5426, 5452 & 5548 Lakeshore Road
Village of Ballantrae
Whitchurch-Stouffville

Proposed Residential Development

Transportation Impact Study

Prepared For: Alcorn & Associates

Previous Report: December 19, 2018
Revised: March 03, 2021

45 St. Clair Avenue West, Suite 300
Toronto, ON M4V 1K9
www.bagroup.com

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1.0 INTRODUCTION

BA Consulting Group (BA Group) is retained by Alcorn & Associates to provide transportation consulting services in relation to the proposed plan of subdivision application on Lakeshore Road in the Town of Whitchurch-Stouffville. A report was previously prepared for the proposal by BA Group, dated December 19, 2018 (herein referred to as the 2018 report). Since the previous submission, comments have received from the Town of Whitchurch-Stouffville and the Region of York, and plans have been revised in response to the comments. This report provides an updated transportation review of the revised plans and addresses the transportation related comments received from the Town of Whitchurch-Stouffville.

The site is located at 5426, 5452, and 5584 Lakeshore Road (herein referred to as 'Farsight Lands') in the village of Ballantrae. The development is to be a private gated low-density residential condominium subdivision consisting of 142 detached homes.

The site which is a single plot of land 16.32 hectares in size, consists of undeveloped land with an agricultural site to the east and north, and a new single-family residential development to the west, and Lakeshore Road to the south. The site has 144 metres of frontage along Lakeshore Road with one small existing home located at the southwest corner of the property. A woodlot bisects the property, which contains a drainage course and pond to be retained.

The site location is illustrated on **Figure 1**.

1.1 SCOPE OF ANALYSIS

This study reviews the transportation related implications of the proposed development. Key transportation considerations reviewed as part of this study include the following:

- a review of the development programme and site;
- a review of the area transportation context in the site vicinity;
- a review of the vehicular parking requirements for the project and the appropriateness of the proposed parking supply;
- a review of the loading considerations associated with the project including an assessment of the suitability of the proposed road network to accommodate waste collection vehicles;
- a review of existing traffic activity levels and patterns in the study area;
- a review of general corridor growth and background development activity in the study area;
- a review of estimated site-related traffic forecasts;
- an assessment of the traffic operations at the area intersections today and in the future in order to review the impact of new site traffic on the area street network, including consideration of the potential north-south road link through the site as identified in the recent Whitchurch Stouffville TMP;
- identification of any recommended road modifications to mitigate site traffic impacts;
- a review of relevant Transportation Demand Management (TDM) strategies proposed for the project; and
- a review and assessment of emergency vehicle access considerations for the site.

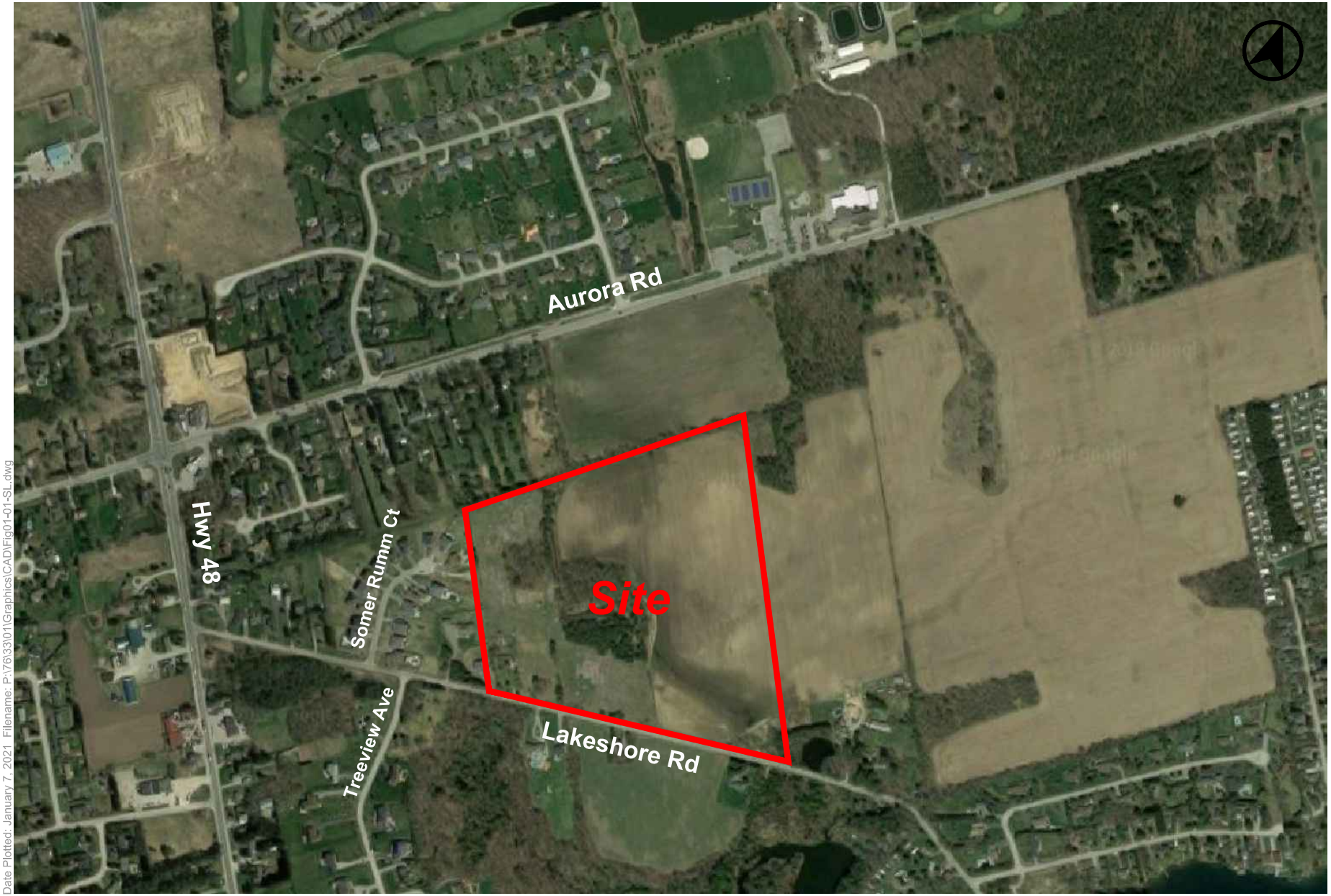

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FIGURE 1 SITE LOCATION

2.0 RESPONSE TO COMMENTS

As discussed in **Section 1.0**, comments have been received from the Town of Whitchurch-Stouffville and the Region of York in relation to the previous submission. This section provides responses to the transportation related comments.

