on a volume to capacity ratio; and
- the level of service ("LOS") for all intersection movements, which is based on the average control delay per vehicle for the various movements through the intersection and overall.

The two-way unsignalized intersection analysis also considers two separate measures:

- the capacity of the critical movements, which is based on a volume to capacity ratio; and
- the LOS for the critical movements, which is based on the average control delay per vehicle for the various critical movements within the intersection.

LOS is based on the average control delay per vehicle for a given movement. Delay is an indicator of how long a vehicle must wait to complete a movement and is represented by a letter between ‘A’ and ‘F’, with ‘F’ being the longest delay. The volume to capacity (v/c) ratio is a measure of the degree of capacity used at an intersection.

There are no signalized intersections within the study area.

Future background traffic volumes for the years 2025 (5-year horizon) and 2035 (15-year horizon) are comprised of existing traffic volumes plus general background traffic growth.

Using available Annual Average Daily Traffic (AADT) data, growth rates were calculated for Highway 138 south of Highway 417, Highway 417 west of Highway 138, and Highway 417 east of Highway 138. Since Highway 138 is a lower volume roadway (carrying approximately 30% of the volume that Highway 417 does), the growth rates from Highway 138 were relied on for all movements including those to and from Highway 417.

Along Highway 138 in the last 5 to 10 years, the growth in the AADTs is approximately 1.83% per annum. Along Highway 417, the last 5 to 10 years indicate that growth is very low (less than 1.50%) or negative. For a conservative approach, a 2.0% growth rate was applied to all turning movement volumes, with the exception of turning movements in to and out of Laflèche Road and Allaire Road as these are local roadways. This assumption is conservative because it is higher than the 1.83% growth observed along Highway 138.

Background traffic volumes and intersection operations for 2025 and 2035 are provided in **Table 3-1** and **Table 3-2**, respectively. Additional details are provided in **Appendix A**.

Table 3-1. Future Background Traffic Conditions (2025)

Intersection and Critical Movement	Weekday AM Peak Hour			Weekday PM Peak Hour			Saturday Peak Hour		
	LOS	v/c	95th	LOS	v/c	95th	LOS	v/c	95th
Hwy 138 / Hwy 417 WB Off-Ramp									
Westbound Approach	A	0.07	1.6	A	0.06	1.4	A	0.04	1.0
Northbound Approach	-	0.03	-	-	0.05	-	-	0.02	-
Southbound Approach	A	0.01	0.1	A	0.01	0.2	A	0.01	0.2
Hwy 138 / Hwy 417 EB Off-Ramp									
Eastbound Approach	B	0.01	0.2	B	0.03	0.8	B	0.01	0.3
Northbound Approach	A	0.02	0.5	A	0.02	0.5	A	0.02	0.4
Southbound Approach	-	0.05	-	-	0.05	-	-	0.05	-
Hwy 138 / Laflèche Rd									
Eastbound Approach	C	0.07	1.8	B	0.10	2.5	B	0.03	0.7
Westbound Approach	B	0.10	2.6	B	0.08	1.9	B	0.01	0.2
Northbound Left-through	A	0.01	0.3	A	0.01	0.2	A	0.00	0.1
Northbound Right-turn	-	0.01	-	-	0.00	-	-	0.00	0.0
Southbound Left-through	A	0.01	0.3	A	0.01	0.2	A	0.00	0.0
Southbound Right-turn	-	0.01	-	-	0.00	-	-	0.01	-
Laflèche Rd / GFL Driveway									
Eastbound Approach	-	0.00	-	-	0.00	-	-	0.00	-
Westbound Approach	-	0.03	-	-	0.01	-	-	0.01	-
Southbound Approach	A	0.02	0.4	A	0.07	1.8	A	0.01	0.3

Under 2025 background conditions all movements at all study intersections will operate well with level of service ‘C’ or better and with volume to capacity ratios of 0.10 or lower indicating that the intersection will operate well and with residual capacity. Level of

Service 'C' is typically considered acceptable and does not indicate need for mitigation or monitoring. All 95th percentile queues will be less than one standard vehicle length (7 metres). There are no operational concerns at any study intersections under 2025 background conditions.

Table 3-2. Future Background Traffic Conditions (2035)

Intersection and Critical Movement	Weekday AM Peak Hour			Weekday PM Peak Hour			Saturday Peak Hour		
	LOS	v/c	95th	LOS	v/c	95th	LOS	v/c	95th
Hwy 138 / Hwy 417 WB Off-Ramp									
Westbound Approach	A	0.08	2.1	B	0.07	1.8	A	0.05	1.2
Northbound Approach	-	0.04	-	-	0.06	-	-	0.03	-
Southbound Approach	A	0.01	0.2	A	0.01	0.3	A	0.01	0.2
Hwy 138 / Hwy 417 EB Off-Ramp									
Eastbound Approach	B	0.01	0.3	B	0.04	1.0	B	0.02	0.5
Northbound Approach	A	0.03	0.6	A	0.03	0.6	A	0.02	0.5
Southbound Approach	-	0.06	-	-	0.06	-	-	0.06	-
Hwy 138 / Laflèche Rd									
Eastbound Approach	C	0.08	2.1	C	0.12	3.0	B	0.04	0.9
Westbound Approach	C	0.12	3.0	C	0.09	2.3	B	0.01	0.2
Northbound Left-through	A	0.01	0.3	A	0.01	0.2	A	0.00	0.1
Northbound Right-turn	-	0.01	-	-	0.00	-	-	0.00	-
Southbound Left-through	A	0.02	0.4	A	0.01	0.2	A	0.00	0.0
Southbound Right-turn	-	0.01	-	-	0.00	-	-	0.01	-
Laflèche Rd / GFL Driveway									
Eastbound Approach	-	0.00	-	-	0.00	-	-	0.00	-
Westbound Approach	-	0.03	-	-	0.01	-	-	0.01	-
Southbound Approach	A	0.02	0.4	A	0.07	1.8	A	0.01	0.3

Under 2035 background conditions all movements at all study intersections will operate well with level of service ‘C’ or better and with volume to capacity ratios of 0.12 or lower indicating that the intersections will operate well and with residual capacity. All 95th percentile queues will be less than one standard vehicle length (7 metres). There are no operational concerns at any study intersections under 2035 background conditions.

The facility is expected to receive comparable levels of waste and compost as it currently does on a typical day. On average, the facility accepts 3,297 tonnes per day of landfill and compost, however, the facility may accept up to 4,000 tonnes per day when required.

On the weekday for which weigh scale data was provided, the facility received approximately 2,600 tonnes of waste and compost combined, which means the observed site traffic should be representative of, or slightly lower than, average daily operations.

Furthermore, the observed traffic volumes represent approximately 65% of the daily maximum capacity. On the Saturday for which weigh scale data was provided, the facility received only 15% of the daily maximum. Saturdays consistently receive less tonnage and experience less activity than weekdays, partly as a result of having shorter operating hours (6 hours) compared to weekdays (10 hours).

Although the facility is not expected to increase its average daily tonnage received or the daily tonnage limits, the traffic analysis was prepared under the assumption that 100% of the daily tonnage limits would be met for both compost and waste, on weekdays and on Saturdays. This represents a very conservative estimate of future site trip generation, particularly for Saturday.

Total traffic volumes are derived by removing existing site traffic volumes from the background traffic volumes and then adding forecast site traffic volumes assuming the daily tonnage limits are reached.

The results of the net effects assessment for each alternative method are provided in **Sections 3.1** and **3.2**.

3.1 Alternative Method 1

Traffic volumes for the EOWHF landfill have been projected based on actual site weigh scale data and are shown in **Table 3-3**. The estimated trips in **Table 3-3** were prepared by using the existing weigh scale tickets and daily tonnage received, along with observed traffic volumes entering the facility, and developing trip rates based on tonnage received. The trips were then scaled up to represent the facility receiving the maximum daily tonnage for landfill and compost even though this amount of traffic is not expected to occur on a typical day.

Based on the observed site traffic generation and tonnage data provided, the site received the typical average daily tonnage of approximately 3,297 tonnes of waste (landfill and compost), and the observed site traffic should therefore be representative of typical daily conditions going forward. There are no changes anticipated to average daily facility traffic associated with compost and landfill.

For a conservative traffic operations analysis, this report assesses future conditions assuming the facility receives and processes up to its current allowable daily maximum tonnage limit of 4,000 tonnes per day of combined landfill and compost on the north side of Laflèche Road. This is unlikely to be realized on Saturdays, during which the operating hours are reduced and less tonnage is consistently received when compared to weekdays. This maximum may occasionally be reached on weekdays.

Based on the theoretical maximum, up to 25 and 27 additional two-way trips are projected to enter the facility during the weekday AM, and PM peak hours, respectively. Relative to existing conditions, this is a 68%, and 69% increase. Saturday trip generation may increase from 15 two-way trips per hour to a theoretical maximum of 113 trips per hour. The weekday projections represent the higher end of traffic anticipated for the facility, while the Saturday projections represent the highest theoretical level of trip generation. As previously mentioned, the average daily facility traffic associated with the landfill is not anticipated to change from observed 2020 conditions. These projections are

theoretical maximums and demonstrate that the facility will have minimal impacts on traffic operations even on atypical, high demand days.

The forecast maximum hourly one-way trip generation on a weekday is 58 vehicles occurring during the weekday PM peak hour, with 58 outbound trips, or one vehicle every 62 seconds on average. The maximum hourly one-way trip generation for the Saturday is 68 outbound trips, or one vehicle every 52 seconds. This estimate is comprised of trucks and light vehicles for the landfill and compost facility.

Detailed information is provided in **Appendix A**, which presents the Transportation Impact Study. The Transportation impact Study also considered potential future uses on the south side of Laflèche Road, thus resulting in a slightly conservative analysis compared to the operations summarized in this effects assessment. Therefore, the revised Synchro reports for the 2025 and 2035 horizon year total traffic operations without the future potential uses is provided in **Appendix B**. Additionally, the revised total traffic volumes including light and heavy vehicles are provided in **Appendix C**.

Table 3-3. Projected Peak Hourly Traffic Volumes for the EOWHF

Component	Observed 2020 Site Trip Generation[a]		
	AM	PM	Saturday
Compost Waste			
Tonnage Received	900		
Light Vehicle Trips			
Inbound Trips	1	1	5
Outbound Trips	0	8	6
Inbound Trip Rate (per 1000 tonnes)	0.31	0.31	4.82
Outbound Trip Rate (per 1000 tonnes)	0.00	8.30	6.43
Heavy Vehicle Trips			
Inbound Trips	7	1	6
Outbound Trips	4	3	6
Inbound Trip Rate (per 1000 tonnes)	7.38	0.92	6.43
Outbound Trip Rate (per 1000 tonnes)	3.69	2.46	6.43
Landfill Waste			
Tonnage Received	3,100		
Light Vehicle Trips			
Inbound Trips	2	2	21
Outbound Trips	0	36	28
Inbound Trip Rate (per 1000 tonnes)	0.42	0.42	6.72
Outbound Trip Rate (per 1000 tonnes)	0.00	11.45	8.96
Heavy Vehicle Trips			
Inbound Trips	32	4	28
Outbound Trips	16	11	28
Inbound Trip Rate (per 1000 tonnes)	10.17	1.27	8.96

Component	Observed 2020 Site Trip Generation[a]		
	AM	PM	Saturday
Compost Waste			
Outbound Trip Rate (per 1000 tonnes)	5.09	3.39	8.96

[a] Due to the data processing and assumptions required to separate trips by vehicle type, there may be some minor inconsistencies in the final trips or trips rates.

The predicted total traffic operations based on the projected future peak hourly traffic volumes presented in **Table 3-3**, are presented in **Table 3-4** for the 2025 horizon year, and **Table 3-5** for the 2035 horizon year.

Table 3-4. Future Total Traffic Conditions (2025)

Intersection and Critical Movement	Weekday AM Peak Hour			Weekday PM Peak Hour			Saturday Peak Hour		
	LOS	v/c	95th	LOS	v/c	95th	LOS	v/c	95th
Hwy 138 / Hwy 417 WB Off-Ramp									
Westbound Approach	A	0.07	1.6	A	0.06	1.4	A	0.04	1.0
Northbound Approach	-	0.03	-	-	0.05	-	-	0.02	-
Southbound Approach	A	0.01	0.1	A	0.01	0.2	A	0.01	0.2
Hwy 138 / Hwy 417 EB Off-Ramp									
Eastbound Approach	B	0.01	0.2	B	0.03	0.8	B	0.01	0.3
Northbound Approach	A	0.02	0.5	A	0.02	0.5	A	0.02	0.4
Southbound Approach	-	0.05	-	-	0.05	-	-	0.05	-
Hwy 138 / Laflèche Rd									
Eastbound Approach	C	0.10	2.4	B	0.15	4.0	C	0.21	6.0
Westbound Approach	C	0.11	2.7	B	0.08	2.0	B	0.01	0.2
Northbound Left-through	A	0.02	0.5	A	0.01	0.2	A	0.02	0.5
Northbound Right-turn	-	0.01	0.0	-	0.00	0.0	-	0.00	0.0
Southbound Left-through	A	0.01	0.3	A	0.01	0.2	A	0.00	0.0
Southbound Right-turn	-	0.01	0.0	-	0.00	0.0	-	0.03	0.0
Laflèche Rd / GFL Driveway									
Eastbound Approach	-	0.00	-	-	0.00	-	-	0.00	-
Westbound Approach	-	0.04	-	-	0.01	-	-	0.05	-
Southbound Approach	A	0.03	0.8	A	0.12	3.1	A	0.11	2.7

Under 2025 total conditions all movements at all study intersections will operate well with level of service 'C' or better and with volume to capacity ratios of 0.26 or lower indicating that the intersections will operate well with residual capacity. All 95th percentile queues will be less than one standard vehicle length (7 metres). There are no operational concerns at any study intersections under 2025 total conditions even with the consideration of potential future uses.

Table 3-5. Future Total Traffic Conditions (2035)

Intersection and Critical Movement	Weekday AM Peak Hour			Weekday PM Peak Hour			Saturday Peak Hour		
	LOS	v/c	95th	LOS	v/c	95th	LOS	v/c	95th
Hwy 138 / Hwy 417 WB Off-Ramp									
Westbound Approach	A	0.08	2.1	B	0.07	1.8	A	0.05	1.2
Northbound Approach	-	0.04	-	-	0.06	-	-	0.03	-
Southbound Approach	A	0.01	0.2	A	0.01	0.3	A	0.01	0.2
Hwy 138 / Hwy 417 EB Off-Ramp									
Eastbound Approach	B	0.01	0.3	B	0.04	1.0	B	0.02	0.5
Northbound Approach	A	0.03	0.6	A	0.03	0.6	A	0.02	0.5
Southbound Approach	-	0.06	-	-	0.06	-	-	0.06	-
Hwy 138 / Laflèche Rd									
Eastbound Approach	C	0.11	2.9	C	0.18	4.8	C	0.26	7.7
Westbound Approach	C	0.12	3.2	C	0.10	2.4	B	0.01	0.2
Northbound Left-through	A	0.02	0.5	A	0.01	0.2	A	0.02	0.6
Northbound Right-turn	-	0.01	0.0	-	0.00	0.0	-	0.00	0.0
Southbound Left-through	A	0.02	0.4	A	0.01	0.2	A	0.00	0.0
Southbound Right-turn	-	0.01	0.0	-	0.00	0.0	-	0.03	0.0
Laflèche Rd / GFL Driveway									
Eastbound Approach	-	0.00	-	-	0.00	-	-	0.00	-
Westbound Approach	-	0.04	-	-	0.01	-	-	0.05	-
Southbound Approach	A	0.03	0.8	A	0.12	3.1	A	0.11	2.7

Under 2035 total conditions all movements at all study intersections will operate well with level of service 'C' or better and with volume to capacity ratios of 0.26 or lower indicating that the intersections will operate well with residual capacity. Most of the 95th percentile queues will be less than one standard vehicle length (7 metres), with the exception of the eastbound approach to Highway 138/Laflèche Road during the Saturday which will have a 95th percentile queue of 7.7 metres which is approximately one standard vehicle length. There are no operational concerns at any study intersections under 2035 total conditions.

Traffic operations are acceptable under existing, future background, and future total conditions during both horizon years, according to the Synchro analysis, and no road network improvements are necessary, even with the potential future uses considered. The need for left-turn lanes along Highway 138 was reviewed at all three study intersections (Appendix A). At the Highway 417 eastbound off-ramp to Highway 138, northbound left-turn lanes are warranted by the year 2035 under background conditions. This is triggered by future background traffic growth and is not triggered by site traffic.

At Highway 138 and Laflèche Road, a southbound lane is warranted under future 2025 background conditions and is not triggered by site traffic. Under future 2035 background traffic conditions a northbound left-turn lane is warranted.

It should be noted that intersection operations are well within capacity with good levels of service under the total future conditions, even without the left-turn lanes. The on-going Highway 138 Study may confirm these findings; however, preliminary study recommendations do not appear to include any upgrades within this study area.

The accident rates for the segment of Highway 138 within the Off-site Study Area were compared to the provincial average, and it was determined that this segment of Highway 138 has an accident rate that is nearly half that of the provincial average, suggesting that this segment is not collision-prone and that there is no significant safety concern (Appendix A).

The net effects assessment for Alternative Method 1 is presented in **Table 3-6**.

Table 3-6. Net Effects Assessment – Alternative Method 1

Evaluation Criteria	Indicator	Key Design Considerations and Assumptions	Potential Effects	Mitigation Measures	Net Effects
Effects from Truck Transportation along Access Roads	Disturbance to traffic operations	• Operations are expected to remain unchanged in terms of origins and destinations of trucks as well as haul routes (no changes to waste haul routes are anticipated as a result of the EOWHF expanded landfill and future development lands). • Site traffic generation is expected to remain unchanged. However, the transportation effects were assessed based on a theoretical daily maximum tonnage received (4,000 tonnes per day landfill and compost) • The expansion is not anticipated to generate additional measurable traffic related to construction due to the nature of the on-site soil materials and their suitability for utilization as the base liner and for cover material. Additional soil requirements for cover are included in the projected vehicle trips presented in the table. • Employee traffic volumes remain unchanged and do not occur during peak hours. • During the peak hour of adjacent street traffic, inbound traffic volumes are equal to outbound traffic volumes. • There will be no changes to on-site times (less than 30 minutes) and weigh scale times (less than 3 minutes). • Hourly, daily, and seasonal patterns remain stable. • The breakdown of vehicle types and average vehicle loads remain stable. • GFL will continue to support the minimization of environmental impacts associated with GHG emissions through reducing the number of waste related trucks hauling material long distances. • No planned road network improvements are identified within the study area. The MTO is currently undertaking an EA for Highway 138 from Highway 417 southward, which is currently on-going; however, the MTO indicated that there are no impacts expected to the study areas. • No background developments were identified for inclusion in the effects assessment by the MTO, the United Counties of Prescott and Russell, or the United Counties of Stormont, Dundas, and Glengarry.	• Based on the theoretical maximum, up to 25 and 27 additional two-way trips are projected to enter the facility during the weekday AM, and PM peak hours, respectively. • Saturday trip generation may increase from 15 two-way trips per hour to a theoretical maximum of 113 trips per hour. The average daily facility traffic associated with the landfill is not anticipated to change from observed 2020 conditions. These projections are theoretical maximums and demonstrate that the facility will have minimal impacts on traffic operations even on high demand days.	None required	There are no net effects on the transportation component of the Built Environment: • Under existing, future background, and future total conditions, during both horizon years (2025 and 2035), there is and will continue to be residual capacity in the road network, even under the conservative assumption that the maximum daily tonnage is received. There are no operational concerns at any study intersections as a result of the EOWHF expanded landfill and future development lands. • No road network improvements are necessary. • Based on the MTO left-turn lane warrants (from the MTO Design Supplement for TAC Geometric Design Guide (GDG) for Canadian Roads), a southbound left-turn lane is warranted at the Highway 138 and Laflèche Road intersection under 2025 background traffic conditions, and a northbound left-turn lane is warranted under future 2035 background traffic conditions. A northbound left-turn lane is also warranted at the Highway 417 eastbound off-ramp intersection with Highway 138 under 2035 background traffic conditions. These left-turn lanes are not required operationally and traffic operations under future background and total conditions will be within acceptable limits.

Table 3-6. Net Effects Assessment – Alternative Method 1

Evaluation Criteria	Indicator	Key Design Considerations and Assumptions	Potential Effects	Mitigation Measures	Net Effects
					• There are no significant safety concerns based on a review of Highway 138 accident rates.

3.2 Alternative Method 2

The net effects assessment for Alternative Method 2 is the same as that for Alternative Method 1 in **Section 3.1**, and is presented in **Table 3-6**.

4 Comparative Evaluation of Net Effects and Identification of the Preferred Alternative

A comparative evaluation of the net effects of each alternative method and the identification of a preferred alternative are carried out in accordance with the methods described in Section 2.2. The results of the comparative evaluation are provided below.

4.1 Comparative Evaluation Results

No preferred alternative is identified from a Transportation perspective as there are no substantial differences in the net effects between the alternative methods.

The results of the comparative evaluation for Transportation component of the Built Environment are provided in **Table 4-1**.

Table 4-1. Comparative Evaluation of Net Effects for the Transportation Component of the Built Environment

Evaluation Criteria	Indicators	Net Effects of Alternative Methods	
		Alternative Method 1	Alternative Method 2
Effects from truck transportation along access roads	Disturbance to traffic operations	No net effects on traffic operations. **No Substantial Difference**	No net effects on traffic operations. **No Substantial Difference**
	Criteria Rating & Rationale	***There is no substantial difference between the alternative methods with regards to the transportation component of the Built Environment.*** No preferred alternative is identified from a Transportation perspective as there is no substantial difference in the net effects between the alternative methods.	

4.2 Advantages and Disadvantages of the Preferred Alternative

The differences in net effects are used to identify and compare the advantages and disadvantages of each alternative method. As no net effects were identified on the transportation component of the Built Environment, there is no substantial difference between the two alternative methods, and no preferred alternative has been identified.

As a result, the same advantages and disadvantages, listed in **Table 4-2** apply to both alternative methods.

Table 4-2. Advantages and Disadvantages of Alternative Methods

Evaluation Criteria	Advantages	Disadvantages
Effects from truck transportation along access roads	• Operations are expected to remain unchanged in terms of origins and destinations of trucks as well as haul routes (no changes to waste haul routes are anticipated as a result of the EOWHF expanded landfill and future development lands) • Site traffic generation is expected to increase nominally. Even if the landfill and compost facility receive the maximum daily tonnage, there are no impacts associated with the increase in facility traffic. • No additional measurable traffic related to construction • No changes to on-site times and weigh scale times, employee traffic volumes or patterns, or the breakdown of vehicle types and average vehicle loads • No operational concerns at any study intersections as a result of the EOWHF expanded landfill and future development lands • No road network improvements are necessary • No addition of left-turn lanes along Highway 138 are triggered by site traffic • No safety concerns have been identified	• No disadvantages to transportation component of the Built Environment are anticipated

5 Commitments and Monitoring

No mitigation measures are proposed for the transportation component of the Built Environment as no effects are predicted as a result of the EOWHF expanded landfill and future development lands. No monitoring is proposed for the EOWHF landfill for the transportation component of the Built Environment.

The commitments associated with the transportation component of the Built Environment are listed in Section 5.1.

5.1 Transportation Commitments

The commitments associated with the transportation component of the Built Environment are as follows:

- No changes to waste haul routes;
- No additional measurable traffic related to construction;
- No changes to employee traffic volumes or patterns, or the breakdown of vehicle types and average vehicle loads; and
- GFL will continue to support the minimization of environmental impacts associated with GHG emissions through reducing the number of waste related trucks hauling material long distances.

6 References

HDR Corporation (HDR)

2021 GFL Environmental Inc. Eastern Ontario Waste Handling Facility Future Development Transportation Impact Study. February 16, 2021.

2022 Conceptual Design Report. Eastern Ontario Waste Handling Facility Future Development Environmental Assessment. April 5, 2022.

Ministry of Transportation of Ontario (MTO)

2014 Ministry of Transportation, Ontario Traffic Impact Study Guideline. September 2014. Available at: https://www.library.mto.gov.on.ca/SydneyPLUS/Sydney/Portal/default.aspx?component=AAAAIY&record=cfe43be4-2461-4b86-befa-8a34cb6c9004

Appendix A. GFL Environmental Inc. Eastern Ontario Waste Handling Facility Future Development Transportation Impact Study. February 16, 2021

Final Report

GFL Environmental Inc.

Eastern Ontario Waste Handling Facility Future Development

Transportation Impact Study

Moose Creek, Ontario

February 16, 2021

Executive Summary

Introduction

HDR Corporation has been retained to undertake the Transportation Impact Study in support of the Environmental Assessment for the future development of the GFL Environmental Inc. (GFL) Eastern Ontario Waste Handling Facility located at 17125 Lafleche Road, Moose Creek. The subject site is located south-west of the junction of Highway 417 and Highway 138 in eastern Ontario, on the western half of Lot 16 and Lots 17 and 18, Concession 10, Township of North Stormont, United Counties of Stormont, Dundas and Glengarry. The future development is proposed to occur on the adjacent lands identified as the eastern half of Lot 16, Lots 14 and 15, and the majority of Lot 13, Concession 10.

The current Environmental Compliance Approval, issued by the Ministry of the Environment, Conservation and Parks (MECP) limits a maximum of 755,000 tonnes annually (equivalent to an average daily rate of 2,500 tonnes per day). It is expected that with the future development the landfill will continue to operate at this level. The expansion into the adjoining lands to the east would permit additional total volume which is expected to extend the current operating life of the site by approximately 20 years to 2045, but with no changes to the annual or daily tonnage restrictions.

In addition to extending the operating life of the existing compost and landfill facilities on the north side of Lafleche Road, a renewable natural gas facility and a compost bagging facility are proposed future uses on the south side of Lafleche Road, opposite the existing facility. A Zoning By-law Amendment (ZBLA) and Site Plan Application (SPA) is required for these proposed new uses. Compost and curing pads currently located north of Lafleche Road will be relocated to the area south of Lafleche Road and the relocation will not result in any changes to traffic volumes or patterns. There will be no changes to vehicle access for these relocated uses and they will continue to travel along Lafleche Road.

An existing sod farm is also currently located along Lafleche Road adjacent to the waste handling facility. The future development lands will displace the sod farm operations on the north side of Lafleche Road. However, for a more conservative analysis, traffic generated by the sod operations has been assumed to be negligible. This report projects traffic volumes for the 5-year and 15-year horizons, for weekday AM and PM, and Saturday midday peak hours, and assesses the impacts on the surrounding road network from an operational perspective. The 15-year horizon of 2035 is 10 years before the facility operating horizon of 2045, but represents a typical horizon year for long-term Transportation Impact Studies. The analysis is based on conservative background traffic growth assumptions but do not include special considerations such as new development or major road network improvements that could occur beyond 2035. An environmental assessment is ongoing for the Highway 138 corridor, and has identified the potential for some improvements, such as passing lanes, to the south of this study area.

Left-turn lane warrants based on Ministry of Transportation criteria were reviewed for turning movements along Highway 138 at all three study area intersections. Collision rates along Highway 138 were also reviewed with respect to the Provincial averages to determine if there are any general safety concerns within the study area.

Findings

Site Traffic

Site traffic projections were estimated separately for the existing waste handling facility north of Lafleche Road, and the proposed new land uses south of Lafleche Road. Site traffic for the north side operations was based on the observed site traffic and weigh scale data. For the south side, the traffic projections were based on planned staffing levels and expected transport trailer trips which were provided by GFL.

Based on the observed site traffic generation and tonnage data provided, the site received the typical average daily tonnage of approximately 2,500 tonnes waste, and the observed site traffic should therefore be representative of typical daily conditions going forward. There are no changes anticipated to average daily facility traffic associated with compost and landfill.

The study further assessed traffic impacts with the introduction of new land uses that are proposed to be located on the south side of Lafleche Road, including a compost bagging operation, and a renewable natural gas processing facility.

For a conservative traffic operations analysis, this report assesses future conditions assuming the facility receives and processes up to its current allowable daily maximum tonnage limit of 4,000 tonnes per day of combined landfill and compost on the north side of Lafleche Road. This is unlikely to be realized, particularly on Saturdays, during which the operating hours are reduced, and less tonnage is consistently received when compared to weekdays.

Based on the theoretical maximum, up to 25 and 27 additional two-way trips are projected to enter the facility during the weekday AM, and PM peak hours, respectively. Relative to existing conditions, this is a 68%, and 69% increase. Saturday trip generation may increase from 15 two-way trips per hour to a theoretical maximum of 113 trips per hour. The weekday projections represent the higher end of traffic anticipated for the facility, while the Saturday projections represent the highest theoretical level of trip generation. As previously mentioned, the average daily facility traffic associated with landfill is not anticipated to change from observed 2020 conditions. These projections are theoretical maximums and demonstrate that the facility will have minimal impacts on traffic operations even on atypical, high demand days.

For the south side land uses on a typical day, an additional 43, 44, and 22 two-way trips are projected during the AM, PM, and Saturday midday peak hours.

The forecast maximum hourly one-way trip generation is 100 vehicles occurring during the weekday PM peak hour, with 100 outbound trips, or one vehicle every 36 seconds on average.

Traffic Operations

Under existing, future background, and future total conditions, during both horizon years (2025 and 2035) there is and will continue to be residual capacity in the road network, even under the conservative assumption that the maximum daily tonnage is received. No road network improvements are required to accommodate the extension of the facility's operating life to approximately 2031 or approximately 10 years beyond the current expected operating life of 2021.

Haul Routes

There are no operational changes anticipated for the facility and it is expected to operate as it currently does and with the same yearly (and daily) tonnage limit. Only the maximum overall capacity will be increased to extend the operating life. Since there is no change to the effective catchment area for the facility, the origin-destination patterns of vehicles traveling to or from the facility, or the maximum daily trips generated, there should be little to no impact to the surrounding road network or along the haul routes within the greater context. The projections estimate up to approximately 1 vehicle entering the site every minute, and this is a minor increase compared to current operations.

Safety

Based on the MTO left-turn lane warrants (from the **MTO Design Supplement for TAC Geometric Design Guide (GDG) for Canadian Roads**), a southbound left-turn lane is warranted at the Highway 138 and Lafleche Road intersection under 2025 background traffic conditions, and a northbound left-turn lane is warranted under future 2035 background traffic conditions. A northbound left-turn lane is also warranted at the Highway 417 eastbound off-ramp intersection with Highway 138, under 2035 background traffic conditions. These left-turn lanes are not required operationally and traffic operations under future background and total conditions will be within acceptable limits.

A review of publically available segment collision rates along Highway 138 in the vicinity of the study area does not indicate any major safety concerns when comparing the collisions rates with the provincial average. The provincial average collision rate over the past 5 years of available data was 1.51 for all roadways in the province of Ontario. This was compared to the collision rate for the Highway 138 segment in the study area which had an average collision rate of 0.78. This segment of Highway 138 within the study area has a rate that is nearly half that of the provincial average, which suggests that this segment is not collision-prone under existing conditions and that there is no significant safety concern.

Detailed collision analysis at the intersection level was not performed based on the segment average being significantly less than the provincial average. Detailed future safety performance would rely on available safety performance functions for this specific road for the assessment of future conditions.

The facility will generate more truck traffic due to the new uses on the south side of Lafleche Road. The traffic associated with existing uses on the north side of Lafleche Road is expected to remain unchanged, and the study is based on data that is expected to be representative of typical average daily traffic volumes for the existing uses. However, there is a potential for site traffic associated with the existing uses to increase if the site receives the maximum daily tonnage (comprised of compost and landfill) – this scenario was assessed for the existing facility for a more conservative operational analysis. Overall, two-way truck trips may increase by 22, 16 and 42 one-way truck trips during the weekday AM, PM, and Saturday peak hours, respectively.

The collisions rates involving trucks were not available for review as part of this study, and therefore, truck activity was not correlated to collision rates. However, as previously mentioned, the adjacent section of Highway 138 has an average collision rate that is nearly half of the provincial average. Although any increases in traffic volumes will theoretically increase the frequency of collisions, based on the data reviewed there is no indication that the increase in facility site traffic will result in any increases to collision rates (expressed as *collisions per vehicle-kilometres*).

Contents

Executive Summary i

1 Introduction 1
1.1 Scope of Work 3
1.2 Intersection Operations and Analysis Methodology 3

2 Existing Conditions 4
2.1 Site Context 4
2.2 Existing Road Network 4
2.3 Active Transportation and Transit 6
2.4 Existing Traffic Volumes 6
2.5 Existing Traffic Operations 8

3 Background Traffic Conditions 9
3.1 Planned Network Improvements 9
3.2 Background Traffic Projections 9
3.2.1 General Background Growth 9
3.2.2 Background Developments 9
3.3 Background Traffic Operations (2025) 9
3.4 Background Traffic Operations (2035) 12

4 Proposed Development 14
4.1 Future Operations 14
4.2 Site Vehicular Traffic Trip Generation 14
4.2.1 Waste Handling Facility 14
4.2.2 Compost Bagging and Natural Gas Facility 18
4.2.3 Total Site Traffic Generation Summary 19
4.3 Site Traffic Distribution and Assignment (Haul Routes) 20

5 Total Traffic Conditions (2025) 23

6 Total Traffic Conditions (2035) 25

7 Highway 138 Left-Turn Lane Warrants 27

8 Highway 138 Accident Rates 28

9 Conclusions 29
9.1 Site Traffic Generation 29
9.2 Haul Routes 30
9.3 Traffic Operations 30
9.4 Safety 30
9.4.1 Left-turn Lanes 30
9.4.2 Collision Rates 30
9.4.3 Truck Activity 31

Tables

Table 1: Existing Intersection Operations 8
Table 2: Background Conditions Intersection Operations (2025) 11
Table 3: Background Conditions Intersection Operations (2035) 12
Table 4: Future Trip Generation Summary for Existing Waste Handling Facility (North Side) 15
Table 5: Projected Maximum Vehicular Peak Hour Site Trip Generation for Compost Waste 16
Table 6: Projected Maximum Vehicular Peak Hour Site Trip Generation for Landfill Waste 17
Table 7: South Side Light Vehicle Trip Generation Summary 18
Table 8: South Side Compost Bagging Truck Trip Generation Calculations 18
Table 9: Facility Vehicle Trip Generation Summary 19
Table 10: Total Conditions Intersection Operations (2025) 23
Table 11: Total Conditions Intersection Operations (2035) 25
Table 12: Left-Turn Lane Warrant Results 27

Exhibits

Exhibit 1: Site Location 2
Exhibit 2: Existing Road Network 5
Exhibit 3: 2020 Existing Traffic Volumes (Seasonally Adjusted) 7
Exhibit 4: Future Background Traffic Volumes (2025) 10
Exhibit 5: Future Background Traffic Volumes (2035) 13
Exhibit 6: Existing Site Traffic (Day of TMC) 21
Exhibit 7: Future Site Traffic 22
Exhibit 8: Future Total Traffic Volumes (2025) 24
Exhibit 9: Future Total Traffic Volumes (2035) 26

Appendices

Appendix A: Turning Movement Counts
Appendix B: Synchro Reports
Appendix C: Weigh Scale Data Processing
Appendix D: Site Traffic Assignment

This page is intentionally left blank.

1 Introduction

HDR Corporation has been retained to undertake the Transportation Impact Study in support of the Environmental Assessment for the future development of the GFL Environmental Inc. (GFL) Eastern Ontario Waste Handling Facility (EOWHF) located at 17125 Lafleche Road. The subject site is located south-west of the junction of Highway 417 and Highway 138 in eastern Ontario, on the western half of Lot 16 and Lots 17 and 18, Concession 10, Township of North Stormont, United Counties of Stormont, Dundas and Glengarry. The future development is proposed to occur on the adjacent lands identified as the eastern half of Lot 16, Lots 14 and 15, and the majority of Lot 13, Concession 10. The site location is shown in **Exhibit 1**.

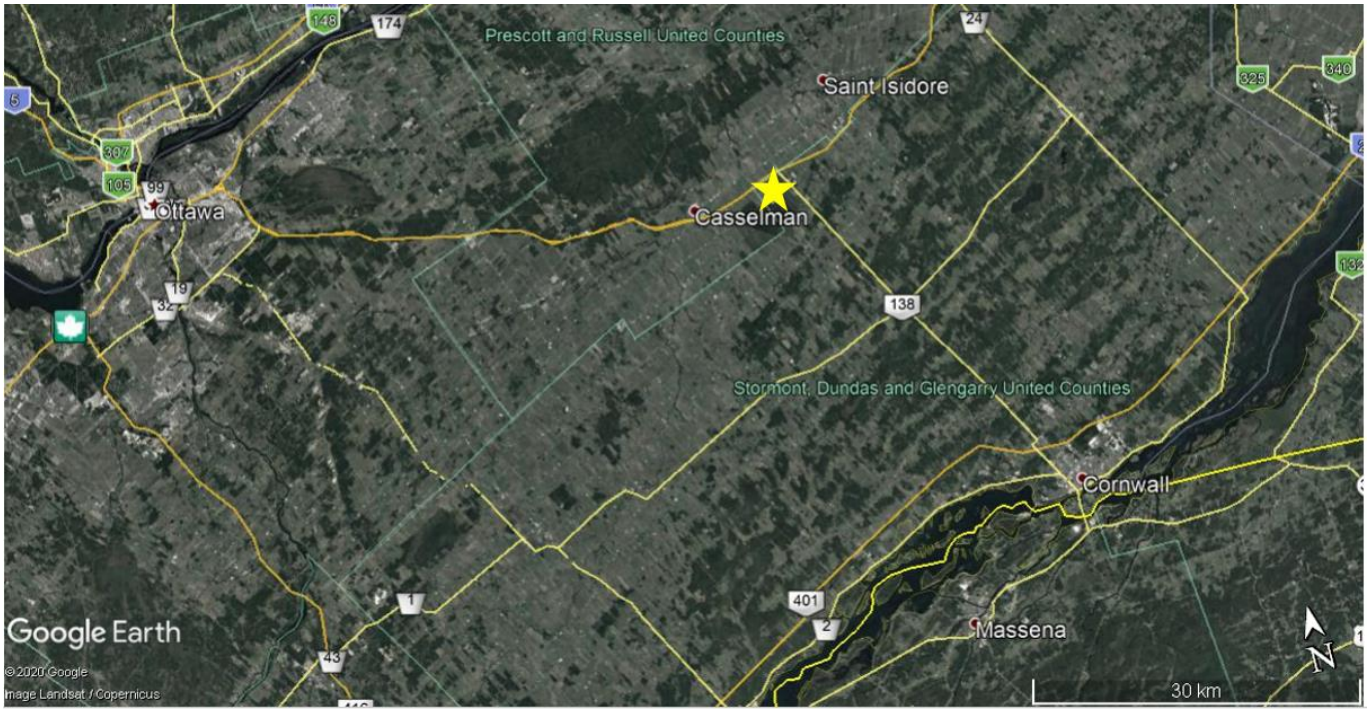
The current Environmental Compliance Approval, issued by the Ministry of the Environment, Conservation and Parks (MECP) limits a maximum of 755,000 tonnes annually (equivalent to an average daily rate of 2,500 tonnes per day). However, daily tonnage limits vary for each waste category, with a total combined daily limit of up to 4,000 tonnes for compost and landfill combined. It is expected that with the future development the landfill may continue to operate up to this maximum level of 4,000 tonnes per day, but will typically receive only 2,500 tonnes per day.

The expansion would permit additional total volume which is expected to extend the current operating life of the site approximately 20 years to 2045, but with no changes to the annual or daily tonnage restrictions.

In addition to extending the operating life of the existing compost and landfill facilities on the north side of Lafleche Road (east of the existing facility), a renewable natural gas facility and a compost bagging facility are proposed on the south side of Lafleche Road, opposite the existing facility. Compost/curing pads on the north side of Lafleche Road will be maintained and shifted to the south. There will be no changes to vehicle access or travel patterns for these relocated uses and they will continue to travel along Lafleche Road.

An existing sod farm is also currently located along Lafleche Road adjacent to the waste handling facility. The future development lands will displace the sod farm operations on the north side of Lafleche Road. However, for a more conservative analysis, traffic generated by the sod operations has been assumed to be negligible.

This report projects traffic volumes for the 5-year and 15-year horizons, for weekday AM and PM, and Saturday midday peak hours, and assesses the impacts on the surrounding road network from an operational perspective. The 15-year horizon (2035) is 10 years before the 2045 operating horizon but is a typical horizon year for long-term Transportation Impact Studies.



Site Context

Site Overview

Exhibit 1: Site Location

1.1 Scope of Work

The scope of work has been prepared in accordance with the Ministry of Transportation of Ontario (MTO) **Guidelines for the Preparation of Traffic Impact Studies**[1] and was presented to the MTO as well as the United Counties of Prescott and Russell, and the United Counties of Stormont, Dundas, and Glengarry. All three agencies confirmed the following scope with no comment:

Scenarios	▪ Existing 2020 Traffic Conditions ▪ 2025 (5-year) Background Traffic Conditions ▪ 2035 (15-year) Background Traffic Conditions ▪ 2025 (5-year) Total Traffic Conditions ▪ 2035 (15-year) Total Traffic Conditions
Time Periods	▪ Weekday AM peak hour (between 7:00am and 9:00am) ▪ Weekday PM peak hour (between 4:00pm and 6:00pm) ▪ Saturday midday peak hour (between 10:00am and 1:00pm)
Intersections	▪ Highway 138 @ Highway 417 WB Off-Ramp ▪ Highway 138 @ Highway 417 EB Off-Ramp ▪ Highway 138 @ Lafleche Road ▪ Lafleche Road @ GFL Environmental Inc. Driveway

1.2 Intersection Operations and Analysis Methodology

Intersection operations were assessed for the site driveways and study intersections using the software program Synchro 9, Traffic Signal Coordination Software Version 9, which employs methodology from the Highway Capacity Manual (HCM2000) published by the Transportation Research Board National Research Council. Synchro can analyze both signalized and unsignalized intersections in a road corridor or network taking into account the spacing, interaction, queues and operations between intersections.

The signalized intersection analysis considers two separate measures of performance:

- the capacity of all intersection movements, which is based on a volume to capacity ratio; and
- the level of service for all intersection movements, which is based on the average control delay per vehicle for the various movements through the intersection and overall.

The two-way unsignalized intersection analysis also considers two separate measures:

- the capacity of the critical movements, which is based on a volume to capacity ratio; and
- the level of service for the critical movements, which is based on the average control delay per vehicle for the various critical movements within the intersection.

Level of service is based on the average control delay per vehicle for a given movement. Delay is an indicator of how long a vehicle must wait to complete a movement and is represented by a letter between ‘A’ and ‘F’, with ‘F’ being the longest delay. The volume to capacity (v/c) ratio is a measure of the degree of capacity utilized at an intersection.

[1] http://www.mto.gov.on.ca/english/engineering/management/corridor/tis-guideline/index.shtml

2 Existing Conditions

2.1 Site Context

The existing EOWHF is bound by Concession Road 7 to the north, property lines to the east and west, and Lafleche Road to the south. The surrounding area is predominantly undeveloped and rural. Highway 417 runs east-west to the north of Concession Road 7.

2.2 Existing Road Network

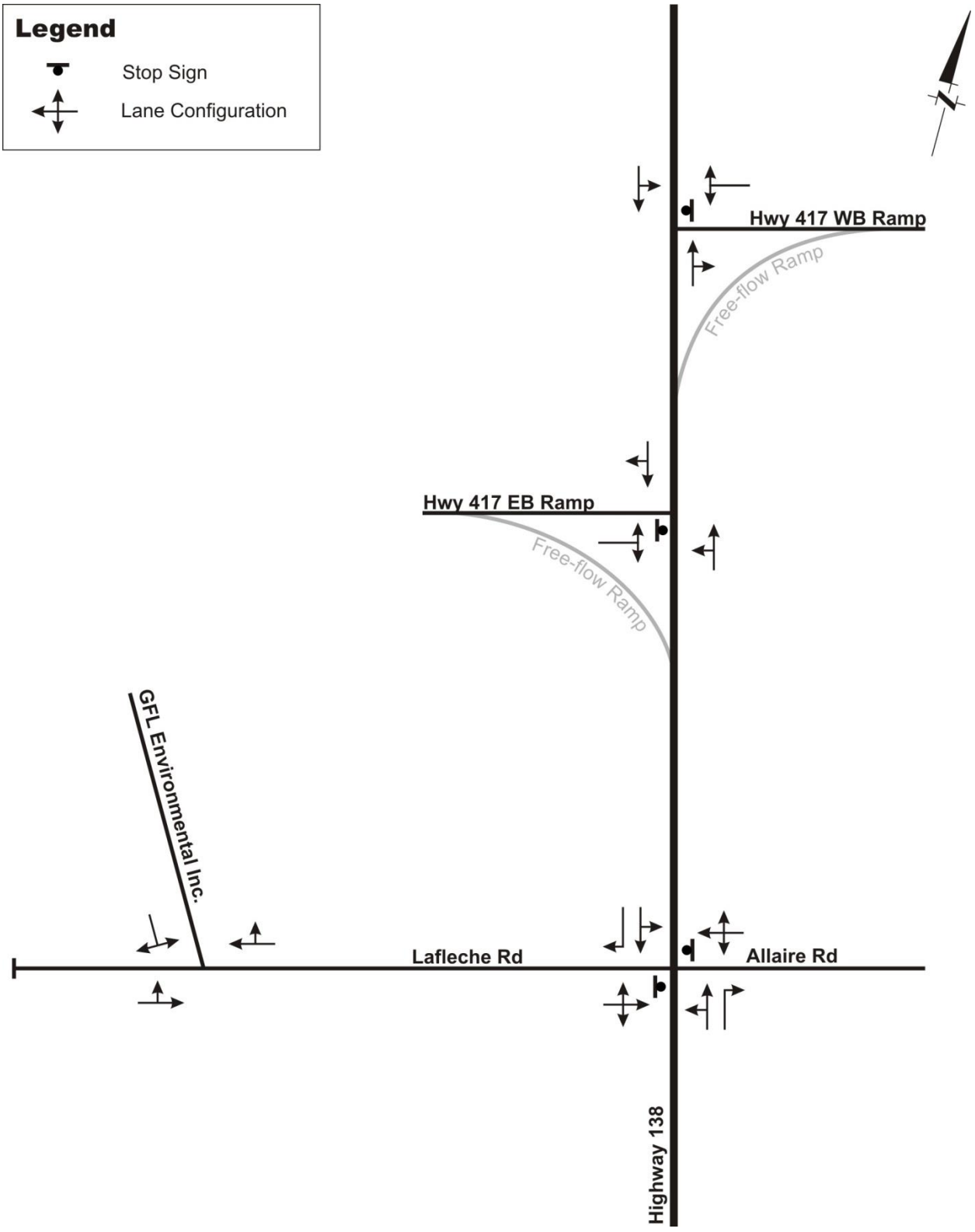
The existing road network is described below and is also illustrated in **Exhibit 2**.

Lafleche Road Lafleche Road is an east-west local road under the jurisdiction of the United Counties of Stormont, Dundas, and Glengarry and has an assumed un-posted speed limit of 50 km/h. It has a two lane cross section with gravel shoulders. No sidewalk or bicycle lanes are provided. There are no posted parking restrictions.

Highway 138 Highway 138 is a north-south rural highway under the jurisdiction of the Ministry of Transportation of Ontario with a posted speed limit of 80 km/h. It is designated as a King's Highway and has a two lane cross section plus gravel shoulders and rumble strips at the edge of pavement as well as along the centreline. Right-turn taper is provided at Lafleche Road in the northbound and southbound directions. No sidewalk or bicycle lanes are provided. There are no posted parking restrictions.

Highway 417 Highway 417 is an east-west controlled-access divided highway under the jurisdiction of the Ministry of Transportation of Ontario with a posted speed limit of 100 km/h. It is designated as a King's Highway and has a four lane cross section plus gravel shoulders. Off-ramps to Highway 138 are stop-controlled with the exception of the west-to-south and the south-to-west ramps, which are free-flow. Parking is not permitted.

Exhibit 2: Existing Road Network



2.3 Active Transportation and Transit

As previously mentioned, the area is predominantly rural and undeveloped and there are no dedicated pedestrian or active transportation facilities. It is expected that cyclists either share the road or use the gravel shoulders and that pedestrians utilize gravel shoulders. Pedestrians and cyclists would not be permitted on Highway 417 since it is controlled-access.

There is also no transit service directly serving the area in the vicinity of the site.

2.4 Existing Traffic Volumes

Due to the COVID-19 pandemic, it was not possible to conduct existing 2020 turning movement counts (TMCs) along Highway 138 that would be representative of typical traffic conditions. Therefore, available count data from 2016 was used as the basis for the projections, by adjusting the 2016 data to 2020 conditions through application of general background growth rates. The 2016 turning movement counts were performed on behalf of HDR by Traffic Survey Analysis Inc. for the weekday AM and PM peak periods (7:00am to 9:00am, and 4:00pm to 6:00pm), as well as the Saturday midday peak period (10:00am to 1:00pm). These hours represent peak traffic generation time for the waste handling facility and also the peak period of adjacent street traffic.

The TMCs along Highway 138 at Highway 417 off-ramps, as well as at Lafleche Road, were performed on Tuesday November 29th and Saturday December 3rd, 2016. Data was collected for the weigh scale access on Thursday April 16th and Saturday April 18th, 2020 to validate the 2016 data and ensure any changes in site traffic generation since 2016 were captured. It should be noted that site traffic was not expected to be impacted by the COVID-19 pandemic as it is mostly comprised of residential waste and compost.

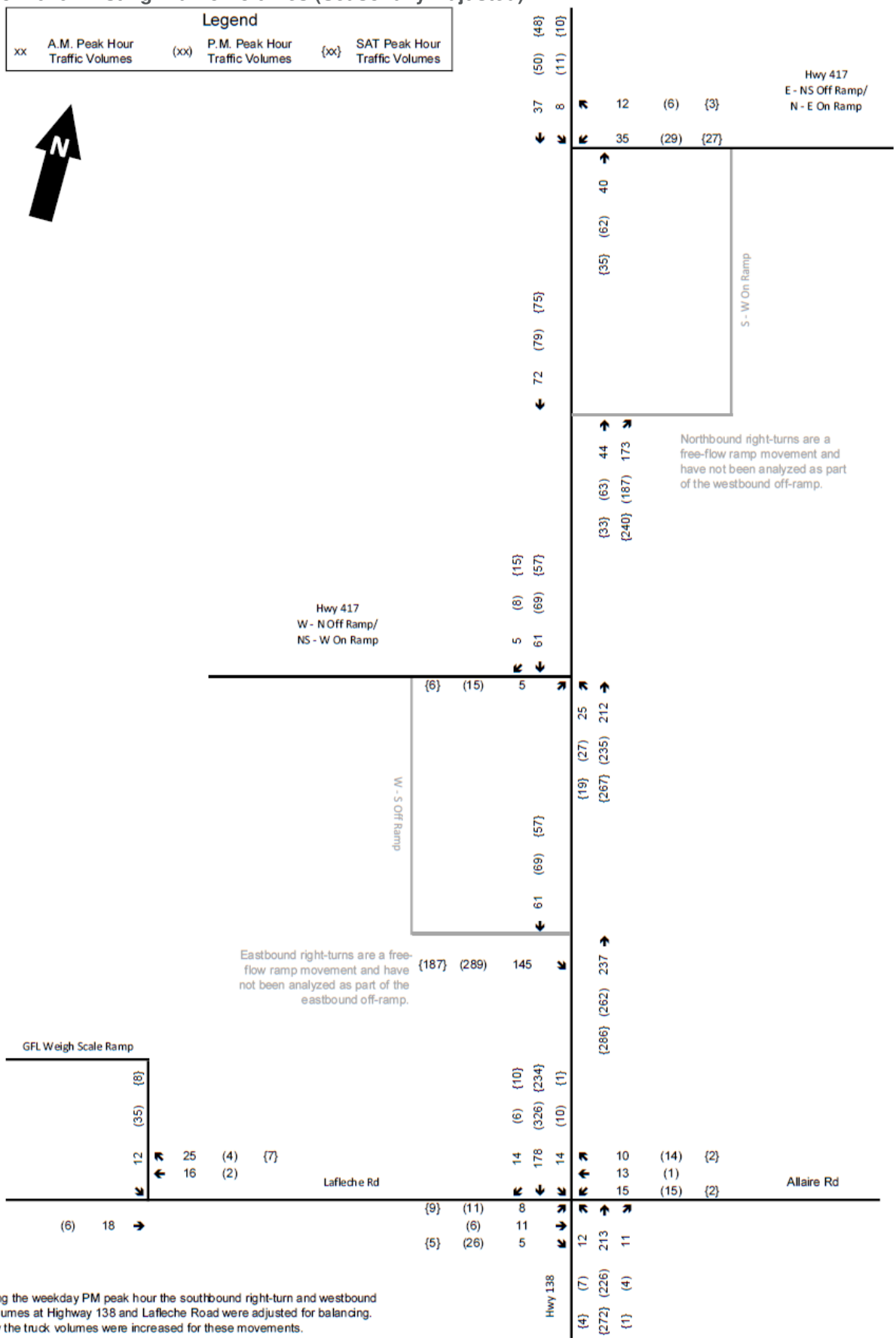
Since the 2016 traffic counts were collected in the month of December, HDR investigated the appropriateness of adjusting the count data for seasonal variations. Using available Annual Average Daily Traffic (AADT)[2] and Winter Average Daily Traffic (WADT)[3] data for Highway 138 available online from the MTO, it was found that AADT volumes are typically 1.13 times greater than WADT volumes (based on data from 2008 to 2013). Traffic volumes for all movements at the Highway 138 and Highway 417 interchange were therefore factored by 1.13 to account for seasonality, along with the through volumes along Highway 138 at Lafleche Road. Turning movement volumes in to and out of Lafleche Road and Allaire Road were not adjusted for seasonality.

To estimate 2020 existing traffic conditions, the seasonally adjusted traffic volumes for intersections that were counted in 2016 were grown using the same methodology described in **Section 3.2.1**. The 2020 existing seasonally adjusted traffic volumes are shown in **Exhibit 3** and detailed data is provided in **Appendix A**.

[2] Annual Average Daily Traffic; defined as the average twenty four hour, two way traffic for the period January 1st to December 31st.

[3] Winter Average Daily Traffic; defined as the average twenty four hour, two way traffic for the period January 1st to March 31st, plus December 1st to December 31st, including weekends.

Exhibit 3: 2020 Existing Traffic Volumes (Seasonally Adjusted)



Note: During the weekday PM peak hour the southbound right-turn and westbound through volumes at Highway 138 and Lafleche Road were adjusted for balancing. Specifically the truck volumes were increased for these movements.

2.5 Existing Traffic Operations

Based on the existing traffic counts shown in **Exhibit 3** and the existing road network depicted in **Exhibit 2**, existing traffic operations were assessed. Intersection operations are summarized in **Table 1**. Detailed Synchro reports are provided in **Appendix B**.

Table 1: Existing Intersection Operations

Intersection & Critical Movement	Weekday AM Pk Hr			Weekday PM Pk Hr			Saturday Pk Hr		
	LOS	v/c	95th	LOS	v/c	95th	LOS	v/c	95th
Hwy 138 / Hwy 417 WB Off-Ramp									
Westbound Approach	A	0.06	1.5	A	0.05	1.2	A	0.04	0.9
Northbound Approach	0	0.03	0.0	0	0.04	0.0	0	0.02	0.0
Southbound Approach	A	0.01	0.1	A	0.01	0.2	A	0.01	0.2
Hwy 138 / Hwy 417 EB Off-Ramp									
Eastbound Approach	B	0.01	0.2	B	0.03	0.6	B	0.01	0.2
Northbound Approach	A	0.02	0.5	A	0.02	0.5	A	0.01	0.3
Southbound Approach	0	0.04	0.0	0	0.05	0.0	0	0.05	0.0
Hwy 138 / Lafleche Rd									
Eastbound Approach	B	0.07	1.6	B	0.09	2.3	B	0.03	0.7
Westbound Approach	B	0.10	2.4	B	0.07	1.7	B	0.01	0.2
Northbound Left-through	A	0.01	0.3	A	0.01	0.2	A	0.00	0.1
Northbound Right-turn	0	0.01	0.0	0	0.00	0.0	0	0.00	0.0
Southbound Left-through	A	0.01	0.3	A	0.01	0.2	A	0.00	0.0
Southbound Right-turn	0	0.01	0.0	0	0.00	0.0	0	0.01	0.0
Lafleche Rd / GFL Driveway									
Eastbound Approach	0	0.00	0.0	0	0.00	0.0	0	0.00	0.0
Westbound Approach	0	0.03	0.0	0	0.01	0.0	0	0.01	0.0
Southbound Approach	A	0.02	0.4	A	0.07	1.8	A	0.01	0.3

LOS – Level of Service v/c – Volume to Capacity Ratio 95th – 95th percentile queue length in metres

Under existing conditions all movements at all study intersections are operating well with level of service ‘A’ or ‘B’ and with volume to capacity ratios of 0.10 or lower indicating that the intersection is operating well with residual capacity.

All 95th percentile queues are less than one standard vehicle length (7 metres). Due to low traffic volumes on minor approaches, there is on average less than one vehicle arriving per minute and no vehicle stacking, which is why Synchro reports the queue (in metres) as being less than 1 vehicle length. There are no operational concerns at any study intersections.

3 Background Traffic Conditions

3.1 Planned Network Improvements

No planned road network improvements were identified within the study area. However, the MTO is currently undertaking an Environmental Assessment for Highway 138[4] from the northerly terminus at Highway 417, southerly. The study is currently ongoing and no impacts to the subject study area have been identified.

3.2 Background Traffic Projections

Future background traffic volumes are comprised of existing traffic volumes plus general background traffic growth, and traffic associated with nearby developments. The following sections outline each component.

3.2.1 General Background Growth

As previously mentioned in **Section 2.4**, AADT data was available for Highway 138 and was also available for Highway 417 for the years preceding and inclusive of 2016. Using the data, growth rates were calculated for Highway 138 south of Highway 417 and along Highway 417 at the Highway 138 interchange. Since Highway 138 is a lower volume roadway (carrying approximately 30% of the volume that Highway 417 does), the growth rates from Highway 138 were relied on for all movements including those to and from Highway 417.

Along Highway 138 over a 6 year period from 2010 to 2016 there has been growth in AADTs of about 1.55% per annum. Along Highway 417, the same 6-year trend indicates that growth is very low (1.25%). For a conservative approach, a 2.0% growth was applied to all turning movement volumes, with the exception of turning movements in to and out of Lafleche Road and Allaire Road since these are local roadways. This is conservative in that it is higher than the 1.55% growth observed along Highway 138.

3.2.2 Background Developments

To determine if any background developments should be included in the future background traffic projections, three agencies were contacted. The agencies included the United Counties of Prescott and Russell, United Counties of Stormont, Dundas, and Glengarry, as well as the MTO. There were no background developments identified for inclusion.

3.3 Background Traffic Operations (2025)

Background traffic volumes resulting from background growth are shown in **Exhibit 4** for the 5-year horizon. Intersection operations for critical movements are summarized in **Table 2** for study intersections based on the existing road network shown in **Exhibit 2**. Detailed reports are provided in **Appendix B**.

[4] http://highway138study.ca/

Exhibit 4: Future Background Traffic Volumes (2025)

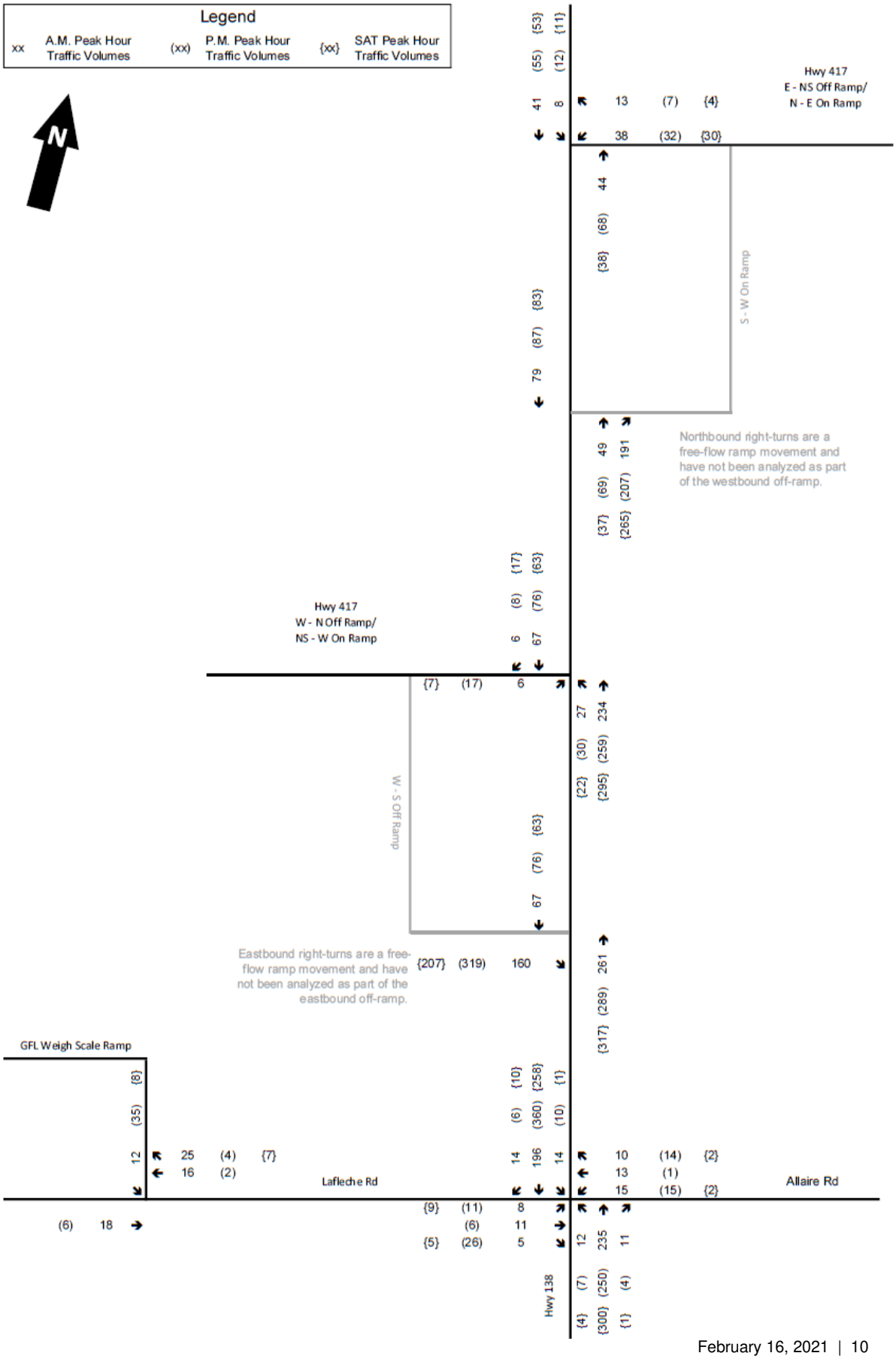


Table 2: Background Conditions Intersection Operations (2025)

Intersection & Critical Movement	Weekday AM Pk Hr			Weekday PM Pk Hr			Saturday Pk Hr		
	LOS	v/c	95th	LOS	v/c	95th	LOS	v/c	95th
Hwy 138 / Hwy 417 WB Off-Ramp									
Westbound Approach	A	0.07	1.6	A	0.06	1.4	A	0.04	1.0
Northbound Approach	0	0.03	0.0	0	0.05	0.0	0	0.02	0.0
Southbound Approach	A	0.01	0.1	A	0.01	0.2	A	0.01	0.2
Hwy 138 / Hwy 417 EB Off-Ramp									
Eastbound Approach	B	0.01	0.2	B	0.03	0.8	B	0.01	0.3
Northbound Approach	A	0.02	0.5	A	0.02	0.5	A	0.02	0.4
Southbound Approach	0	0.05	0.0	0	0.05	0.0	0	0.05	0.0
Hwy 138 / Lafleche Rd									
Eastbound Approach	C	0.07	1.8	B	0.10	2.5	B	0.03	0.7
Westbound Approach	B	0.10	2.6	B	0.08	1.9	B	0.01	0.2
Northbound Left-through	A	0.01	0.3	A	0.01	0.2	A	0.00	0.1
Northbound Right-turn	0	0.01	0.0	0	0.00	0.0	0	0.00	0.0
Southbound Left-through	A	0.01	0.3	A	0.01	0.2	A	0.00	0.0
Southbound Right-turn	0	0.01	0.0	0	0.00	0.0	0	0.01	0.0
Lafleche Rd / GFL Driveway									
Eastbound Approach	0	0.00	0.0	0	0.00	0.0	0	0.00	0.0
Westbound Approach	0	0.03	0.0	0	0.01	0.0	0	0.01	0.0
Southbound Approach	A	0.02	0.4	A	0.07	1.8	A	0.01	0.3

LOS – Level of Service v/c – Volume to Capacity Ratio 95th – 95th percentile queue length in metres

Under 2025 background conditions all movements at all study intersections will operate well with level of service 'C' or better and with volume to capacity ratios of 0.10 or lower indicating that the intersection will operate well and with residual capacity. All 95th percentile queues will be less than one standard vehicle length (7 metres). There are no operational concerns at any study intersections under 2025 background conditions.

3.4 Background Traffic Operations (2035)

Background traffic volumes resulting from background growth are shown in **Exhibit 5** for the 15-year horizon. Intersection operations for critical movements are summarized in **Table 3** for study intersections based on the existing road network shown in **Exhibit 2**. Detailed reports are provided in **Appendix B**.

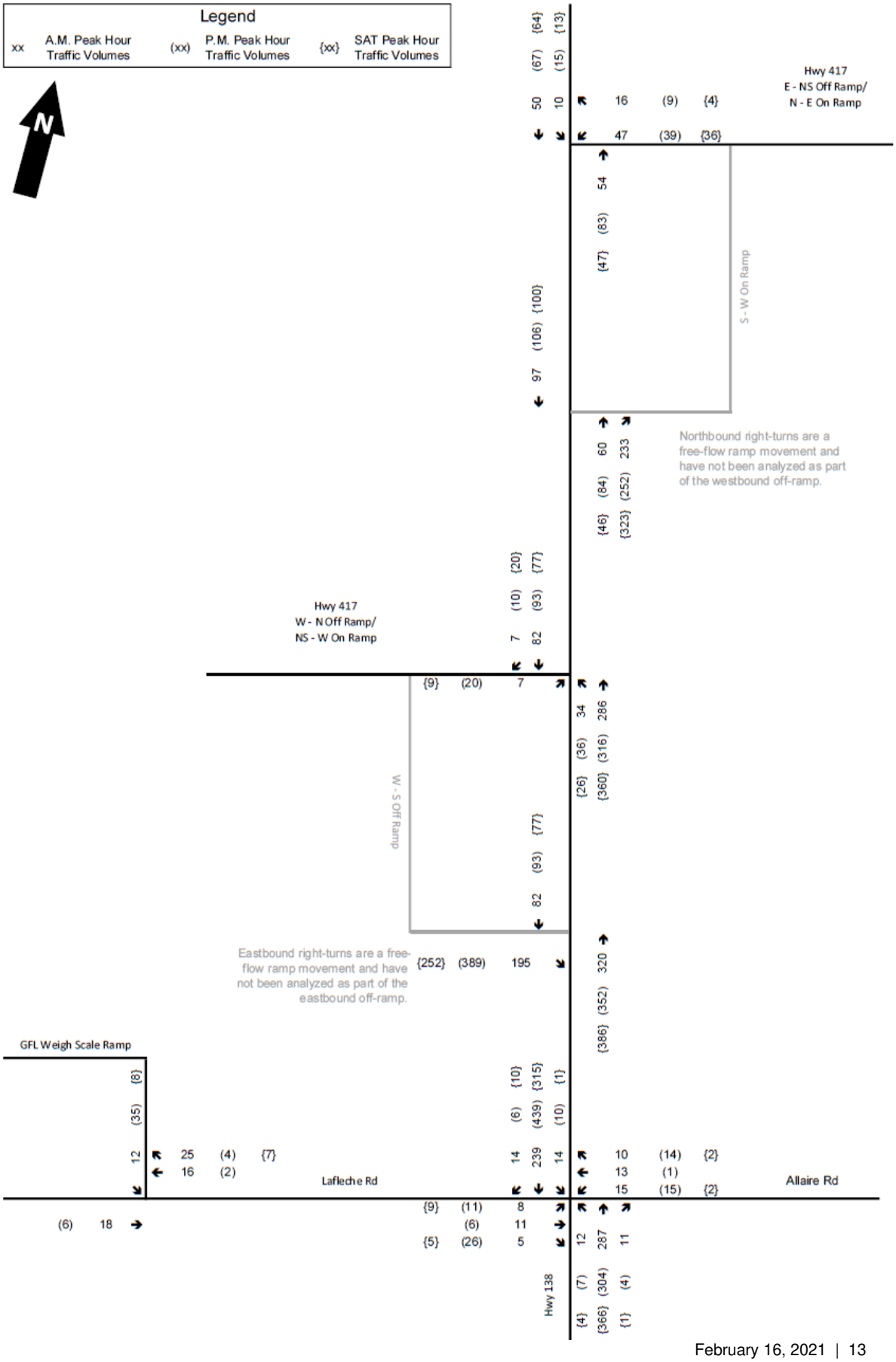
Table 3: Background Conditions Intersection Operations (2035)

Intersection & Critical Movement	Weekday AM Pk Hr			Weekday PM Pk Hr			Saturday Pk Hr		
	LOS	v/c	95th	LOS	v/c	95th	LOS	v/c	95th
Hwy 138 / Hwy 417 WB Off-Ramp									
Westbound Approach	A	0.08	2.1	B	0.07	1.8	A	0.05	1.2
Northbound Approach	0	0.04	0.0	0	0.06	0.0	0	0.03	0.0
Southbound Approach	A	0.01	0.2	A	0.01	0.3	A	0.01	0.2
Hwy 138 / Hwy 417 EB Off-Ramp									
Eastbound Approach	B	0.01	0.3	B	0.04	1.0	B	0.02	0.5
Northbound Approach	A	0.03	0.6	A	0.03	0.6	A	0.02	0.5
Southbound Approach	0	0.06	0.0	0	0.06	0.0	0	0.06	0.0
Hwy 138 / Lafleche Rd									
Eastbound Approach	C	0.08	2.1	C	0.12	3.0	B	0.04	0.9
Westbound Approach	C	0.12	3.0	C	0.09	2.3	B	0.01	0.2
Northbound Left-through	A	0.01	0.3	A	0.01	0.2	A	0.00	0.1
Northbound Right-turn	0	0.01	0.0	0	0.00	0.0	0	0.00	0.0
Southbound Left-through	A	0.02	0.4	A	0.01	0.2	A	0.00	0.0
Southbound Right-turn	0	0.01	0.0	0	0.00	0.0	0	0.01	0.0
Lafleche Rd / GFL Driveway									
Eastbound Approach	0	0.00	0.0	0	0.00	0.0	0	0.00	0.0
Westbound Approach	0	0.03	0.0	0	0.01	0.0	0	0.01	0.0
Southbound Approach	A	0.02	0.4	A	0.07	1.8	A	0.01	0.3

LOS – Level of Service v/c – Volume to Capacity Ratio 95th – 95th percentile queue length in metres

Under 2035 background conditions all movements at all study intersections will operate well within level of service 'C' or better and with volume to capacity ratios of 0.12 or lower indicating that the intersection will operate well and with residual capacity. All 95th percentile queues will be less than one standard vehicle length (7 metres). There are no operational concerns at any study intersections under 2035 background conditions.

Exhibit 5: Future Background Traffic Volumes (2035)



4 Proposed Development

4.1 Future Operations

There are two potential development/expansion areas proposed, as shown in **Exhibit 1**. To the east of the existing site (on the north side of Lafleche Road) is the proposed landfill development area which would increase the site total capacity. To the south of the existing site, and on the south side of Lafleche Road is an area for the proposed relocation of compost operations, bagging operations and a renewable natural gas facility. Compost and curing pads currently located north of Lafleche Road will be relocated to the area south of Lafleche Road and the relocation will not result in any changes to traffic volumes or patterns. There will be no changes to vehicle access for these relocated uses and they will continue to travel along Lafleche Road.

It is assumed that the current land uses south of Lafleche Road (i.e. peat extraction) will continue to the south of the proposed new facilities. Site traffic accessing these facilities will continue to use the same accesses and would continue to follow the same routes. Furthermore, the existing sod farm operations on the north side of Lafleche Road within the potential development areas would be displaced.

This traffic study is in support of the future development of the EOWHF landfill along the north side of Lafleche Road extending the life of the facility by approximately 20 years, to approximately 2045, and for the future development of new facilities on the south side of Lafleche Road. There are no proposed changes to the current daily and yearly tonnage limits of the waste handling facility. The purpose of this study is to identify any required traffic mitigation measures required to accommodate the proposed future development throughout its extended life to 2035 by assessing the 2035 horizon year to meet the standard MTO horizon year of 15-years for longer-term forecast Transportation Impact Studies.

4.2 Site Vehicular Traffic Trip Generation

4.2.1 Waste Handling Facility

Weigh scale data was provided to HDR and was used to correlate the trip generation characteristics of the waste handling facility with the tonnage received. The weigh scale data provides a daily summary of all vehicles entering the facility's weigh scale, as well as the total landfill and total compost tonnage received. This data was collected on the same dates as the April 2020 TMC's that were collected at the weigh scale driveway. Traffic not passing through the weigh scale is typically comprised of employee traffic, or traffic associated with the peat extraction operation on the south side of Lafleche Road. These vehicles are not captured in the weigh scale data. The data was disaggregated into two sets (weekday and Saturday) and was separated for waste types (waste and compost).

The facility is expected to receive comparable levels of waste and compost as it currently does on a typical day. On average, the facility accepts 2,500 tonnes per day, however, the facility may accept up to 4,000 tonnes per day when required.

On the weekday for which weigh scale data was provided, the facility received approximately 2,600 tonnes of waste and compost combined, which means the observed site traffic should be

representative of, or slightly higher than, average daily operations. Furthermore, the observed traffic volumes represent approximately 65% of the daily maximum capacity. On the Saturday for which weigh scale data was provided, the facility received only 15% of the daily maximum. Saturdays consistently receive less tonnage and experience less activity than weekdays, partly as a result of having shorter operating hours (6 hours) compared to weekdays (10 hours).

Although the facility is not expected to increase its average daily tonnage received or the daily tonnage limits, the traffic analysis was prepared under the assumption that 100% of the daily tonnage limits would be met for both compost and waste, on weekdays and on Saturdays. This represents a very conservative estimate of future site trip generation, particularly for Saturday.

This data was used to project future traffic volumes for the facility under the following assumptions:

- The maximum daily limit of 900 tonnes of compost is received on both weekdays and weekends.
- The maximum daily limit of 4,000 tonnes of total waste is received.
  - ↳ Assuming the maximum limit for compost is received, this would result in a maximum of 3,100 tonnes of landfill waste for both weekdays and weekends.
- The ratio of compost to landfill trips over the peak hour is equal to that over the full day.
  - ↳ According to the weigh scale data, compost trips account for 27.2% and 76.2% during the weekday and Saturday, respectively;
- Employee traffic volumes remain unchanged;
- Traffic associated with the existing land uses south of Lafleche Road will not change;
- The origins/destinations of site traffic do not change;
- Haul routes do not change;
- The hourly, daily, and seasonal patterns remain stable; and,
- The breakdown of vehicle types and average vehicle loads remain stable.

The site traffic volumes observed in the TMC were correlated with the daily tonnage received on the same day to derive separate trip generation rates for light and heavy vehicles. The resulting trip generation is summarized in **Table 4**. Detailed calculations for the compost and waste components are shown in **Table 5** and in **Table 6**, respectively. Further detail is provided in **Appendix C**.

Table 4: Future Trip Generation Summary for Existing Waste Handling Facility (North Side)

Component		Weekday AM Peak Hour			Weekday PM Peak Hour			Saturday Peak Hour		
		In	Out	2-Way	In	Out	2-Way	In	Out	2-Way
Landfill	Lights	2	0	2	2	36	38	21	28	49
	Heavies	32	16	48	4	11	15	28	28	56
Compost	Lights	1	0	1	1	8	9	5	6	11
	Heavies	7	4	10	1	3	4	6	6	12
Subtotal by Vehicle Type	Lights	3	0	3	3	44	47	26	34	60
	Heavies	39	20	58	5	14	19	34	34	68
Total		42	20	**62**	8	58	**66**	60	68	**128**

Notes: Rounded values shown in table. Exact values used in calculations and trip assignment.
Trip generation reflects 3,100 tonnes/day of landfill waste received and 900 tonnes/day of compost received.

It is projected that the site may therefore generate up to 62, 66, and 128 two-way trips during the weekday AM and PM, and Saturday midday peak hours, respectively. The nature of the site (waste disposal) means that there are no active transportation or transit trips anticipated. Thus, the vehicular site trip generation represents all trips generated by the facility.

Table 5: Projected Maximum Vehicular Peak Hour Site Trip Generation for Compost Waste

Component	Observed Site Operations (April 2020)			Projected Trips (if the site were to receive 900 tonnes per day)		
	AM	PM	SAT	AM	PM	SAT
Daily Tonnage	884		474	900		
Compost %[1]	27.2%		76.2%	27.2%		76.2%
Light Inbound Trips[2]	1	1	3	2	2	5
Light Outbound Trips[2]	0	27	4	0	39	6
Est. Compost Light Inbound Trips[3]	0	0	2	1	1	5
Est. Compost Light Outbound Trips[3]	0	7	3	0	8	6
Compost Light Inbound Trip Rate (per 1000 tonnes)	0.31	0.31	4.82	*Same as existing*		
Compost Light Outbound Trip Rate (per 1000 tonnes)	0	8.30	6.43			
Heavy Inbound Trips[2]	24	3	4	35	5	6
Heavy Outbound Trips[2]	12	8	4	18	12	6
Est. Compost Heavy Inbound Trips[3]	7	1	3	7	1	6
Est. Compost Heavy Outbound Trips[3]	3	2	3	4	3	6
Heavy Inbound Trip Rate (per 1000 tonnes)	7.38	0.92	6.43	*Same as existing*		
Heavy Outbound Trip Rate (per 1000 tonnes)	3.69	2.46	6.43			
Two-way Compost Light Vehicle Trips	0	8	5	1	8	11
Two-way Compost Heavy Vehicle Trips	10	3	6	10	4	12
Two-way Compost Trips	**10**	**11**	**11**	**11**	**11**	**22**

Notes: Rounded values shown in table. Exact values used in calculations and trip assignment.
1) Based on the daily weigh scale summary.
2) Combined landfill and compost.
Observed values taken directly from 2020 turning movement count at the facility driveway.
3) Calculated from the turning movement count by applying the landfill-to-compost split from the weigh scale.

Table 6: Projected Maximum Vehicular Peak Hour Site Trip Generation for Landfill Waste

Component	Observed Site Operations (April 2020)			Projected Trips (if the site were to receive 3,100 tonnes per day)		
	AM	PM	SAT	AM	PM	SAT
Daily Tonnage	1,717		106	3,100		
Landfill %[1]	72.8%		23.8%	72.8%		23.8%
Light Inbound Trips[2]	1	1	3	2	2	5
Light Outbound Trips[2]	0	27	4	0	39	6
Est. Landfill Light Inbound Trips[3]	1	1	1	2	2	21
Est. Landfill Light Outbound Trips[3]	0	20	1	0	36	28
Landfill Light Inbound Trip Rate (per 1000 tonnes)	0.42	0.42	6.72	*Same as existing*		
Landfill Light Outbound Trip Rate (per 1000 tonnes)	0	11.45	8.96			
Heavy Inbound Trips[2]	24	3	4	35	5	6
Heavy Outbound Trips[2]	12	8	4	18	12	6
Est. Landfill Heavy Inbound Trips[3]	17	2	1	32	4	28
Est. Landfill Heavy Outbound Trips[3]	9	6	1	16	11	28
Heavy Inbound Trip Rate (per 1000 tonnes)	10.17	1.27	8.96	*Same as existing*		
Heavy Outbound Trip Rate (per 1000 tonnes)	5.09	3.39	8.96			
Two-way Landfill Light Vehicle Trips	1	20	2	2	37	49
Two-way Landfill Heavy Vehicle Trips	26	8	2	48	15	56
Two-way Landfill Trips	**27**	**28**	**4**	**49**	**52**	**105**

Notes: Rounded values shown in table. Exact values used in calculations and trip assignment.
1) Based on the daily weigh scale summary.
2) Combined landfill and compost.
Observed values taken directly from 2020 turning movement count at the facility driveway.
3) Calculated from the turning movement count by applying the landfill-to-compost split from the weigh scale.

4.2.2 Compost Bagging and Natural Gas Facility

For the proposed new land uses south of Lafleche Road, the trip generation was estimated for light and heavy vehicles separately using the following assumptions:

4.2.2.1 Light Vehicles

- The natural gas facility is expected to have two employees. Both employees are expected to arrive and depart to and from the site during the AM and PM peak hours, respectively.
- The compost bagging operations will involve up to 30 employees. To be conservative, all 30 employees are assumed to arrive to and from the site during the AM and PM peak hours, respectively.
- During the weekend, all employee traffic is expected to arrive to and from the site outside of the peak hour.

Table 7: South Side Light Vehicle Trip Generation Summary

Component		Weekday AM Peak Hour	Weekday PM Peak Hour	Saturday Peak Hour
Compost Bagging and Natural Gas Facility Employee Light Vehicle trips	Inbound	32	0	0
	Outbound	0	32	0

4.2.2.2 Heavy Vehicles

There will be 30 trucks per day serving the compost bagging operations for both weekday and weekend. To estimate the number of truck trips during peak hours, it was assumed that the proportion of daily transport trailers arriving and departing during the peak hours follows the ratio of daily vehicles arriving and departing the north side weigh scale ramp. The calculations are shown in **Table 8**.

Table 8: South Side Compost Bagging Truck Trip Generation Calculations

Component		Weekday AM Peak Hour	Weekday PM Peak Hour	Saturday Peak Hour
North Side Waste Handling Facility Input Data	Load Count[1]	114		21
	Inbound[2]	25	4	7
	Outbound[2]	12	35	8
	Inbound Peak Hour to Day Ratio	0.22	0.04	0.33
	Outbound Peak Hour to Day Ratio	0.11	0.31	0.38
Compost Bagging Truck Trip Output Calculations	Daily Truck Trips[3]	30		
	Inbound Peak Hour Trips	7	2	10
	Outbound Peak Hour Trips	4	10	12
	Total (2-way) Peak Hour Trips	**11**	**12**	**22**

Note: 1) Based on the combined number of loads for compost and landfill, from the daily weigh scale summary.
2) Observed values taken directly from 2020 turning movement count at the facility driveway.
3) Estimate of future daily truck trips provided by GFL.

4.2.3 Total Site Traffic Generation Summary

The site trip generation is summarized in **Table 9**.