2.1 TOWN OF WHITCHURCH-STOUFFVILLE COMMENTS

2.1.1 Burnside Comments (dated May 27, 2019)

2.1.1.1 Draft Plan Comments

1.6

d) Demonstrate that the road geometry is in conformance with the Town standards:

- **Label all road allowance radii;**
- **Label centreline of pavement radii to ensure a minimum of 12 m radius, including each lane on the proposed divided roads;**
- **Provide 5 m by 5 m daylight triangles at intersections.**

Response:
The road pavement geometry has been designed in accordance with Town standards. A road plan has been prepared and is attached in **Appendix B** and road allowance radii, centreline of pavement radii and daylight triangles are shown on the draft plan of subdivision.

f) The Town's Transportation Master Plan identifies a new road allowance in the location of this plan from Lakeshore Road to Aurora Road. The submitted Planning Justification Report is to include Exhibit 7-1 from the Master Plan. This road serves a community function, and therefore, should be a public 18 m wide road allowance, constructed to the Town's standards including any traffic circles proposed along its route. Street E may form part of this road connection and should be extended to the north property line and terminated with a temporary cul-de-sac.

Response:
It is understood that agreement has been reached with the Town of Whitchurch-Stouffville that permits private roads with an easement to be conveyed to the Town over Street A (its entire length) and Street E (the section with a 13.5m right-of-way). The provision of Block 155 at the north property limit allows for the future Town completion of the link through other lands. The easement will be confined to the pavement for public vehicular passage in emergencies only.

2.1.1.2 Traffic Impact Study

1.36 – Section 2.0

As per the Town's Transportation Master Plan, a new connection is required between Lakeshore Road and Aurora Road through the subject lands. The proposed plan should be updated to include a public local road through the subdivision. Further discussion with Town staff is required on the implementation of this new connection. It is our opinion that there will be no other opportunity along Lakeshore Road to provide this connection.

See response to comment 1.6(f) in **Section 2.1.1.1** above.

The proposed "roundabout" appears to be a traffic circle. Clarification is required as to its function and it should be designed to accommodate any expected service vehicles (Town refuse pickup, delivery or moving trucks).

Response:
This intersection has been adjusted to an all-way stop design. The intersection will accommodate expected service vehicles. The intersection design is reflected in the road plan attached in **Appendix B** and vehicle manoeuvring diagrams are attached in **Appendix E**.

The secondary emergency access needs to be confirmed with the fire department.

Response:
Noted.

1.37 – Section 3.0

a) Based on 2016 TTS, information from Ward 2 (the study area), only 5% of trips made by residents in that area are associated with GO Train. As Table 1 includes a zone south of the site (closer to the GO station), it may have resulted in a higher transit usage. This is to be noted, but no further action required.

Response:
Noted.

1.38 – Section 5.0

a) As noted above, it is our opinion that refuse vehicles will not be the largest vehicle to require access to this development. Clarification is required on the size of the proposed homes. If they are typical two-storey single family homes, then it would be expected that a WB-20 moving van would require access. The largest expected vehicle should be tested.

Response:
It is noted that a WB-20.5 moving truck would represent the longest and likely most infrequent moving vehicle that would come to the site. A WB-20.5 generally represents an extended tractor with sleeper cab with a maximum 53 foot trailer. This type of vehicle would typically be associated with long-haul moves whereas the majority of moving vehicles are single unit trucks.

Notwithstanding the conservative nature of the design vehicle requested, a review has been undertaken of the accessibility of the site by WB-20.5 tractor trailer. The accessibility of these vehicles was reviewed and confirmed in the context of whether a vehicle could physically get in and out of the site, including allowance for occasional crossing the centreline and correction manoeuvres. This is considered to be appropriate, given that access to the site by vehicles of this size are expected to be a rare occurrence and the standards for public local roads rely upon a similar approach for accommodating the same design vehicle. Moreover, the turnaround facility pavements are designed in accordance with Town of Whitchurch-Stouffville requirements. Vehicle manoeuvring diagrams are attached in **Appendix E**.

b) The proposed hammerhead and cul-de-sacs are to be designed to Town standards.

Response:
The pavement for the proposed cul-de-sacs have been designed in accordance with the Town of Whitchurch-Stouffville's standard drawing for a residential curbed cul-de-sac (WS-116), however the boulevard width has been maintained at 1.75 metres, consistent with the balance of the subdivision. The previously proposed hammerhead has been removed from the plan and replaced with a cul-de-sac. The proposed road plan is attached in **Appendix B**.

c) The fire route should be depicted on the site plan with the path width, centreline and minimum radii as per the Ontario Building Code.

Response:
The proposed fire route is shown in **Appendix C**, including the path width, centreline and minimum radii as per the Ontario Building Code.

1.39 – Section 6.0

a) Existing traffic data and signal timing plan should be provided in the appendix.

Response:
Existing turning movement counts are attached in **Appendix F** and existing signal timing plans are attached in **Appendix J**.

It is noted that since the submission of the previous report in 2018, updated traffic counts have been undertaken by BA Group (June 26, 2019). The analysis has therefore been updated to incorporate the more recent counts. The updated traffic forecasts are outlined in **Section 7.0**.

b) The growth rate was acceptable but apply the growth to all movements at the Aurora Road/Highway 48 intersection.

Response:
The analysis has been updated to apply the corridor growth rate to all movements at the Aurora Road / Highway 48 intersection. The updated traffic forecasts are outlined in **Section 7.0**.

c) Excerpts illustrating the background development trips from the respective Traffic Studies for each background development should be provided in the appendices.

Response:
Excerpts from the respective traffic studies for each background development are attached in **Appendix G**.

d) Please clarify the location of the proxy trip generation survey as there does not appear to be a Fletcher Boulevard in the southeast quadrant of Aurora/Hwy 48 or in the Town.

Response:
The location of the proxy trip generation survey should be Felcher Boulevard in the southwest quadrant of Aurora Road / Highway 48. The reference to this survey in **Table 3** and **Section 7.6** have been updated accordingly.

e) Provide all the traffic data associated with the trip generation surveys.

Response:
The raw data for the Felcher Boulevard and Lakeshore Road & Treeview Avenue trip generation surveys are attached in **Appendix H**.

f) It appears that the ITE Trip generation rate is incorrect.

Response:
The ITE trip rates have been updated for the current proposal for 142 detached dwelling units, based on the fitted curve equation for Land Use Code 210 (single family detached housing) during the peak hour of adjacent street network, in the ITE Trip Generation Manual 10th Edition. Subsequently, the selected trip rate has been recalculated as the average of the ITE rate and the abovementioned proxy surveys. The revised trip generation rates are shown in **Table 3**.