Table 9: Facility Vehicle Trip Generation Summary

Component	Direction	Observed Site Trips			Projected Site Trips			Increase		
		AM	PM	SAT	AM	PM	SAT	AM	PM	SAT
Compost Waste Handling (Projected Maximum)										
Light Vehicles	In	0	0	2	1	1	5	1	1	3
	Out	0	7	3	0	8	6	0	1	3
Trucks	In	7	1	3	7	1	6	0	0	3
	Out	3	2	3	4	3	6	1	1	3
All Vehicles	In	7	1	5	8	2	11	1	1	6
	Out	3	9	6	4	11	12	1	2	6
	Two-way	10	10	11	12	13	23	2	3	12
Landfill Waste Handling (Projected Maximum)										
Light Vehicles	In	1	1	1	2	2	21	1	1	20
	Out	0	20	1	0	36	28	0	16	27
Trucks	In	17	2	1	32	4	28	15	2	27
	Out	9	6	1	16	11	28	7	5	27
All Vehicles	In	18	3	2	34	6	49	16	3	47
	Out	9	26	2	16	47	56	7	21	54
	Two-way	27	29	4	50	53	105	23	24	101
Compost Bagging										
Light Vehicles	In	*Future operation only*			30	0	0	30	0	0
	Out				0	30	0	0	30	0
Trucks	In				0	0	0	0	0	0
	Out				0	0	0	0	0	0
All Vehicles	In				30	0	0	30	0	0
	Out				0	30	0	0	30	0
	Two-way				30	30	0	30	30	0
Renewable Natural Gas Facility										
Light Vehicles	In	*Future operation only*			2	0	0	2	0	0
	Out				0	2	0	0	2	0
Trucks	In				7	2	10	7	2	10
	Out				4	10	12	4	10	12
All Vehicles	In				9	2	10	9	2	10
	Out				4	12	12	4	12	12
	Two-way				13	14	22	13	14	22
Facility Total										
Light Vehicles	In	1	1	3	35	3	26	34	2	23
	Out	0	27	4	0	76	34	0	49	30
	Two-way	1	28	7	35	79	60	34	51	53
Trucks	In	24	3	4	46	7	44	22	4	40
	Out	12	8	4	24	24	46	12	16	42
	Two-way	36	11	8	70	31	90	34	20	82
All Vehicles	In	25	4	7	81	10	70	56	6	63
	Out	12	35	8	24	100	80	12	65	72
	Two-way	37	39	15	105	110	150	68	71	135

Note: Raw trip values shown in red font. Values calculated from raw values shown in black font.

4.3 Site Traffic Distribution and Assignment (Haul Routes)

The facility is expected to continue current operations and there will be no changes to the daily or yearly tonnage limits or the origin-destination patterns and haul routes.

Based on the TMC data, traffic entering the weigh scale are predominantly trucks and heavy vehicles during the weekday peak hours, and a more balanced mixture of trucks and light vehicles during the weekend peak hour. The larger trucks will generally be traveling to/from Ottawa or to/from the south via Highway 138. The smaller personal vehicles and pick-up trucks would likely be serving the surrounding local communities. The assumed distribution and assignment of future trips matches the observed assignment at the intersection of Highway 138 and Lafleche Road based on the turning movement counts. Two separate assignments were applied to the heavy vehicles and to light vehicles. Any traffic travelling east-west across Highway 138 is associated with other businesses on the east side of Highway 138 (along Allaire Road).

It is also noted that at the Highway 417 / Highway 138 interchange, the S-W ramp (from the south to the west) and W-S ramp (from the west to the south) are free flow, and these are the two ramps expected to be used by site traffic. Thus, site traffic will have minimal operational impact at these Highway 417 Off-ramps, with the exception of adding minor volume to the northbound through movement at the Highway 417 eastbound ramp (southerly intersection). Although site traffic was assigned to the free-flow ramps, the free-flow ramp volumes have not been included as part of the Synchro analysis since they would not impact intersection operations and are unimpeded.

All traffic associated with the proposed new land uses south of Lafleche Road are assumed to travel straight-through (east-west), without entering the GFL weigh scale driveway along Lafleche Road.

To determine total future volumes, the existing site traffic volumes from the turning movement counts were removed from the network under the future background scenario, and the future site traffic projections are then added back onto the network. The existing and future site traffic volumes are shown in **Exhibit 6** and **Exhibit 7**, respectively.

For the site traffic, a breakdown of trips by waste-type (compost versus landfill for the north side), as well as trips associated with the new south side uses (with compost bagging and renewable natural gas processing operations combined) is shown in **Appendix D**. **Appendix D** also includes a summary of site trips by vehicle type (light vs. heavy). It was assumed that the trip distribution of the new land uses south of Lafleche Road is consistent with that of the waste handling facility on the north side.

Exhibit 6: Existing Site Traffic (Day of TMC)

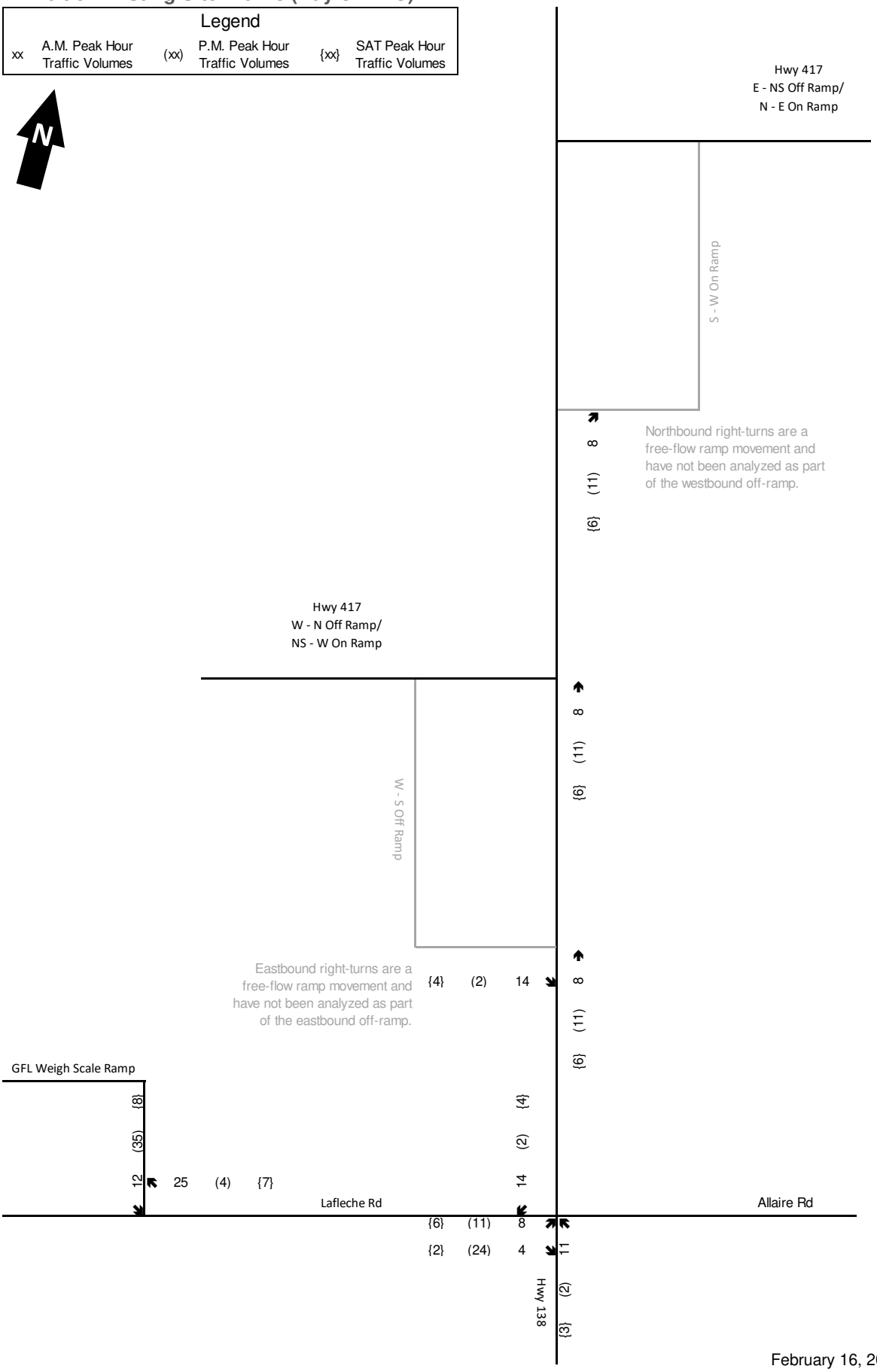
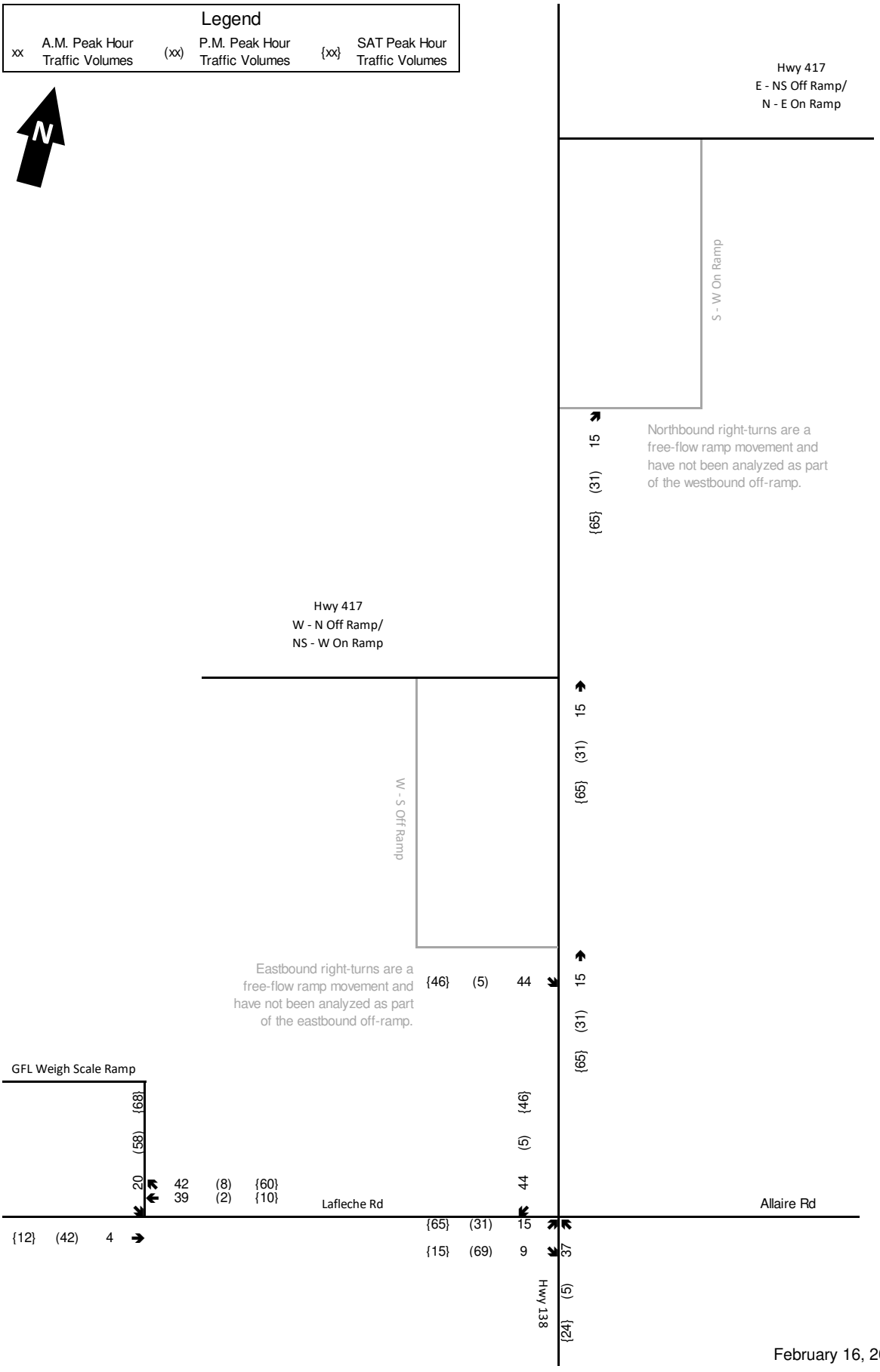


Exhibit 7: Future Site Traffic



5 Total Traffic Conditions (2025)

Total traffic volumes shown in **Exhibit 8** were derived by removing existing site traffic volumes shown in **Exhibit 6** from the background traffic volumes shown in **Exhibit 4**, then adding future site traffic volumes shown in **Exhibit 7**. Intersection operations are summarized in **Table 10**. Detailed reports are provided in **Appendix B**.

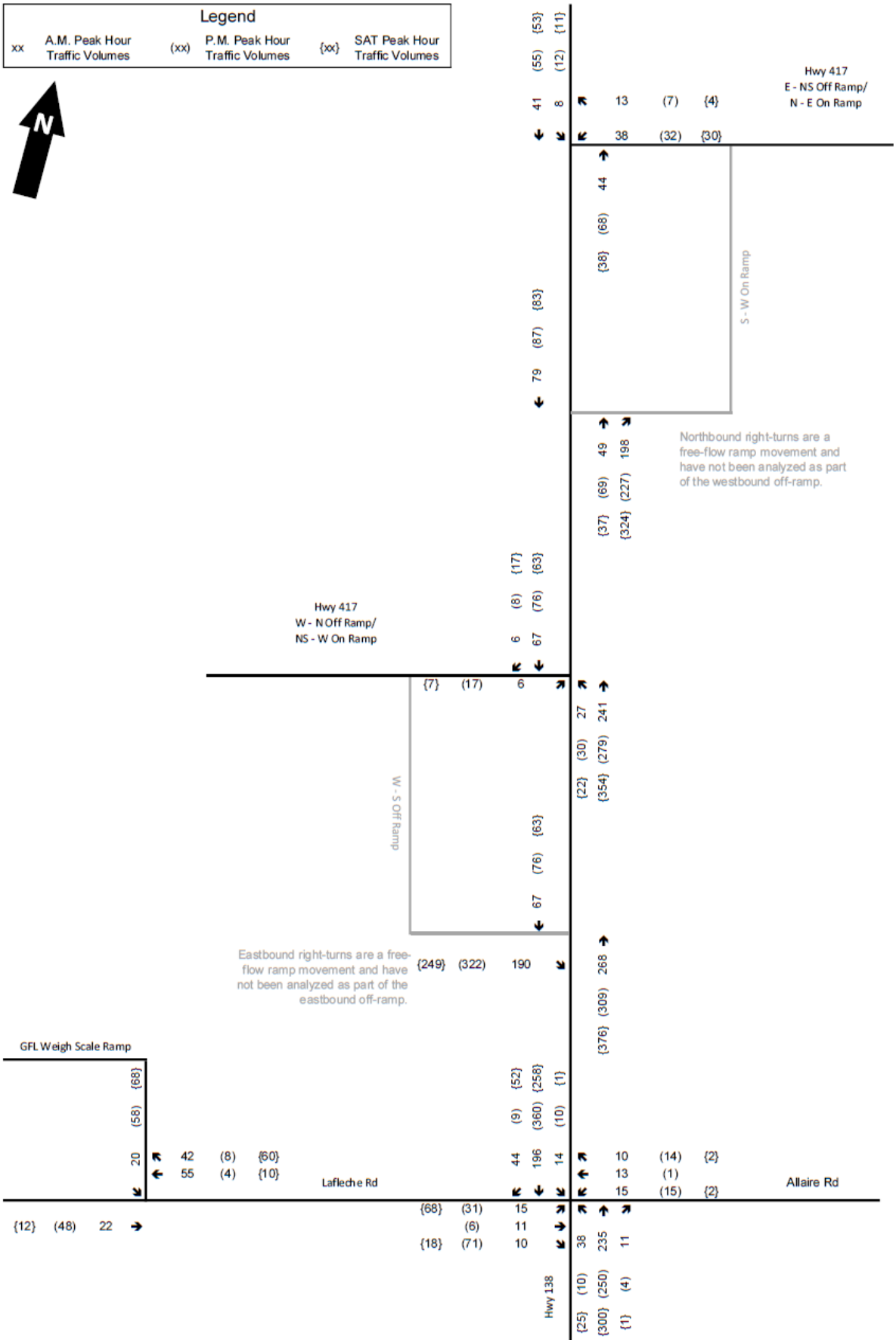
Table 10: Total Conditions Intersection Operations (2025)

Intersection & Critical Movement	Weekday AM Pk Hr			Weekday PM Pk Hr			Saturday Pk Hr		
	LOS	v/c	95th	LOS	v/c	95th	LOS	v/c	95th
Hwy 138 / Hwy 417 WB Off-Ramp									
Westbound Approach	A	0.07	1.6	A	0.06	1.4	A	0.04	1.0
Northbound Approach	0	0.03	0.0	0	0.05	0.0	0	0.02	0.0
Southbound Approach	A	0.01	0.1	A	0.01	0.2	A	0.01	0.2
Hwy 138 / Hwy 417 EB Off-Ramp									
Eastbound Approach	B	0.01	0.2	B	0.03	0.8	B	0.01	0.3
Northbound Approach	A	0.02	0.5	A	0.02	0.5	A	0.02	0.4
Southbound Approach	0	0.05	0.0	0	0.05	0.0	0	0.05	0.0
Hwy 138 / Lafleche Rd									
Eastbound Approach	C	0.11	2.9	B	0.24	7.0	C	0.26	7.7
Westbound Approach	C	0.12	3.0	C	0.09	2.1	B	0.01	0.2
Northbound Left-through	A	0.04	0.9	A	0.01	0.3	A	0.03	0.7
Northbound Right-turn	0	0.01	0.0	0	0.00	0.0	0	0.00	0.0
Southbound Left-through	A	0.01	0.3	A	0.01	0.2	A	0.00	0.0
Southbound Right-turn	0	0.03	0.0	0	0.01	0.0	0	0.03	0.0
Lafleche Rd / GFL Driveway									
Eastbound Approach	0	0.00	0.0	0	0.00	0.0	0	0.00	0.0
Westbound Approach	0	0.07	0.0	0	0.01	0.0	0	0.05	0.0
Southbound Approach	B	0.03	0.8	A	0.14	3.6	A	0.11	2.8

LOS – Level of Service v/c – Volume to Capacity Ratio 95th – 95th percentile queue length in metres

Under 2025 total conditions all movements at all study intersections will operate well with level of service 'C' or better and with volume to capacity ratios of 0.26 or lower indicating that the intersections will operate well with residual capacity. Most 95th percentile queues will be less than one standard vehicle length (7 metres). The exception is the eastbound approach to Highway 138 at Lafleche Road, which will have a 95th percentile queue of less than 8 metres. There are no operational concerns at any study intersections under 2025 total conditions.

Exhibit 8: Future Total Traffic Volumes (2025)



6 Total Traffic Conditions (2035)

Total traffic volumes shown in **Exhibit 9** were derived by removing existing site traffic volumes shown in **Exhibit 6** from the background traffic volumes shown in **Exhibit 5**, then adding future site traffic volumes shown in **Exhibit 7**. Intersection operations are summarized in **Table 11**. Detailed reports are provided in **Appendix B**.

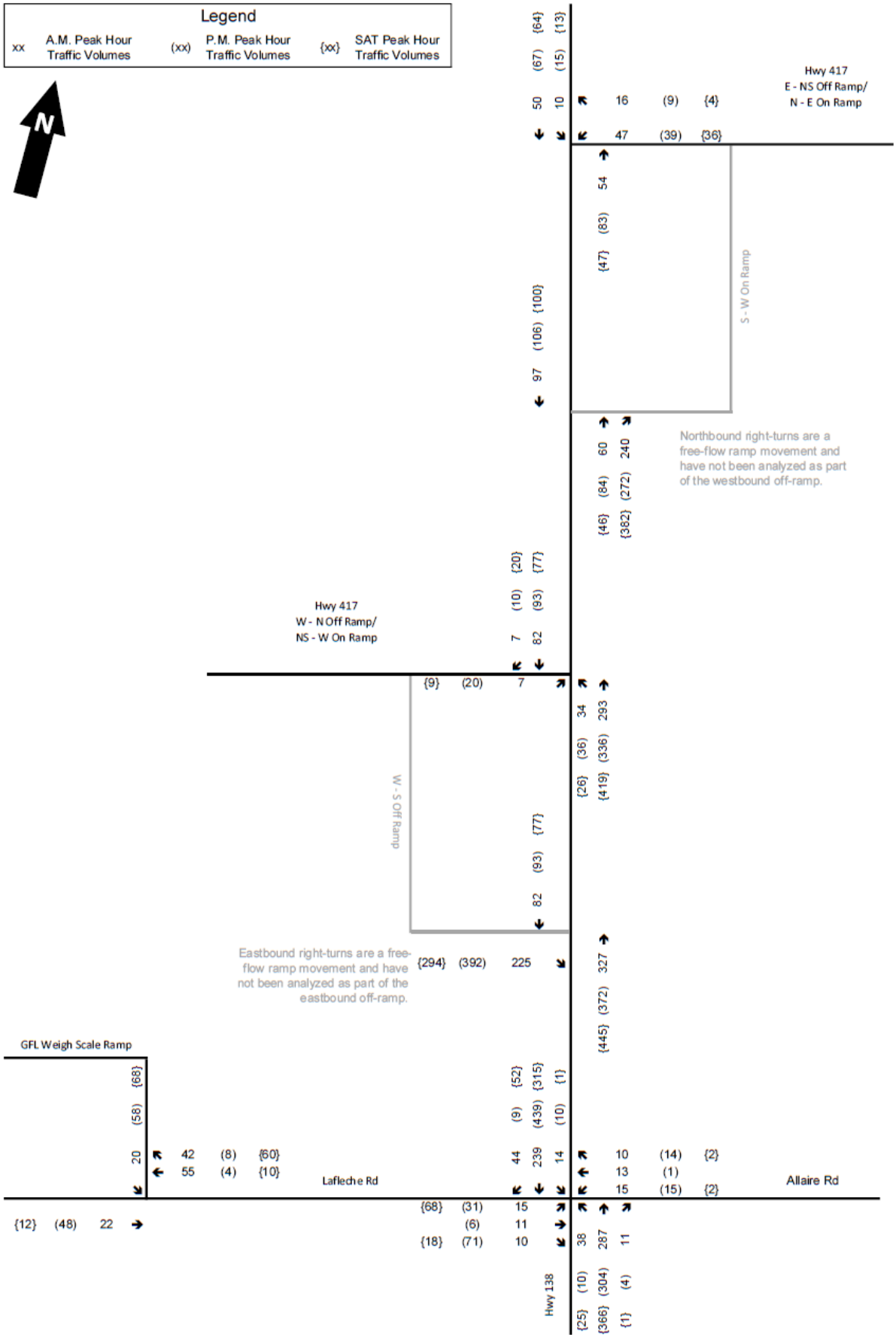
Table 11: Total Conditions Intersection Operations (2035)

Intersection & Critical Movement	Weekday AM Pk Hr			Weekday PM Pk Hr			Saturday Pk Hr		
	LOS	v/c	95th	LOS	v/c	95th	LOS	v/c	95th
Hwy 138 / Hwy 417 WB Off-Ramp									
Westbound Approach	A	0.08	2.1	B	0.07	1.8	A	0.05	1.2
Northbound Approach	0	0.04	0.0	0	0.06	0.0	0	0.03	0.0
Southbound Approach	A	0.01	0.2	A	0.01	0.3	A	0.01	0.2
Hwy 138 / Hwy 417 EB Off-Ramp									
Eastbound Approach	B	0.01	0.3	B	0.04	1.1	B	0.02	0.5
Northbound Approach	A	0.03	0.6	A	0.03	0.6	A	0.02	0.5
Southbound Approach	0	0.06	0.0	0	0.06	0.0	0	0.06	0.0
Hwy 138 / Lafleche Rd									
Eastbound Approach	C	0.13	3.5	C	0.28	8.6	C	0.32	10.0
Westbound Approach	C	0.14	3.5	C	0.10	2.6	B	0.01	0.2
Northbound Left-through	A	0.04	0.9	A	0.01	0.3	A	0.03	0.7
Northbound Right-turn	0	0.01	0.0	0	0.00	0.0	0	0.00	0.0
Southbound Left-through	A	0.02	0.4	A	0.01	0.2	A	0.00	0.0
Southbound Right-turn	0	0.03	0.0	0	0.01	0.0	0	0.03	0.0
Lafleche Rd / GFL Driveway									
Eastbound Approach	0	0.00	0.0	0	0.00	0.0	0	0.00	0.0
Westbound Approach	0	0.07	0.0	0	0.01	0.0	0	0.05	0.0
Southbound Approach	B	0.03	0.8	A	0.14	3.6	A	0.11	2.8

LOS – Level of Service v/c – Volume to Capacity Ratio 95th – 95th percentile queue length in metres

Under 2035 total conditions all movements at all study intersections will operate well with level of service 'C' or better and with volume to capacity ratios of 0.32 or lower indicating that the intersection will operate well with residual capacity. Most of the 95th percentile queues will be less than one standard vehicle length (7 metres), with the exception of the eastbound approach to Highway 138/Lafleche Road in the PM and Saturday. There are no operational concerns at any study intersections under 2035 total conditions.

Exhibit 9: Future Total Traffic Volumes (2035)



7 Highway 138 Left-Turn Lane Warrants

There is residual capacity for all study intersections under existing, future background, and future total conditions during both horizon years, and no road network improvements are necessary.

However, the need for left-turn lanes along Highway 138 was also reviewed at all three study intersections using nomographs from the **MTO Design Supplement for TAC Geometric Design Guide (GDG) for Canadian Roads**. These standards specify when left-turn lanes are warranted on highways and also detail the amount of storage and taper required. The nomographs are contained within Appendix 9A for Section 9.17.2.1 Volume Warrants for Left-Turn Lanes.

The left-turn lane warrants were applied to the weekday AM and PM, and Saturday midday peak hours, for future background and total conditions, and both horizon years (2025 and 2035). The design speed of the highway was selected as 100 kph and when the calculation of percent left-turns resulted in a value lying between nomographs, the graph corresponding to the higher volume was selected for a more conservative approach. The results are summarized in **Table 12**.

Table 12: Left-Turn Lane Warrant Results

Scenario	Highway 138 @ Lafleche Road			Highway 138 @ Hwy 417 EB Off-Ramp			Highway 138 @ Hwy 417 WB Off-Ramp		
	AM	PM	SAT	AM	PM	SAT	AM	PM	SAT
Future Background (2025)	X	SBL	X	X	X	X	X	X	X
Future Total (2025)	X [1]	SBL	X [1]	X	X	X	X	X	X
Future Background (2035)	X	NBL,SBL	NBL	X	NBL	NBL	X	X	X
Future Total (2035)	NBL	NBL,SBL	NBL,SBL	X	NBL	NBL	X	X	X

Note: 1. Not warranted based on average daily volumes. Potentially warranted based on maximum daily traffic volumes.

Based on a review of the nomographs and the projected volumes, left-turn lanes along Highway 138 at the Highway 417 westbound ramp are not warranted under the forecasted future conditions.

At the Highway 417 eastbound off-ramp to Highway 138, northbound left-turn lanes are warranted by the year 2035 under background conditions. This is triggered by future background traffic growth and is not triggered by site traffic.

At Highway 138 and Lafleche Road, a southbound lane is warranted under future 2025 background conditions and is not triggered by site traffic. Under future 2035 background traffic conditions a northbound left-turn lane is warranted.

It should be noted that intersection operations are well within capacity with good levels of service under the total future conditions, even without the left-turn lanes, as explained in **Section 6** of this report. The ongoing Highway 138 Study discussed in **Section 3.1** may confirm these findings, however, preliminary study recommendations do not appear to include an upgrades within this study area.

Left-turn lane storage requirements are 15 metres minimum. However, according to the MTO Design Supplement, the storage length must be increased according to Exhibit 9A-1, which specifies length increases correlated to commercial vehicle percentages, where higher heavy vehicle composition requires longer storage lengths.

8 Highway 138 Accident Rates

The accident rates (AR) for the segment of Highway 138 within the study area was compared to the provincial average provided in the **Ontario Road Safety Annual Report 2017**[5]. The MTO defines AR as "*the number of reportable accidents occurring annually on a particular highway section for every million vehicle kilometres (MVKM) travelled on that section during the same period.*"

During the last year for which data is available (2017), the provincial average AR was 1.45. The average AR over the past 5 years (2013 to 2017) was 1.51. This provincial average refers to million vehicle kilometres for all roadways in the province (not only King's Highways).

This was compared to the AR for the Highway 138 segment in the study area (available from the MTO[6]) which had an AR of 0.60 as of the most recent year for which data is available (2010). The average AR over the past 5 years beginning in 2010 was 0.78.

This segment of Highway 138 within the study area has an AR that is nearly half that of the provincial average which suggests that this segment is not collision-prone and that there is no significant safety concern. These findings may be further reviewed as part of the Highway 138 Study discussed in **Section 3.1**.

Detailed collision analysis at the intersection level was not performed based on the segment average being significantly less than the provincial average. Detailed future safety performance would rely on available safety performance functions for this specific road for the assessment of future conditions.

The collisions rates involving trucks were not available for review as part of this study, and therefore, truck activity was not correlated to collision rates. However, as previously mentioned, the adjacent section of Highway 138 has an average collision rate that is nearly half of the provincial average. Based on the data reviewed, there is no indication that the increase in truck volumes will result in any increases to collision rates.

[5] http://www.mto.gov.on.ca/english/publications/ontario-road-safety-annual-report.shtml

[6] https://www.library.mto.gov.on.ca/SydneyPLUS/TechPubs/Portal/tp/tvSplash.aspx

9 Conclusions

The purpose of this study was to assess future traffic operations beyond the currently permitted facility life cycle, and to seek an extension of the facility operations to approximately 2045. Future traffic projections were assessed for the 2025 and 2035 horizons which includes the 5-year and 15-year horizons that are standard analysis horizons for MTO Transportation Impact Studies, and represents a conservative estimate of future traffic conditions for that forecast year.

9.1 Site Traffic Generation

Site traffic projections were estimated separately for the existing waste handling facility north of Lafleche Road, and the proposed new land uses south of Lafleche Road. Site traffic for the north side operations was based on the observed site traffic and weigh scale data. For the south side, the traffic projections were based on planned staffing levels and expected transport trailer trips which were provided by GFL.

Based on the observed site traffic generation and tonnage data provided, the site received the typical average daily tonnage of approximately 2,500 tonnes waste, and the observed site traffic should therefore be representative of typical daily conditions going forward. There are no changes anticipated to facility traffic associated with compost and waste landfill.

The facility received the daily average tonnage during the weekday (2,500 tonnes), but only received 25% of the average daily tonnage on the Saturday (600 tonnes). The facility is expected to receive comparable levels of waste and compost as it currently does on a typical day (reflective of approximately 2,500 tonnes of landfill on a weekday and approximately 600 tonnes on a Saturday). On average, throughout the year the facility accepts 2,500 tonnes per day (inclusive of Saturdays), however, the facility may accept up to 4,000 tonnes per day when there is demand.

For a conservative traffic operations analysis, this report assesses future conditions assuming the facility receives and processes up to its current allowable daily maximum tonnage limit of 4,000 tonnes per day of combined landfill and compost on the north side of Lafleche Road. It was assumed that the compost operations would receive the maximum of 900 tonnes per day and that the landfill operations would also receive the remaining 3,100 tonnes per day. The study further assessed traffic impacts with the introduction of new land uses that are proposed to be located on the south side of Lafleche Road, including a compost bagging operation, and a renewable natural gas facility.

When compared to the existing site trips for the north side, scaled up to the theoretical maximum daily tonnage limit, up to 25 and 27 additional two-way trips are projected to enter the facility during the weekday AM, and PM peak hours, respectively. Relative to existing conditions, this is a 68%, and 69% increase. Saturday trip generation may increase from 15 two-way trips per hour to a theoretical maximum of 113 trips per hour. These projections reflect the current trip rates extrapolated to future horizon years assuming the daily maximum of 4,000 tonnes is reached during both weekdays and Saturdays. The weekday projections represent the higher end of traffic anticipated for the facility, while the Saturday projections represent the highest theoretical level of trip generation possible but which is unlikely to be achieved. As previously mentioned, the average daily facility traffic associated with landfill is not anticipated to change from observed 2020 conditions. Furthermore, Saturdays typically result in less tonnage received.

For the south side land uses, an additional 43, 44, and 22 two-way trips are projected during the AM, PM, and Saturday midday peak hours.

The forecast maximum hourly one-way trip generation is 100 vehicles occurring during the weekday PM peak hour, with 100 outbound trips, or one vehicle every 36 seconds on average.

9.2 Haul Routes

As previously mentioned, there are no operational changes anticipated for the facility and it is expected to operate as it currently does and with the same yearly (and daily) tonnage limit. Only the maximum overall capacity will be increased to extend the operating life. Since there is no change to the effective catchment area for the facility, the origin-destination patterns of vehicles traveling to or from the facility, or the maximum daily trips generated, there is little to no impact expected to the surrounding road network or along the haul routes within the greater context.

9.3 Traffic Operations

Under existing, future background, and future total conditions, during both horizon years (2025 and 2035) there is and will continue to be capacity in the road network, even under the conservative assumption that the maximum daily tonnage is received. No road network improvements are required to accommodate the extension of the facility's operating life to 2031, 10 years beyond the current operating lifecycle ending in 2025.

9.4 Safety

9.4.1 Left-turn Lanes

Based on the MTO left-turn lane warrants (from the **MTO Design Supplement for TAC Geometric Design Guide (GDG) for Canadian Roads**), a southbound left-turn lane is warranted at the Highway 138 and Lafleche Road intersection under 2025 background traffic conditions, and a northbound left-turn lane is warranted under future 2035 background traffic conditions. A northbound left-turn lane is also warranted at the Highway 417 eastbound off-ramp intersection with Highway 138, under 2035 background traffic conditions. These left-turn lanes are not required operationally and traffic operations under future background and total conditions will be within acceptable limits.

9.4.2 Collision Rates

A review of publically available segment collision rates along Highway 138 in the vicinity of the study area does not indicate any major safety concerns when comparing the collisions rates with the provincial average. The provincial average collision rate over the past 5 years of available data was 1.51 for all roadways in the province of Ontario. This was compared to the collision rate for the Highway 138 segment in the study area which had an average collision rate of 0.78. This segment of Highway 138 within the study area has a rate that is nearly half that of the provincial average, which suggests that this segment is not collision-prone under existing conditions and that there is no significant safety concern.

Detailed collision analysis at the intersection level was not performed based on the segment average being significantly less than the provincial average. Detailed future safety performance would rely on available safety performance functions for this specific road for the assessment of future conditions.

The collisions rates involving trucks were not available for review as part of this study, and therefore, truck activity was not correlated to collision rates. However, as previously mentioned, the adjacent section of Highway 138 has an average collision rate that is nearly half of the provincial average. Although any increases in traffic volumes will theoretically increase the frequency of collisions, based on the data reviewed there is no indication that the increase in facility site traffic will result in any increases to collision rates (expressed as *collisions per vehicle-kilometres*).

9.4.3 Truck Activity

The facility will generate more truck traffic due to the proposed new uses on the south side of Lafleche Road. The truck activity associated with the tonnage received on the north side of Lafleche Road is expected to continue to operate as it does today and up to the same levels. The traffic data and weigh scale data used as the basis of the analysis is therefore expected to be representative of average daily operations.

However, there is a potential theoretical increase to truck traffic if the site receives the maximum daily tonnage on a single day. Overall, two-way truck trips associated with north-side land uses may increase by 22, 16 and 42 one-way truck trips during the weekday AM, PM, and Saturday peak hours, respectively, under this maximum tonnage scenario. This is an over estimation of typical daily truck volumes, but demonstrates that the traffic operations will remain within acceptable limits even when the maximum tonnage is received and site traffic generation is at maximum levels.

Appendix A

Turning Movement Counts

Lafleche Road & GFL Scale Access 1

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 7:00:00
To: 8:00:00

Municipality: North Stormont
Site #: 0000000018
Intersection: Lafleche Road & GFL Scale Access
TFR File #: 1
Count date: 16-Apr-2020

Weather conditions:
Clear

Person(s) who counted:

**** Non-Signalized Intersection ****

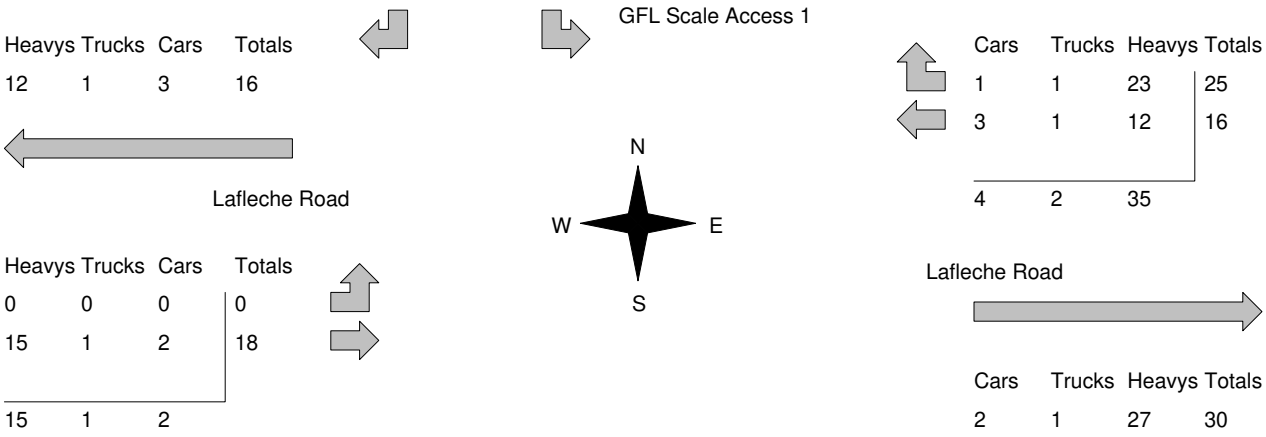
Major Road: Lafleche Road runs W/E

North Leg Total: 37
North Entering: 12
North Peds: 0
Peds Cross: ⋈

Heavys	0	12	12
Trucks	0	0	0
Cars	0	0	0
Totals	0	12	

Heavys	23
Trucks	1
Cars	1
Totals	25

East Leg Total: 71
East Entering: 41
East Peds: 0
Peds Cross: ⧖



Peds Cross: ⧖
West Peds: 0
West Entering: 18
West Leg Total: 34

Comments

from 17:19 the road was closed on the east-west through direction

Lafleche Road & GFL Scale Access 1

Afternoon Peak Diagram

Specified Period
From: 16:00:00
To: 18:00:00

One Hour Peak
From: 16:15:00
To: 17:15:00

Municipality: North Stormont
Site #: 0000000018
Intersection: Lafleche Road & GFL Scale Access
TFR File #: 1
Count date: 16-Apr-2020

Weather conditions:
Clear

Person(s) who counted:

**** Non-Signalized Intersection ****

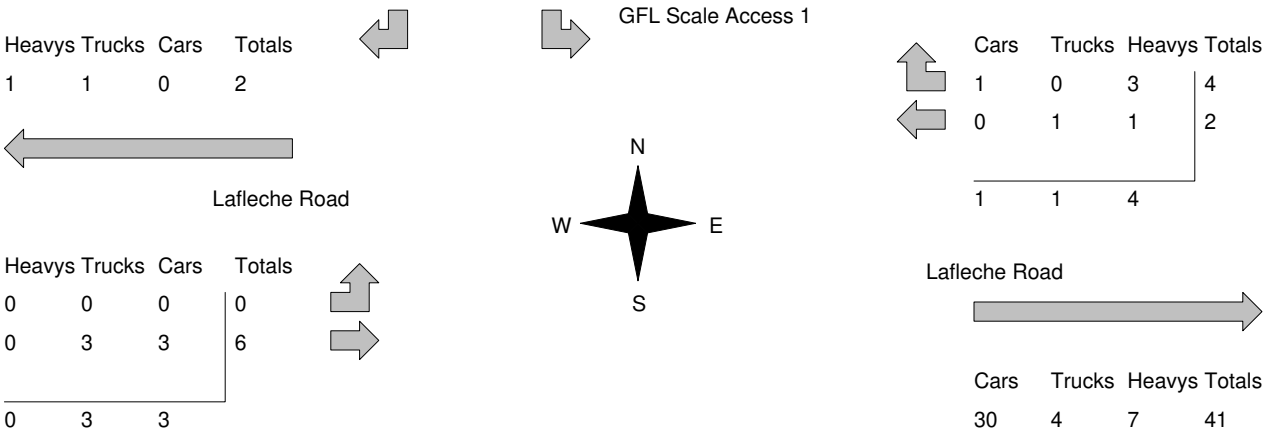
Major Road: Lafleche Road runs W/E

North Leg Total: 39
North Entering: 35
North Peds: 0
Peds Cross: ⋈

Heavys	0	7	7
Trucks	0	1	1
Cars	0	27	27
Totals	0	35	

Heavys	3
Trucks	0
Cars	1
Totals	4

East Leg Total: 47
East Entering: 6
East Peds: 0
Peds Cross: ⧖



Peds Cross: ⧖
West Peds: 0
West Entering: 6
West Leg Total: 8

Comments

from 17:19 the road was closed on the east-west through direction

Lafleche Road & GFL Scale Access 1

Total Count Diagram

Municipality: North Stormont
Site #: 0000000018
Intersection: Lafleche Road & GFL Scale Access
TFR File #: 1
Count date: 16-Apr-2020

Weather conditions:
Clear

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Lafleche Road runs W/E

North Leg Total: 117
North Entering: 73
North Peds: 0
Peds Cross: ⋈

Heavys	0	37	37
Trucks	0	1	1
Cars	0	35	35
Totals	0	73	

Heavys	38
Trucks	1
Cars	5
Totals	44

East Leg Total: 191
East Entering: 79
East Peds: 0
Peds Cross: ⧖

GFL Scale Access 1

Heavys	Trucks	Cars	Totals
26	4	5	35

Lafleche Road

Heavys	Trucks	Cars	Totals
0	0	0	0
26	5	8	39
26	5	8	

Cars	Trucks	Heavys	Totals
5	1	38	44
5	4	26	35
10	5	64	

Lafleche Road

Cars	Trucks	Heavys	Totals
43	6	63	112

N
W E
S

Peds Cross: ⧖
West Peds: 0
West Entering: 39
West Leg Total: 74

Comments

from 17:19 the road was closed on the east-west through direction

Lafleche Road & GFL Scale Access 1
Traffic Count Summary

Intersection: Lafleche Road & GFL Scale Acces | **Count Date:** 16-Apr-2020 | **Municipality:** North Stormont

North Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys: Left	Thru	Right	Grand Total	Total Peds	North/South Total Approaches
7:00:00	0	0	0	0	0	0
8:00:00	12	0	0	12	0	12
9:00:00	14	0	0	14	0	14
16:00:00	0	0	0	0	0	0
17:00:00	32	0	0	32	0	32
18:00:00	15	0	0	15	0	15
Totals:	73	0	0	73	0	73

South Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys: Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	0	0	0	0
8:00:00	0	0	0	0	0
9:00:00	0	0	0	0	0
16:00:00	0	0	0	0	0
17:00:00	0	0	0	0	0
18:00:00	0	0	0	0	0
	0	0	0	0	0

East Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys: Left	Thru	Right	Grand Total	Total Peds	East/West Total Approaches
7:00:00	0	0	0	0	0	0
8:00:00	0	16	25	41	0	59
9:00:00	0	15	14	29	0	41
16:00:00	0	0	0	0	0	0
17:00:00	0	4	4	8	0	14
18:00:00	0	0	1	1	0	4
Totals:	0	35	44	79	0	118

West Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys: Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	0	0	0	0
8:00:00	0	18	0	18	0
9:00:00	0	12	0	12	0
16:00:00	0	0	0	0	0
17:00:00	0	6	0	6	0
18:00:00	0	3	0	3	0
	0	39	0	39	0

Calculated Values for Traffic Crossing Major Street

Hours Ending:	7:00	8:00	9:00	16:00	17:00	18:00	18:00	18:00
Crossing Values:	0	12	14	0	32	15	15	3

Lafleche Road & GFL Scale Access 1

Mid-day Peak Diagram

Specified Period
From: 11:00:00
To: 13:00:00

One Hour Peak
From: 11:30:00
To: 12:30:00

Municipality: North Stormont
Site #: 0000000018
Intersection: Lafleche Road & GFL Scale Acces
TFR File #: 1
Count date: 18-Apr-2020

Weather conditions:
Clear

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Lafleche Road runs W/E

North Leg Total: 15
North Entering: 8
North Peds: 0
Peds Cross: ⋈

Heavys	0	3	3
Trucks	0	1	1
Cars	0	4	4
Totals	0	8	

Heavys	3
Trucks	1
Cars	3
Totals	7

East Leg Total: 15
East Entering: 7
East Peds: 0
Peds Cross: ⧖

GFL Scale Access 1

Heavys	Trucks	Cars	Totals
0	0	0	0

Cars	Trucks	Heavys	Totals
3	1	3	7
0	0	0	0
3	1	3	

Lafleche Road

N
W E
S

Heavys	Trucks	Cars	Totals
0	0	0	0
0	0	0	0
0	0	0	

Lafleche Road

Cars	Trucks	Heavys	Totals
4	1	3	8

Peds Cross: ⧖
West Peds: 0
West Entering: 0
West Leg Total: 0

Comments

from 11:00 until 13:00 the road was closed on the east-west through direction

Lafleche Road & GFL Scale Access 1

Total Count Diagram

Municipality: North Stormont
Site #: 0000000018
Intersection: Lafleche Road & GFL Scale Acces
TFR File #: 1
Count date: 18-Apr-2020

Weather conditions:
Clear
Person(s) who counted:

**** Non-Signalized Intersection ****

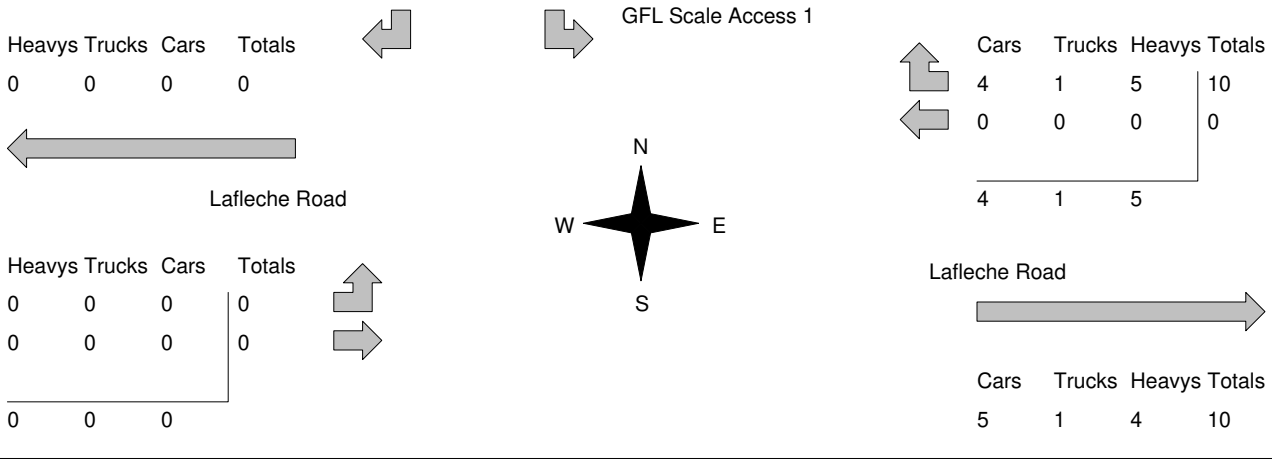
Major Road: Lafleche Road runs W/E

North Leg Total: 20
North Entering: 10
North Peds: 0
Peds Cross: ⋈

Heavys	0	4	4
Trucks	0	1	1
Cars	0	5	5
Totals	0	10	

Heavys	5
Trucks	1
Cars	4
Totals	10

East Leg Total: 20
East Entering: 10
East Peds: 0
Peds Cross: ⧖



Peds Cross: ⧖
West Peds: 0
West Entering: 0
West Leg Total: 0

Comments

from 11:00 until 13:00 the road was closed on the east-west through direction

Lafleche Road & GFL Scale Access 1
Traffic Count Summary

Intersection: Lafleche Road & GFL Scale Acces | **Count Date:** 18-Apr-2020 | **Municipality:** North Stormont

North Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds	North/South Total Approaches
	Left	Thru	Right	Grand Total		
11:00:00	0	0	0	0	0	0
12:00:00	3	0	0	3	0	3
13:00:00	7	0	0	7	0	7
Totals:	10	0	0	10	0	10

South Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds
	Left	Thru	Right	Grand Total	
11:00:00	0	0	0	0	0
12:00:00	0	0	0	0	0
13:00:00	0	0	0	0	0
	0	0	0	0	0

East Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds	East/West Total Approaches
	Left	Thru	Right	Grand Total		
11:00:00	0	0	0	0	0	0
12:00:00	0	0	5	5	0	5
13:00:00	0	0	5	5	0	5
Totals:	0	0	10	10	0	10

West Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds
	Left	Thru	Right	Grand Total	
11:00:00	0	0	0	0	0
12:00:00	0	0	0	0	0
13:00:00	0	0	0	0	0
	0	0	0	0	0

Calculated Values for Traffic Crossing Major Street

Hours Ending:	0:00	0:00	11:00	11:00	12:00	12:00	13:00	13:00
Crossing Values:	0	0	0	0	0	3	7	0

Highway 138 & Lafleche Road

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 7:45:00
To: 8:45:00

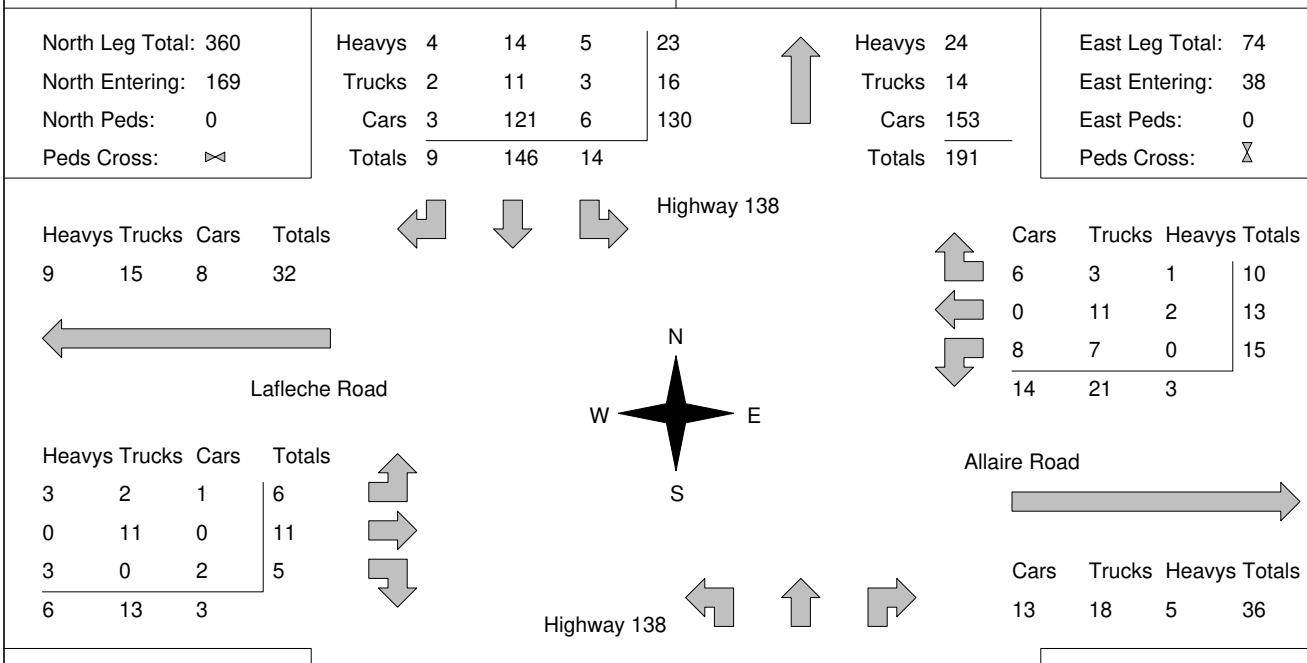
Municipality: North Stormont
Site #: 0000009503
Intersection: Highway 138 & Lafleche Road
TFR File #: 1
Count date: 29-Nov-2016

Weather conditions:
Cloudy / Rain

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Highway 138 runs N/S



Comments

Highway 138 & Lafleche Road

Afternoon Peak Diagram

Specified Period
From: 16:00:00
To: 18:00:00

One Hour Peak
From: 16:00:00
To: 17:00:00

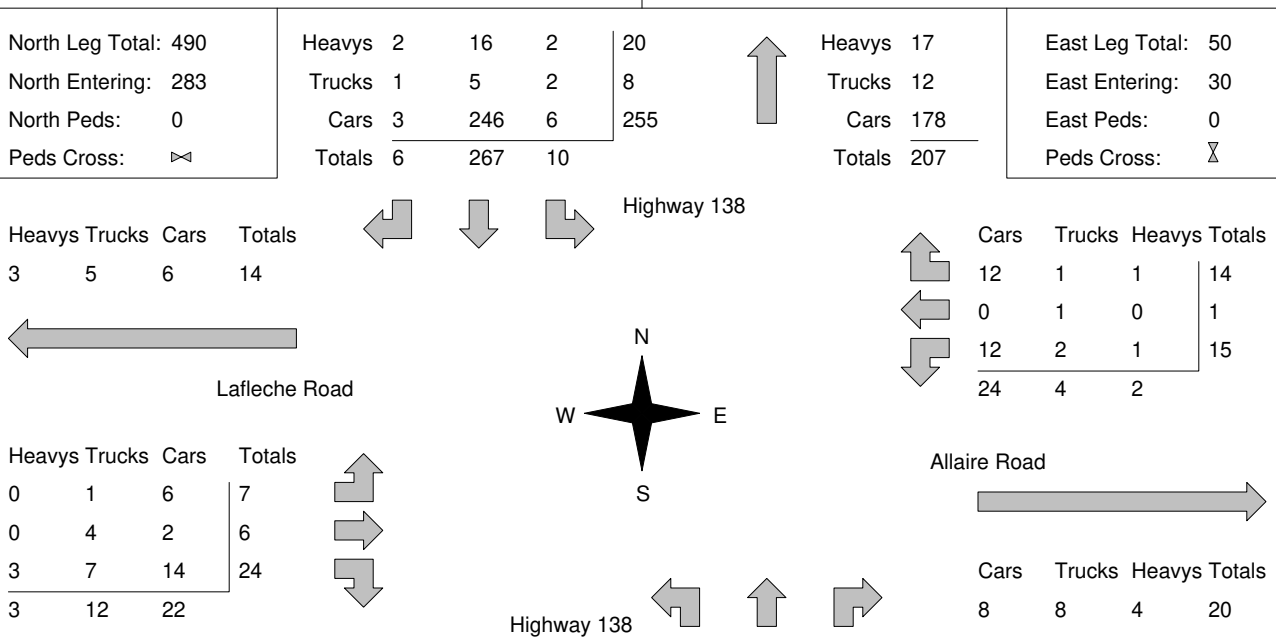
Municipality: North Stormont
Site #: 0000009503
Intersection: Highway 138 & Lafleche Road
TFR File #: 1
Count date: 29-Nov-2016

Weather conditions:
Cloudy / Rain

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Highway 138 runs N/S



Comments

Highway 138 & Lafleche Road

Total Count Diagram

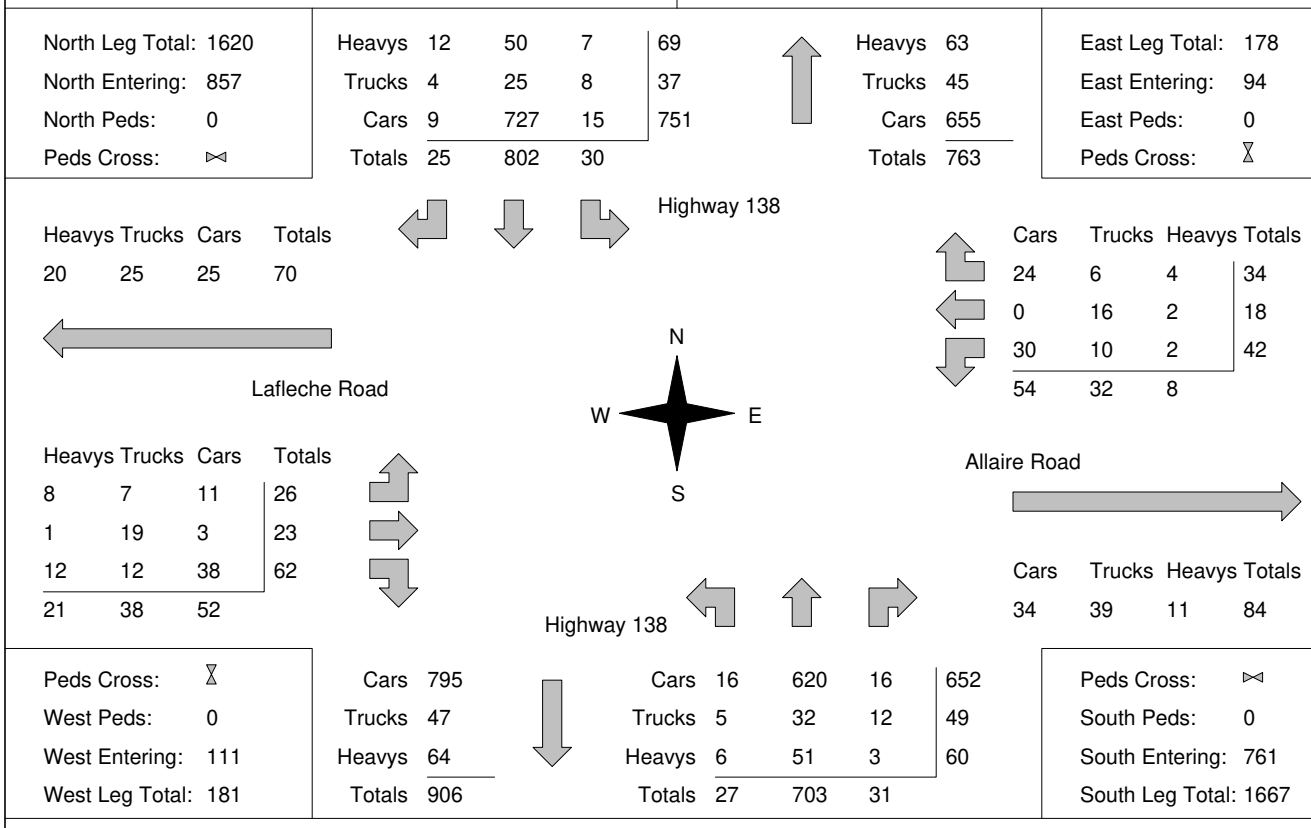
Municipality: North Stormont
Site #: 0000009503
Intersection: Highway 138 & Lafleche Road
TFR File #: 1
Count date: 29-Nov-2016

Weather conditions:
Cloudy / Rain

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Highway 138 runs N/S



Comments

Highway 138 & Lafleche Road
Traffic Count Summary

Intersection: Highway 138 & Lafleche Road | **Count Date:** 29-Nov-2016 | **Municipality:** North Stormont

North Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys: Left	Thru	Right	Grand Total	Total Peds	North/South Total Approaches
7:00:00	0	0	0	0	0	0
8:00:00	6	133	8	147	0	343
9:00:00	12	152	10	174	0	369
16:00:00	0	0	0	0	0	0
17:00:00	10	267	6	283	0	480
18:00:00	2	250	1	253	0	426
Totals:	30	802	25	857	0	1618

South Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys: Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	0	0	0	0
8:00:00	12	169	15	196	0
9:00:00	8	178	9	195	0
16:00:00	0	0	0	0	0
17:00:00	7	186	4	197	0
18:00:00	0	170	3	173	0
Totals:	27	703	31	761	0

East Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys: Left	Thru	Right	Grand Total	Total Peds	East/West Total Approaches
7:00:00	0	0	0	0	0	0
8:00:00	7	4	4	15	0	37
9:00:00	13	13	9	35	0	55
16:00:00	0	0	0	0	0	0
17:00:00	15	1	14	30	0	67
18:00:00	7	0	7	14	0	46
Totals:	42	18	34	94	0	205

West Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys: Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	0	0	0	0
8:00:00	8	7	7	22	0
9:00:00	4	10	6	20	0
16:00:00	0	0	0	0	0
17:00:00	7	6	24	37	0
18:00:00	7	0	25	32	0
Totals:	26	23	62	111	0

Calculated Values for Traffic Crossing Major Street

Hours Ending:	7:00	8:00	9:00	16:00	17:00	18:00	18:00	18:00
Crossing Values:	0	22	30	0	28	14	14	14

Highway 138 & Lafleche Road

Mid-day Peak Diagram

Specified Period
From: 10:00:00
To: 13:00:00

One Hour Peak
From: 10:00:00
To: 11:00:00

Municipality: North Stormont
Site #: 0000009503
Intersection: Highway 138 & Lafleche Road
TFR File #: 1
Count date: 3-Dec-2016

Weather conditions:
Cloudy

Person(s) who counted:

**** Non-Signalized Intersection ****

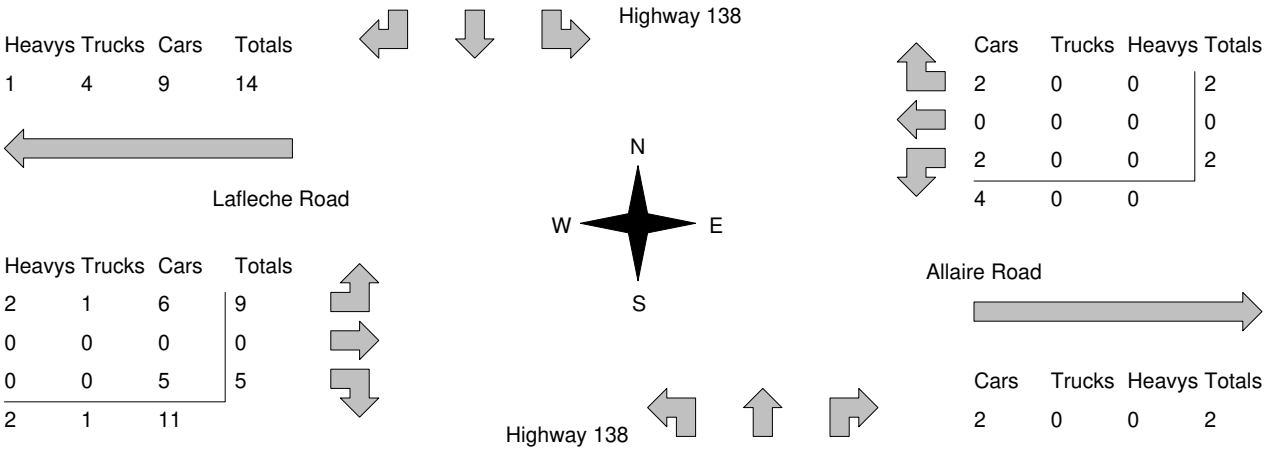
Major Road: Highway 138 runs N/S

North Leg Total: 437
North Entering: 203
North Peds: 0
Peds Cross: ⋈

Heavys	0	3	0	3
Trucks	3	1	0	4
Cars	7	188	1	196
Totals	10	192	1	

Heavys	7
Trucks	4
Cars	223
Totals	234

East Leg Total: 6
East Entering: 4
East Peds: 0
Peds Cross: ⧖



Peds Cross: ⧖
West Peds: 0
West Entering: 14
West Leg Total: 28

Cars	195			
Trucks	1			
Heavys	3			
Totals	199			

Cars	2	215	1	218
Trucks	1	3	0	4
Heavys	1	5	0	6
Totals	4	223	1	

Peds Cross: ⋈
South Peds: 0
South Entering: 228
South Leg Total: 427

Comments

Highway 138 & Lafleche Road

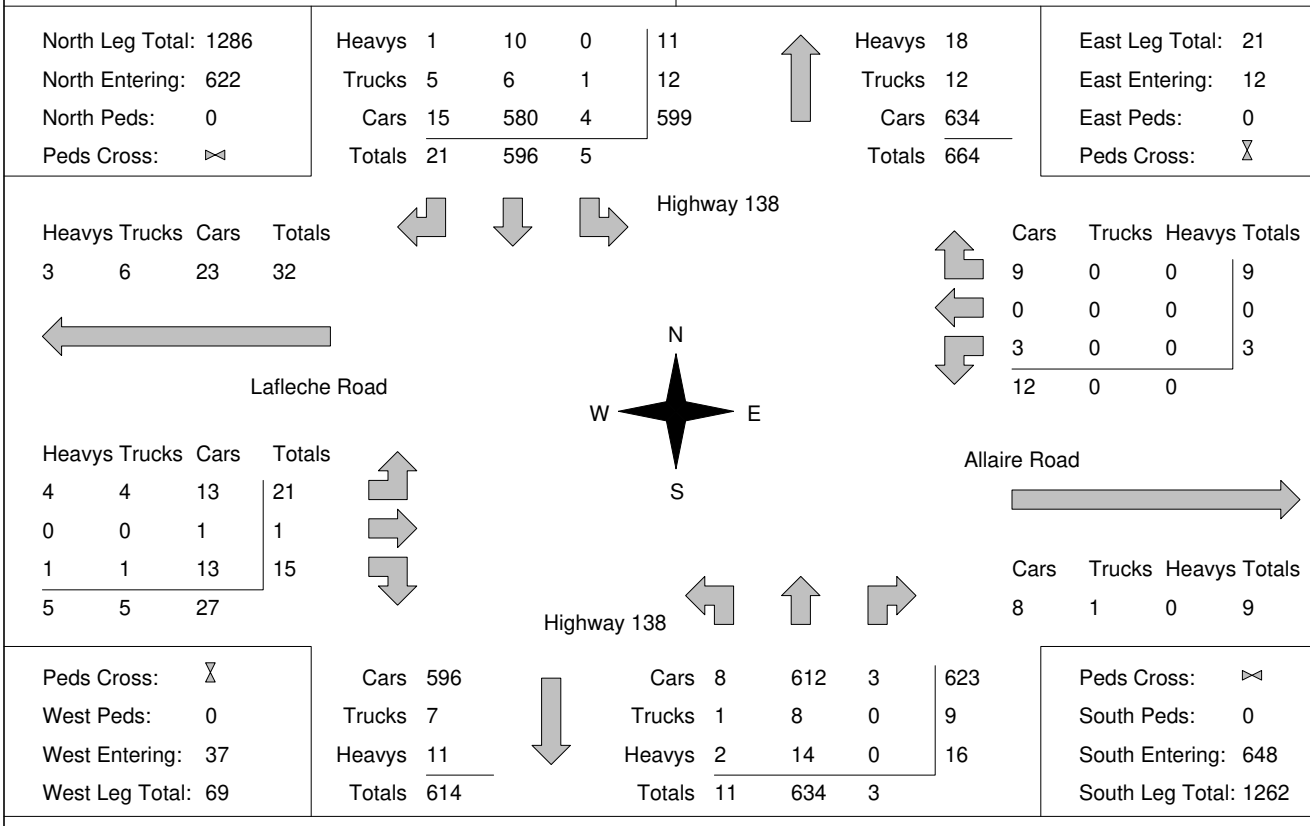
Total Count Diagram

Municipality: North Stormont
Site #: 0000009503
Intersection: Highway 138 & Lafleche Road
TFR File #: 1
Count date: 3-Dec-2016

Weather conditions:
Cloudy
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Highway 138 runs N/S



Comments

Highway 138 & Lafleche Road
Traffic Count Summary

Intersection: Highway 138 & Lafleche Road | **Count Date:** 3-Dec-2016 | **Municipality:** North Stormont

North Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys: Left	Thru	Right	Grand Total	Total Peds	North/South Total Approaches
10:00:00	0	0	0	0	0	0
11:00:00	1	192	10	203	0	431
12:00:00	3	177	5	185	0	406
13:00:00	1	227	6	234	0	433
Totals:	5	596	21	622	0	1270

South Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys: Left	Thru	Right	Grand Total	Total Peds
10:00:00	0	0	0	0	0
11:00:00	4	223	1	228	0
12:00:00	5	216	0	221	0
13:00:00	2	195	2	199	0
Totals:	11	634	3	648	0

East Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys: Left	Thru	Right	Grand Total	Total Peds	East/West Total Approaches
10:00:00	0	0	0	0	0	0
11:00:00	2	0	2	4	0	18
12:00:00	0	0	3	3	0	15
13:00:00	1	0	4	5	0	16
Totals:	3	0	9	12	0	49

West Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys: Left	Thru	Right	Grand Total	Total Peds
10:00:00	0	0	0	0	0
11:00:00	9	0	5	14	0
12:00:00	7	1	4	12	0
13:00:00	5	0	6	11	0
Totals:	21	1	15	37	0

Calculated Values for Traffic Crossing Major Street

Hours Ending:	10:00	10:00	11:00	11:00	12:00	12:00	13:00	13:00
Crossing Values:	0	0	11	11	8	8	6	6

Highway 138 & Highway 417 EB Off-Ramp

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

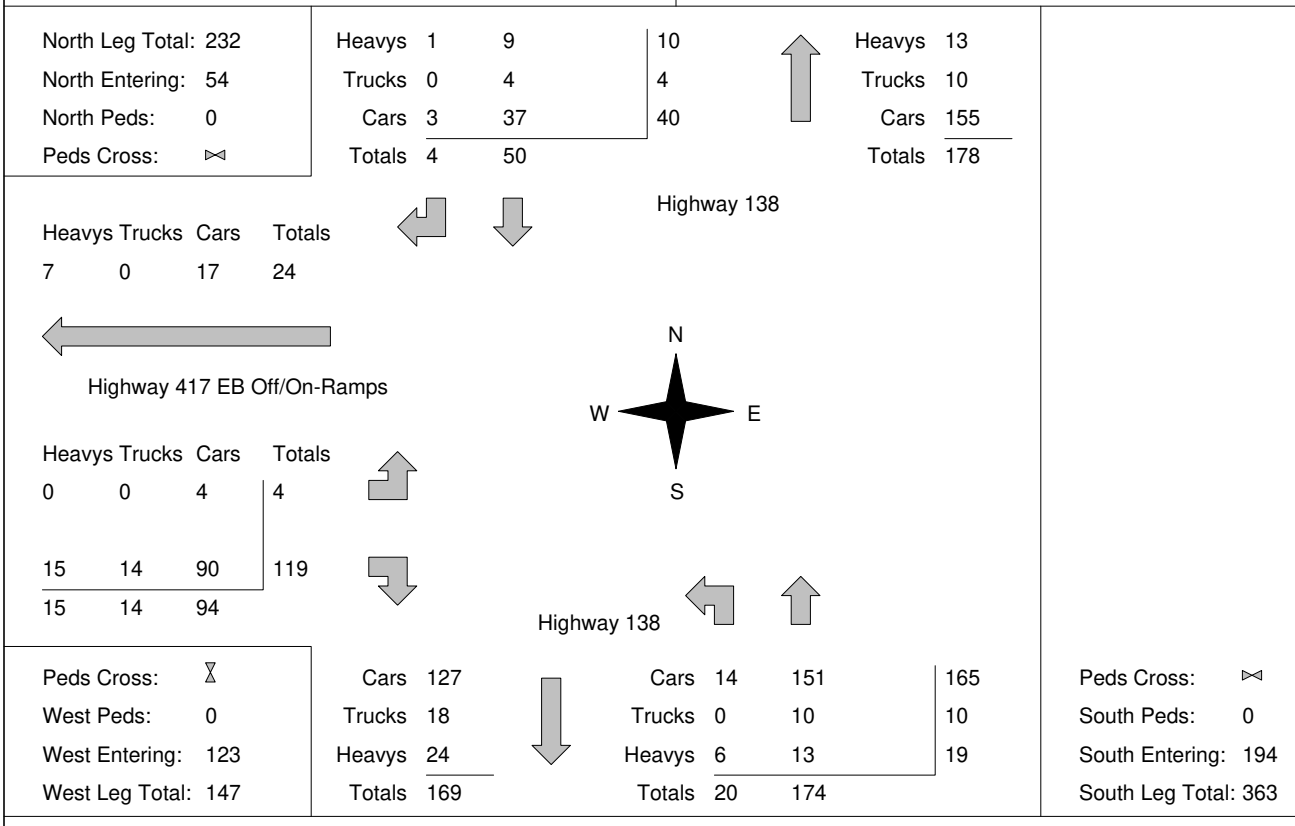
One Hour Peak
From: 8:00:00
To: 9:00:00

Municipality: North Stormont
Site #: 0000009502
Intersection: Highway 138 & Highway 417 EB Of
TFR File #: 1
Count date: 29-Nov-2016

Weather conditions:
Cloudy / Rain
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Highway 138 runs N/S



Comments

Highway 138 & Highway 417 EB Off-Ramp

Afternoon Peak Diagram

Specified Period
From: 16:00:00
To: 18:00:00

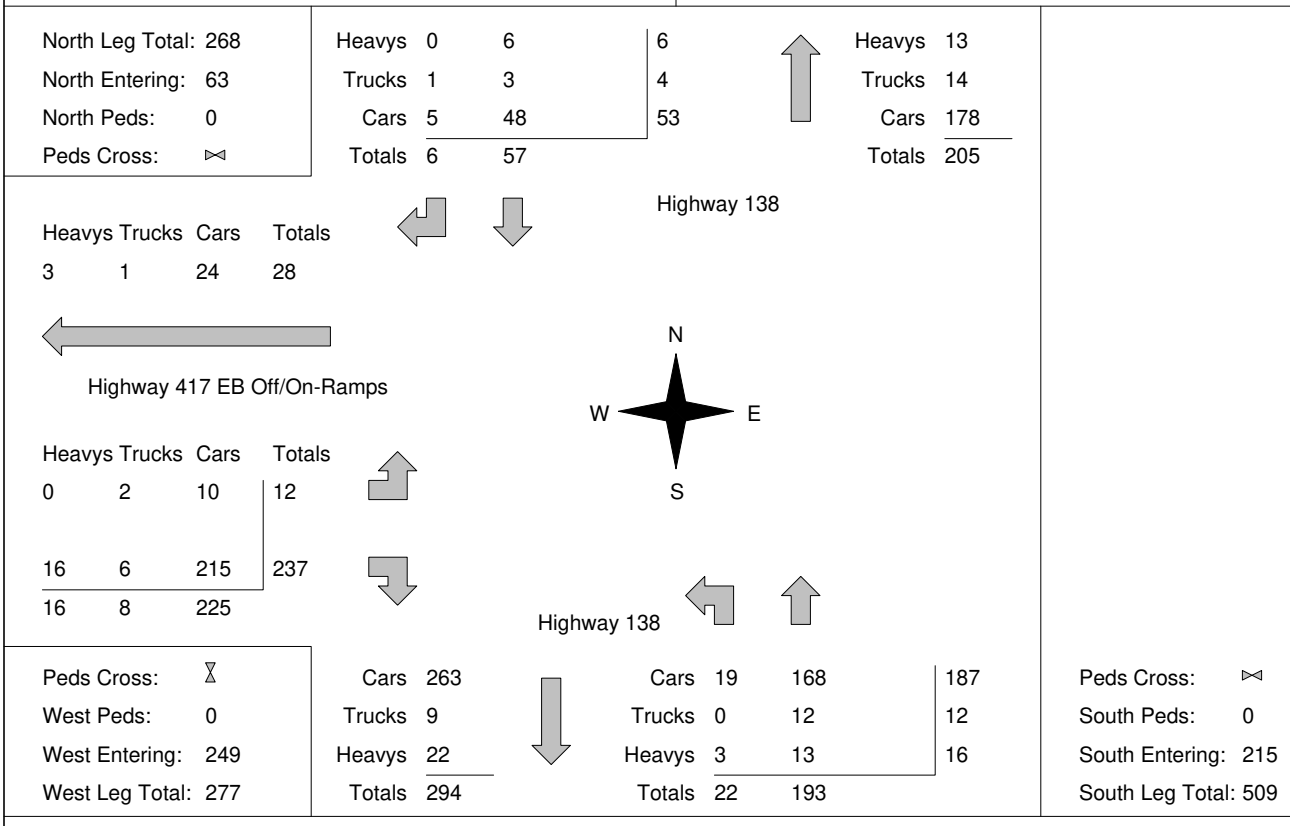
One Hour Peak
From: 16:00:00
To: 17:00:00

Municipality: North Stormont
Site #: 0000009502
Intersection: Highway 138 & Highway 417 EB Of
TFR File #: 1
Count date: 29-Nov-2016

Weather conditions:
Cloudy / Rain
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Highway 138 runs N/S



Comments

Highway 138 & Highway 417 EB Off-Ramp

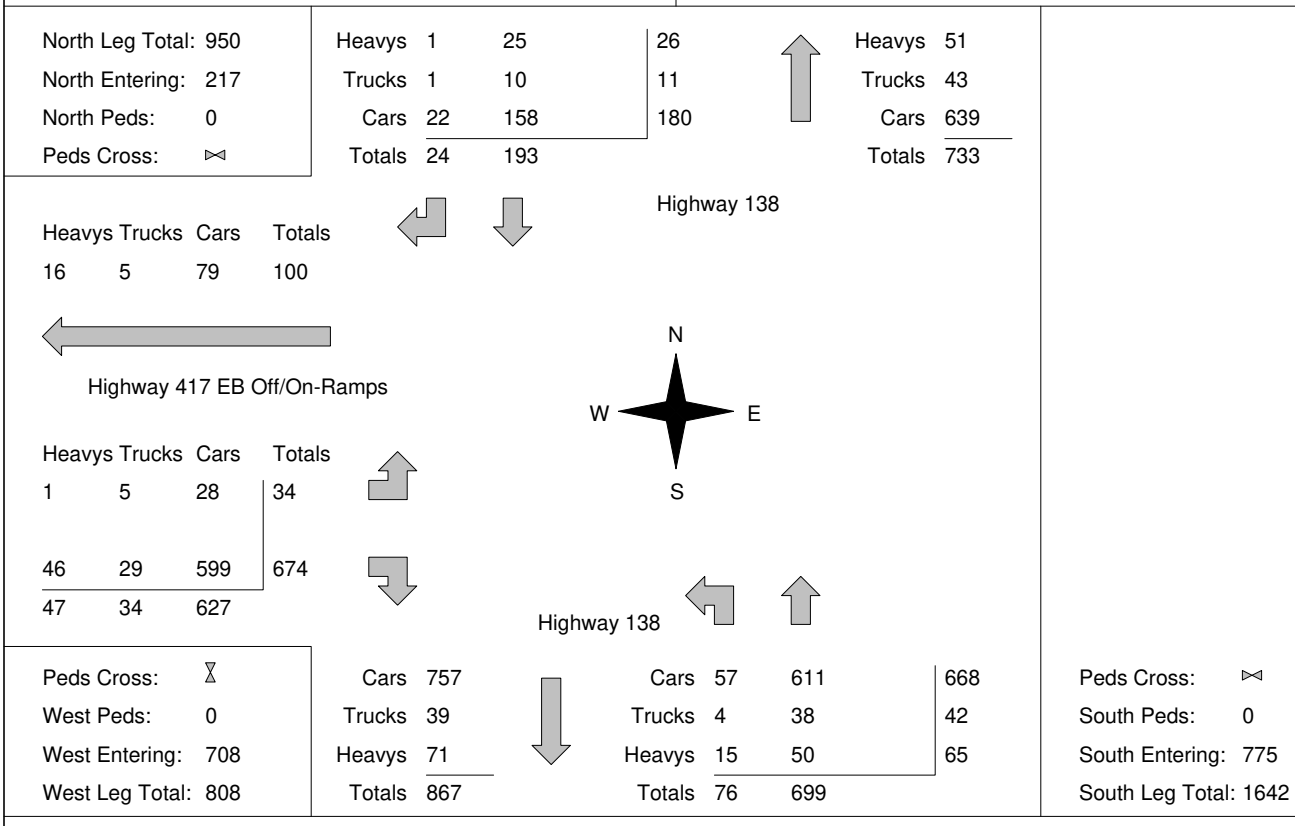
Total Count Diagram

Municipality: North Stormont
Site #: 0000009502
Intersection: Highway 138 & Highway 417 EB Of
TFR File #: 1
Count date: 29-Nov-2016

Weather conditions:
Cloudy / Rain
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Highway 138 runs N/S



Comments

Highway 138 & Highway 417 EB Off-Ramp
Traffic Count Summary

Intersection: Highway 138 & Highway 417 EB C | **Count Date:** 29-Nov-2016 | **Municipality:** North Stormont

North Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys: Left	Thru	Right	Grand Total	Total Peds	North/South Total Approaches
7:00:00	0	0	0	0	0	0
8:00:00	0	43	6	49	0	229
9:00:00	0	50	4	54	0	248
16:00:00	0	0	0	0	0	0
17:00:00	0	57	6	63	0	278
18:00:00	0	43	8	51	0	237
Totals:	0	193	24	217	0	992

South Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys: Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	0	0	0	0
8:00:00	21	159	0	180	0
9:00:00	20	174	0	194	0
16:00:00	0	0	0	0	0
17:00:00	22	193	0	215	0
18:00:00	13	173	0	186	0
Totals:	76	699	0	775	0

East Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys: Left	Thru	Right	Grand Total	Total Peds	East/West Total Approaches
7:00:00	0	0	0	0	0	0
8:00:00	0	0	0	0	0	115
9:00:00	0	0	0	0	0	123
16:00:00	0	0	0	0	0	0
17:00:00	0	0	0	0	0	249
18:00:00	0	0	0	0	0	221
Totals:	0	0	0	0	0	708

West Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys: Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	0	0	0	0
8:00:00	8	0	107	115	0
9:00:00	4	0	119	123	0
16:00:00	0	0	0	0	0
17:00:00	12	0	237	249	0
18:00:00	10	0	211	221	0
Totals:	34	0	674	708	0

Calculated Values for Traffic Crossing Major Street

Hours Ending:	7:00	8:00	9:00	16:00	17:00	18:00	18:00	18:00
Crossing Values:	0	8	4	0	12	10	10	10

Highway 138 & Highway 417 EB Off-Ramp

Mid-day Peak Diagram

Specified Period
From: 10:00:00
To: 13:00:00

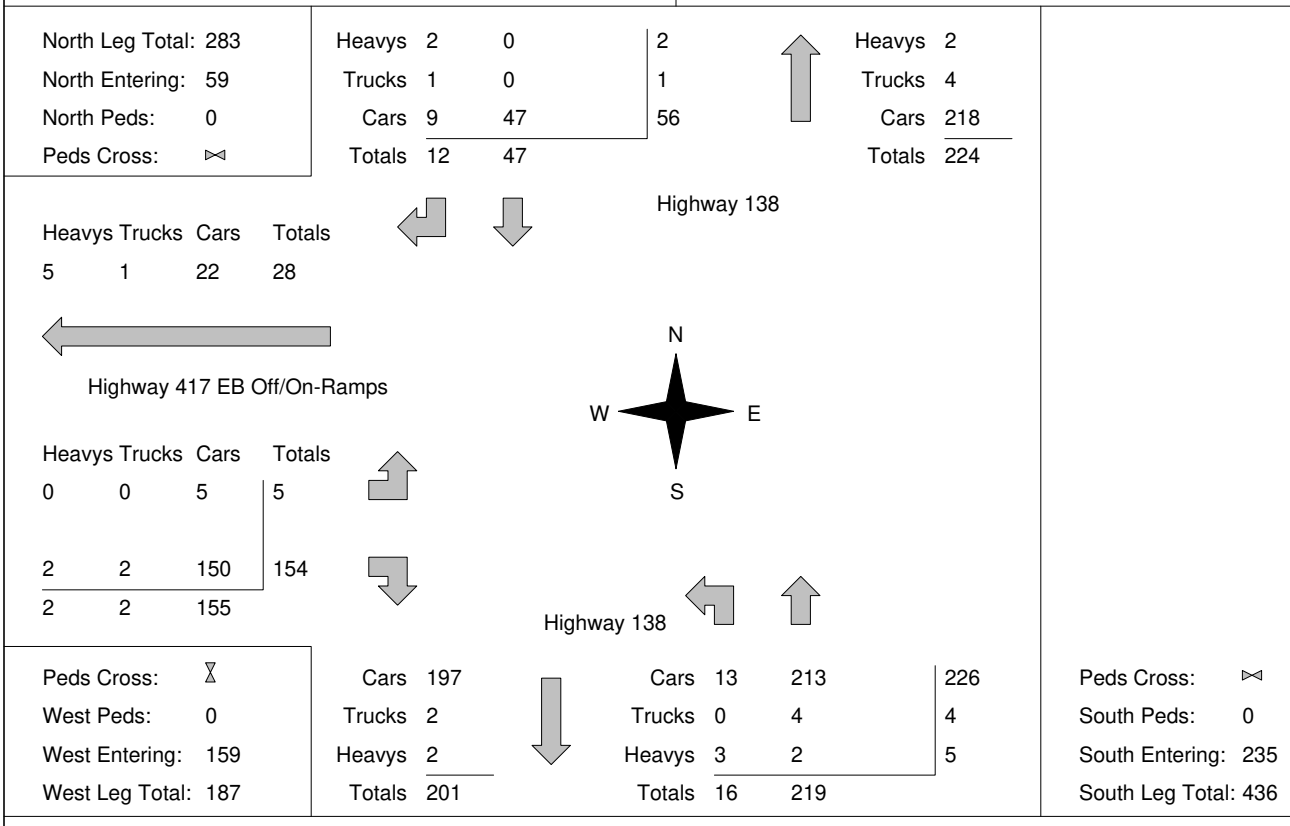
One Hour Peak
From: 10:15:00
To: 11:15:00