1.40 – Section 7.0

a) Synchro electronic files should be provided for all analyses, but based on the Synchro reports, we have the following comments:

- **Lost time was applied for all movements at the Highway 48/Aurora Road intersection. Please justify this adjustment;**
- **Queue analyses are required for all conditions and movements including queueing at the proposed gate.**

Response:
The lost time adjustment has been adjusted to 0 seconds, in accordance with the York Region Transportation Mobility Plan Guidelines.

Queue analyses have also been undertaken for the intersections in the study area.

The updated analysis is provided in **Section 8.0** and synchro outputs are attached in **Appendix K**.

Regarding queueing at the proposed entrance, there is no gate proposed and therefore queuing is not expected at this location.

b) As per the Town's TIS Guidelines, the Region's Transportation Mobility Guideline for Development Applications are to be followed. A transit, pedestrian and cyclist performance evaluation for all conditions (existing, background and total) is missing.

Response:
A transit, pedestrian and cyclist performance evaluation is provided in **Section 9.0**.

1.41 – Section 8.0

a) The new connection between Lakeshore Road and Aurora Road is required by the Town's TMP. The analyses in this section of the TIS should be the main scenario.

Response:
As discussed in response to comment 1.6(f) in **Section 2.1** above, it is understood that agreement has been reached with the Town of Whitchurch-Stouffville that an easement will be conveyed to the Town to provide this connection and that the easement will be confined to the pavement for public vehicular passage in emergencies only.

The analysis has been updated, such that the main scenario assumes the abovementioned connection is in place, and is available for public vehicular passage. A second sensitivity analysis scenario has been undertaken which reviews projected traffic operations in the event that the connection through the lands to the north is not constructed by the study horizon year (2027).

The updated analysis is provided in **Section 8.0**.

b) Rather than redistributing the existing traffic, the redistribution should occur under background conditions. Provide a figure illustrating the background traffic redistribution assumptions.

Response:
Updated figures are provided in **Section 7.5.4** which illustrate the projected redistribution of future background traffic volumes.

c) Update all analyses with the above comments.

Response:
The updated analysis is provided in **Section 8.0**.

1.42 – Section 9.0

d) Sidewalks should be provided on both sides of Street A where it has a ROW of 13 m. All other streets should have sidewalk on one side of the street.

Response:
A 1.5m sidewalk will be provided along one side of Street A and Street E (north of Street A), to accommodate pedestrian activity along the central route through the site. All other routes are proposed without sidewalks which is acceptable given the low volume nature of the roads and is in keeping with the character of other residential streets in the Ballantrae area.

2.1.1.3 Fire and Emergency Services Division (dated October 8, 2019)

1.0 – Means of access into the development(s) shall be provided by more than one point.

Response:
The private condominium development plan includes a single point of vehicle access to/from Lakeshore Road into the community. In order to ensure that appropriate emergency vehicle access is maintained, two secondary access points to/from Lakeshore Road will be provided for emergency vehicles only in order to ensure appropriate and safe access opportunities are provided into the site in the event the primary vehicle access is blocked.

The location of the emergency vehicle accesses are currently proposed through dedicated blocks in the plan (Blocks 153 and 154). The dedicated blocks are located at the southwest and southeast corners of the plan and will connect between Lakeshore Road and Streets C and B, respectively.

3.0 – This department does not recommend the use of cul-de-sac's as access is limited. It is recommended to adjust the proposed design or provide a secondary access point. Alternatives can be discussed with this department.

Response:
Cul-de-sacs are currently proposed at the south end of Street B, at the south end of Street E and at the north end of Street C. The proposed cul-de-sacs occur as a result of woodlot and open space (flood plain) constraints to the planning of the lands.

The pavement for the proposed cul-de-sacs have been designed in accordance with the Town of Whitchurch-Stouffville's standard drawing for a residential curbed cul-de-sac (WS-116) and are therefore considered to provide sufficient space for fire vehicle manoeuvring.

It is noted that the Street B cul-de-sac connects to the Block 154 emergency access, providing through access for fire vehicles as required.

In addition, the cul-de-sac section of Street E has a length of approximately 80 metres. This is less than 90 metres, which is specified in the minimum fire route requirements in the Town of Whitchurch-Stouffville Fire Route Application Guideline Document as the limit for a dead end portion of an access route where a turn-around facility is required.

The cul-de-sac section of Street C has a length of approximately 250 metres. This does not meet the 90 metres dead-end limit outlined in the Town of Whitchurch-Stouffville Fire Route Application Guideline Document. However as mentioned above, the Street C cul-de-sac (designed to the Town's standard WS-116) is considered to provide sufficient space for an aerial fire truck. Which is representative of the longest type of fire truck that would likely come to the site. The aerial fire truck manoeuvring diagram provided in **Appendix C** confirms that the representative truck can turn around within the proposed cul-de-sac design and is appropriate.

Overall, the proposed cul-de-sac arrangements are considered to be appropriate.

5.0 – Private roads shall be constructed in conformance with town standards and Ontario Building Code requirements for fire access routes.

Response:
Noted. The fire access route is shown in **Appendix C**.

6.0 – Private roads shall satisfy the requirements of the town's fire route by-law. Application, fee, and process information can be found on the town's website.

Response:
Noted. The fire access route is shown in **Appendix C**.

2.2 REGION OF YORK COMMENTS

2.2.1 Comments dated August 28, 2019

1.0 – The Region supports the Town of Whitchurch-Stouffville's Transportation Master Plan recommendation to provide a new connection (north-south road) from Lakeshore Road to Aurora Road, east of Highway 48. This will require the proposed Draft Plan of Subdivision to be revised to show a continuous north-south road connection from Lakeshore Road to the lands to the north.

Response:
See response to comment 1.6(f) in **Section 2.1.1.1** above.

2.0 – The Transportation Impact Study provided is not consistent with the format and recommendations of the Region's Transportation Mobility Plan Guidelines for Development Applications (November 2016). The Traffic Impact Study shall be revised to include the assessment of transit and active transportation modes for the future total conditions.

Response:
A transit, pedestrian and cyclist performance evaluation is provided in **Section 9.0**.

3.0 – The TDM Plan shall also include a cost for an external venue to effectively deliver the Information Packages and pre-loaded PRESTO Cards to residents. The applicant is responsible for the coordination and for providing a venue for the distribution of PRESTO cards. Each event, approximately four hours of staff time, can serve approximately 100 residential units. The applicant shall coordinate specific event details with York Region/York Region Transit Staff allowing a minimum of two months' notice. All costs borne by York Region shall be indicated by "TBD" and amounts shall be removed. Note the Region does not provide pre-loaded PRESTO cards to developers for distribution as they must be directly distributed to residents.

Response:
Noted. The TDM plan in **Section 10.2** has been updated accordingly.

4.0 – Page 32, text in notes "1. York Region responsible for providing promotional materials to the developer. Nominal allowance of $250 to cover cost of distributing materials provided by the Region that would be provided to 14 homeowners. 2. Presto Cards Funded through TDM Allowances within York Region Development Charges Fund. Amount to be determined. Nominal allowance of $250 to cover mailing costs." shall be removed as the Region will not be held to cost contributions. The Region will determine what the appropriate TDM measures are for this proposed development at a later date.

Response:
Noted. The TDM plan in **Section 10.2** has been updated accordingly.

3.0 PROPOSED DEVELOPMENT

The existing home is to be demolished and the new development would consist of 142 single-family detached homes on private condominium roads. The development will have one access to/from Lakeshore Road with two emergency access blocks (Blocks 153 and 154) that provides secondary access for emergency vehicles at the southwest corner and southeast corner of the site respectively.

Five (5) new private condominium streets (Streets A through E) are proposed to make up the local road network. All of the detached dwelling units are proposed to have frontage onto the new private local streets. There are three (3) turnaround facilities which occur as a result of woodlot and open space (flood plain) constraints to the planning of the lands.

The internal road network will consist of private streets. A variety of types of internal private streets are proposed as follows:

1) a short 23.0m wide right-of-way with a 6.0m pavement on both the inbound and outbound side of a 4.0m wide median (Street A at site entrance)
2) a 15.5m wide right-of-way with a 8.5m pavement (Street A)
3) a 13.5m wide right-of-way with a 8.5m pavement width (Streets A and E); and
4) a 11.0m wide right-of-way with a 7.5m pavement width (Streets B, C, D and E).

In response to the potential north-south road link through the site as identified in the recent Whitchurch Stouffville TMP, it has been agreed with the Town of Whitchurch-Stouffville that an easement will be conveyed to the Town over Street A (its entire length) and Street E (the section with a 13.5m right-of-way). The provision of Block 155 at the north property limit allows for the future Town completion of the link through other lands. The easement will be confined to the pavement for public vehicular passage in emergencies only.

A copy of the proposed internal street cross sections is provided in **Appendix A**. A road plan is provided in **Appendix B** and a fire route plan is provided in **Appendix C**.

An all-way stop intersection is proposed in the centre of the site. All other intersections are expected to operate under two-way stop control with the stop control associated with the side street approach.

The development plan also includes a north-south walking trail through the site. The proposed trail will run from Aurora Road in the north, through an adjacent land parcel and connect to a north-south walkway within the site that continues south to Lakeshore Road. Within the site the trail / walkway will be adjacent to the existing woodlot / drainage course.

4.0 TRANSPORTATION NETWORK

4.1 EXISTING TRANSPORTATION SYSTEM

4.1.1 Existing Area Road Network

The existing road network, lane configurations, signal controls and intersection turning restrictions in the site's environs are shown in **Figure 2**. A brief description of the area road network is included in the following section.

Highway 48 is a north - south oriented major arterial road located west of the site which provides a major link from Markham to Highway 12 in Township of Brock. In the site vicinity, Highway 48 has a 2-lane cross section (per direction), with dedicated left-turn lanes and a southbound right-turn lane at Highway 48 and Aurora Road intersection. Highway 48 has a posted speed limit of 60 kilometre per hour within the site's environs and increases to 80 kilometre per hour approximately 220 m north of Highway 48 / Aurora Road intersection. There are no sidewalks along Highway 48 in the vicinity of the site.

Aurora Road, also named as York Regional Road 15, runs east / west, being situated approximately 200 metres to the north of the site. It changes into Wellington Street once it passes west of Highway 404 in Aurora, and connects Whitchurch – Stouffville with Aurora and King City. In the site vicinity, Aurora Road has a 2-lane cross section, with dedicated left-turn lanes at Highway 48 / Aurora Road intersection and at McMullen Drive. The posted speed limit through the village of Ballantrae is 60 kilometre per hour. In the vicinity of the site, there are sidewalks along parts of Aurora Road on the north side.

Lakeshore Road is a local road that runs along the southern site boundary. It extends from Highway 48 to Ninth Line and passes through the community of Musselman's Lake with connection to Aurora Road to the north and Bloomington Road to the south, via the Ninth Line. Lakeshore Road operates generally in the east-west direction with a 40 kilometre per hour speed limit and a 2-lane rural cross section. There are no sidewalks along Lakeshore Road in the vicinity of the site.

4.1.2 Existing Transit Network

The site is not located in proximity to any transit services. The closest transit service is the Lincolnville GO Station located 6 kilometres southeast of the site on the intersection of Tenth Line and Bethesda Side Road. The Lincolnville GO Station is an approximate 10 minute drive from the site, and provides parking for commuters. The station provides services to the rest of the Greater Toronto Area with the Stouffville Line GO Train, 70 Stouffville Train Meet Bus Service and 71 Stouffville Train-Bus Service.

The Wellington Street East at Highway 404 Park and Ride GO Bus Station is situated approximately 9 km to the west (approximate 10 minute drive from the site) providing access to GO Bus services to downtown Toronto, and York Region Transit bus services.

Additional York Region Transit bus services are also available from the Highway 48 / Stouffville Road intersection in Whitchurch-Stouffville, approximately 7.5 kilometres south of the site (approximate 10 minute drive).

4.1.3 Existing Active Transportation Infrastructure

Currently, there is a narrow paved shoulder along Aurora Road for cycling and pedestrian use in the vicinity of Ballantrae, as identified in the Whitchurch-Stouffville TMP. This route extends east along Aurora Road to York-Durham Line, and extends west to Highway 404 to become a separated sidewalk. A separated sidewalk exists along the north side of parts of Aurora Road, including adjacent the public school to the east of Highway 48 and in the vicinity of Grayfield Drive on the western edge of the community.

4.2 FUTURE TRANSPORTATION SYSTEM

4.2.1 Future Area Road Network

On May 15th 2018 the Town of Whitchurch-Stouffville Council approved a new Transportation Master Plan (TMP). The TMP was prepared by HDR Inc. and is dated February 2017.

The TMP recommends a new north-south public road connecting between Lakeshore Road and Aurora Road that would bisect the proposed development site. The rationale for the new road connection in the TMP is to provide an alternative connection to the external arterial road network (i.e. Aurora Road) for traffic on Lakeshore Road and, in doing so, relieve anticipated delays for traffic experienced by the westbound left turn on Lakeshore Road at Highway 48. In this regard, the unsignalized capacity analysis in the TMP estimated by 2031, without the road link, the westbound left turn delays will be 44 seconds and 27 seconds during the weekday morning and weekday afternoon peak hours, respectively.