Municipality: North Stormont
Site #: 0000009502
Intersection: Highway 138 & Highway 417 EB Off
TFR File #: 1
Count date: 3-Dec-2016

Weather conditions:
Cloudy
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Highway 138 runs N/S



Comments

Highway 138 & Highway 417 EB Off-Ramp

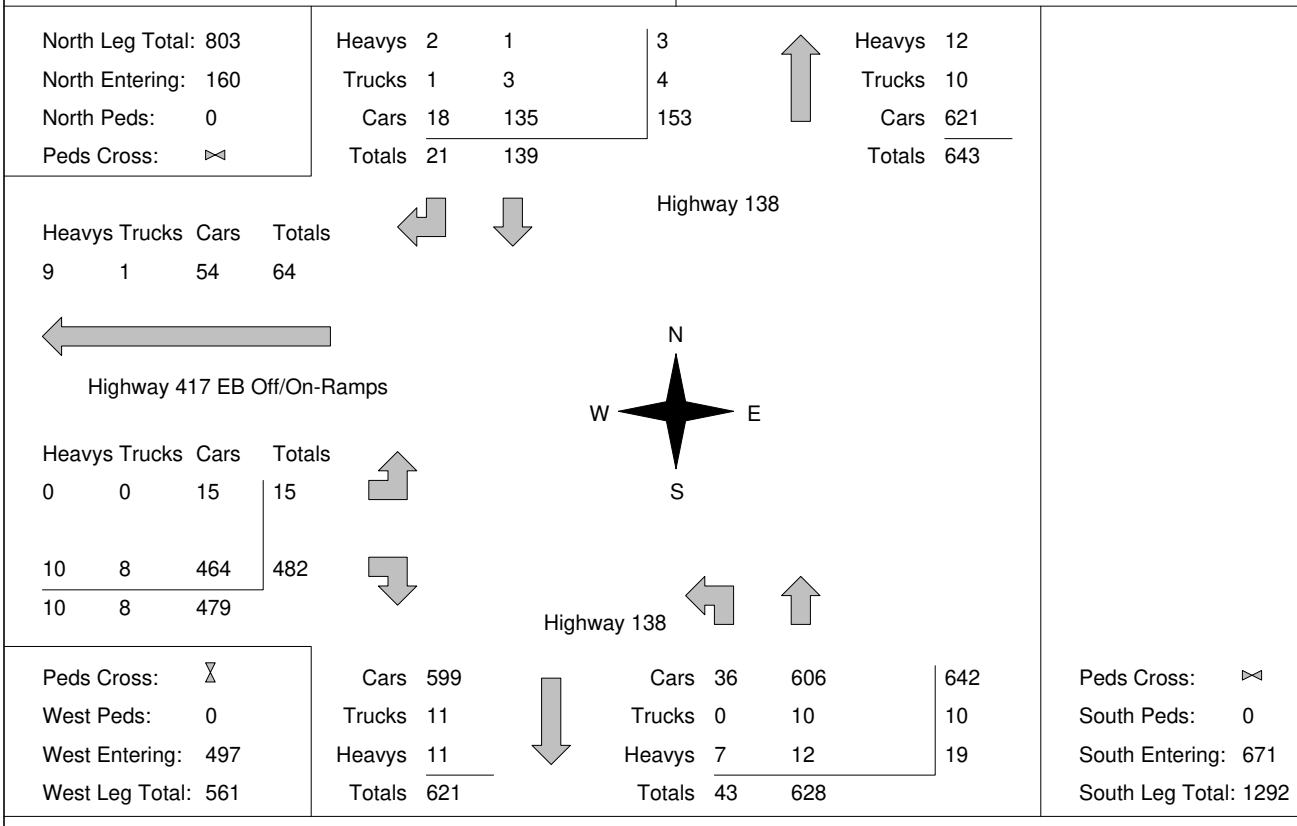
Total Count Diagram

Municipality: North Stormont
Site #: 0000009502
Intersection: Highway 138 & Highway 417 EB Off
TFR File #: 1
Count date: 3-Dec-2016

Weather conditions:
Cloudy
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Highway 138 runs N/S



Comments

Highway 138 & Highway 417 EB Off-Ramp
Traffic Count Summary

Intersection: Highway 138 & Highway 417 EB O | **Count Date:** 3-Dec-2016 | **Municipality:** North Stormont

North Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys: Left	Thru	Right	Grand Total	Total Peds	North/South Total Approaches
10:00:00	0	0	0	0	0	0
11:00:00	0	47	8	55	0	289
12:00:00	0	37	8	45	0	273
13:00:00	0	55	5	60	0	269
Totals:	0	139	21	160	0	831

South Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys: Left	Thru	Right	Grand Total	Total Peds
10:00:00	0	0	0	0	0
11:00:00	17	217	0	234	0
12:00:00	12	216	0	228	0
13:00:00	14	195	0	209	0
	43	628	0	671	0

East Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys: Left	Thru	Right	Grand Total	Total Peds	East/West Total Approaches
10:00:00	0	0	0	0	0	0
11:00:00	0	0	0	0	0	160
12:00:00	0	0	0	0	0	153
13:00:00	0	0	0	0	0	184
Totals:	0	0	0	0	0	497

West Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys: Left	Thru	Right	Grand Total	Total Peds
10:00:00	0	0	0	0	0
11:00:00	4	0	156	160	0
12:00:00	6	0	147	153	0
13:00:00	5	0	179	184	0
	15	0	482	497	0

Calculated Values for Traffic Crossing Major Street

Hours Ending:	10:00	11:00	12:00	12:00	12:00	13:00	13:00	13:00
Crossing Values:	0	4	6	6	6	5	5	5

Highway 138 & Highway 417 WB Off-Ramp

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 7:15:00
To: 8:15:00

Municipality: North Stormont
Site #: 0000009501
Intersection: Highway 138 & Highway 417 WB Of
TFR File #: 1
Count date: 29-Nov-2016

Weather conditions:
Cloudy / Rain

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Highway 138 runs N/S

North Leg Total: 79
North Entering: 36
North Peds: 0
Peds Cross: ⋈

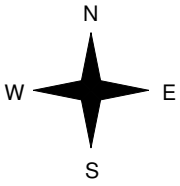
Heavys	2	0	2
Trucks	3	0	3
Cars	25	6	31
Totals	30	6	

Heavys	5
Trucks	9
Cars	29
Totals	43

East Leg Total: 186
East Entering: 38
East Peds: 0
Peds Cross: ⋈

Highway 138

Cars	Trucks	Heavys	Totals
6	3	1	10
21	3	4	28
27	6	5	



Highway 417 WB Off/On-Ramps

Cars	Trucks	Heavys	Totals
129	6	13	148

Highway 138

Cars	46
Trucks	6
Heavys	6
Totals	58

Cars	23	123	146
Trucks	6	6	12
Heavys	4	13	17
Totals	33	142	

Peds Cross: ⋈
South Peds: 0
South Entering: 175
South Leg Total: 233

Comments

Highway 138 & Highway 417 WB Off-Ramp

Afternoon Peak Diagram

Specified Period
From: 16:00:00
To: 18:00:00

One Hour Peak
From: 16:00:00
To: 17:00:00

Municipality: North Stormont
Site #: 0000009501
Intersection: Highway 138 & Highway 417 WB Of
TFR File #: 1
Count date: 29-Nov-2016

Weather conditions:
Cloudy / Rain

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Highway 138 runs N/S

North Leg Total: 106
North Entering: 50
North Peds: 0
Peds Cross: ⋈

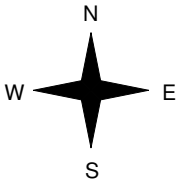
Heavys	2	0	2
Trucks	5	0	5
Cars	34	9	43
Totals	41	9	

Heavys	2
Trucks	8
Cars	46
Totals	56

East Leg Total: 192
East Entering: 29
East Peds: 0
Peds Cross: ⧖

Highway 138

Cars	Trucks	Heavys	Totals
1	3	1	5
20	0	4	24
21	3	5	



Highway 417 WB Off/On-Ramps

Cars	Trucks	Heavys	Totals
141	11	11	163

Highway 138

Cars	54
Trucks	5
Heavys	6
Totals	65

Cars	45	132	177
Trucks	5	11	16
Heavys	1	11	12
Totals	51	154	

Peds Cross: ⋈
South Peds: 0
South Entering: 205
South Leg Total: 270

Comments

Highway 138 & Highway 417 WB Off-Ramp

Total Count Diagram

Municipality: North Stormont
Site #: 0000009501
Intersection: Highway 138 & Highway 417 WB Of
TFR File #: 1
Count date: 29-Nov-2016

Weather conditions:
Cloudy / Rain

Person(s) who counted:

**** Non-Signalized Intersection ****

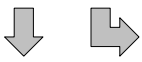
Major Road: Highway 138 runs N/S

North Leg Total: 323
North Entering: 143
North Peds: 0
Peds Cross: ⋈

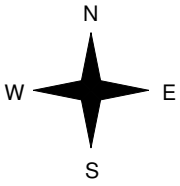
Heavys	8	0	8
Trucks	8	1	9
Cars	104	22	126
Totals	120	23	

Heavys	9
Trucks	24
Cars	147
Totals	180

East Leg Total: 728
East Entering: 126
East Peds: 0
Peds Cross: ⋈



	Cars	Trucks	Heavys	Totals
	19	7	2	28
	78	4	16	98
	97	11	18	



Cars	Trucks	Heavys	Totals
531	28	43	602

Cars	182	128	509	637
Trucks	12	17	27	44
Heavys	24	7	43	50
Totals	218	152	579	

Peds Cross: ⋈
South Peds: 0
South Entering: 731
South Leg Total: 949

Comments

Highway 138 & Highway 417 WB Off-Ramp
Traffic Count Summary

Intersection: Highway 138 & Highway 417 WB C | **Count Date:** 29-Nov-2016 | **Municipality:** North Stormont

North Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys: Left	Thru	Right	Grand Total	Total Peds	North/South Total Approaches
7:00:00	0	0	0	0	0	0
8:00:00	4	29	0	33	0	201
9:00:00	8	27	0	35	0	215
16:00:00	0	0	0	0	0	0
17:00:00	9	41	0	50	0	255
18:00:00	2	23	0	25	0	203
Totals:	23	120	0	143	0	874

South Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys: Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	0	0	0	0
8:00:00	0	25	143	168	0
9:00:00	0	33	147	180	0
16:00:00	0	0	0	0	0
17:00:00	0	51	154	205	0
18:00:00	0	43	135	178	0
Totals:	0	152	579	731	0

East Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys: Left	Thru	Right	Grand Total	Total Peds	East/West Total Approaches
7:00:00	0	0	0	0	0	0
8:00:00	23	0	8	31	0	31
9:00:00	25	0	8	33	0	33
16:00:00	0	0	0	0	0	0
17:00:00	24	0	5	29	0	29
18:00:00	26	0	7	33	0	33
Totals:	98	0	28	126	0	126

West Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys: Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	0	0	0	0
8:00:00	0	0	0	0	0
9:00:00	0	0	0	0	0
16:00:00	0	0	0	0	0
17:00:00	0	0	0	0	0
18:00:00	0	0	0	0	0
Totals:	0	0	0	0	0

Calculated Values for Traffic Crossing Major Street

Hours Ending:	7:00	8:00	9:00	16:00	17:00	18:00	18:00	18:00
Crossing Values:	0	23	25	0	24	26	26	26

Highway 138 & Highway 417 WB Off-Ramp

Mid-day Peak Diagram

Specified Period
From: 10:00:00
To: 13:00:00

One Hour Peak
From: 10:15:00
To: 11:15:00

Municipality: North Stormont
Site #: 0000009501
Intersection: Highway 138 & Highway 417 WB Of
TFR File #: 1
Count date: 3-Dec-2016

Weather conditions:
Cloudy

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Highway 138 runs N/S

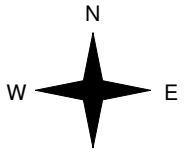
North Leg Total: 78
North Entering: 47
North Peds: 0
Peds Cross: ⋈

Heavys	2	0	2
Trucks	1	1	2
Cars	36	7	43
Totals	39	8	

Heavys	1	
Trucks	2	
Cars	28	
Totals	31	

East Leg Total: 230
East Entering: 25
East Peds: 0
Peds Cross: ⋈

Cars	Trucks	Heavys	Totals
2	1	0	3
22	0	0	22
24	1	0	



Cars	Trucks	Heavys	Totals
200	4	1	205

Cars	58
Trucks	1
Heavys	2
Totals	61

Cars	26	193	219
Trucks	1	3	4
Heavys	1	1	2
Totals	28	197	

Peds Cross: ⋈
South Peds: 0
South Entering: 225
South Leg Total: 286

Comments

Highway 138 & Highway 417 WB Off-Ramp

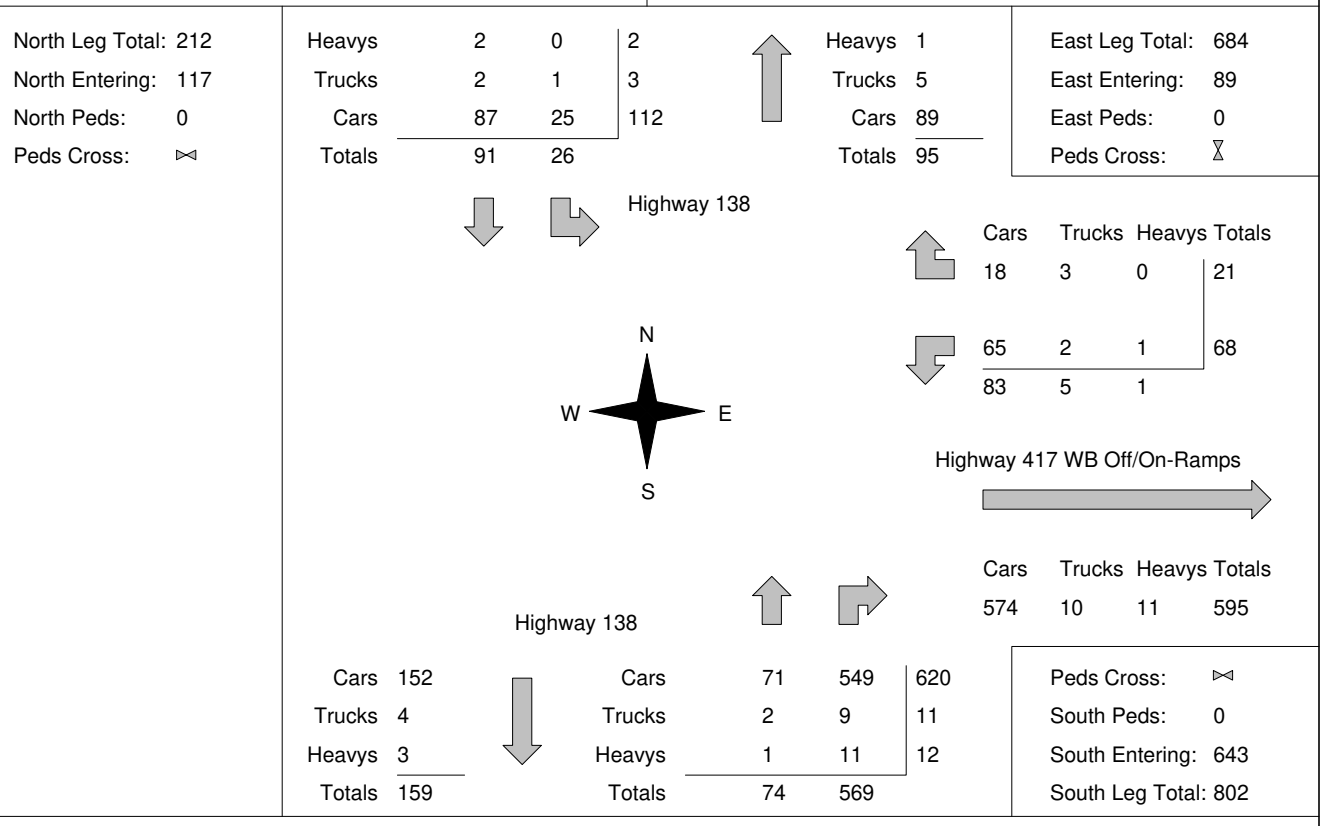
Total Count Diagram

Municipality: North Stormont
Site #: 0000009501
Intersection: Highway 138 & Highway 417 WB Of
TFR File #: 1
Count date: 3-Dec-2016

Weather conditions:
Cloudy
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Highway 138 runs N/S



Comments

Highway 138 & Highway 417 WB Off-Ramp
Traffic Count Summary

Intersection: Highway 138 & Highway 417 WB C | **Count Date:** 3-Dec-2016 | **Municipality:** North Stormont

North Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys: Left	Thru	Right	Grand Total	Total Peds	North/South Total Approaches
10:00:00	0	0	0	0	0	0
11:00:00	10	36	0	46	0	267
12:00:00	11	31	0	42	0	267
13:00:00	5	24	0	29	0	226
Totals:	26	91	0	117	0	760

South Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys: Left	Thru	Right	Grand Total	Total Peds
10:00:00	0	0	0	0	0
11:00:00	0	25	196	221	0
12:00:00	0	26	199	225	0
13:00:00	0	23	174	197	0
	0	74	569	643	0

East Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys: Left	Thru	Right	Grand Total	Total Peds	East/West Total Approaches
10:00:00	0	0	0	0	0	0
11:00:00	17	0	5	22	0	22
12:00:00	17	0	4	21	0	21
13:00:00	34	0	12	46	0	46
Totals:	68	0	21	89	0	89

West Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys: Left	Thru	Right	Grand Total	Total Peds
10:00:00	0	0	0	0	0
11:00:00	0	0	0	0	0
12:00:00	0	0	0	0	0
13:00:00	0	0	0	0	0
	0	0	0	0	0

Calculated Values for Traffic Crossing Major Street

Hours Ending:	10:00	11:00	12:00	12:00	12:00	13:00	13:00	13:00
Crossing Values:	0	17	17	17	17	34	34	34

Appendix B

Synchro Reports

HCM Unsignalized Intersection Capacity Analysis
3: Highway 138 & Hwy 417 WB Off-Ramp

08/21/2020

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	35	12	40	0	8	37
Future Volume (Veh/h)	35	12	40	0	8	37
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	39	13	44	0	9	41
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	103	44			44	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	103	44			44	
tC, single (s)	6.6	6.6			4.1	
tC, 2 stage (s)						
tF (s)	3.7	3.7			2.2	
p0 queue free %	95	99			99	
cM capacity (veh/h)	838	928			1577	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	52	44	50
Volume Left	39	0	9
Volume Right	13	0	0
cSH	858	1700	1577
Volume to Capacity	0.06	0.03	0.01
Queue Length 95th (m)	1.5	0.0	0.1
Control Delay (s)	9.5	0.0	1.3
Lane LOS	A		A
Approach Delay (s)	9.5	0.0	1.3
Approach LOS	A		

Intersection Summary			
Average Delay	3.8		
Intersection Capacity Utilization	18.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
5: Highway 138 & Hwy 417 EB Off-Ramp

08/21/2020

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	0	25	212	61	5
Future Volume (Veh/h)	5	0	25	212	61	5
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	5	0	27	226	65	5
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	348	68	70			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	348	68	70			
tC, single (s)	6.4	6.2	4.4			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.5			
p0 queue free %	99	100	98			
cM capacity (veh/h)	641	1002	1370			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	5	253	70
Volume Left	5	27	0
Volume Right	0	0	5
cSH	641	1370	1700
Volume to Capacity	0.01	0.02	0.04
Queue Length 95th (m)	0.2	0.5	0.0
Control Delay (s)	10.7	1.0	0.0
Lane LOS	B	A	
Approach Delay (s)	10.7	1.0	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	29.2%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
9: Highway 138 & LaFleche Road

08/21/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	11	5	15	13	10	12	213	11	14	178	14
Future Volume (Veh/h)	8	11	5	15	13	10	12	213	11	14	178	14
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	9	12	5	16	14	11	13	234	12	15	196	15
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	504	498	196	497	501	234	211			246		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	504	498	196	497	501	234	211			246		
tC, single (s)	7.9	7.5	6.8	7.6	7.5	6.6	4.6			4.7		
tC, 2 stage (s)												
tF (s)	4.2	4.9	3.8	3.9	4.9	3.7	2.7			2.7		
p0 queue free %	97	97	99	96	96	98	99			99		
cM capacity (veh/h)	347	349	717	396	348	720	1120			1057		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	26	41	247	12	211	15
Volume Left	9	16	13	0	15	0
Volume Right	5	11	0	12	0	15
cSH	386	427	1120	1700	1057	1700
Volume to Capacity	0.07	0.10	0.01	0.01	0.01	0.01
Queue Length 95th (m)	1.6	2.4	0.3	0.0	0.3	0.0
Control Delay (s)	15.0	14.3	0.5	0.0	0.7	0.0
Lane LOS	B	B	A		A	
Approach Delay (s)	15.0	14.3	0.5		0.7	
Approach LOS	B	B				

Intersection Summary				
Average Delay	2.3			
Intersection Capacity Utilization	31.0%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
11: LaFleche Road & LaFleche Driveway

08/21/2020

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	18	16	25	12	0
Future Volume (Veh/h)	0	18	16	25	12	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	0	21	19	30	14	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	49				55	34
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	49				55	34
tC, single (s)	4.1				7.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				4.4	3.3
p0 queue free %	100				98	100
cM capacity (veh/h)	1571				756	1045

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	21	49	14
Volume Left	0	0	14
Volume Right	0	30	0
cSH	1571	1700	756
Volume to Capacity	0.00	0.03	0.02
Queue Length 95th (m)	0.0	0.0	0.4
Control Delay (s)	0.0	0.0	9.9
Lane LOS			A
Approach Delay (s)	0.0	0.0	9.9
Approach LOS			A

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
3: Highway 138 & Hwy 417 WB Off-Ramp

08/21/2020

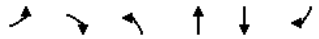
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	29	6	62	0	11	50
Future Volume (Veh/h)	29	6	62	0	11	50
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	33	7	71	0	13	57
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	154	71			71	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	154	71			71	
tC, single (s)	6.6	7.0			4.1	
tC, 2 stage (s)						
tF (s)	3.7	4.0			2.2	
p0 queue free %	96	99			99	
cM capacity (veh/h)	797	811			1542	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	40	71	70
Volume Left	33	0	13
Volume Right	7	0	0
cSH	799	1700	1542
Volume to Capacity	0.05	0.04	0.01
Queue Length 95th (m)	1.2	0.0	0.2
Control Delay (s)	9.7	0.0	1.4
Lane LOS	A		A
Approach Delay (s)	9.7	0.0	1.4
Approach LOS	A		

Intersection Summary			
Average Delay	2.7		
Intersection Capacity Utilization	19.9%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
5: Highway 138 & Hwy 417 EB Off-Ramp

08/21/2020



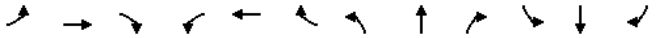
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	15	0	27	235	69	8
Future Volume (Veh/h)	15	0	27	235	69	8
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	16	0	28	245	72	8
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	377	76	80			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	377	76	80			
tC, single (s)	6.6	6.2	4.2			
tC, 2 stage (s)						
tF (s)	3.7	3.3	2.3			
p0 queue free %	97	100	98			
cM capacity (veh/h)	584	991	1445			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	16	273	80
Volume Left	16	28	0
Volume Right	0	0	8
cSH	584	1445	1700
Volume to Capacity	0.03	0.02	0.05
Queue Length 95th (m)	0.6	0.5	0.0
Control Delay (s)	11.3	0.9	0.0
Lane LOS	B	A	
Approach Delay (s)	11.3	0.9	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	30.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
9: Highway 138 & LaFleche Road

08/21/2020



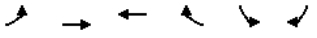
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	6	26	15	1	14	7	226	4	10	326	6
Future Volume (Veh/h)	11	6	26	15	1	14	7	226	4	10	326	6
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	11	6	27	16	1	15	7	235	4	10	340	6
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	624	613	340	639	615	235	346			239		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	624	613	340	639	615	235	346			239		
tC, single (s)	7.2	7.2	6.6	7.3	7.5	6.3	4.7			4.5		
tC, 2 stage (s)												
tF (s)	3.6	4.6	3.7	3.7	4.9	3.4	2.7			2.6		
p0 queue free %	97	98	96	95	100	98	99			99		
cM capacity (veh/h)	368	327	620	340	296	775	962			1134		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	44	32	242	4	350	6
Volume Left	11	16	7	0	10	0
Volume Right	27	15	0	4	0	6
cSH	480	458	962	1700	1134	1700
Volume to Capacity	0.09	0.07	0.01	0.00	0.01	0.00
Queue Length 95th (m)	2.3	1.7	0.2	0.0	0.2	0.0
Control Delay (s)	13.3	13.4	0.3	0.0	0.3	0.0
Lane LOS	B	B	A		A	
Approach Delay (s)	13.3	13.4	0.3		0.3	
Approach LOS	B	B				

Intersection Summary				
Average Delay	1.8			
Intersection Capacity Utilization	35.2%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
11: LaFleche Road & LaFleche Driveway

08/21/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	6	2	4	35	0
Future Volume (Veh/h)	0	6	2	4	35	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.51	0.51	0.51	0.51	0.51	0.51
Hourly flow rate (vph)	0	12	4	8	69	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	12				20	8
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	12				20	8
tC, single (s)	4.1				6.6	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.7	3.3
p0 queue free %	100				93	100
cM capacity (veh/h)	1620				946	1080

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	12	12	69
Volume Left	0	0	69
Volume Right	0	8	0
cSH	1620	1700	946
Volume to Capacity	0.00	0.01	0.07
Queue Length 95th (m)	0.0	0.0	1.8
Control Delay (s)	0.0	0.0	9.1
Lane LOS			A
Approach Delay (s)	0.0	0.0	9.1
Approach LOS			A

Intersection Summary				
Average Delay	6.8			
Intersection Capacity Utilization	13.3%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
3: Highway 138 & Hwy 417 WB Off-Ramp

08/21/2020

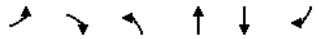
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	27	3	35	0	10	48
Future Volume (Veh/h)	27	3	35	0	10	48
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	29	3	38	0	11	52
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	112	38			38	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	112	38			38	
tC, single (s)	6.4	6.5			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.6			2.3	
p0 queue free %	97	100			99	
cM capacity (veh/h)	883	952			1504	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	32	38	63
Volume Left	29	0	11
Volume Right	3	0	0
cSH	889	1700	1504
Volume to Capacity	0.04	0.02	0.01
Queue Length 95th (m)	0.9	0.0	0.2
Control Delay (s)	9.2	0.0	1.3
Lane LOS	A		A
Approach Delay (s)	9.2	0.0	1.3
Approach LOS	A		

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	19.7%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
5: Highway 138 & Hwy 417 EB Off-Ramp

08/21/2020



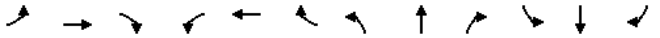
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	6	0	19	267	57	15
Future Volume (Veh/h)	6	0	19	267	57	15
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	6	0	20	284	61	16
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	393	69	77			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	393	69	77			
tC, single (s)	6.4	6.2	4.3			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.4			
p0 queue free %	99	100	99			
cM capacity (veh/h)	607	1000	1421			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	6	304	77
Volume Left	6	20	0
Volume Right	0	0	16
cSH	607	1421	1700
Volume to Capacity	0.01	0.01	0.05
Queue Length 95th (m)	0.2	0.3	0.0
Control Delay (s)	11.0	0.6	0.0
Lane LOS	B	A	
Approach Delay (s)	11.0	0.6	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	31.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
9: Highway 138 & LaFleche Road

08/21/2020



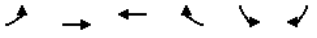
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	9	0	5	2	0	2	4	272	1	1	234	10
Future Volume (Veh/h)	9	0	5	2	0	2	4	272	1	1	234	10
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	9	0	5	2	0	2	4	283	1	1	244	10
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	539	538	244	542	547	283	254			284		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	539	538	244	542	547	283	254			284		
tC, single (s)	7.4	6.5	6.2	7.1	6.5	6.2	4.6			4.1		
tC, 2 stage (s)												
tF (s)	3.8	4.0	3.3	3.5	4.0	3.3	2.7			2.2		
p0 queue free %	98	100	99	100	100	100	100			100		
cM capacity (veh/h)	406	451	800	450	445	761	1077			1290		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	14	4	287	1	245	10
Volume Left	9	2	4	0	1	0
Volume Right	5	2	0	1	0	10
cSH	493	565	1077	1700	1290	1700
Volume to Capacity	0.03	0.01	0.00	0.00	0.00	0.01
Queue Length 95th (m)	0.7	0.2	0.1	0.0	0.0	0.0
Control Delay (s)	12.5	11.4	0.2	0.0	0.0	0.0
Lane LOS	B	B	A		A	
Approach Delay (s)	12.5	11.4	0.2		0.0	
Approach LOS	B	B				

Intersection Summary				
Average Delay	0.5			
Intersection Capacity Utilization	31.2%	ICU Level of Service		A
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
11: LaFleche Road & LaFleche Driveway

08/21/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	7	8	0
Future Volume (Veh/h)	0	0	0	7	8	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	0	0	0	9	11	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	9				4	4
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	9				4	4
tC, single (s)	4.1				6.9	6.2
tC, 2 stage (s)						
tF (s)	2.2				4.0	3.3
p0 queue free %	100				99	100
cM capacity (veh/h)	1624				906	1085

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	0	9	11
Volume Left	0	0	11
Volume Right	0	9	0
cSH	1700	1700	906
Volume to Capacity	0.00	0.01	0.01
Queue Length 95th (m)	0.0	0.0	0.3
Control Delay (s)	0.0	0.0	9.0
Lane LOS			A
Approach Delay (s)	0.0	0.0	9.0
Approach LOS			A

Intersection Summary				
Average Delay	5.0			
Intersection Capacity Utilization	13.3%	ICU Level of Service		A
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
3: Highway 138 & Hwy 417 WB Off-Ramp

08/21/2020

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	38	13	44	0	8	41
Future Volume (Veh/h)	38	13	44	0	8	41
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	42	14	49	0	9	46
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	113	49			49	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	113	49			49	
tC, single (s)	6.6	6.6			4.1	
tC, 2 stage (s)						
tF (s)	3.7	3.7			2.2	
p0 queue free %	95	98			99	
cM capacity (veh/h)	826	922			1571	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	56	49	55
Volume Left	42	0	9
Volume Right	14	0	0
cSH	848	1700	1571
Volume to Capacity	0.07	0.03	0.01
Queue Length 95th (m)	1.6	0.0	0.1
Control Delay (s)	9.5	0.0	1.2
Lane LOS	A		A
Approach Delay (s)	9.5	0.0	1.2
Approach LOS	A		

Intersection Summary			
Average Delay	3.8		
Intersection Capacity Utilization	19.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
5: Highway 138 & Hwy 417 EB Off-Ramp

08/21/2020

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	6	0	27	234	67	6
Future Volume (Veh/h)	6	0	27	234	67	6
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	6	0	29	249	71	6
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	381	74	77			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	381	74	77			
tC, single (s)	6.4	6.2	4.4			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.5			
p0 queue free %	99	100	98			
cM capacity (veh/h)	612	993	1362			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	6	278	77
Volume Left	6	29	0
Volume Right	0	0	6
cSH	612	1362	1700
Volume to Capacity	0.01	0.02	0.05
Queue Length 95th (m)	0.2	0.5	0.0
Control Delay (s)	10.9	1.0	0.0
Lane LOS	B	A	
Approach Delay (s)	10.9	1.0	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	30.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
9: Highway 138 & LaFleche Road

08/21/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	11	5	15	13	10	12	235	11	14	196	14
Future Volume (Veh/h)	8	11	5	15	13	10	12	235	11	14	196	14
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	9	12	5	16	14	11	13	258	12	15	215	15
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	547	541	215	540	544	258	230			270		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	547	541	215	540	544	258	230			270		
tC, single (s)	7.9	7.5	6.8	7.6	7.5	6.6	4.6			4.7		
tC, 2 stage (s)												
tF (s)	4.2	4.9	3.8	3.9	4.9	3.7	2.7			2.7		
p0 queue free %	97	96	99	96	96	98	99			99		
cM capacity (veh/h)	322	328	699	369	326	697	1101			1033		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	26	41	271	12	230	15
Volume Left	9	16	13	0	15	0
Volume Right	5	11	0	12	0	15
cSH	362	402	1101	1700	1033	1700
Volume to Capacity	0.07	0.10	0.01	0.01	0.01	0.01
Queue Length 95th (m)	1.8	2.6	0.3	0.0	0.3	0.0
Control Delay (s)	15.7	15.0	0.5	0.0	0.7	0.0
Lane LOS	C	B	A		A	
Approach Delay (s)	15.7	15.0	0.5		0.6	
Approach LOS	C	B				

Intersection Summary				
Average Delay	2.2			
Intersection Capacity Utilization	32.1%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
11: LaFleche Road & LaFleche Driveway

08/21/2020

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	18	16	25	12	0
Future Volume (Veh/h)	0	18	16	25	12	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	0	21	19	30	14	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	49				55	34
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	49				55	34
tC, single (s)	4.1				7.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				4.4	3.3
p0 queue free %	100				98	100
cM capacity (veh/h)	1571				756	1045

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	21	49	14
Volume Left	0	0	14
Volume Right	0	30	0
cSH	1571	1700	756
Volume to Capacity	0.00	0.03	0.02
Queue Length 95th (m)	0.0	0.0	0.4
Control Delay (s)	0.0	0.0	9.9
Lane LOS			A
Approach Delay (s)	0.0	0.0	9.9
Approach LOS			A

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
3: Highway 138 & Hwy 417 WB Off-Ramp

08/21/2020

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	32	7	68	0	12	55
Future Volume (Veh/h)	32	7	68	0	12	55
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	37	8	78	0	14	63
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	169	78			78	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	169	78			78	
tC, single (s)	6.6	7.0			4.1	
tC, 2 stage (s)						
tF (s)	3.7	4.0			2.2	
p0 queue free %	95	99			99	
cM capacity (veh/h)	781	803			1533	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	45	78	77
Volume Left	37	0	14
Volume Right	8	0	0
cSH	785	1700	1533
Volume to Capacity	0.06	0.05	0.01
Queue Length 95th (m)	1.4	0.0	0.2
Control Delay (s)	9.9	0.0	1.4
Lane LOS	A		A
Approach Delay (s)	9.9	0.0	1.4
Approach LOS	A		

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	20.2%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
5: Highway 138 & Hwy 417 EB Off-Ramp

08/21/2020

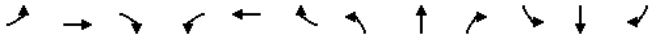
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	17	0	30	259	76	8
Future Volume (Veh/h)	17	0	30	259	76	8
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	18	0	31	270	79	8
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	415	83	87			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	415	83	87			
tC, single (s)	6.6	6.2	4.2			
tC, 2 stage (s)						
tF (s)	3.7	3.3	2.3			
p0 queue free %	97	100	98			
cM capacity (veh/h)	554	982	1437			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	18	301	87
Volume Left	18	31	0
Volume Right	0	0	8
cSH	554	1437	1700
Volume to Capacity	0.03	0.02	0.05
Queue Length 95th (m)	0.8	0.5	0.0
Control Delay (s)	11.7	1.0	0.0
Lane LOS	B	A	
Approach Delay (s)	11.7	1.0	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	32.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
9: Highway 138 & LaFleche Road

08/21/2020



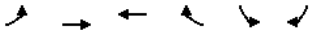
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	6	26	15	1	14	7	250	4	10	360	6
Future Volume (Veh/h)	11	6	26	15	1	14	7	250	4	10	360	6
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	11	6	27	16	1	15	7	260	4	10	375	6
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	684	673	375	699	675	260	381			264		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	684	673	375	699	675	260	381			264		
tC, single (s)	7.2	7.2	6.6	7.3	7.5	6.3	4.7			4.5		
tC, 2 stage (s)												
tF (s)	3.6	4.6	3.7	3.7	4.9	3.4	2.7			2.6		
p0 queue free %	97	98	95	95	100	98	99			99		
cM capacity (veh/h)	335	300	591	308	271	750	931			1109		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	44	32	267	4	385	6
Volume Left	11	16	7	0	10	0
Volume Right	27	15	0	4	0	6
cSH	447	423	931	1700	1109	1700
Volume to Capacity	0.10	0.08	0.01	0.00	0.01	0.00
Queue Length 95th (m)	2.5	1.9	0.2	0.0	0.2	0.0
Control Delay (s)	13.9	14.2	0.3	0.0	0.3	0.0
Lane LOS	B	B	A		A	
Approach Delay (s)	13.9	14.2	0.3		0.3	
Approach LOS	B	B				

Intersection Summary				
Average Delay	1.7			
Intersection Capacity Utilization	37.0%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
11: LaFleche Road & LaFleche Driveway

08/21/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	6	2	4	35	0
Future Volume (Veh/h)	0	6	2	4	35	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.51	0.51	0.51	0.51	0.51	0.51
Hourly flow rate (vph)	0	12	4	8	69	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	12				20	8
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	12				20	8
tC, single (s)	4.1				6.6	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.7	3.3
p0 queue free %	100				93	100
cM capacity (veh/h)	1620				946	1080

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	12	12	69
Volume Left	0	0	69
Volume Right	0	8	0
cSH	1620	1700	946
Volume to Capacity	0.00	0.01	0.07
Queue Length 95th (m)	0.0	0.0	1.8
Control Delay (s)	0.0	0.0	9.1
Lane LOS			A
Approach Delay (s)	0.0	0.0	9.1
Approach LOS			A

Intersection Summary			
Average Delay	6.8		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
3: Highway 138 & Hwy 417 WB Off-Ramp

08/21/2020

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	30	4	38	0	11	53
Future Volume (Veh/h)	30	4	38	0	11	53
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	4	41	0	12	58
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	123	41			41	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	123	41			41	
tC, single (s)	6.4	6.5			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.6			2.3	
p0 queue free %	96	100			99	
cM capacity (veh/h)	870	948			1500	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	37	41	70
Volume Left	33	0	12
Volume Right	4	0	0
cSH	878	1700	1500
Volume to Capacity	0.04	0.02	0.01
Queue Length 95th (m)	1.0	0.0	0.2
Control Delay (s)	9.3	0.0	1.3
Lane LOS	A		A
Approach Delay (s)	9.3	0.0	1.3
Approach LOS	A		

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	20.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
5: Highway 138 & Hwy 417 EB Off-Ramp

08/21/2020

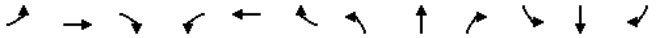
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	0	22	295	63	17
Future Volume (Veh/h)	7	0	22	295	63	17
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	7	0	23	314	67	18
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	436	76	85			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	436	76	85			
tC, single (s)	6.4	6.2	4.3			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.4			
p0 queue free %	99	100	98			
cM capacity (veh/h)	572	991	1411			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	7	337	85
Volume Left	7	23	0
Volume Right	0	0	18
cSH	572	1411	1700
Volume to Capacity	0.01	0.02	0.05
Queue Length 95th (m)	0.3	0.4	0.0
Control Delay (s)	11.4	0.7	0.0
Lane LOS	B	A	
Approach Delay (s)	11.4	0.7	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	33.4%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
9: Highway 138 & LaFleche Road

08/21/2020



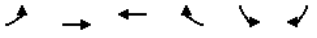
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	9	0	5	2	0	2	4	300	1	1	258	10
Future Volume (Veh/h)	9	0	5	2	0	2	4	300	1	1	258	10
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	9	0	5	2	0	2	4	313	1	1	269	10
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	594	593	269	597	602	313	279			314		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	594	593	269	597	602	313	279			314		
tC, single (s)	7.4	6.5	6.2	7.1	6.5	6.2	4.6			4.1		
tC, 2 stage (s)												
tF (s)	3.8	4.0	3.3	3.5	4.0	3.3	2.7			2.2		
p0 queue free %	98	100	99	100	100	100	100			100		
cM capacity (veh/h)	372	419	775	414	414	732	1052			1258		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	14	4	317	1	270	10
Volume Left	9	2	4	0	1	0
Volume Right	5	2	0	1	0	10
cSH	457	528	1052	1700	1258	1700
Volume to Capacity	0.03	0.01	0.00	0.00	0.00	0.01
Queue Length 95th (m)	0.7	0.2	0.1	0.0	0.0	0.0
Control Delay (s)	13.1	11.9	0.1	0.0	0.0	0.0
Lane LOS	B	B	A		A	
Approach Delay (s)	13.1	11.9	0.1		0.0	
Approach LOS	B	B				

Intersection Summary				
Average Delay	0.5			
Intersection Capacity Utilization	32.7%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
11: LaFleche Road & LaFleche Driveway