Relevant excerpts from the TMP is attached in **Appendix D**, along with a letter prepared by BA Group, dated December 6th 2017 providing input to the Town in response to the draft TMP. The TMP is required to be implemented by an amendment to the Town Official Plan.

The December 6, 2017 BA Group letter reviewed the benefits of the potential proposed north-south road link in the TMP from a traffic capacity perspective. In that submission BA Group concluded that the proposed TMP road link was not required from a traffic capacity perspective and would deliver minimal benefit to the area road network.

It understood that it has been agreed with the Town of Whitchurch-Stouffville that an easement will be conveyed to the Town over Street A (its entire length) and Street E (the section with a 13.5m right-of-way). The provision of Block 155 at the north property limit allows for the future Town completion of the link through other lands. The easement will be confined to the pavement for public vehicular passage in emergencies only. A figure illustrating the proposed easement link is provided in **Figure 3**.

4.2.2 Future Transit Network

As outlined in the Whitchurch-Stouffville TMP, rural transit links are proposed along Highway 48 between Stouffville and Ballantrae, along Highway 48 between Ballantrae and Mount Albert to the north, and along Aurora Road between Ballantrae and Highway 404.

4.2.3 Future Cycling and Pedestrian Facilities and Infrastructure

As part of the Whitchurch-Stouffville Transportation Master Plan, new cycling facilities are planned. Aurora Road is designated to be a part of a region-wide Greenbelt cycling route. In-boulevard cycling facility is proposed for the section of Highway 48 in the vicinity of the site and Lakeshore Road will be designated as shared route.

The TMP identifies existing or proposed active transportation routes, which will provide cyclist access to the other parts of Ballantrae, Stouffville GO Station and the town centres of Newmarket, Aurora, and Stouffville.

The proposed development includes a new trail through the site that will connect from Lake Shore Road to Aurora Road. The proposed walking trail will generally run alongside the drainage course within the site. Two additional east-west trail connections will also be provided linking the residential areas in the northwest and northeast areas of the plan to the proposed main north-south trail. The proposed trail in the community master plan is illustrated in **Figure 4.**

4.3 EXISTING AREA TRAVEL CHARACTERISTICS

BA Group has reviewed the travel mode choice characteristics of residents within the local area based upon data from the 2016 Transportation Tomorrow Survey (TTS). The corresponding mode split for the area is shown below in **Table 1**.

TABLE 1 EXISTING AREA TRAVEL MODE SPLIT

Travel Mode	Morning Outbound	Afternoon Inbound
Auto Driver	73%	80%
Auto Passenger[2]	12%	12%
Transit[3]	14%	7%
Walk	1%	1%
Cycle	0%	0%
Total	**100%**	**100%**

Notes:
1. Reflects all trips made to/from residential land uses within 2006 TTS Zones 2716 and 2717 during the weekday morning and afternoon peak hour periods.
2. Includes auto passenger and taxi passenger.
3. Includes solely GO transit only, joint GO transit and local transit, and school bus.

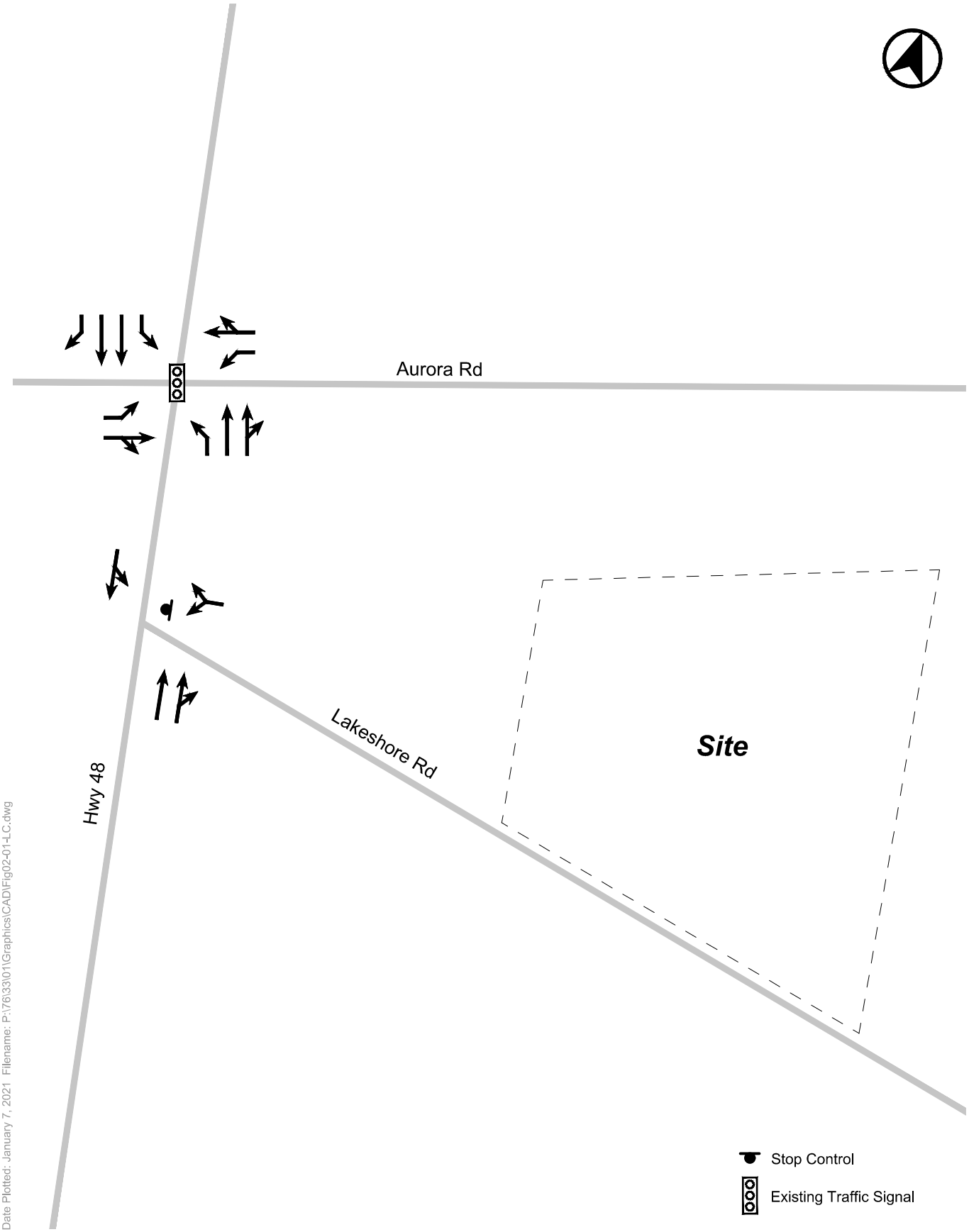

FIGURE 2 EXISTING LANE CONFIGURATION AND TRAFFIC CONTROL

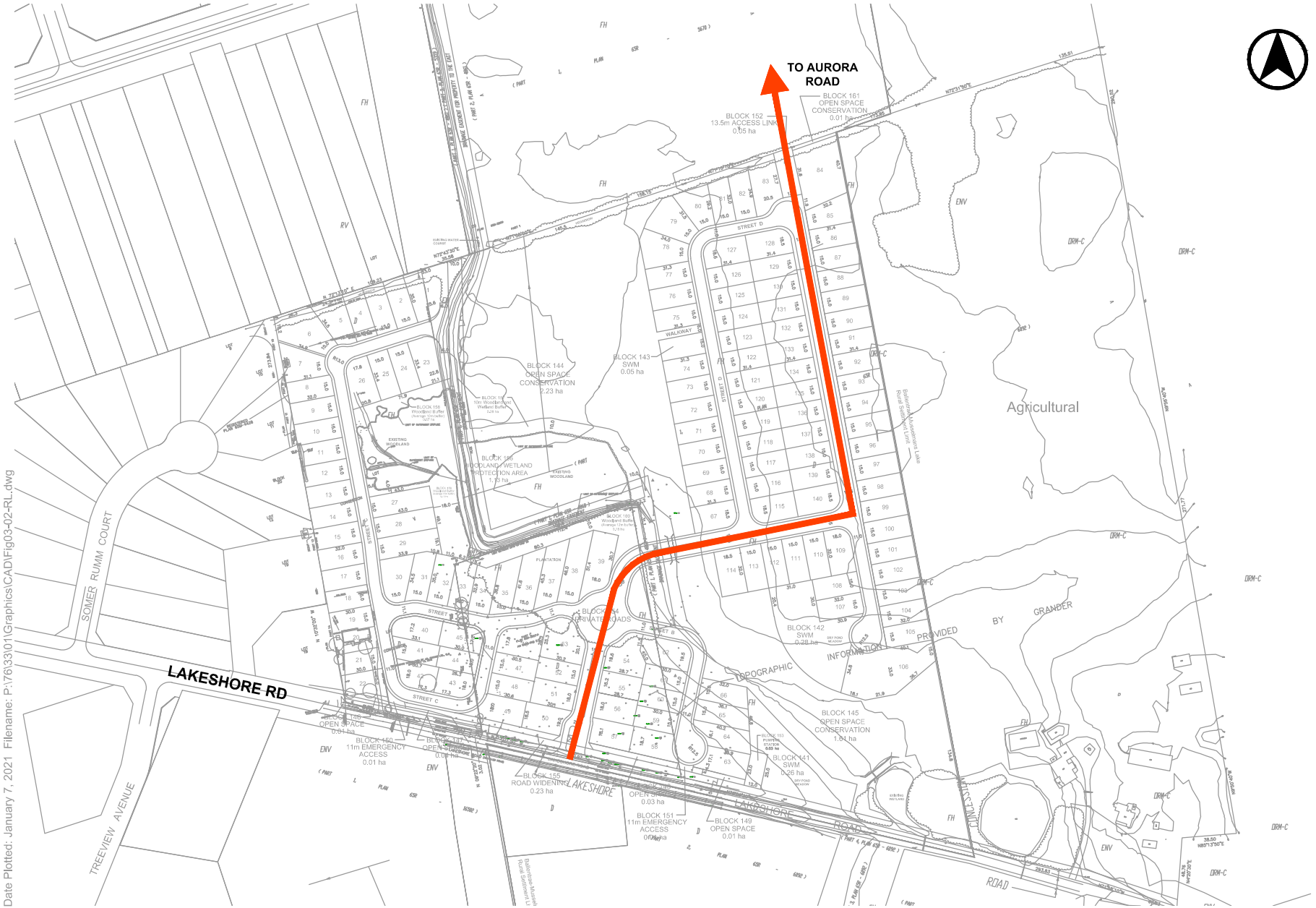

FIGURE 3 PROPOSED EASEMENT LINK

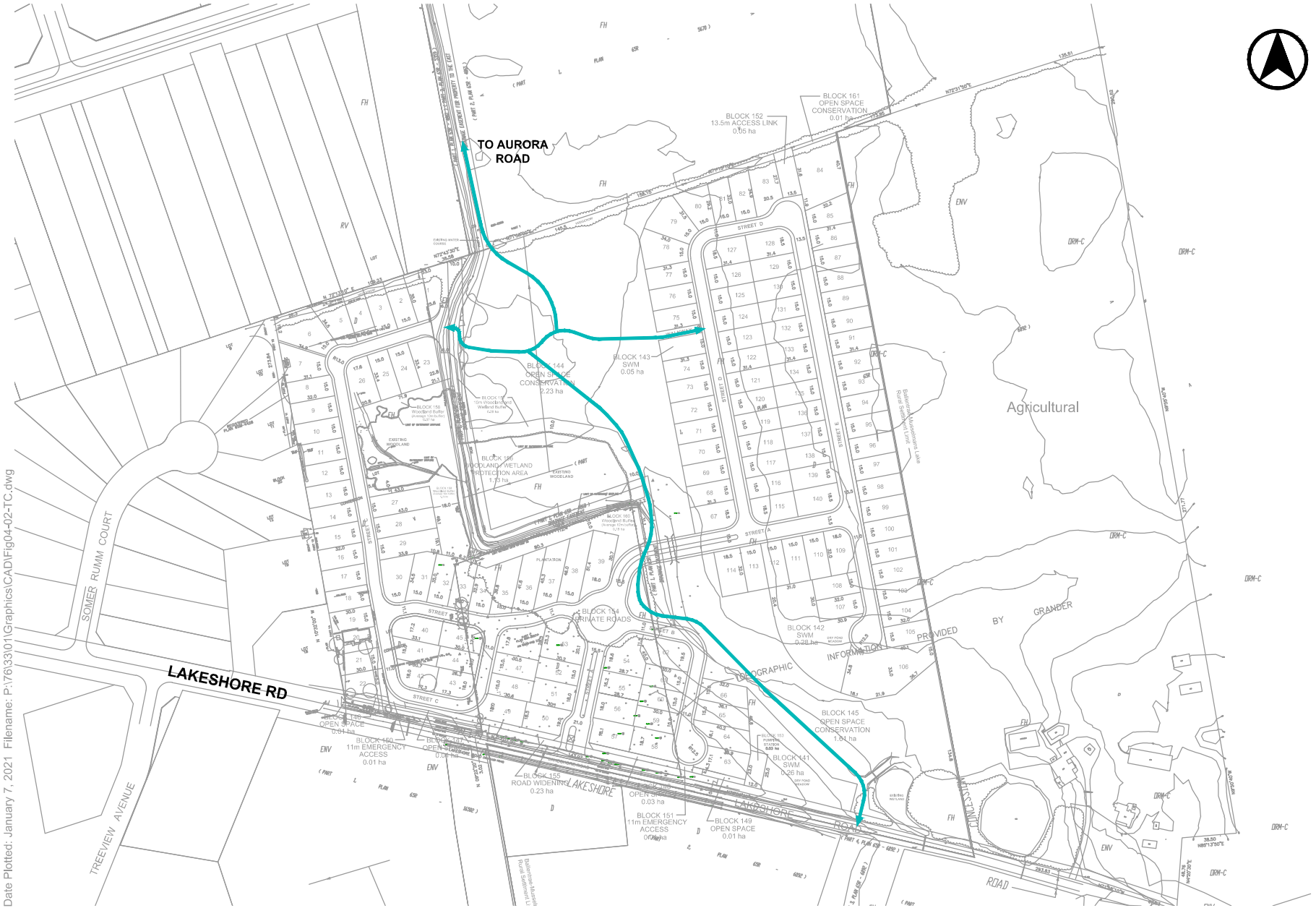

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FIGURE 4 PROPOSED TRAIL INFRASTRUCTURE WITHIN COMMUNITY MASTER PLAN

5.0 VEHICLE PARKING CONSIDERATIONS

5.1 ZONING BY-LAW REQUIREMENT

The Town of Whitchurch-Stouffville currently has Zoning By-Law 2010-001-ZO in effect. According to the parking regulations outlined in the by-law, a total of two (2) off-street parking spaces are required per residential dwelling unit. As a result of this regulation, 284 overall parking spaces are required for the residential uses of the development.

5.2 PROPOSED PARKING SUPPLY

Vehicle parking is proposed within the driveway and garage of each lot with each unit having a two car driveway and a two car garage. Based on the 142 proposed single family detached dwellings, the resulting parking supply for the development is 568 spaces which is sufficient to accommodate the Zoning By-law requirements.

6.0 LOADING CONSIDERATIONS

6.1 ZONING BY-LAW REQUIREMENT

The Town of Whitchurch Stouffville Zoning By-law does not require loading for the proposed detached residential units.

6.2 MANOEUVRING ANALYSIS

An AutoTrack swept path analysis was undertaken to test vehicular swept paths of a waste collection and snow plow vehicle to ensure that they can acceptably negotiate the proposed road geometry. The swept path analysis was undertaken using the assumed pavement widths as outlined in the two internal street cross sections proposed.

The swept path analysis utilized design vehicles comparable to a City of Aurora refuse vehicle measuring 12.0 metres in length and 2.5 metres in width and a representative snow plow measuring 11.4 metres long and 3.5 metres wide.

It is anticipated that waste pickup will occur utilizing a rear or side-loading vehicle. As with typical residential collection procedures, it is anticipated that the vehicle will travel along the internal streets and briefly stop along the driveway of each home, and waste/recycling/organic bins from each household will be emptied into the truck compactor. The proposed street network has been tested accordingly, and designed to ensure an appropriate turnaround facility is available at the terminus of each street.

In response to a comment received from the Town of Whitchurch-Stouffville, a review has been undertaken with respect to a WB-20.5 tractor trailer accessing the site. This review was undertaken in response to comments received on the application. The ability for a WB-20.5 to negotiate the internal street geometry was reviewed in the context of whether a vehicle could physically get in and out of the site, including allowance for occasional crossing the centreline and correction manoeuvres within internal routes. This is considered to be appropriate, given that access to the site by vehicles of this size are expected to be a rare occurrence associated with the longest type of moving truck (i.e. a cross country highway tractor trailer), and recognizing that internal streets are designed in accordance with fire route requirements and that turnaround facilities are designed in accordance with Town of Whitchurch-Stouffville requirements which accommodate WB-20.5 trucks in the same manner.