08/21/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	7	8	0
Future Volume (Veh/h)	0	0	0	7	8	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	0	0	0	9	11	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	9				4	4
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	9				4	4
tC, single (s)	4.1				6.9	6.2
tC, 2 stage (s)						
tF (s)	2.2				4.0	3.3
p0 queue free %	100				99	100
cM capacity (veh/h)	1624				906	1085

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	0	9	11
Volume Left	0	0	11
Volume Right	0	9	0
cSH	1700	1700	906
Volume to Capacity	0.00	0.01	0.01
Queue Length 95th (m)	0.0	0.0	0.3
Control Delay (s)	0.0	0.0	9.0
Lane LOS			A
Approach Delay (s)	0.0	0.0	9.0
Approach LOS			A

Intersection Summary			
Average Delay	5.0		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
3: Highway 138 & Hwy 417 WB Off-Ramp

08/21/2020

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	38	13	44	0	8	41
Future Volume (Veh/h)	38	13	44	0	8	41
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	42	14	49	0	9	46
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	113	49			49	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	113	49			49	
tC, single (s)	6.6	6.6			4.1	
tC, 2 stage (s)						
tF (s)	3.7	3.7			2.2	
p0 queue free %	95	98			99	
cM capacity (veh/h)	826	922			1571	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	56	49	55
Volume Left	42	0	9
Volume Right	14	0	0
cSH	848	1700	1571
Volume to Capacity	0.07	0.03	0.01
Queue Length 95th (m)	1.6	0.0	0.1
Control Delay (s)	9.5	0.0	1.2
Lane LOS	A		A
Approach Delay (s)	9.5	0.0	1.2
Approach LOS	A		

Intersection Summary			
Average Delay	3.8		
Intersection Capacity Utilization	19.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
5: Highway 138 & Hwy 417 EB Off-Ramp

08/21/2020

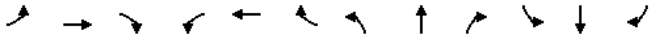
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	6	0	27	241	67	6
Future Volume (Veh/h)	6	0	27	241	67	6
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	6	0	29	256	71	6
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	388	74	77			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	388	74	77			
tC, single (s)	6.4	6.2	4.4			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.5			
p0 queue free %	99	100	98			
cM capacity (veh/h)	606	993	1362			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	6	285	77
Volume Left	6	29	0
Volume Right	0	0	6
cSH	606	1362	1700
Volume to Capacity	0.01	0.02	0.05
Queue Length 95th (m)	0.2	0.5	0.0
Control Delay (s)	11.0	1.0	0.0
Lane LOS	B	A	
Approach Delay (s)	11.0	1.0	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	30.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
9: Highway 138 & LaFleche Road

08/21/2020



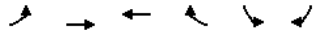
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	11	10	15	13	10	38	235	11	14	196	44
Future Volume (Veh/h)	15	11	10	15	13	10	38	235	11	14	196	44
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	16	12	11	16	14	11	42	258	12	15	215	48
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	605	599	215	604	635	258	263			270		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	605	599	215	604	635	258	263			270		
tC, single (s)	7.9	7.5	7.0	7.6	7.5	6.6	4.5			4.7		
tC, 2 stage (s)												
tF (s)	4.2	4.9	4.0	3.9	4.9	3.7	2.6			2.7		
p0 queue free %	94	96	98	95	95	98	96			99		
cM capacity (veh/h)	287	292	663	322	277	697	1110			1029		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	39	41	300	12	230	48
Volume Left	16	16	42	0	15	0
Volume Right	11	11	0	12	0	48
cSH	344	353	1110	1700	1029	1700
Volume to Capacity	0.11	0.12	0.04	0.01	0.01	0.03
Queue Length 95th (m)	2.9	3.0	0.9	0.0	0.3	0.0
Control Delay (s)	16.8	16.5	1.5	0.0	0.7	0.0
Lane LOS	C	C	A		A	
Approach Delay (s)	16.8	16.5	1.4		0.6	
Approach LOS	C	C				

Intersection Summary				
Average Delay	2.9			
Intersection Capacity Utilization	38.9%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
11: LaFleche Road & LaFleche Driveway

08/21/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	22	55	42	20	0
Future Volume (Veh/h)	0	22	55	42	20	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	0	26	65	50	24	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	115				116	90
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	115				116	90
tC, single (s)	4.1				7.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				4.4	3.3
p0 queue free %	100				97	100
cM capacity (veh/h)	1487				691	973

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	26	115	24
Volume Left	0	0	24
Volume Right	0	50	0
cSH	1487	1700	691
Volume to Capacity	0.00	0.07	0.03
Queue Length 95th (m)	0.0	0.0	0.8
Control Delay (s)	0.0	0.0	10.4
Lane LOS			B
Approach Delay (s)	0.0	0.0	10.4
Approach LOS			B

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	15.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
3: Highway 138 & Hwy 417 WB Off-Ramp

08/21/2020

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	32	7	68	0	12	55
Future Volume (Veh/h)	32	7	68	0	12	55
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	37	8	78	0	14	63
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	169	78			78	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	169	78			78	
tC, single (s)	6.6	7.0			4.1	
tC, 2 stage (s)						
tF (s)	3.7	4.0			2.2	
p0 queue free %	95	99			99	
cM capacity (veh/h)	781	803			1533	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	45	78	77
Volume Left	37	0	14
Volume Right	8	0	0
cSH	785	1700	1533
Volume to Capacity	0.06	0.05	0.01
Queue Length 95th (m)	1.4	0.0	0.2
Control Delay (s)	9.9	0.0	1.4
Lane LOS	A		A
Approach Delay (s)	9.9	0.0	1.4
Approach LOS	A		

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	20.2%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
5: Highway 138 & Hwy 417 EB Off-Ramp

08/21/2020

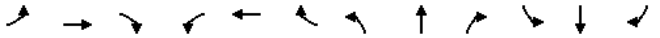
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	17	0	30	279	76	8
Future Volume (Veh/h)	17	0	30	279	76	8
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	18	0	31	291	79	8
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	436	83	87			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	436	83	87			
tC, single (s)	6.6	6.2	4.2			
tC, 2 stage (s)						
tF (s)	3.7	3.3	2.3			
p0 queue free %	97	100	98			
cM capacity (veh/h)	538	982	1437			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	18	322	87
Volume Left	18	31	0
Volume Right	0	0	8
cSH	538	1437	1700
Volume to Capacity	0.03	0.02	0.05
Queue Length 95th (m)	0.8	0.5	0.0
Control Delay (s)	11.9	0.9	0.0
Lane LOS	B	A	
Approach Delay (s)	11.9	0.9	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	33.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
9: Highway 138 & LaFleche Road

08/21/2020



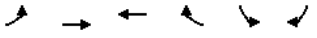
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	31	6	71	15	1	14	10	250	4	10	360	9
Future Volume (Veh/h)	31	6	71	15	1	14	10	250	4	10	360	9
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	32	6	74	16	1	15	10	260	4	10	375	9
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	690	679	375	752	684	260	384			264		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	690	679	375	752	684	260	384			264		
tC, single (s)	7.2	7.2	6.6	7.3	7.5	6.4	4.7			4.5		
tC, 2 stage (s)												
tF (s)	3.6	4.6	3.6	3.7	4.9	3.4	2.7			2.6		
p0 queue free %	91	98	88	94	100	98	99			99		
cM capacity (veh/h)	339	297	602	260	266	748	918			1109		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	112	32	270	4	385	9
Volume Left	32	16	10	0	10	0
Volume Right	74	15	0	4	0	9
cSH	472	374	918	1700	1109	1700
Volume to Capacity	0.24	0.09	0.01	0.00	0.01	0.01
Queue Length 95th (m)	7.0	2.1	0.3	0.0	0.2	0.0
Control Delay (s)	15.0	15.5	0.4	0.0	0.3	0.0
Lane LOS	B	C	A		A	
Approach Delay (s)	15.0	15.5	0.4		0.3	
Approach LOS	B	C				

Intersection Summary				
Average Delay	3.0			
Intersection Capacity Utilization	40.6%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
11: LaFleche Road & LaFleche Driveway

08/21/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	48	4	8	58	0
Future Volume (Veh/h)	0	48	4	8	58	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.51	0.51	0.51	0.51	0.51	0.51
Hourly flow rate (vph)	0	94	8	16	114	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	24				110	16
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	24				110	16
tC, single (s)	4.1				6.6	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.7	3.3
p0 queue free %	100				86	100
cM capacity (veh/h)	1604				837	1069

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	94	24	114
Volume Left	0	0	114
Volume Right	0	16	0
cSH	1604	1700	837
Volume to Capacity	0.00	0.01	0.14
Queue Length 95th (m)	0.0	0.0	3.6
Control Delay (s)	0.0	0.0	10.0
Lane LOS			A
Approach Delay (s)	0.0	0.0	10.0
Approach LOS			A

Intersection Summary			
Average Delay	4.9		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
3: Highway 138 & Hwy 417 WB Off-Ramp

08/21/2020

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	30	4	38	0	11	53
Future Volume (Veh/h)	30	4	38	0	11	53
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	4	41	0	12	58
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	123	41			41	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	123	41			41	
tC, single (s)	6.4	6.5			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.6			2.3	
p0 queue free %	96	100			99	
cM capacity (veh/h)	870	948			1500	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	37	41	70
Volume Left	33	0	12
Volume Right	4	0	0
cSH	878	1700	1500
Volume to Capacity	0.04	0.02	0.01
Queue Length 95th (m)	1.0	0.0	0.2
Control Delay (s)	9.3	0.0	1.3
Lane LOS	A		A
Approach Delay (s)	9.3	0.0	1.3
Approach LOS	A		

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	20.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
5: Highway 138 & Hwy 417 EB Off-Ramp

08/21/2020

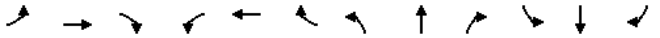
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	0	22	354	63	17
Future Volume (Veh/h)	7	0	22	354	63	17
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	7	0	23	377	67	18
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	499	76	85			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	499	76	85			
tC, single (s)	6.4	6.2	4.3			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.4			
p0 queue free %	99	100	98			
cM capacity (veh/h)	526	991	1411			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	7	400	85
Volume Left	7	23	0
Volume Right	0	0	18
cSH	526	1411	1700
Volume to Capacity	0.01	0.02	0.05
Queue Length 95th (m)	0.3	0.4	0.0
Control Delay (s)	11.9	0.6	0.0
Lane LOS	B	A	
Approach Delay (s)	11.9	0.6	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	36.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
9: Highway 138 & LaFleche Road

08/21/2020



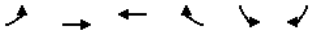
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	68	0	18	2	0	2	25	300	1	1	258	52
Future Volume (Veh/h)	68	0	18	2	0	2	25	300	1	1	258	52
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	71	0	19	2	0	2	26	313	1	1	269	54
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	638	637	269	655	690	313	323			314		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	638	637	269	655	690	313	323			314		
tC, single (s)	7.8	6.5	6.2	7.1	6.5	6.2	4.8			4.1		
tC, 2 stage (s)												
tF (s)	4.1	4.0	3.3	3.5	4.0	3.3	2.8			2.2		
p0 queue free %	77	100	98	99	100	100	97			100		
cM capacity (veh/h)	304	386	775	365	360	732	930			1258		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	90	4	339	1	270	54
Volume Left	71	2	26	0	1	0
Volume Right	19	2	0	1	0	54
cSH	349	487	930	1700	1258	1700
Volume to Capacity	0.26	0.01	0.03	0.00	0.00	0.03
Queue Length 95th (m)	7.7	0.2	0.7	0.0	0.0	0.0
Control Delay (s)	18.9	12.5	1.0	0.0	0.0	0.0
Lane LOS	C	B	A		A	
Approach Delay (s)	18.9	12.5	1.0		0.0	
Approach LOS	C	B				

Intersection Summary				
Average Delay	2.8			
Intersection Capacity Utilization	48.3%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
11: LaFleche Road & LaFleche Driveway

08/21/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	12	10	60	68	0
Future Volume (Veh/h)	0	12	10	60	68	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	0	16	13	80	91	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	93				69	53
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	93				69	53
tC, single (s)	4.1				6.9	6.2
tC, 2 stage (s)						
tF (s)	2.2				4.0	3.3
p0 queue free %	100				89	100
cM capacity (veh/h)	1514				829	1020

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	16	93	91
Volume Left	0	0	91
Volume Right	0	80	0
cSH	1514	1700	829
Volume to Capacity	0.00	0.05	0.11
Queue Length 95th (m)	0.0	0.0	2.8
Control Delay (s)	0.0	0.0	9.9
Lane LOS			A
Approach Delay (s)	0.0	0.0	9.9
Approach LOS			A

Intersection Summary			
Average Delay	4.5		
Intersection Capacity Utilization	14.7%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
3: Highway 138 & Hwy 417 WB Off-Ramp

08/21/2020

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	47	16	54	0	10	50
Future Volume (Veh/h)	47	16	54	0	10	50
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	52	18	60	0	11	56
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	138	60			60	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	138	60			60	
tC, single (s)	6.6	6.6			4.1	
tC, 2 stage (s)						
tF (s)	3.7	3.7			2.2	
p0 queue free %	93	98			99	
cM capacity (veh/h)	798	908			1556	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	70	60	67
Volume Left	52	0	11
Volume Right	18	0	0
cSH	824	1700	1556
Volume to Capacity	0.08	0.04	0.01
Queue Length 95th (m)	2.1	0.0	0.2
Control Delay (s)	9.8	0.0	1.2
Lane LOS	A		A
Approach Delay (s)	9.8	0.0	1.2
Approach LOS	A		

Intersection Summary			
Average Delay	3.9		
Intersection Capacity Utilization	20.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
5: Highway 138 & Hwy 417 EB Off-Ramp

08/21/2020

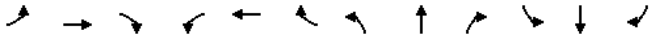
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	0	34	286	82	7
Future Volume (Veh/h)	7	0	34	286	82	7
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	7	0	36	304	87	7
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	466	90	94			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	466	90	94			
tC, single (s)	6.4	6.2	4.4			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.5			
p0 queue free %	99	100	97			
cM capacity (veh/h)	543	973	1342			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	7	340	94
Volume Left	7	36	0
Volume Right	0	0	7
cSH	543	1342	1700
Volume to Capacity	0.01	0.03	0.06
Queue Length 95th (m)	0.3	0.6	0.0
Control Delay (s)	11.7	1.0	0.0
Lane LOS	B	A	
Approach Delay (s)	11.7	1.0	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	33.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
9: Highway 138 & LaFleche Road

08/21/2020



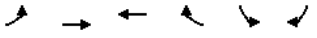
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	11	5	15	13	10	12	287	11	14	239	14
Future Volume (Veh/h)	8	11	5	15	13	10	12	287	11	14	239	14
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	9	12	5	16	14	11	13	315	12	15	263	15
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	652	646	263	645	649	315	278			327		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	652	646	263	645	649	315	278			327		
tC, single (s)	7.9	7.5	6.8	7.6	7.5	6.6	4.6			4.7		
tC, 2 stage (s)												
tF (s)	4.2	4.9	3.8	3.9	4.9	3.7	2.7			2.7		
p0 queue free %	97	96	99	95	95	98	99			98		
cM capacity (veh/h)	267	280	654	309	278	645	1053			980		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	26	41	328	12	278	15
Volume Left	9	16	13	0	15	0
Volume Right	5	11	0	12	0	15
cSH	309	344	1053	1700	980	1700
Volume to Capacity	0.08	0.12	0.01	0.01	0.02	0.01
Queue Length 95th (m)	2.1	3.0	0.3	0.0	0.4	0.0
Control Delay (s)	17.7	16.9	0.5	0.0	0.6	0.0
Lane LOS	C	C	A		A	
Approach Delay (s)	17.7	16.9	0.4		0.6	
Approach LOS	C	C				

Intersection Summary				
Average Delay	2.1			
Intersection Capacity Utilization	34.8%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
11: LaFleche Road & LaFleche Driveway

08/21/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	18	16	25	12	0
Future Volume (Veh/h)	0	18	16	25	12	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	0	21	19	30	14	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	49				55	34
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	49				55	34
tC, single (s)	4.1				7.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				4.4	3.3
p0 queue free %	100				98	100
cM capacity (veh/h)	1571				756	1045

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	21	49	14
Volume Left	0	0	14
Volume Right	0	30	0
cSH	1571	1700	756
Volume to Capacity	0.00	0.03	0.02
Queue Length 95th (m)	0.0	0.0	0.4
Control Delay (s)	0.0	0.0	9.9
Lane LOS			A
Approach Delay (s)	0.0	0.0	9.9
Approach LOS			A

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
3: Highway 138 & Hwy 417 WB Off-Ramp

08/21/2020

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	39	9	83	0	15	67
Future Volume (Veh/h)	39	9	83	0	15	67
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	45	10	95	0	17	77
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	206	95			95	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	206	95			95	
tC, single (s)	6.6	7.0			4.1	
tC, 2 stage (s)						
tF (s)	3.7	4.0			2.2	
p0 queue free %	94	99			99	
cM capacity (veh/h)	741	785			1512	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	55	95	94
Volume Left	45	0	17
Volume Right	10	0	0
cSH	749	1700	1512
Volume to Capacity	0.07	0.06	0.01
Queue Length 95th (m)	1.8	0.0	0.3
Control Delay (s)	10.2	0.0	1.4
Lane LOS	B		A
Approach Delay (s)	10.2	0.0	1.4
Approach LOS	B		

Intersection Summary				
Average Delay		2.8		
Intersection Capacity Utilization		21.0%	ICU Level of Service	A
Analysis Period (min)		15		

HCM Unsignalized Intersection Capacity Analysis
5: Highway 138 & Hwy 417 EB Off-Ramp

08/21/2020

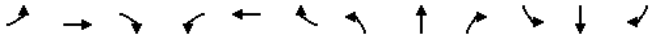
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	20	0	36	316	93	10
Future Volume (Veh/h)	20	0	36	316	93	10
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	21	0	38	329	97	10
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	507	102	107			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	507	102	107			
tC, single (s)	6.6	6.2	4.2			
tC, 2 stage (s)						
tF (s)	3.7	3.3	2.3			
p0 queue free %	96	100	97			
cM capacity (veh/h)	486	959	1412			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	21	367	107
Volume Left	21	38	0
Volume Right	0	0	10
cSH	486	1412	1700
Volume to Capacity	0.04	0.03	0.06
Queue Length 95th (m)	1.0	0.6	0.0
Control Delay (s)	12.7	1.0	0.0
Lane LOS	B	A	
Approach Delay (s)	12.7	1.0	0.0
Approach LOS	B		

Intersection Summary				
Average Delay		1.3		
Intersection Capacity Utilization		35.3%	ICU Level of Service	A
Analysis Period (min)		15		

HCM Unsignalized Intersection Capacity Analysis
9: Highway 138 & LaFleche Road

08/21/2020



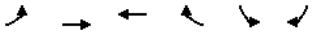
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	6	26	15	1	14	7	304	4	10	439	6
Future Volume (Veh/h)	11	6	26	15	1	14	7	304	4	10	439	6
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	11	6	27	16	1	15	7	317	4	10	457	6
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	824	812	457	838	814	317	463			321		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	824	812	457	838	814	317	463			321		
tC, single (s)	7.2	7.2	6.6	7.3	7.5	6.3	4.7			4.5		
tC, 2 stage (s)												
tF (s)	3.6	4.6	3.7	3.7	4.9	3.4	2.7			2.6		
p0 queue free %	96	98	95	93	100	98	99			99		
cM capacity (veh/h)	268	245	529	245	219	697	862			1053		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	44	32	324	4	467	6
Volume Left	11	16	7	0	10	0
Volume Right	27	15	0	4	0	6
cSH	377	350	862	1700	1053	1700
Volume to Capacity	0.12	0.09	0.01	0.00	0.01	0.00
Queue Length 95th (m)	3.0	2.3	0.2	0.0	0.2	0.0
Control Delay (s)	15.8	16.3	0.3	0.0	0.3	0.0
Lane LOS	C	C	A		A	
Approach Delay (s)	15.8	16.3	0.3		0.3	
Approach LOS	C	C				

Intersection Summary				
Average Delay	1.6			
Intersection Capacity Utilization	41.1%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
11: LaFleche Road & LaFleche Driveway

08/21/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	6	2	4	35	0
Future Volume (Veh/h)	0	6	2	4	35	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.51	0.51	0.51	0.51	0.51	0.51
Hourly flow rate (vph)	0	12	4	8	69	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	12				20	8
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	12				20	8
tC, single (s)	4.1				6.6	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.7	3.3
p0 queue free %	100				93	100
cM capacity (veh/h)	1620				946	1080

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	12	12	69
Volume Left	0	0	69
Volume Right	0	8	0
cSH	1620	1700	946
Volume to Capacity	0.00	0.01	0.07
Queue Length 95th (m)	0.0	0.0	1.8
Control Delay (s)	0.0	0.0	9.1
Lane LOS			A
Approach Delay (s)	0.0	0.0	9.1
Approach LOS			A

Intersection Summary			
Average Delay	6.8		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
3: Highway 138 & Hwy 417 WB Off-Ramp

08/21/2020

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	36	4	47	0	13	64
Future Volume (Veh/h)	36	4	47	0	13	64
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	39	4	51	0	14	70
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	149	51			51	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	149	51			51	
tC, single (s)	6.4	6.5			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.6			2.3	
p0 queue free %	95	100			99	
cM capacity (veh/h)	840	936			1488	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	43	51	84
Volume Left	39	0	14
Volume Right	4	0	0
cSH	848	1700	1488
Volume to Capacity	0.05	0.03	0.01
Queue Length 95th (m)	1.2	0.0	0.2
Control Delay (s)	9.5	0.0	1.3
Lane LOS	A		A
Approach Delay (s)	9.5	0.0	1.3
Approach LOS	A		

Intersection Summary				
Average Delay	2.9			
Intersection Capacity Utilization	20.8%	ICU Level of Service		A
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
5: Highway 138 & Hwy 417 EB Off-Ramp

08/21/2020

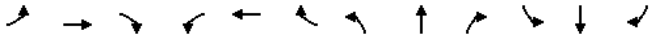
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	9	0	26	360	77	20
Future Volume (Veh/h)	9	0	26	360	77	20
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	10	0	28	383	82	21
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	532	92	103			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	532	92	103			
tC, single (s)	6.4	6.2	4.3			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.4			
p0 queue free %	98	100	98			
cM capacity (veh/h)	502	970	1389			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	10	411	103
Volume Left	10	28	0
Volume Right	0	0	21
cSH	502	1389	1700
Volume to Capacity	0.02	0.02	0.06
Queue Length 95th (m)	0.5	0.5	0.0
Control Delay (s)	12.3	0.7	0.0
Lane LOS	B	A	
Approach Delay (s)	12.3	0.7	0.0
Approach LOS	B		

Intersection Summary				
Average Delay	0.8			
Intersection Capacity Utilization	37.1%	ICU Level of Service		A
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
9: Highway 138 & LaFleche Road

08/21/2020



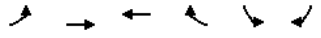
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	9	0	5	2	0	2	4	366	1	1	315	10
Future Volume (Veh/h)	9	0	5	2	0	2	4	366	1	1	315	10
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	9	0	5	2	0	2	4	381	1	1	328	10
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	721	720	328	724	729	381	338			382		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	721	720	328	724	729	381	338			382		
tC, single (s)	7.4	6.5	6.2	7.1	6.5	6.2	4.6			4.1		
tC, 2 stage (s)												
tF (s)	3.8	4.0	3.3	3.5	4.0	3.3	2.7			2.2		
p0 queue free %	97	100	99	99	100	100	100			100		
cM capacity (veh/h)	304	355	718	340	350	671	996			1188		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	14	4	385	1	329	10
Volume Left	9	2	4	0	1	0
Volume Right	5	2	0	1	0	10
cSH	383	451	996	1700	1188	1700
Volume to Capacity	0.04	0.01	0.00	0.00	0.00	0.01
Queue Length 95th (m)	0.9	0.2	0.1	0.0	0.0	0.0
Control Delay (s)	14.8	13.1	0.1	0.0	0.0	0.0
Lane LOS	B	B	A		A	
Approach Delay (s)	14.8	13.1	0.1		0.0	
Approach LOS	B	B				

Intersection Summary					
Average Delay	0.4				
Intersection Capacity Utilization	36.2%	ICU Level of Service		A	
Analysis Period (min)	15				

HCM Unsignalized Intersection Capacity Analysis
11: LaFleche Road & LaFleche Driveway

08/21/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	7	8	0
Future Volume (Veh/h)	0	0	0	7	8	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	0	0	0	9	11	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	9				4	4
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	9				4	4
tC, single (s)	4.1				6.9	6.2
tC, 2 stage (s)						
tF (s)	2.2				4.0	3.3
p0 queue free %	100				99	100
cM capacity (veh/h)	1624				906	1085

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	0	9	11
Volume Left	0	0	11
Volume Right	0	9	0
cSH	1700	1700	906
Volume to Capacity	0.00	0.01	0.01
Queue Length 95th (m)	0.0	0.0	0.3
Control Delay (s)	0.0	0.0	9.0
Lane LOS			A
Approach Delay (s)	0.0	0.0	9.0
Approach LOS			A

Intersection Summary				
Average Delay	5.0			
Intersection Capacity Utilization	13.3%	ICU Level of Service		A
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
3: Highway 138 & Hwy 417 WB Off-Ramp

08/21/2020

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	47	16	54	0	10	50
Future Volume (Veh/h)	47	16	54	0	10	50
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	52	18	60	0	11	56
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	138	60			60	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	138	60			60	
tC, single (s)	6.6	6.6			4.1	
tC, 2 stage (s)						
tF (s)	3.7	3.7			2.2	
p0 queue free %	93	98			99	
cM capacity (veh/h)	798	908			1556	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	70	60	67
Volume Left	52	0	11
Volume Right	18	0	0
cSH	824	1700	1556
Volume to Capacity	0.08	0.04	0.01
Queue Length 95th (m)	2.1	0.0	0.2
Control Delay (s)	9.8	0.0	1.2
Lane LOS	A		A
Approach Delay (s)	9.8	0.0	1.2
Approach LOS	A		

Intersection Summary			
Average Delay	3.9		
Intersection Capacity Utilization	20.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
5: Highway 138 & Hwy 417 EB Off-Ramp

08/21/2020

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	0	34	293	82	7
Future Volume (Veh/h)	7	0	34	293	82	7
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	7	0	36	312	87	7
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	474	90	94			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	474	90	94			
tC, single (s)	6.4	6.2	4.4			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.5			
p0 queue free %	99	100	97			
cM capacity (veh/h)	538	973	1342			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	7	348	94
Volume Left	7	36	0
Volume Right	0	0	7
cSH	538	1342	1700
Volume to Capacity	0.01	0.03	0.06
Queue Length 95th (m)	0.3	0.6	0.0
Control Delay (s)	11.8	1.0	0.0
Lane LOS	B	A	
Approach Delay (s)	11.8	1.0	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	34.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
9: Highway 138 & LaFleche Road

08/21/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	11	10	15	13	10	38	287	11	14	239	44
Future Volume (Veh/h)	15	11	10	15	13	10	38	287	11	14	239	44
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	16	12	11	16	14	11	42	315	12	15	263	48
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	710	704	263	709	740	315	311			327		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	710	704	263	709	740	315	311			327		
tC, single (s)	7.9	7.5	7.0	7.6	7.5	6.6	4.5			4.7		
tC, 2 stage (s)												
tF (s)	4.2	4.9	4.0	3.9	4.9	3.7	2.6			2.7		
p0 queue free %	93	95	98	94	94	98	96			98		
cM capacity (veh/h)	238	249	620	269	236	645	1063			976		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	39	41	357	12	278	48
Volume Left	16	16	42	0	15	0
Volume Right	11	11	0	12	0	48
cSH	293	302	1063	1700	976	1700
Volume to Capacity	0.13	0.14	0.04	0.01	0.02	0.03
Queue Length 95th (m)	3.5	3.5	0.9	0.0	0.4	0.0
Control Delay (s)	19.2	18.8	1.4	0.0	0.6	0.0
Lane LOS	C	C	A		A	
Approach Delay (s)	19.2	18.8	1.3		0.5	
Approach LOS	C	C				

Intersection Summary				
Average Delay	2.8			
Intersection Capacity Utilization	43.9%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
11: LaFleche Road & LaFleche Driveway

08/21/2020

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	22	55	42	20	0
Future Volume (Veh/h)	0	22	55	42	20	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	0	26	65	50	24	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	115				116	90
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	115				116	90
tC, single (s)	4.1				7.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				4.4	3.3
p0 queue free %	100				97	100
cM capacity (veh/h)	1487				691	973

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	26	115	24
Volume Left	0	0	24
Volume Right	0	50	0
cSH	1487	1700	691
Volume to Capacity	0.00	0.07	0.03
Queue Length 95th (m)	0.0	0.0	0.8
Control Delay (s)	0.0	0.0	10.4
Lane LOS			B
Approach Delay (s)	0.0	0.0	10.4
Approach LOS			B

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	15.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
3: Highway 138 & Hwy 417 WB Off-Ramp

08/21/2020

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	39	9	83	0	15	67
Future Volume (Veh/h)	39	9	83	0	15	67
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	45	10	95	0	17	77
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	206	95			95	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	206	95			95	
tC, single (s)	6.6	7.0			4.1	
tC, 2 stage (s)						
tF (s)	3.7	4.0			2.2	
p0 queue free %	94	99			99	
cM capacity (veh/h)	741	785			1512	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	55	95	94
Volume Left	45	0	17
Volume Right	10	0	0
cSH	749	1700	1512
Volume to Capacity	0.07	0.06	0.01
Queue Length 95th (m)	1.8	0.0	0.3
Control Delay (s)	10.2	0.0	1.4
Lane LOS	B		A
Approach Delay (s)	10.2	0.0	1.4
Approach LOS	B		

Intersection Summary				
Average Delay		2.8		
Intersection Capacity Utilization		21.0%	ICU Level of Service	A
Analysis Period (min)		15		

HCM Unsignalized Intersection Capacity Analysis
5: Highway 138 & Hwy 417 EB Off-Ramp

08/21/2020

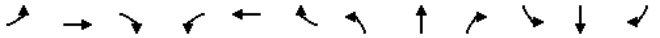
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	20	0	36	336	93	10
Future Volume (Veh/h)	20	0	36	336	93	10
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	21	0	38	350	97	10
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	528	102	107			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	528	102	107			
tC, single (s)	6.6	6.2	4.2			
tC, 2 stage (s)						
tF (s)	3.7	3.3	2.3			
p0 queue free %	96	100	97			
cM capacity (veh/h)	473	959	1412			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	21	388	107
Volume Left	21	38	0
Volume Right	0	0	10
cSH	473	1412	1700
Volume to Capacity	0.04	0.03	0.06
Queue Length 95th (m)	1.1	0.6	0.0
Control Delay (s)	13.0	1.0	0.0
Lane LOS	B	A	
Approach Delay (s)	13.0	1.0	0.0
Approach LOS	B		

Intersection Summary				
Average Delay		1.3		
Intersection Capacity Utilization		36.3%	ICU Level of Service	A
Analysis Period (min)		15		

HCM Unsignalized Intersection Capacity Analysis
9: Highway 138 & LaFleche Road

08/21/2020



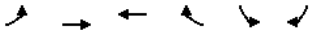
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	31	6	71	15	1	14	10	304	4	10	439	9
Future Volume (Veh/h)	31	6	71	15	1	14	10	304	4	10	439	9
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	32	6	74	16	1	15	10	317	4	10	457	9
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	830	818	457	891	823	317	466			321		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	830	818	457	891	823	317	466			321		
tC, single (s)	7.2	7.2	6.6	7.3	7.5	6.4	4.7			4.5		
tC, 2 stage (s)												
tF (s)	3.6	4.6	3.6	3.7	4.9	3.4	2.7			2.6		
p0 queue free %	88	98	86	92	100	98	99			99		
cM capacity (veh/h)	272	242	539	204	215	694	849			1053		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	112	32	327	4	467	9
Volume Left	32	16	10	0	10	0
Volume Right	74	15	0	4	0	9
cSH	401	305	849	1700	1053	1700
Volume to Capacity	0.28	0.10	0.01	0.00	0.01	0.01
Queue Length 95th (m)	8.6	2.6	0.3	0.0	0.2	0.0
Control Delay (s)	17.4	18.2	0.4	0.0	0.3	0.0
Lane LOS	C	C	A		A	
Approach Delay (s)	17.4	18.2	0.4		0.3	
Approach LOS	C	C				

Intersection Summary				
Average Delay	2.9			
Intersection Capacity Utilization	44.7%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
11: LaFleche Road & LaFleche Driveway

08/21/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	48	4	8	58	0
Future Volume (Veh/h)	0	48	4	8	58	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.51	0.51	0.51	0.51	0.51	0.51
Hourly flow rate (vph)	0	94	8	16	114	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	24				110	16
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	24				110	16
tC, single (s)	4.1				6.6	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.7	3.3
p0 queue free %	100				86	100
cM capacity (veh/h)	1604				837	1069

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	94	24	114
Volume Left	0	0	114
Volume Right	0	16	0
cSH	1604	1700	837
Volume to Capacity	0.00	0.01	0.14
Queue Length 95th (m)	0.0	0.0	3.6
Control Delay (s)	0.0	0.0	10.0
Lane LOS			A
Approach Delay (s)	0.0	0.0	10.0
Approach LOS			A

Intersection Summary				
Average Delay	4.9			
Intersection Capacity Utilization	13.3%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
3: Highway 138 & Hwy 417 WB Off-Ramp

08/21/2020

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	36	4	47	0	13	64
Future Volume (Veh/h)	36	4	47	0	13	64
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	39	4	51	0	14	70
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	149	51			51	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	149	51			51	
tC, single (s)	6.4	6.5			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.6			2.3	
p0 queue free %	95	100			99	
cM capacity (veh/h)	840	936			1488	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	43	51	84
Volume Left	39	0	14
Volume Right	4	0	0
cSH	848	1700	1488
Volume to Capacity	0.05	0.03	0.01
Queue Length 95th (m)	1.2	0.0	0.2
Control Delay (s)	9.5	0.0	1.3
Lane LOS	A		A
Approach Delay (s)	9.5	0.0	1.3
Approach LOS	A		

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	20.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
5: Highway 138 & Hwy 417 EB Off-Ramp

08/21/2020

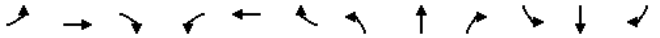
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	9	0	26	419	77	20
Future Volume (Veh/h)	9	0	26	419	77	20
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	10	0	28	446	82	21
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	594	92	103			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	594	92	103			
tC, single (s)	6.4	6.2	4.3			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.4			
p0 queue free %	98	100	98			
cM capacity (veh/h)	461	970	1389			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	10	474	103
Volume Left	10	28	0
Volume Right	0	0	21
cSH	461	1389	1700
Volume to Capacity	0.02	0.02	0.06
Queue Length 95th (m)	0.5	0.5	0.0
Control Delay (s)	13.0	0.6	0.0
Lane LOS	B	A	
Approach Delay (s)	13.0	0.6	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	40.2%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
9: Highway 138 & LaFleche Road

08/21/2020



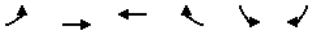
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	68	0	18	2	0	2	25	366	1	1	315	52
Future Volume (Veh/h)	68	0	18	2	0	2	25	366	1	1	315	52
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	71	0	19	2	0	2	26	381	1	1	328	54
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	765	764	328	782	817	381	382			382		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	765	764	328	782	817	381	382			382		
tC, single (s)	7.8	6.5	6.2	7.1	6.5	6.2	4.8			4.1		
tC, 2 stage (s)												
tF (s)	4.1	4.0	3.3	3.5	4.0	3.3	2.8			2.2		
p0 queue free %	71	100	97	99	100	100	97			100		
cM capacity (veh/h)	246	326	718	299	304	671	878			1188		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	90	4	407	1	329	54
Volume Left	71	2	26	0	1	0
Volume Right	19	2	0	1	0	54
cSH	285	413	878	1700	1188	1700
Volume to Capacity	0.32	0.01	0.03	0.00	0.00	0.03
Queue Length 95th (m)	10.0	0.2	0.7	0.0	0.0	0.0
Control Delay (s)	23.3	13.8	0.9	0.0	0.0	0.0
Lane LOS	C	B	A		A	
Approach Delay (s)	23.3	13.8	0.9		0.0	
Approach LOS	C	B				

Intersection Summary				
Average Delay	2.9			
Intersection Capacity Utilization	54.0%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
11: LaFleche Road & LaFleche Driveway

08/21/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	12	10	60	68	0
Future Volume (Veh/h)	0	12	10	60	68	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	0	16	13	80	91	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	93				69	53
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	93				69	53
tC, single (s)	4.1				6.9	6.2
tC, 2 stage (s)						
tF (s)	2.2				4.0	3.3
p0 queue free %	100				89	100
cM capacity (veh/h)	1514				829	1020

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	16	93	91
Volume Left	0	0	91
Volume Right	0	80	0
cSH	1514	1700	829
Volume to Capacity	0.00	0.05	0.11
Queue Length 95th (m)	0.0	0.0	2.8
Control Delay (s)	0.0	0.0	9.9
Lane LOS			A
Approach Delay (s)	0.0	0.0	9.9
Approach LOS			A

Intersection Summary			
Average Delay	4.5		
Intersection Capacity Utilization	14.7%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix C

Weigh Scale Data Processing

Summary Material Activity Report

April 16, 2020 to April 16, 2020

All Ticket Types

* -

Selected Reporting Groups

History and Waiting

All Facilities

H3-COMPOST IN

Material	Weight Inbound	Weight Outbound	Volume Inbound	Volume Outbound	Count Inbound	Count Outbound	Billing Qty	Material Total	Load Count
TRANSPORTATION	183.10	0.00 MT	0.00	0.00 YD			0.00	0.00	8
COMPOST - FOOD WASTE - COMMERCIAL	460.73	0.00 MT	0.00	0.00 YD			0.00	0.00	13
WOOD CHIPS	24.18	0.00 MT	0.00	0.00 YD			0.00	0.00	1
YARDWASTE	399.94	0.00 MT	0.00	0.00 YD			0.00	0.00	17
	1,067.95	0.00 MT	0.00	0.00 YD	0.00	0.00		1,067.95	**31**

GVANLOENEN 04/23/2020 9:55 AM

GFL10 - Moose Creek Trsf (WIT)

Note that Transportation is a second count of a load, done for billing purposes. For total count on the day, transportation should be subtracted. In this case, a total of 31 trucks came to site on April 16, 2020, with compost waste material.

Summary Material Activity Report

April 18, 2020 to April 18, 2020

All Ticket Types

* -

Selected Reporting Groups

History and Waiting

All Facilities

H3-COMPOST IN

Material	Weight Inbound	Weight Outbound	Volume Inbound	Volume Outbound	Count Inbound	Count Outbound	Billing Qty	Material Total	Load Count
TRANSPORTATION	88.41	0.00 MT	0.00	0.00 YD			0.00	0.00	4
COMPOST - FOOD WASTE - COMMERCIAL	312.97	0.00 MT	0.00	0.00 YD			0.00	0.00	9
YARDWASTE	161.26	0.00 MT	0.00	0.00 YD			0.00	0.00	7
	562.64	0.00 MT	0.00	0.00 YD	0.00	0.00	0.00	562.64	**16**

GVANLOENEN 04/23/2020 10:44 AM

GFL10 - Moose Creek Trsf (WIT)

Note that Transportation is a second count of a load, done for billing purposes.

Summary Material Activity Report

April 16, 2020 to April 16, 2020

All Ticket Types

* -

Selected Reporting Groups

History and Waiting

All Facilities

H3-WASTE IN

Material	Weight Inbound	Weight Outbound		Volume Inbound	Volume Outbound		Count Inbound	Count Outbound	Billing Qty	Material Total	Load Count
CONST. & DEMO.	94.24	0.00	MT	0.00	0.00	YD			0.00	94.24	3
ASBESTOS	44.00	0.00	MT	0.00	0.00	YD			0.00	44.00	3
ICI	917.61	0.00	MT	0.00	0.00	YD			0.00	917.61	45
MSW	531.94	0.00	MT	0.00	0.00	YD			0.00	531.94	26
COVER MATERIAL	105.31	0.00	MT	0.00	0.00	YD			0.00	105.31	4
SPECIAL WASTE	10.24	0.00	MT	0.00	0.00	YD			0.00	10.24	1
SRM - SPECIFIC RISK MATERIAL	14.02	0.00	MT	0.00	0.00	YD			0.00	14.02	1
	1,717.36	0.00	MT	0.00	0.00	YD	0.00	0.00		1,717.36	**83**

GVANLOENEN 04/23/2020 10:52 AM

GFL10 - Moose Creek Trsf (WIT)

Summary Material Activity Report

April 18, 2020 to April 18, 2020

All Ticket Types

* -

Selected Reporting Groups

History and Waiting

All Facilities

H3-WASTE IN

Material	Weight Inbound	Weight Outbound		Volume Inbound	Volume Outbound		Count Inbound	Count Outbound	Billing Qty	Material Total	Load Count
ICI	45.11	0.00	MT	0.00	0.00	YD			0.00	45.11	2
MSW	61.24	0.00	MT	0.00	0.00	YD			0.00	61.24	3
	106.35	0.00	MT	0.00	0.00	YD	0.00	0.00		106.35	**5**

GVANLOENEN 04/23/2020 10:51 AM

GFL10 - Moose Creek Trsf (WIT)

Appendix D

Site Trip Assignment

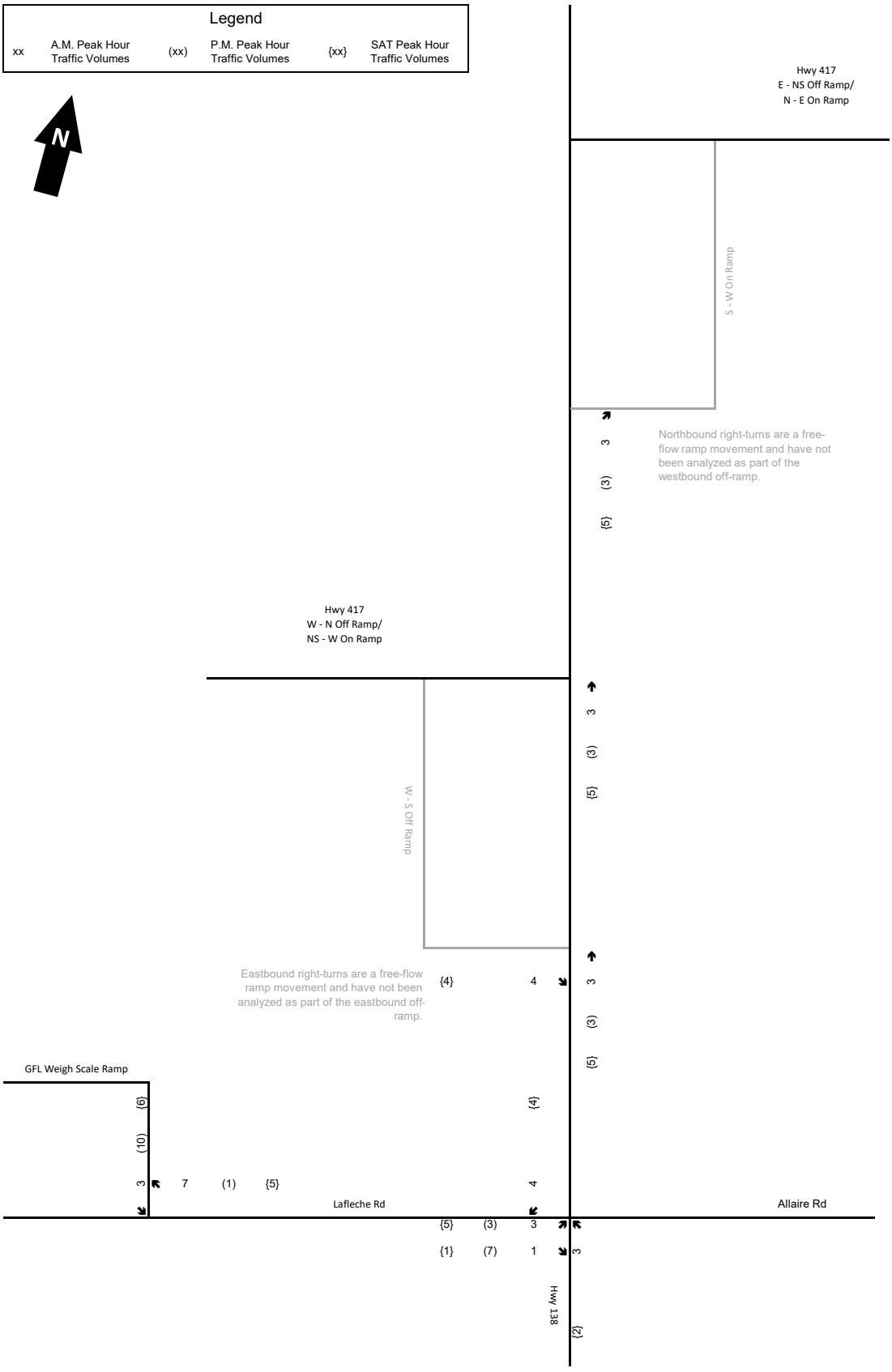


Figure Existing Compost

Existing trips associated with compost waste

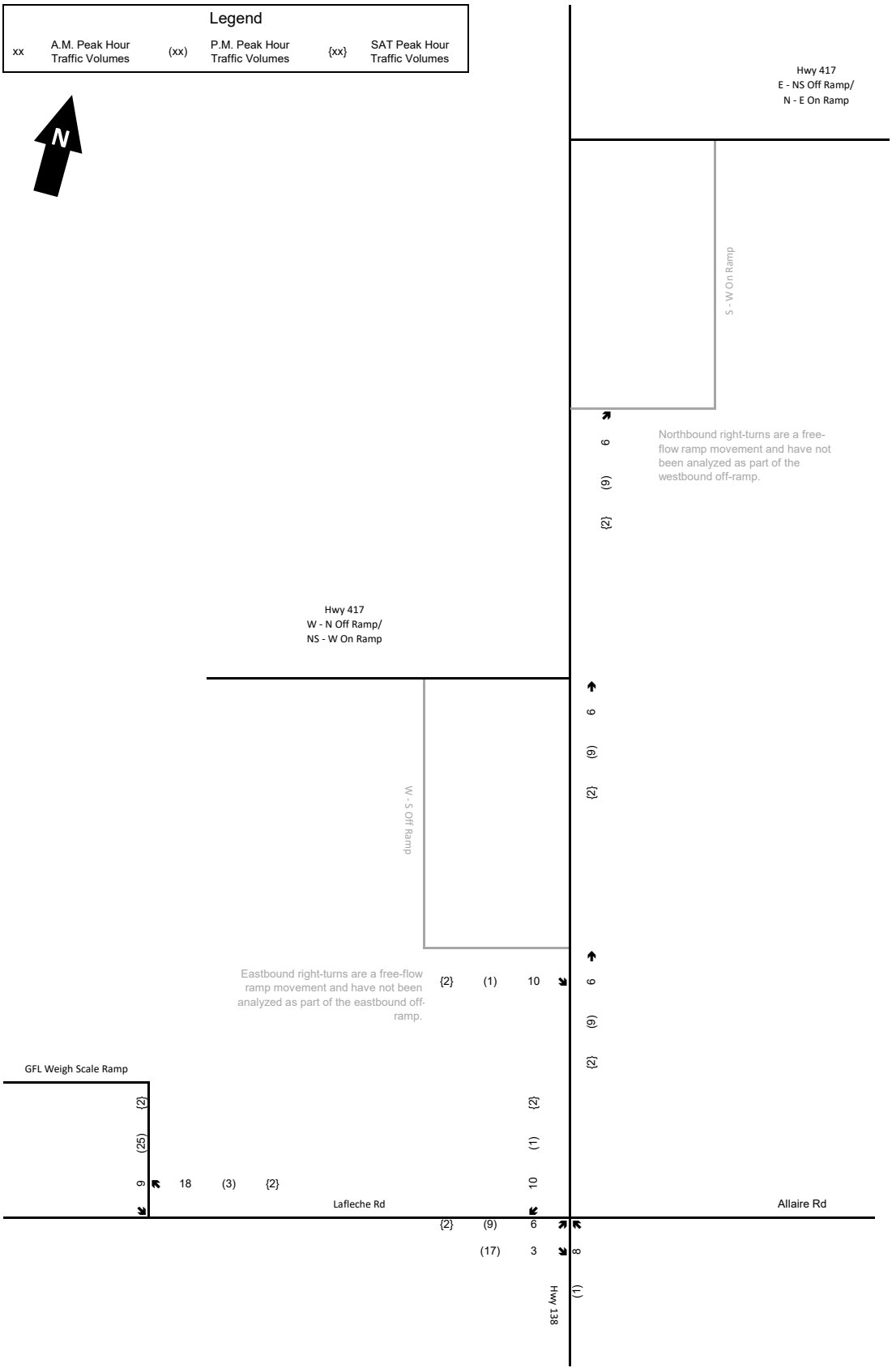


Figure Existing Landfill

Existing trips associated with landfill waste

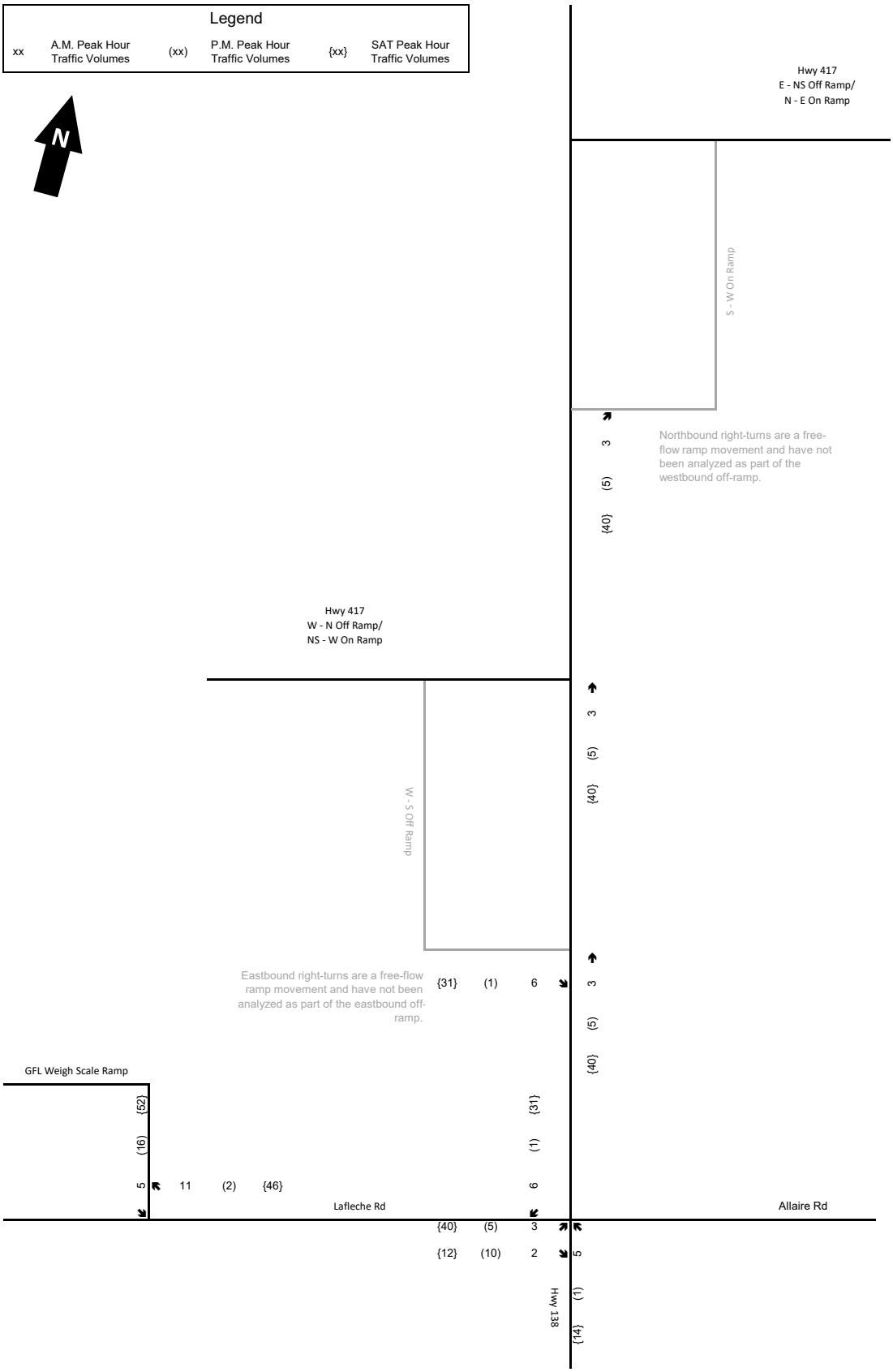


Figure Future Compost

Future Site Trips associated with 900 tonnes/day of Compost

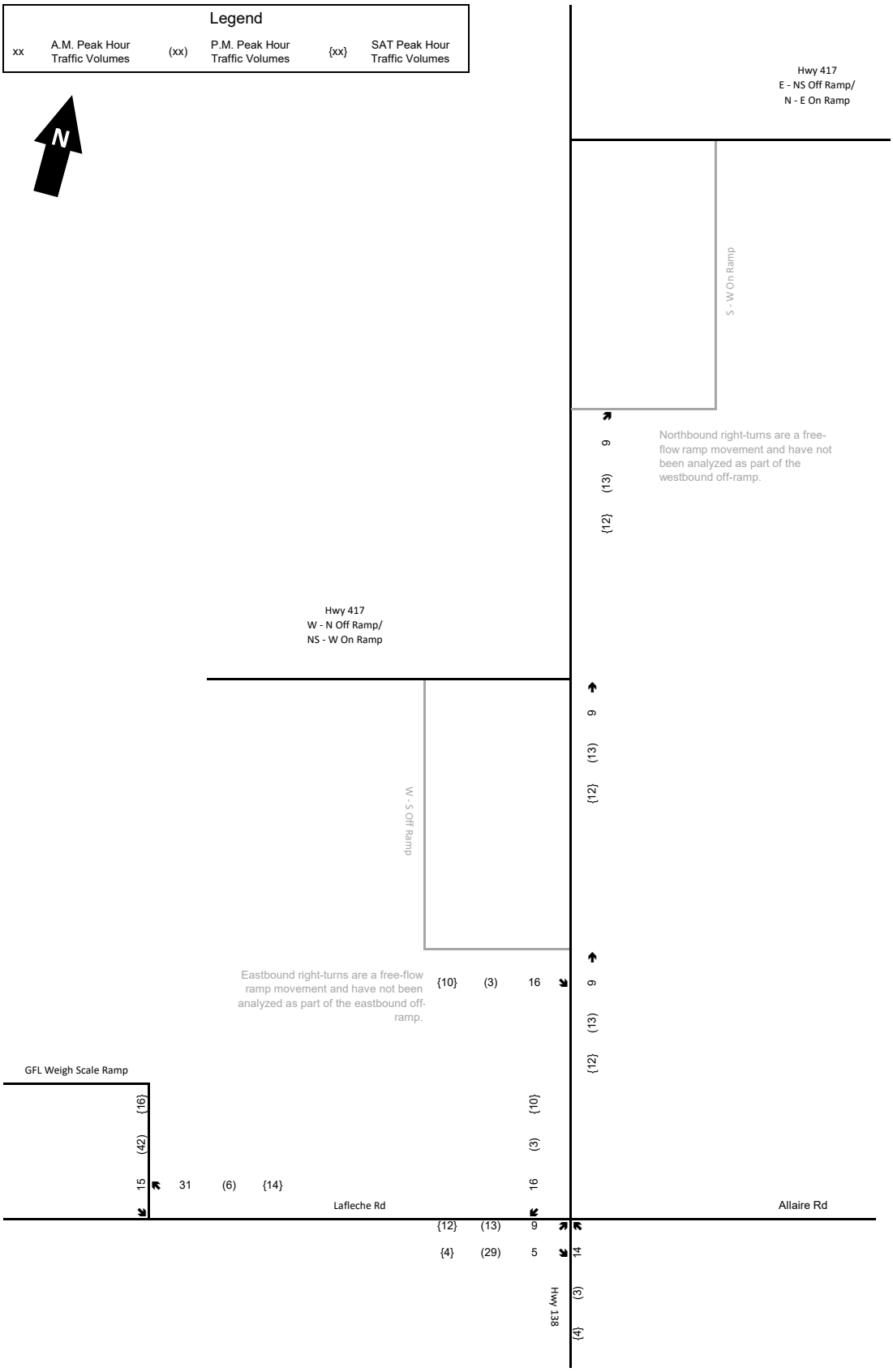


Figure Future Landfill

Future Site Trips associated with 3,100 tonnes/day of Landfill

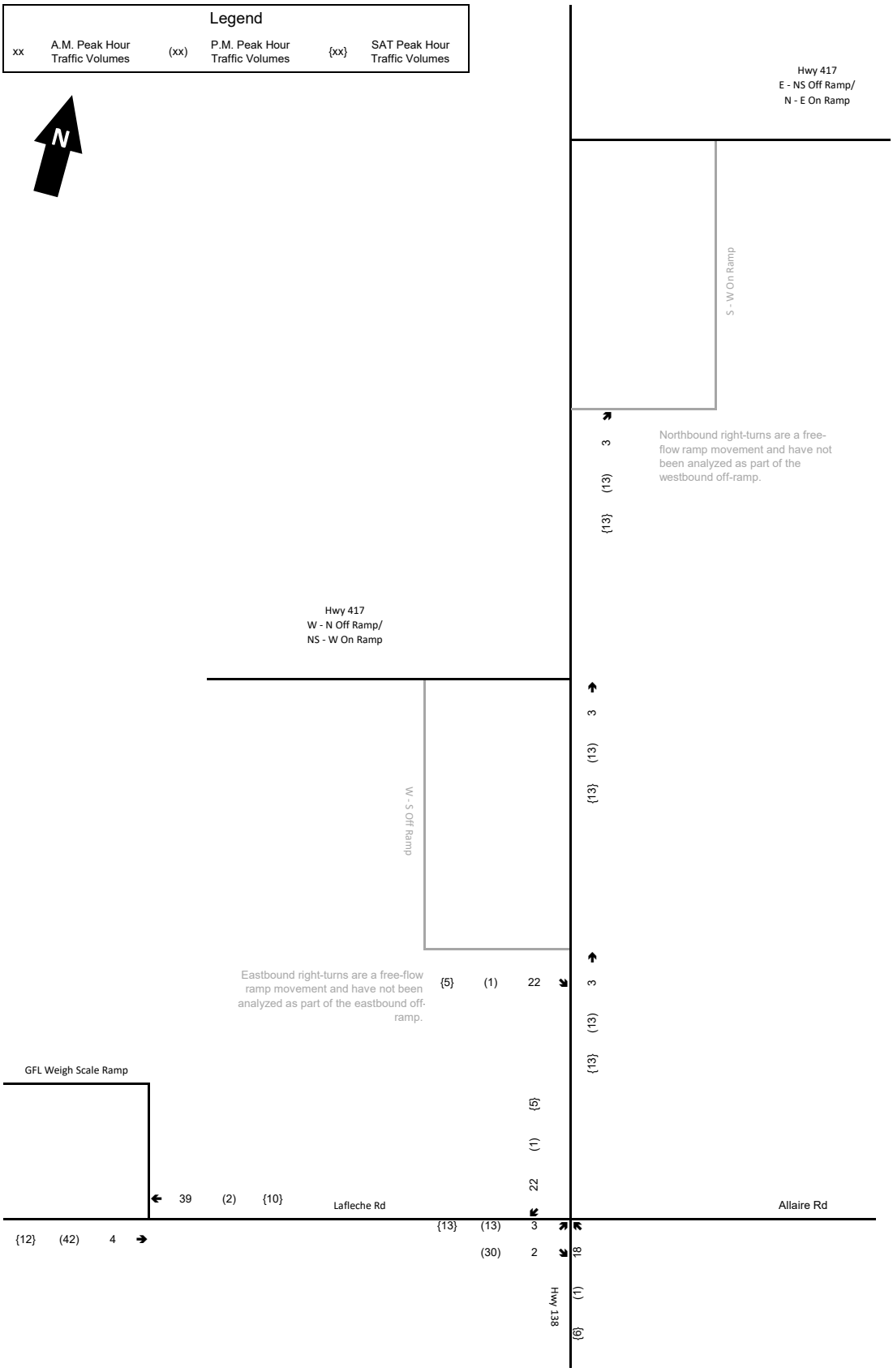


Figure Future South Side

Future Site Trips associated with new bagging and natural gas processing operations

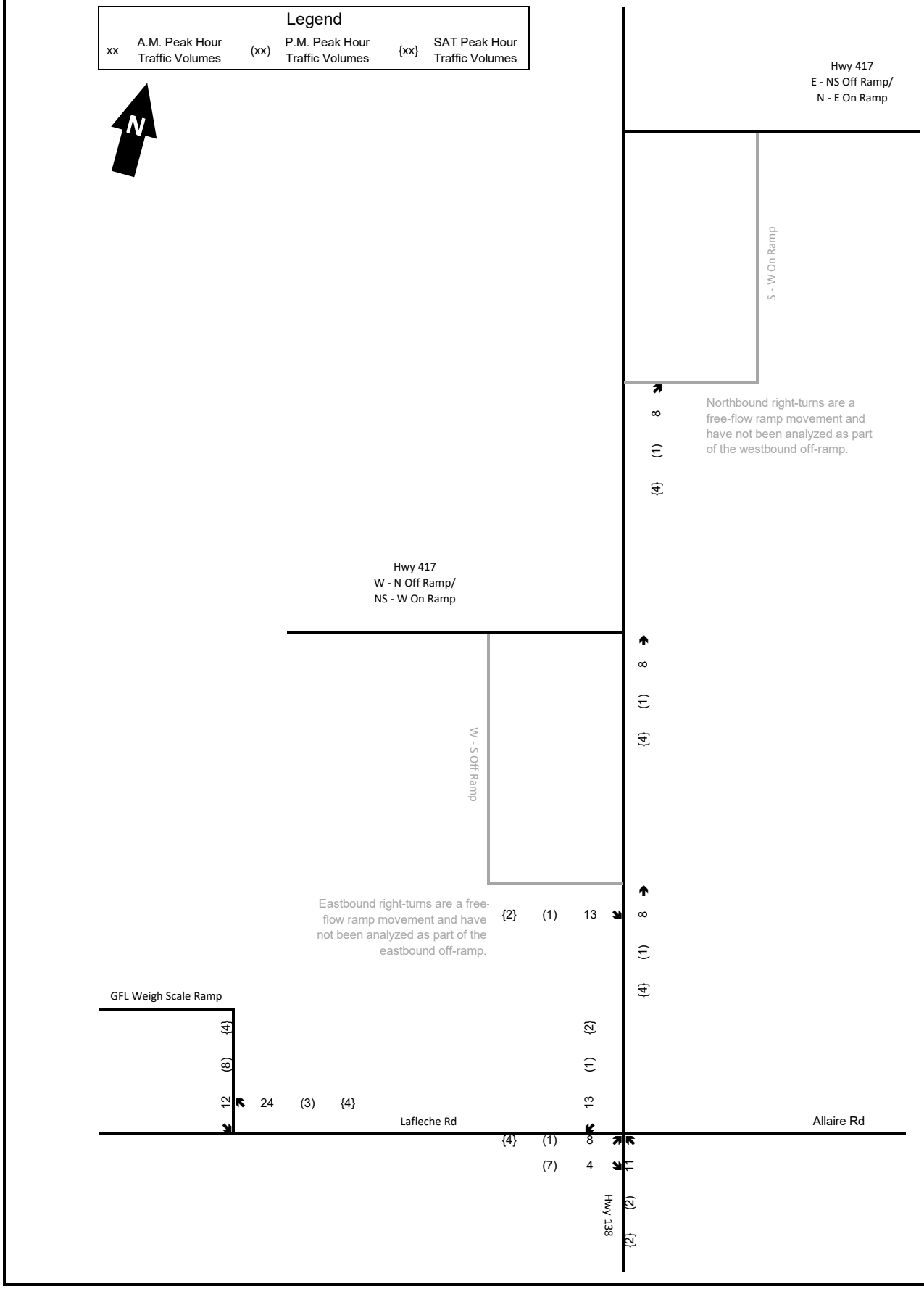


Figure Existing Site Heavys

Heavy Vehicles that currently use the GFL Weigh Scale Ramp

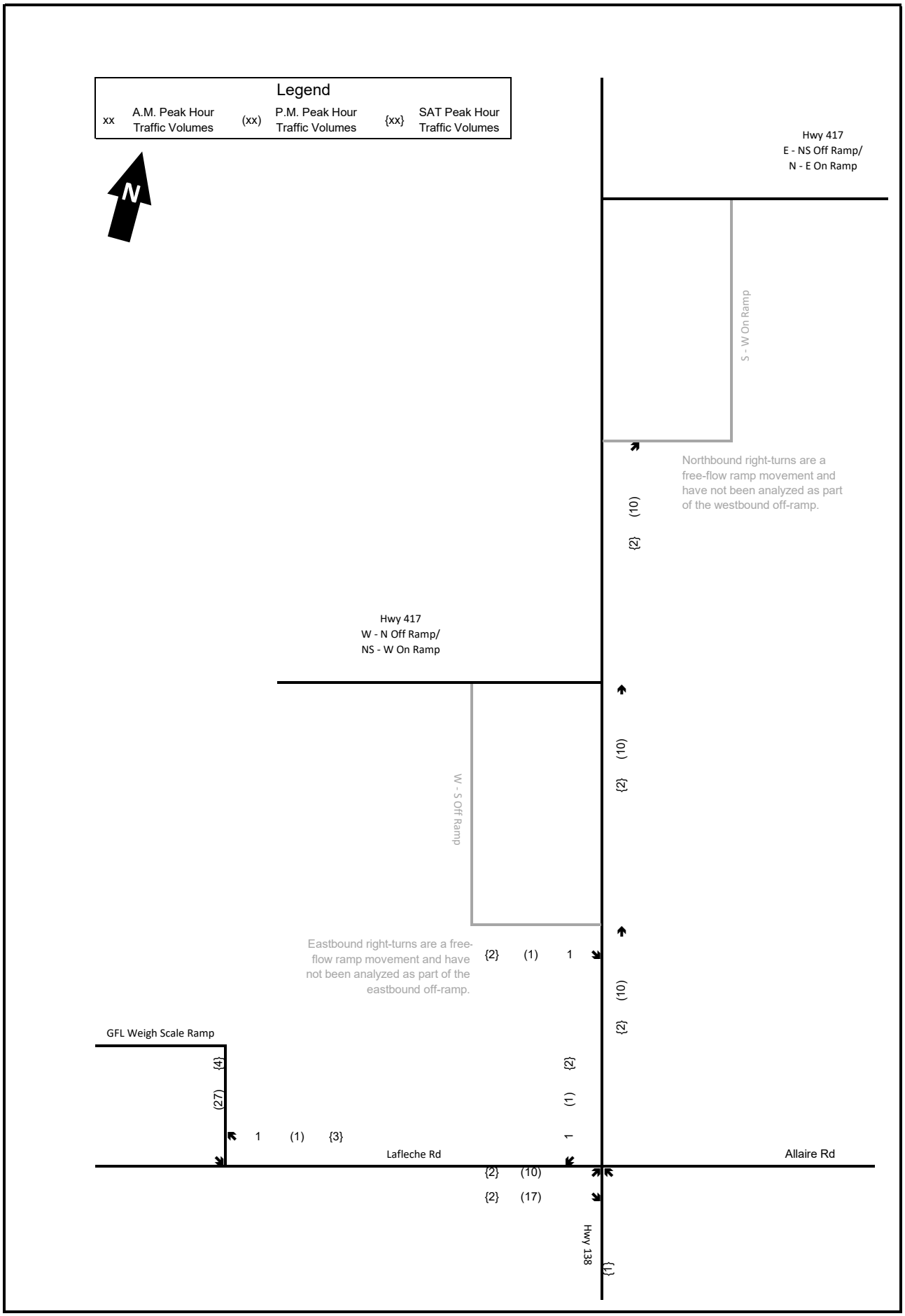


Figure Existing Site Lights

Light Vehicles that currently use the GFL Weigh Scale Ramp

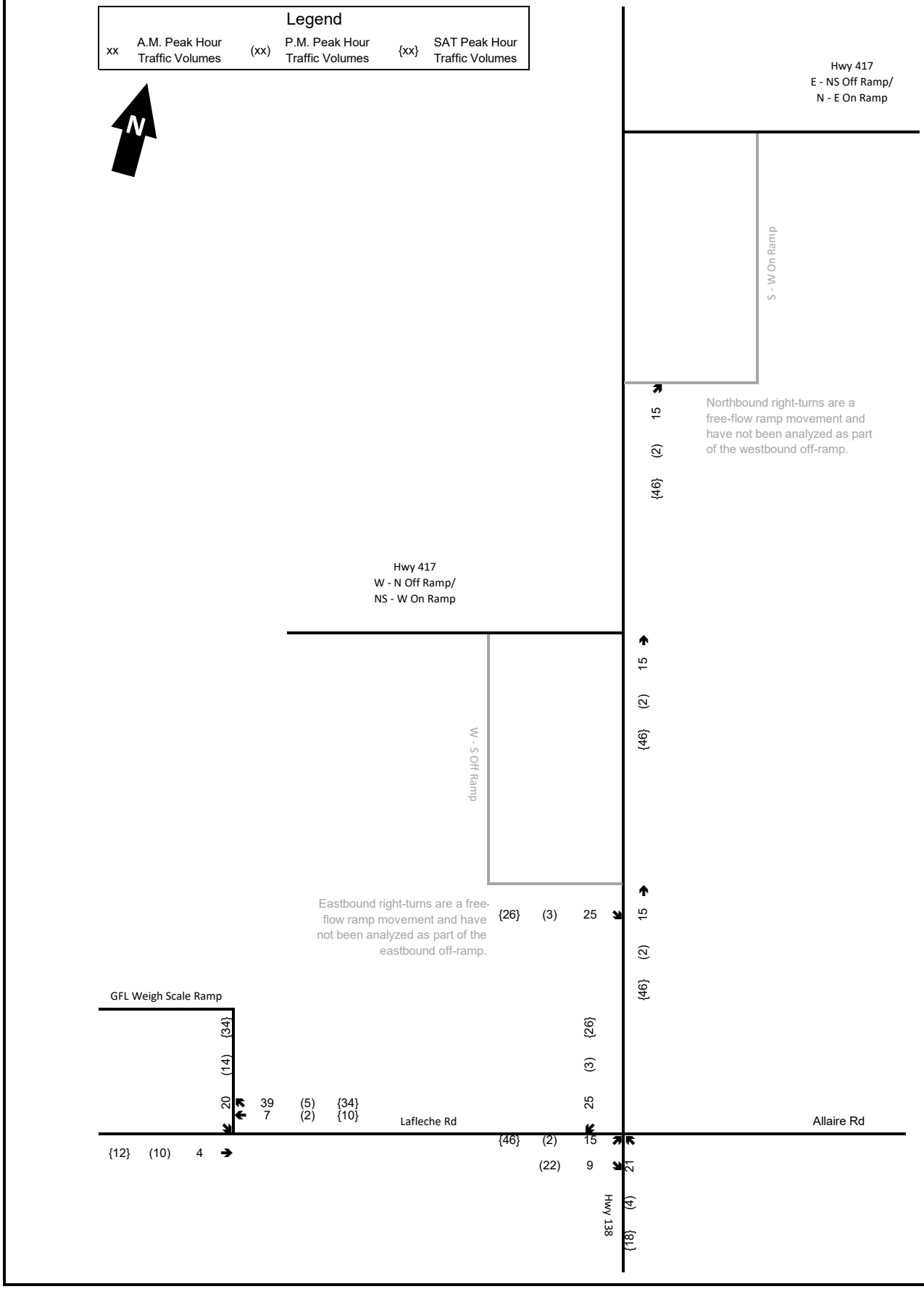


Figure Future Site Heavys

Heavy Vehicles that will use the GFL Weigh Scale Ramp, plus
access the new south side uses

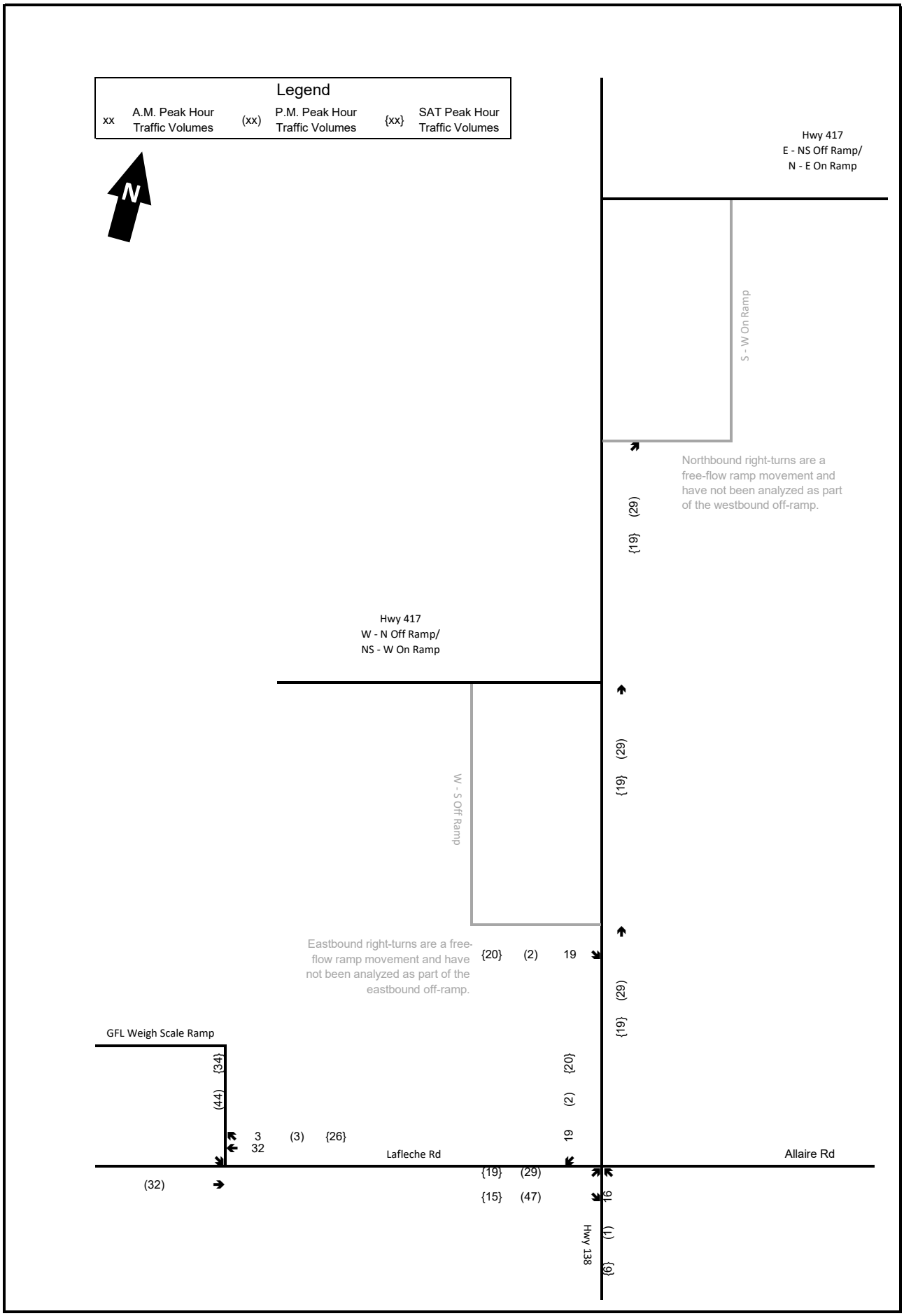


Figure Future Site Lights

Light Vehicles that will use the GFL Weigh Scale Ramp, plus access the new south side uses

Appendix B. Updated Synchro Reports (2025 and 2035 Horizon Year Total Traffic Operations)

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	38	13	44	0	8	41
Future Volume (Veh/h)	38	13	44	0	8	41
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	42	14	49	0	9	46
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	113	49			49	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	113	49			49	
tC, single (s)	6.6	6.6			4.1	
tC, 2 stage (s)						
tF (s)	3.7	3.7			2.2	
p0 queue free %	95	98			99	
cM capacity (veh/h)	826	922			1571	

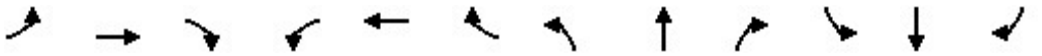
Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	56	49	55
Volume Left	42	0	9
Volume Right	14	0	0
cSH	848	1700	1571
Volume to Capacity	0.07	0.03	0.01
Queue Length 95th (m)	1.6	0.0	0.1
Control Delay (s)	9.5	0.0	1.2
Lane LOS	A		A
Approach Delay (s)	9.5	0.0	1.2
Approach LOS	A		

Intersection Summary			
Average Delay	3.8		
Intersection Capacity Utilization	19.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	6	0	27	239	67	6
Future Volume (Veh/h)	6	0	27	239	67	6
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	6	0	29	254	71	6
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	386	74	77			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	386	74	77			
tC, single (s)	6.4	6.2	4.4			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.5			
p0 queue free %	99	100	98			
cM capacity (veh/h)	608	993	1362			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	6	283	77
Volume Left	6	29	0
Volume Right	0	0	6
cSH	608	1362	1700
Volume to Capacity	0.01	0.02	0.05
Queue Length 95th (m)	0.2	0.5	0.0
Control Delay (s)	11.0	1.0	0.0
Lane LOS	B	A	
Approach Delay (s)	11.0	1.0	0.0
Approach LOS	B		

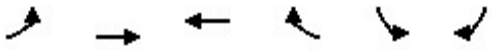
Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	30.7%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	13	11	8	15	13	10	20	235	11	14	196	23
Future Volume (Veh/h)	13	11	8	15	13	10	20	235	11	14	196	23
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	14	12	9	16	14	11	22	258	12	15	215	25
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	565	559	215	562	572	258	240			270		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	565	559	215	562	572	258	240			270		
tC, single (s)	7.9	7.5	7.0	7.6	7.5	6.6	4.5			4.7		
tC, 2 stage (s)												
tF (s)	4.2	4.9	4.0	3.9	4.9	3.7	2.6			2.7		
p0 queue free %	96	96	99	95	95	98	98			99		
cM capacity (veh/h)	313	316	663	351	310	697	1133			1029		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	35	41	280	12	230	25
Volume Left	14	16	22	0	15	0
Volume Right	9	11	0	12	0	25
cSH	364	385	1133	1700	1029	1700
Volume to Capacity	0.10	0.11	0.02	0.01	0.01	0.01
Queue Length 95th (m)	2.4	2.7	0.5	0.0	0.3	0.0
Control Delay (s)	16.0	15.5	0.8	0.0	0.7	0.0
Lane LOS	C	C	A		A	
Approach Delay (s)	16.0	15.5	0.8		0.6	
Approach LOS	C	C				

Intersection Summary				
Average Delay	2.5			
Intersection Capacity Utilization	37.9%	ICU Level of Service		A
Analysis Period (min)	15			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	18	16	42	20	0
Future Volume (Veh/h)	0	18	16	42	20	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	0	21	19	50	24	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	69				65	44
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	69				65	44
tC, single (s)	4.1				7.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				4.4	3.3
p0 queue free %	100				97	100
cM capacity (veh/h)	1545				745	1032

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	21	69	24
Volume Left	0	0	24
Volume Right	0	50	0
cSH	1545	1700	745
Volume to Capacity	0.00	0.04	0.03
Queue Length 95th (m)	0.0	0.0	0.8
Control Delay (s)	0.0	0.0	10.0
Lane LOS			A
Approach Delay (s)	0.0	0.0	10.0
Approach LOS			A

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	13.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	32	7	68	0	12	55
Future Volume (Veh/h)	32	7	68	0	12	55
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	37	8	78	0	14	63
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	169	78			78	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	169	78			78	
tC, single (s)	6.6	7.0			4.1	
tC, 2 stage (s)						
tF (s)	3.7	4.0			2.2	
p0 queue free %	95	99			99	
cM capacity (veh/h)	781	803			1533	

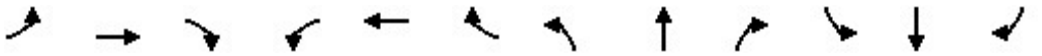
Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	45	78	77
Volume Left	37	0	14
Volume Right	8	0	0
cSH	785	1700	1533
Volume to Capacity	0.06	0.05	0.01
Queue Length 95th (m)	1.4	0.0	0.2
Control Delay (s)	9.9	0.0	1.4
Lane LOS	A		A
Approach Delay (s)	9.9	0.0	1.4
Approach LOS	A		

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	20.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	17	0	30	266	76	8
Future Volume (Veh/h)	17	0	30	266	76	8
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	18	0	31	277	79	8
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	422	83	87			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	422	83	87			
tC, single (s)	6.6	6.2	4.2			
tC, 2 stage (s)						
tF (s)	3.7	3.3	2.3			
p0 queue free %	97	100	98			
cM capacity (veh/h)	549	982	1437			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	18	308	87
Volume Left	18	31	0
Volume Right	0	0	8
cSH	549	1437	1700
Volume to Capacity	0.03	0.02	0.05
Queue Length 95th (m)	0.8	0.5	0.0
Control Delay (s)	11.8	0.9	0.0
Lane LOS	B	A	
Approach Delay (s)	11.8	0.9	0.0
Approach LOS	B		

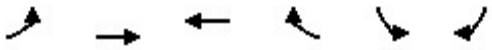
Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	32.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	18	6	42	15	1	14	9	250	4	10	360	8
Future Volume (Veh/h)	18	6	42	15	1	14	9	250	4	10	360	8
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	19	6	44	16	1	15	9	260	4	10	375	8
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	688	677	375	720	681	260	383			264		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	688	677	375	720	681	260	383			264		
tC, single (s)	7.2	7.2	6.6	7.3	7.5	6.4	4.7			4.5		
tC, 2 stage (s)												
tF (s)	3.6	4.6	3.6	3.7	4.9	3.4	2.7			2.6		
p0 queue free %	94	98	93	94	100	98	99			99		
cM capacity (veh/h)	341	298	602	289	268	748	919			1109		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	69	32	269	4	385	8
Volume Left	19	16	9	0	10	0
Volume Right	44	15	0	4	0	8
cSH	463	404	919	1700	1109	1700
Volume to Capacity	0.15	0.08	0.01	0.00	0.01	0.00
Queue Length 95th (m)	4.0	2.0	0.2	0.0	0.2	0.0
Control Delay (s)	14.1	14.7	0.4	0.0	0.3	0.0
Lane LOS	B	B	A		A	
Approach Delay (s)	14.1	14.7	0.4		0.3	
Approach LOS	B	B				

Intersection Summary				
Average Delay	2.2			
Intersection Capacity Utilization	37.9%	ICU Level of Service		A
Analysis Period (min)	15			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	6	2	8	58	0
Future Volume (Veh/h)	0	6	2	8	58	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.51	0.51	0.51	0.51	0.51	0.51
Hourly flow rate (vph)	0	12	4	16	114	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	20				24	12
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	20				24	12
tC, single (s)	4.1				6.6	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.7	3.3
p0 queue free %	100				88	100
cM capacity (veh/h)	1609				938	1074

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	12	20	114
Volume Left	0	0	114
Volume Right	0	16	0
cSH	1609	1700	938
Volume to Capacity	0.00	0.01	0.12
Queue Length 95th (m)	0.0	0.0	3.1
Control Delay (s)	0.0	0.0	9.4
Lane LOS			A
Approach Delay (s)	0.0	0.0	9.4
Approach LOS			A