Based on the analysis the proposed road geometry will acceptably accommodate the swept paths of the anticipated vehicles. A copy of the swept path analysis is provided in **Appendix E.**

7.0 VEHICLE TRAFFIC FORECASTS

7.1 STUDY AREA

The following intersections are considered in the traffic analyses undertaken as part of this study:

- Highway 48 and Aurora Road
- Highway 48 and Lakeshore Road
- Lakeshore Road and Site access

Traffic operations analyses have been undertaken for weekday morning and afternoon peak hour periods, which reflect the busiest periods of traffic activity on the area road network.

7.2 HORIZON YEAR

It is estimated that it will take approximately 2 years to build-out the development corresponding to a build-out year of 2022. A five (5) year post-build-out horizon of 2027 has been considered for the purposes of the traffic / transportation analysis undertaken herein.

Background developments have been assumed to be built by this horizon year (2027).

7.3 ANALYSIS SCENARIOS

Traffic operations have been undertaken for the following three main baseline analysis conditions:

1. ***Existing traffic conditions:*** Considering the prevailing levels of activity on the area street network and existing street configuration.
2. ***Future background traffic conditions:*** Considering existing levels of activity in addition to anticipated changes due to the construction and occupancy of other development proposals in the area.
3. ***Future total traffic conditions (with north-south link):*** Considering future background levels of activity and any activity changes relating to development of the site. This analysis assumes the completion of the north-south link through the lands to the north and for the purpose of analysis, assumes it is available for public vehicular access, albeit is noted that the easement through the site is for public vehicular access in emergencies only.
4. ***Future total traffic conditions – Sensitivity Analysis (without north-south link):*** Considering future background levels of activity and any activity changes relating to development of the site. This is a sensitivity analysis in the event that the north-south link through the lands to the north is not completed by the study horizon year (2027).

7.4 EXISTING TRAFFIC VOLUMES

Base existing traffic volumes were established for the weekday morning and afternoon street peak hours for intersections within the study area, based on traffic count information collected by, Spectrum Traffic Data Inc., on behalf of BA Group on Wednesday, June 26, 2019. The existing turning movement counts are attached in **Appendix F.**

The existing traffic count information was reviewed in detail to ensure a general consistency between intersections. Conservative (positive) adjustments were made to the through movement volumes at various intersections within the study area to provide a balanced and representative traffic volume base for the purposes of the traffic operations analyses undertaken as part of this assessment.