Intersection Summary			
Average Delay	7.3		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	30	4	38	0	11	53
Future Volume (Veh/h)	30	4	38	0	11	53
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	4	41	0	12	58
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	123	41			41	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	123	41			41	
tC, single (s)	6.4	6.5			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.6			2.3	
p0 queue free %	96	100			99	
cM capacity (veh/h)	870	948			1500	

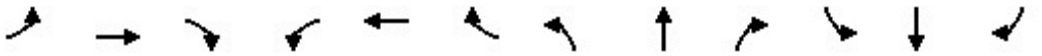
Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	37	41	70
Volume Left	33	0	12
Volume Right	4	0	0
cSH	878	1700	1500
Volume to Capacity	0.04	0.02	0.01
Queue Length 95th (m)	1.0	0.0	0.2
Control Delay (s)	9.3	0.0	1.3
Lane LOS	A		A
Approach Delay (s)	9.3	0.0	1.3
Approach LOS	A		

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	20.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	0	22	342	63	17
Future Volume (Veh/h)	7	0	22	342	63	17
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	7	0	23	364	67	18
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	486	76	85			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	486	76	85			
tC, single (s)	6.4	6.2	4.3			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.4			
p0 queue free %	99	100	98			
cM capacity (veh/h)	535	991	1411			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	7	387	85
Volume Left	7	23	0
Volume Right	0	0	18
cSH	535	1411	1700
Volume to Capacity	0.01	0.02	0.05
Queue Length 95th (m)	0.3	0.4	0.0
Control Delay (s)	11.8	0.6	0.0
Lane LOS	B	A	
Approach Delay (s)	11.8	0.6	0.0
Approach LOS	B		

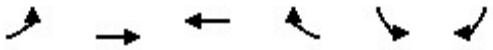
Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	35.9%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	56	0	18	2	0	2	21	300	1	1	258	46
Future Volume (Veh/h)	56	0	18	2	0	2	21	300	1	1	258	46
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	58	0	19	2	0	2	22	312	1	1	269	48
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	629	628	269	646	675	312	317			313		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	629	628	269	646	675	312	317			313		
tC, single (s)	7.8	6.5	6.2	7.1	6.5	6.2	4.8			4.1		
tC, 2 stage (s)												
tF (s)	4.1	4.0	3.3	3.5	4.0	3.3	2.8			2.2		
p0 queue free %	81	100	98	99	100	100	98			100		
cM capacity (veh/h)	310	393	775	371	369	733	935			1259		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	77	4	334	1	270	48
Volume Left	58	2	22	0	1	0
Volume Right	19	2	0	1	0	48
cSH	363	493	935	1700	1259	1700
Volume to Capacity	0.21	0.01	0.02	0.00	0.00	0.03
Queue Length 95th (m)	6.0	0.2	0.5	0.0	0.0	0.0
Control Delay (s)	17.6	12.4	0.8	0.0	0.0	0.0
Lane LOS	C	B	A		A	
Approach Delay (s)	17.6	12.4	0.8		0.0	
Approach LOS	C	B				

Intersection Summary				
Average Delay	2.3			
Intersection Capacity Utilization	46.0%	ICU Level of Service		A
Analysis Period (min)	15			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	60	68	0
Future Volume (Veh/h)	0	0	0	60	68	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	0	0	0	80	91	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	80				40	40
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	80				40	40
tC, single (s)	4.1				6.9	6.2
tC, 2 stage (s)						
tF (s)	2.2				4.0	3.3
p0 queue free %	100				89	100
cM capacity (veh/h)	1531				863	1037

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	0	80	91
Volume Left	0	0	91
Volume Right	0	80	0
cSH	1700	1700	863
Volume to Capacity	0.00	0.05	0.11
Queue Length 95th (m)	0.0	0.0	2.7
Control Delay (s)	0.0	0.0	9.7
Lane LOS			A
Approach Delay (s)	0.0	0.0	9.7
Approach LOS			A

Intersection Summary			
Average Delay	5.1		
Intersection Capacity Utilization	14.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	47	16	54	0	10	50
Future Volume (Veh/h)	47	16	54	0	10	50
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	52	18	60	0	11	56
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	138	60			60	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	138	60			60	
tC, single (s)	6.6	6.6			4.1	
tC, 2 stage (s)						
tF (s)	3.7	3.7			2.2	
p0 queue free %	93	98			99	
cM capacity (veh/h)	798	908			1556	

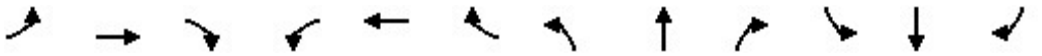
Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	70	60	67
Volume Left	52	0	11
Volume Right	18	0	0
cSH	824	1700	1556
Volume to Capacity	0.08	0.04	0.01
Queue Length 95th (m)	2.1	0.0	0.2
Control Delay (s)	9.8	0.0	1.2
Lane LOS	A		A
Approach Delay (s)	9.8	0.0	1.2
Approach LOS	A		

Intersection Summary			
Average Delay	3.9		
Intersection Capacity Utilization	20.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	0	34	291	82	7
Future Volume (Veh/h)	7	0	34	291	82	7
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	7	0	36	310	87	7
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	472	90	94			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	472	90	94			
tC, single (s)	6.4	6.2	4.4			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.5			
p0 queue free %	99	100	97			
cM capacity (veh/h)	539	973	1342			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	7	346	94
Volume Left	7	36	0
Volume Right	0	0	7
cSH	539	1342	1700
Volume to Capacity	0.01	0.03	0.06
Queue Length 95th (m)	0.3	0.6	0.0
Control Delay (s)	11.8	1.0	0.0
Lane LOS	B	A	
Approach Delay (s)	11.8	1.0	0.0
Approach LOS	B		

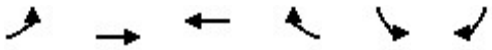
Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	33.9%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	13	11	8	15	13	10	20	287	11	14	239	23
Future Volume (Veh/h)	13	11	8	15	13	10	20	287	11	14	239	23
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	14	12	9	16	14	11	22	315	12	15	263	25
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	670	664	263	667	677	315	288			327		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	670	664	263	667	677	315	288			327		
tC, single (s)	7.9	7.5	7.0	7.6	7.5	6.6	4.5			4.7		
tC, 2 stage (s)												
tF (s)	4.2	4.9	4.0	3.9	4.9	3.7	2.6			2.7		
p0 queue free %	95	96	99	95	95	98	98			98		
cM capacity (veh/h)	260	270	620	294	265	645	1085			976		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	35	41	337	12	278	25
Volume Left	14	16	22	0	15	0
Volume Right	9	11	0	12	0	25
cSH	310	330	1085	1700	976	1700
Volume to Capacity	0.11	0.12	0.02	0.01	0.02	0.01
Queue Length 95th (m)	2.9	3.2	0.5	0.0	0.4	0.0
Control Delay (s)	18.1	17.5	0.7	0.0	0.6	0.0
Lane LOS	C	C	A		A	
Approach Delay (s)	18.1	17.5	0.7		0.6	
Approach LOS	C	C				

Intersection Summary				
Average Delay	2.4			
Intersection Capacity Utilization	41.5%	ICU Level of Service		A
Analysis Period (min)	15			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	18	16	42	20	0
Future Volume (Veh/h)	0	18	16	42	20	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	0	21	19	50	24	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	69				65	44
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	69				65	44
tC, single (s)	4.1				7.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				4.4	3.3
p0 queue free %	100				97	100
cM capacity (veh/h)	1545				745	1032

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	21	69	24
Volume Left	0	0	24
Volume Right	0	50	0
cSH	1545	1700	745
Volume to Capacity	0.00	0.04	0.03
Queue Length 95th (m)	0.0	0.0	0.8
Control Delay (s)	0.0	0.0	10.0
Lane LOS			A
Approach Delay (s)	0.0	0.0	10.0
Approach LOS			A

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	13.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	39	9	83	0	15	67
Future Volume (Veh/h)	39	9	83	0	15	67
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	45	10	95	0	17	77
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	206	95			95	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	206	95			95	
tC, single (s)	6.6	7.0			4.1	
tC, 2 stage (s)						
tF (s)	3.7	4.0			2.2	
p0 queue free %	94	99			99	
cM capacity (veh/h)	741	785			1512	

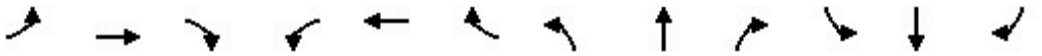
Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	55	95	94
Volume Left	45	0	17
Volume Right	10	0	0
cSH	749	1700	1512
Volume to Capacity	0.07	0.06	0.01
Queue Length 95th (m)	1.8	0.0	0.3
Control Delay (s)	10.2	0.0	1.4
Lane LOS	B		A
Approach Delay (s)	10.2	0.0	1.4
Approach LOS	B		

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	21.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	20	0	36	323	93	10
Future Volume (Veh/h)	20	0	36	323	93	10
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	21	0	38	336	97	10
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	514	102	107			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	514	102	107			
tC, single (s)	6.6	6.2	4.2			
tC, 2 stage (s)						
tF (s)	3.7	3.3	2.3			
p0 queue free %	96	100	97			
cM capacity (veh/h)	482	959	1412			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	21	374	107
Volume Left	21	38	0
Volume Right	0	0	10
cSH	482	1412	1700
Volume to Capacity	0.04	0.03	0.06
Queue Length 95th (m)	1.0	0.6	0.0
Control Delay (s)	12.8	1.0	0.0
Lane LOS	B	A	
Approach Delay (s)	12.8	1.0	0.0
Approach LOS	B		

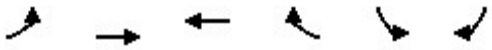
Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	35.7%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	18	6	42	15	1	14	9	304	4	10	439	8
Future Volume (Veh/h)	18	6	42	15	1	14	9	304	4	10	439	8
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	19	6	44	16	1	15	9	317	4	10	457	8
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	828	816	457	859	820	317	465			321		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	828	816	457	859	820	317	465			321		
tC, single (s)	7.2	7.2	6.6	7.3	7.5	6.4	4.7			4.5		
tC, 2 stage (s)												
tF (s)	3.6	4.6	3.6	3.7	4.9	3.4	2.7			2.6		
p0 queue free %	93	98	92	93	100	98	99			99		
cM capacity (veh/h)	273	243	539	229	217	694	850			1053		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	69	32	326	4	467	8
Volume Left	19	16	9	0	10	0
Volume Right	44	15	0	4	0	8
cSH	392	332	850	1700	1053	1700
Volume to Capacity	0.18	0.10	0.01	0.00	0.01	0.00
Queue Length 95th (m)	4.8	2.4	0.2	0.0	0.2	0.0
Control Delay (s)	16.1	17.0	0.4	0.0	0.3	0.0
Lane LOS	C	C	A		A	
Approach Delay (s)	16.1	17.0	0.4		0.3	
Approach LOS	C	C				

Intersection Summary				
Average Delay	2.1			
Intersection Capacity Utilization	42.0%	ICU Level of Service		A
Analysis Period (min)	15			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	6	2	8	58	0
Future Volume (Veh/h)	0	6	2	8	58	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.51	0.51	0.51	0.51	0.51	0.51
Hourly flow rate (vph)	0	12	4	16	114	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	20				24	12
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	20				24	12
tC, single (s)	4.1				6.6	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.7	3.3
p0 queue free %	100				88	100
cM capacity (veh/h)	1609				938	1074

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	12	20	114
Volume Left	0	0	114
Volume Right	0	16	0
cSH	1609	1700	938
Volume to Capacity	0.00	0.01	0.12
Queue Length 95th (m)	0.0	0.0	3.1
Control Delay (s)	0.0	0.0	9.4
Lane LOS			A
Approach Delay (s)	0.0	0.0	9.4
Approach LOS			A

Intersection Summary			
Average Delay	7.3		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	36	4	47	0	13	64
Future Volume (Veh/h)	36	4	47	0	13	64
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	39	4	51	0	14	70
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	149	51			51	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	149	51			51	
tC, single (s)	6.4	6.5			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.6			2.3	
p0 queue free %	95	100			99	
cM capacity (veh/h)	840	936			1488	

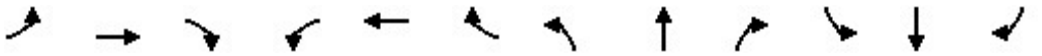
Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	43	51	84
Volume Left	39	0	14
Volume Right	4	0	0
cSH	848	1700	1488
Volume to Capacity	0.05	0.03	0.01
Queue Length 95th (m)	1.2	0.0	0.2
Control Delay (s)	9.5	0.0	1.3
Lane LOS	A		A
Approach Delay (s)	9.5	0.0	1.3
Approach LOS	A		

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	20.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	9	0	26	407	77	20
Future Volume (Veh/h)	9	0	26	407	77	20
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	10	0	28	433	82	21
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	582	92	103			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	582	92	103			
tC, single (s)	6.4	6.2	4.3			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.4			
p0 queue free %	98	100	98			
cM capacity (veh/h)	469	970	1389			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	10	461	103
Volume Left	10	28	0
Volume Right	0	0	21
cSH	469	1389	1700
Volume to Capacity	0.02	0.02	0.06
Queue Length 95th (m)	0.5	0.5	0.0
Control Delay (s)	12.8	0.7	0.0
Lane LOS	B	A	
Approach Delay (s)	12.8	0.7	0.0
Approach LOS	B		

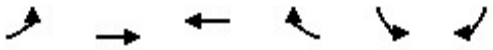
Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	39.5%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	56	0	18	2	0	2	21	366	1	1	315	46
Future Volume (Veh/h)	56	0	18	2	0	2	21	366	1	1	315	46
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	58	0	19	2	0	2	22	381	1	1	328	48
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	757	756	328	774	803	381	376			382		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	757	756	328	774	803	381	376			382		
tC, single (s)	7.8	6.5	6.2	7.1	6.5	6.2	4.8			4.1		
tC, 2 stage (s)												
tF (s)	4.1	4.0	3.3	3.5	4.0	3.3	2.8			2.2		
p0 queue free %	77	100	97	99	100	100	98			100		
cM capacity (veh/h)	250	331	718	304	311	671	883			1188		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	77	4	403	1	329	48
Volume Left	58	2	22	0	1	0
Volume Right	19	2	0	1	0	48
cSH	298	418	883	1700	1188	1700
Volume to Capacity	0.26	0.01	0.02	0.00	0.00	0.03
Queue Length 95th (m)	7.7	0.2	0.6	0.0	0.0	0.0
Control Delay (s)	21.3	13.7	0.8	0.0	0.0	0.0
Lane LOS	C	B	A		A	
Approach Delay (s)	21.3	13.7	0.8		0.0	
Approach LOS	C	B				

Intersection Summary				
Average Delay	2.3			
Intersection Capacity Utilization	49.4%	ICU Level of Service		A
Analysis Period (min)	15			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	60	68	0
Future Volume (Veh/h)	0	0	0	60	68	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	0	0	0	80	91	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	80				40	40
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	80				40	40
tC, single (s)	4.1				6.9	6.2
tC, 2 stage (s)						
tF (s)	2.2				4.0	3.3
p0 queue free %	100				89	100
cM capacity (veh/h)	1531				863	1037

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	0	80	91
Volume Left	0	0	91
Volume Right	0	80	0
cSH	1700	1700	863
Volume to Capacity	0.00	0.05	0.11
Queue Length 95th (m)	0.0	0.0	2.7
Control Delay (s)	0.0	0.0	9.7
Lane LOS			A
Approach Delay (s)	0.0	0.0	9.7
Approach LOS			A

Intersection Summary			
Average Delay	5.1		
Intersection Capacity Utilization	14.1%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix C. Updated Forecast Traffic Volumes (2025 and 2035 Horizon Year Total Traffic)

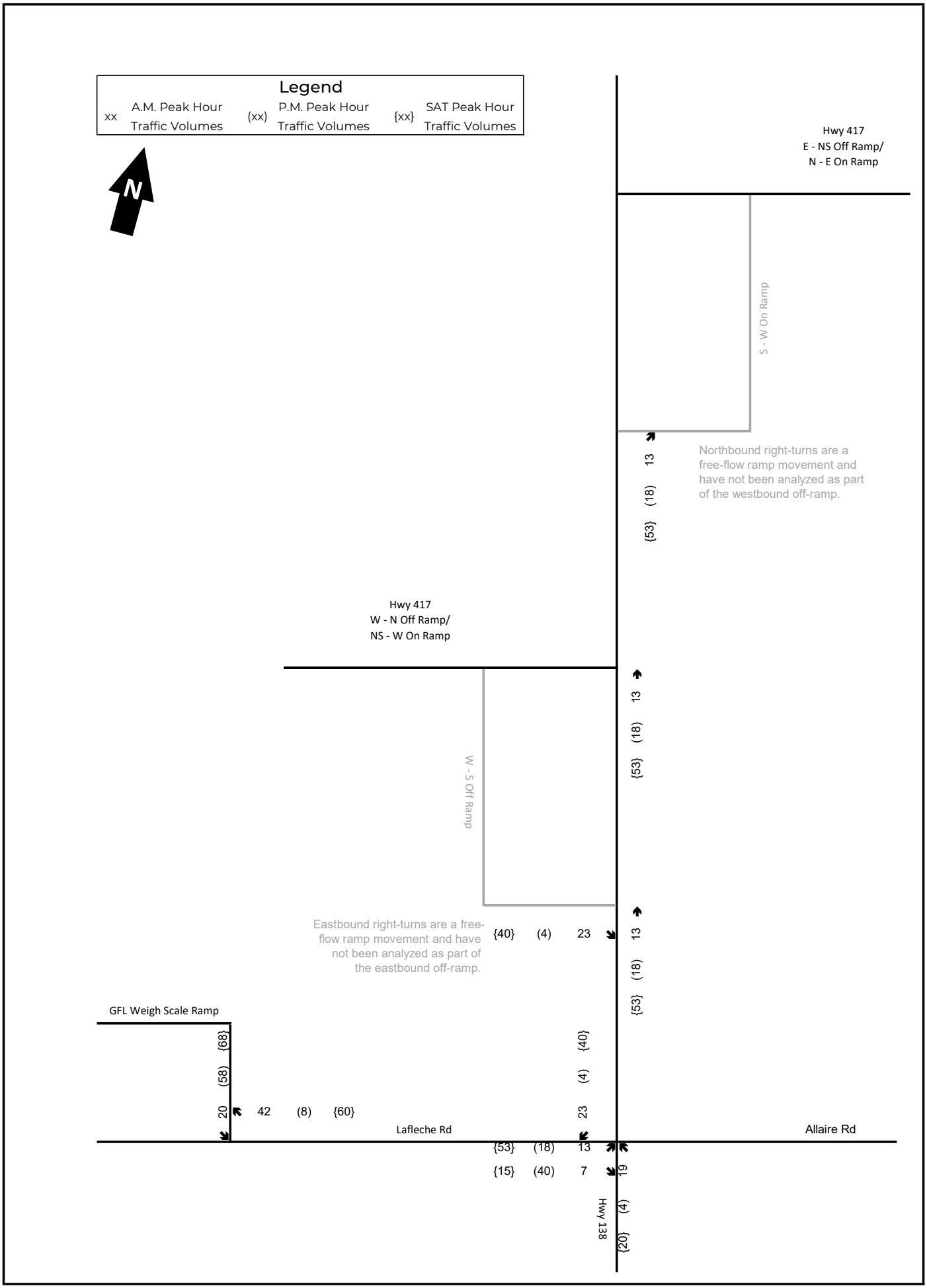


Figure Future Site Total

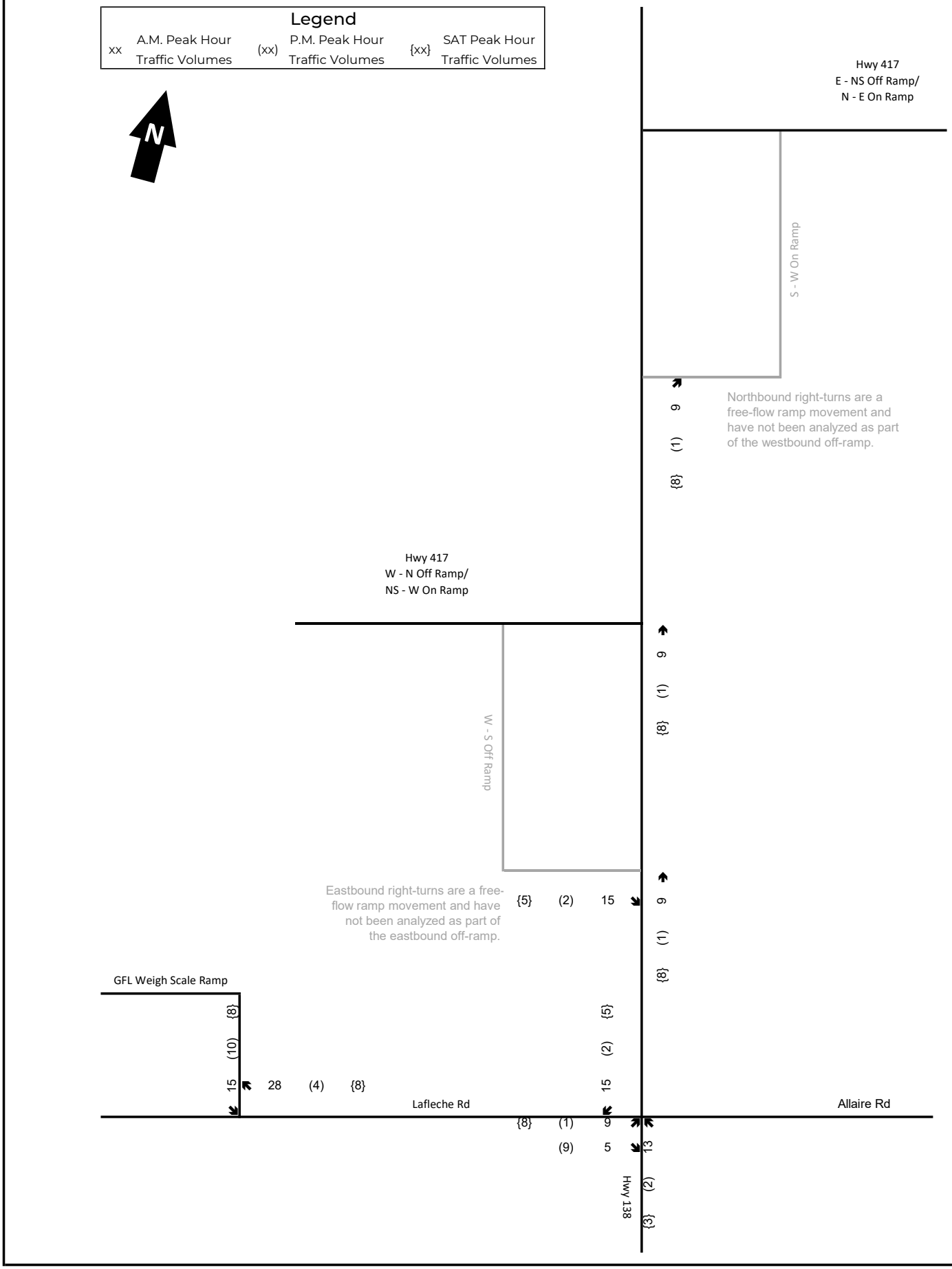


Figure Future Landfill Heavy

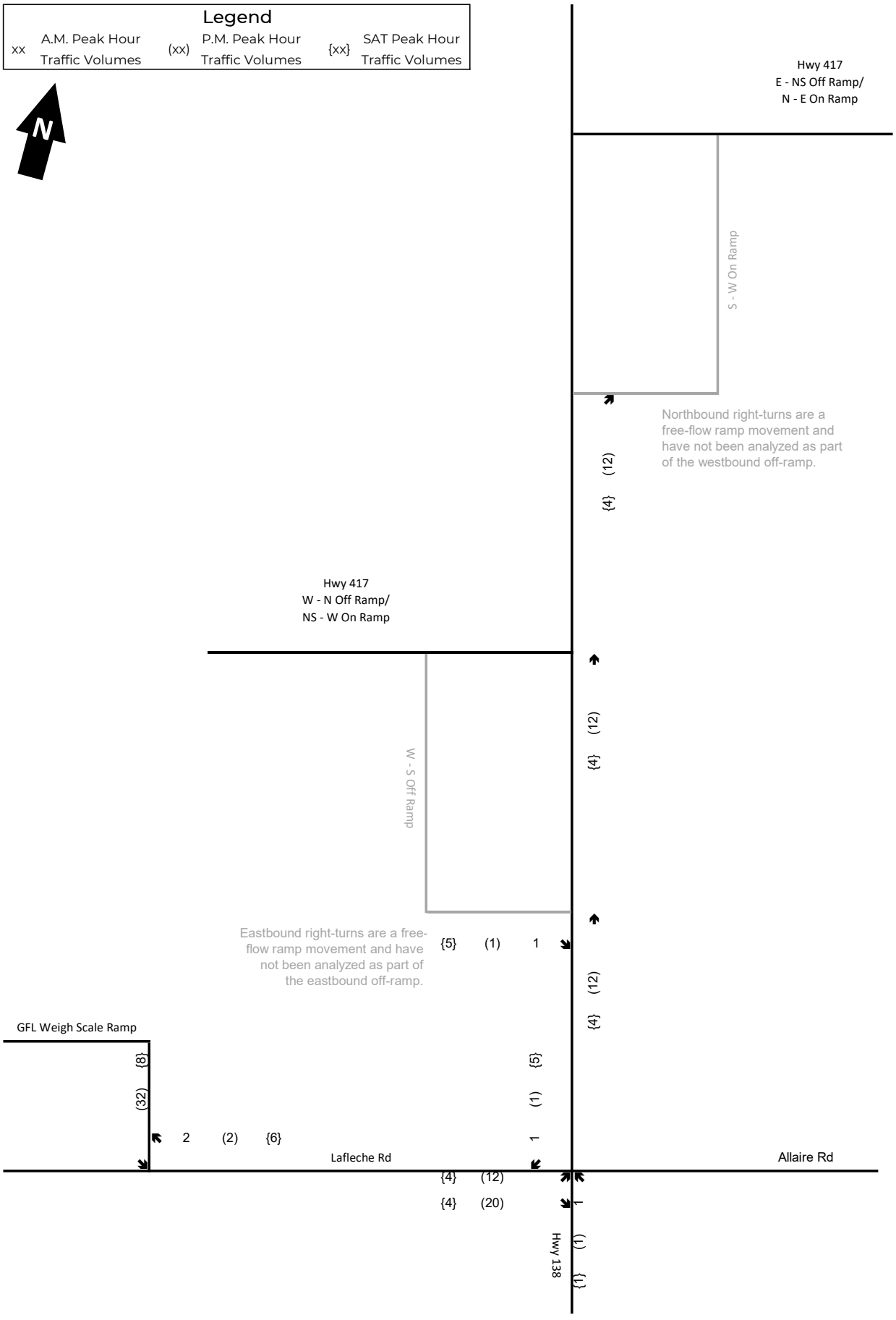


Figure Future Landfill Lights

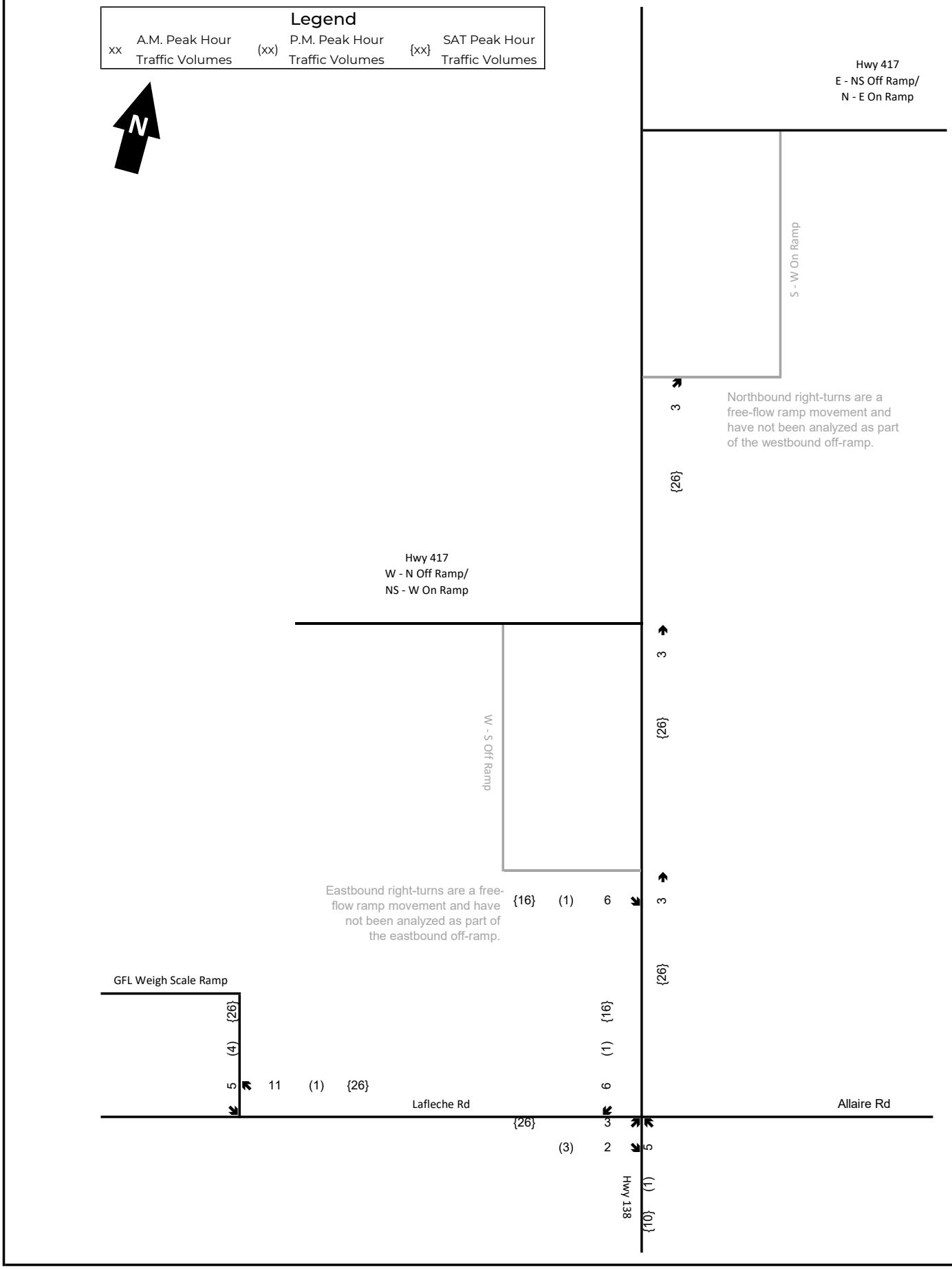


Figure Future Compost Heavy

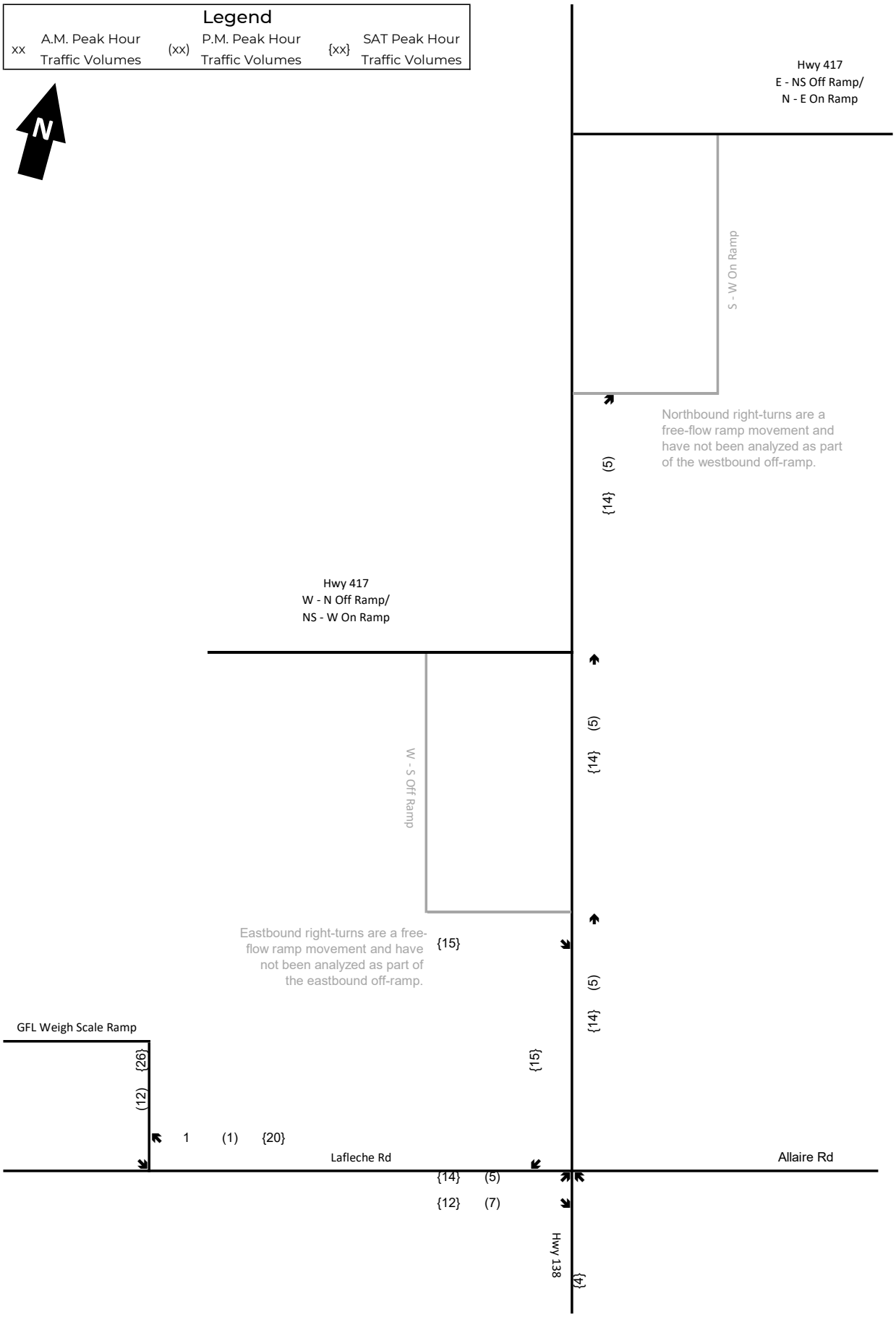


Figure Future Compost Lights

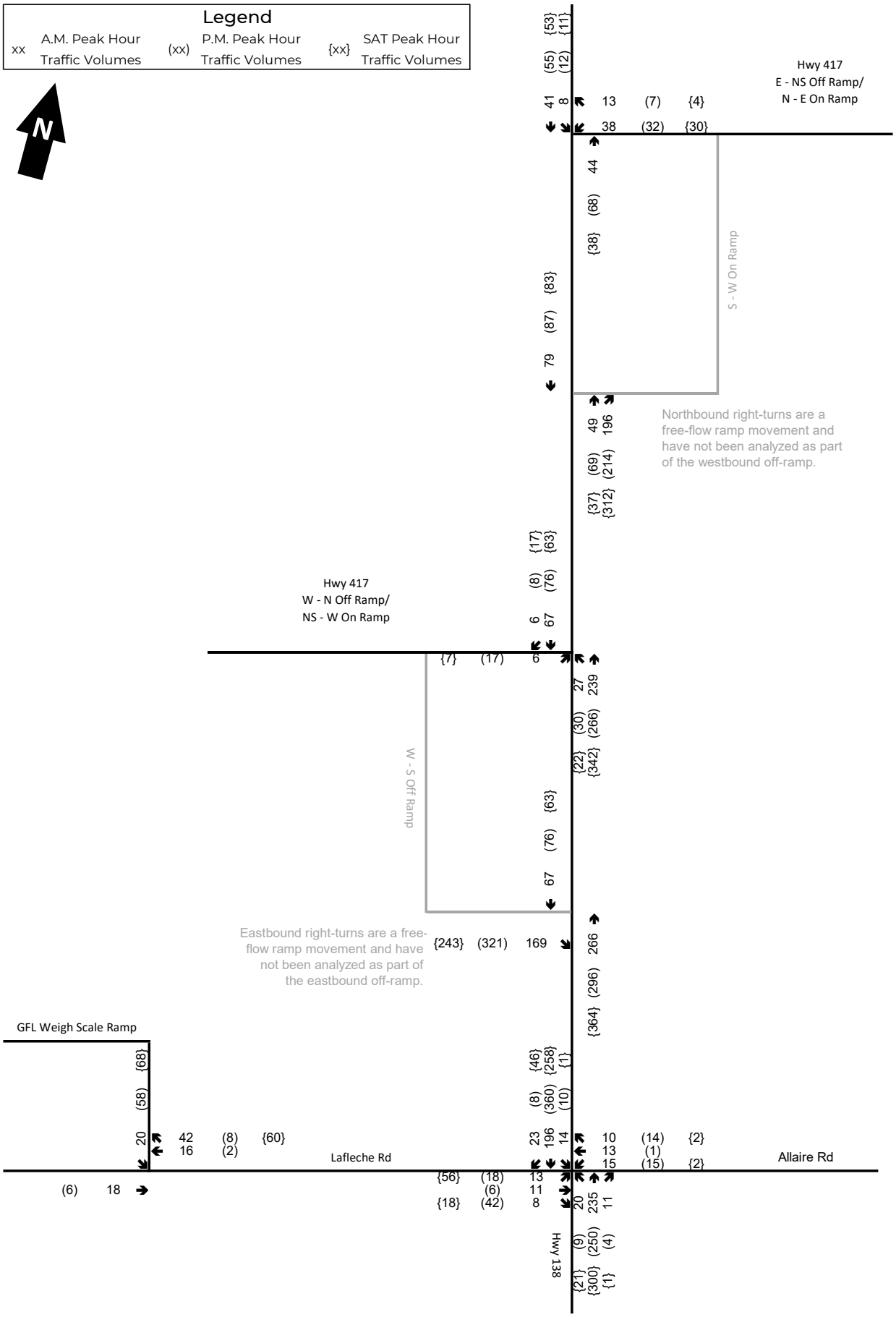


Figure TF 2025

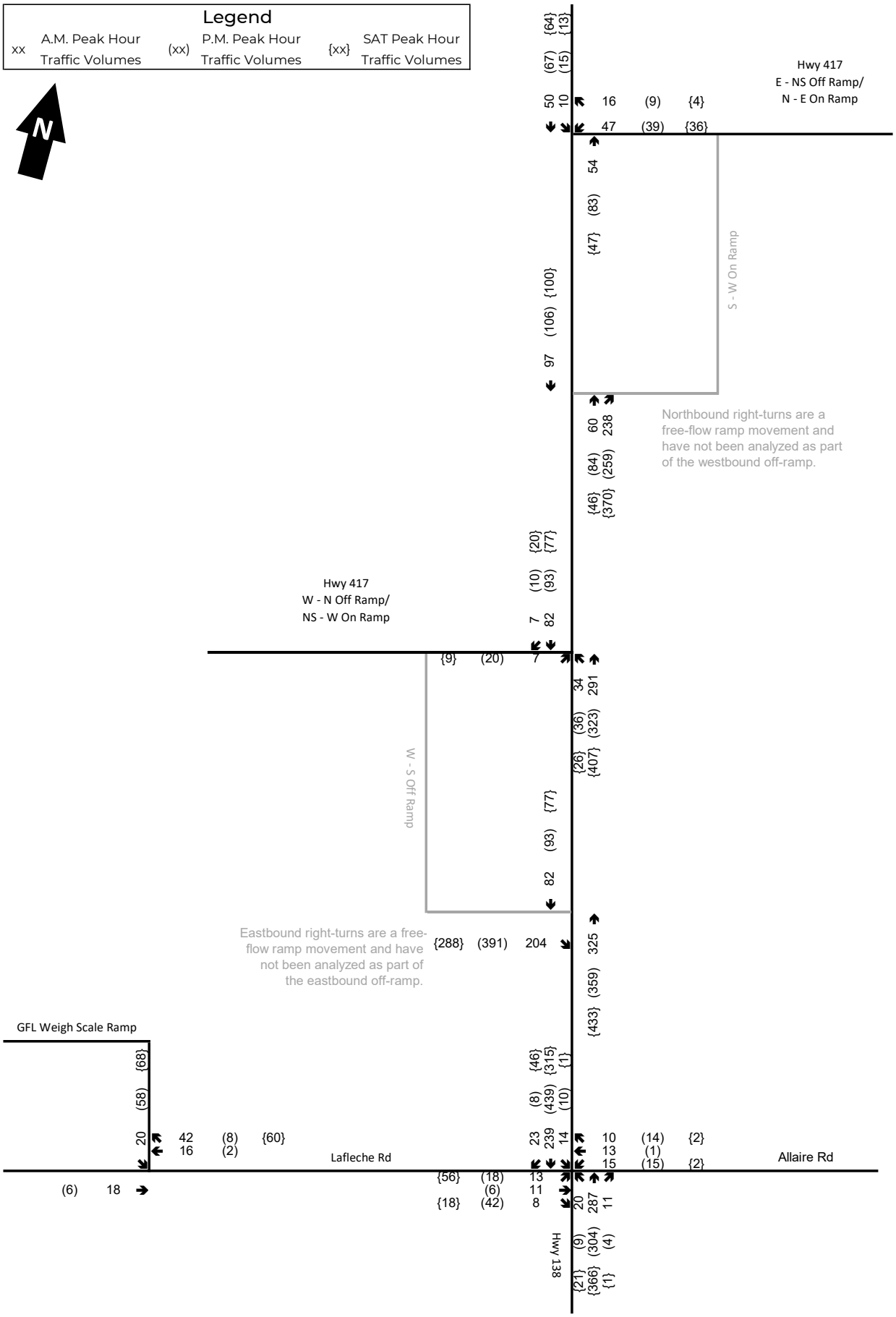


Figure TF 2035