Resultant existing traffic volumes during the morning and afternoon peak hours on the area street system surrounding the proposed development site are illustrated in **Figure 5.**

7.5 FUTURE BACKGROUND TRAFFIC VOLUMES

7.5.1 Corridor Traffic Growth

According to the Whitchurch-Stouffville Transportation Master Plan done by HDR Inc., the annual growth rate along arterial rates across the Town of Whitchurch-Stouffville is, on average, 2%. Therefore, a conservative 2% growth factor was applied to estimate future traffic growth on Aurora Road.

The assumed growth rate was applied to the 7 years time horizon to the 2027 horizon year to obtain future background traffic volumes.

The corridor growth traffic volumes are presented in **Figure 6**.

7.5.2 Site Specific Background Development

A review of development proposals in the area that are approved but not yet built or are in the process of approval with the Town of Whitchurch-Stouffville was undertaken. Currently, four background development proposals were considered based upon discussions with the Town of Whitchurch-Stouffville Development Services staff and review of the Town of Whitchurch-Stouffville Residential Activity Map. The respective sources of related traffic assignment incorporated in this study is shown in **Table 2.** The resultant sum of the site specific background traffic allowances are set out in **Figure 7**. Background development traffic volume excerpts from each development are attached in **Appendix G**.

TABLE 2 SITE SPECIFIC BACKGROUND DEVELOPMENTS

Development Address	Scope	Study	Status
5194, 5208, 5222, 5232 Aurora Road & 115288 Highway 48	54 townhouse units	GHD Group July 2015	Proposed Draft Plan
Northeast of Aurora Road / Highway 48	88 single detached units	Dionne Bacchus & Associates February 15, 2017	Proposed Draft Plan
Northeast corner of Aurora Road / Highway 48	Office: 9,924 square ft. GFA General shopping or retail: 28,105 square ft. GFA	Poulos & Chung Ltd. November 2015	Proposed Draft Plan
14745 Highway 48	39 single detached units 60 townhouse units	BA Group October 15, 2020	Proposed Draft Plan

7.5.3 Future Background Traffic Volumes

Future Background Traffic volumes have been established for the morning and afternoon peak hour periods by adding Existing Traffic volumes with corridor traffic growth allowances and the site specific background allowances. Resultant Future Background traffic volumes are presented in **Figure 8**.

7.5.4 Future Background Traffic Volumes with North-South Link

As discussed in **Section 7.3**, the third analysis scenario (Future total traffic conditions (with north-south link)) assumes the completion of the north-south link through the lands to the north and for the purpose of analysis, assumes it is available for public vehicular access, albeit is noted that the easement through the site is for public vehicular access in emergencies only. On this basis, future background traffic has been redistributed on the basis that the north-south link is fully completed and available for public access.

The redistributions are shown in **Figure 9** and the resultant Future Background traffic volumes (with north-south link) are shown in **Figure 10**. It is noted that because of its reliance on the construction of the Site, future background with the north-south link in place is not an analysis scenario in its own right. However it has been utilized to form part of the projected traffic volumes for the Future total traffic conditions (with north-south link) scenario.

7.6 SITE TRAFFIC TRIP GENERATION

Site development traffic was estimated through a review of trip generation characteristics of existing neighbourhoods in Ballantrae, and through a comparison to trip rates from the Institute of Transportation Engineers Trip Generation Manual.

Trip generation characteristics from the area were obtained from automatic traffic recording (ATR) counts that were set up to record traffic entering/exiting existing homes located on Felcher Boulevard in the southwest quadrant of Aurora Road / Highway 48 on March 21, 2018. Two counts were conducted: one immediately south of the intersection of Felcher Boulevard / Aurora Road, and immediately west of the intersection of Felcher Boulevard / Highway 48. The residential units located along Felcher Boulevard between these two locations were counted to complete the trip generation for the area. Trip rates were also obtained from a previous transportation review on a development in a nearby site in Ballantrae at Lakeshore Road and Treeview Avenue. Trip generation proxy survey data is attached in **Appendix H.**

Trip rates from the ITE Trip Generation Manual were also consulted. The estimated site trip generation is summarized in **Table 3**.

TABLE 3 RESIDENTIAL TRIP GENERATION RATES

Subject Site (14 units)	AM Peak Hour			PM Peak Hour		
	In	Out	2-Way	In	Out	2-Way
Felcher Blvd Trip Generation Survey[1]	0.17	0.44	0.61	0.43	0.27	0.69
Lakeshore Rd. & Treeview Ave. Trip Generation Survey[2]	0.31	0.56	0.88	0.56	0.38	0.94
ITE Land Use Code 210 Trip Rates (Single-Family Detached Housing) [3]	0.19	0.55	0.74	0.63	0.37	1.00
Selected Rate	**0.22**	**0.52**	**0.74**	**0.54**	**0.34**	**0.88**
Number of Trips *(142 proposed lots)*	**30**	**75**	**105**	**75**	**50**	**125**

Notes:
1. Based upon a BA Group survey from March 21, 2018 of 108 houses on Felcher Blvd and Aurora Road, and Felcher Blvd and Highway 48.
2. Survey completed on May 24, 2012.
3. Rates calculated by fitted curve equation. Based on ITE Trip Generation Manual 10th Edition rates.
4. Volumes rounded to the nearest 5.

Based upon a review of the comparable residential building trip generation rates, the following trip rates were adopted for this study:

1. 0.74 weekday morning peak hour two-way trips per unit (0.22 in, 0.52 out)
2. 0.88 weekday afternoon peak hour two-way trips per unit (0.54 in, 0.34 out)

The proposed development is expected to generate in the order of 105 two-way trips during the morning and 125 two-way trips in the afternoon peak hours.

7.7 TRIP DISTRIBUTION AND ASSIGNMENT

Residential site traffic has been assigned onto the area road network based upon a review of travel information provided by the 2016 TTS. The TTS data provides information on origin and destination patterns of trips within Central Ontario and is broken down into geographical zones. Trips destined to/from zones in the subject site area (2006 TTS Zones 2717 and 2718) were analyzed to determine the trip distribution pattern for the proposed developments. Detailed output TTS data and distribution assumptions are included in **Appendix I.**

The distribution of inbound and outbound traffic for the proposed development is presented in **Table 4**.

TABLE 4 SITE TRAFFIC DISTRIBUTION

Directional Orientation	Morning / Afternoon Peak Hour	
	Inbound	Outbound
To / From the north – Highway 48	15%	5%
To / From the south – Highway 48	40%	55%
To / From the east – Aurora road	5%	5%
To / From the west – Aurora road	40%	35%

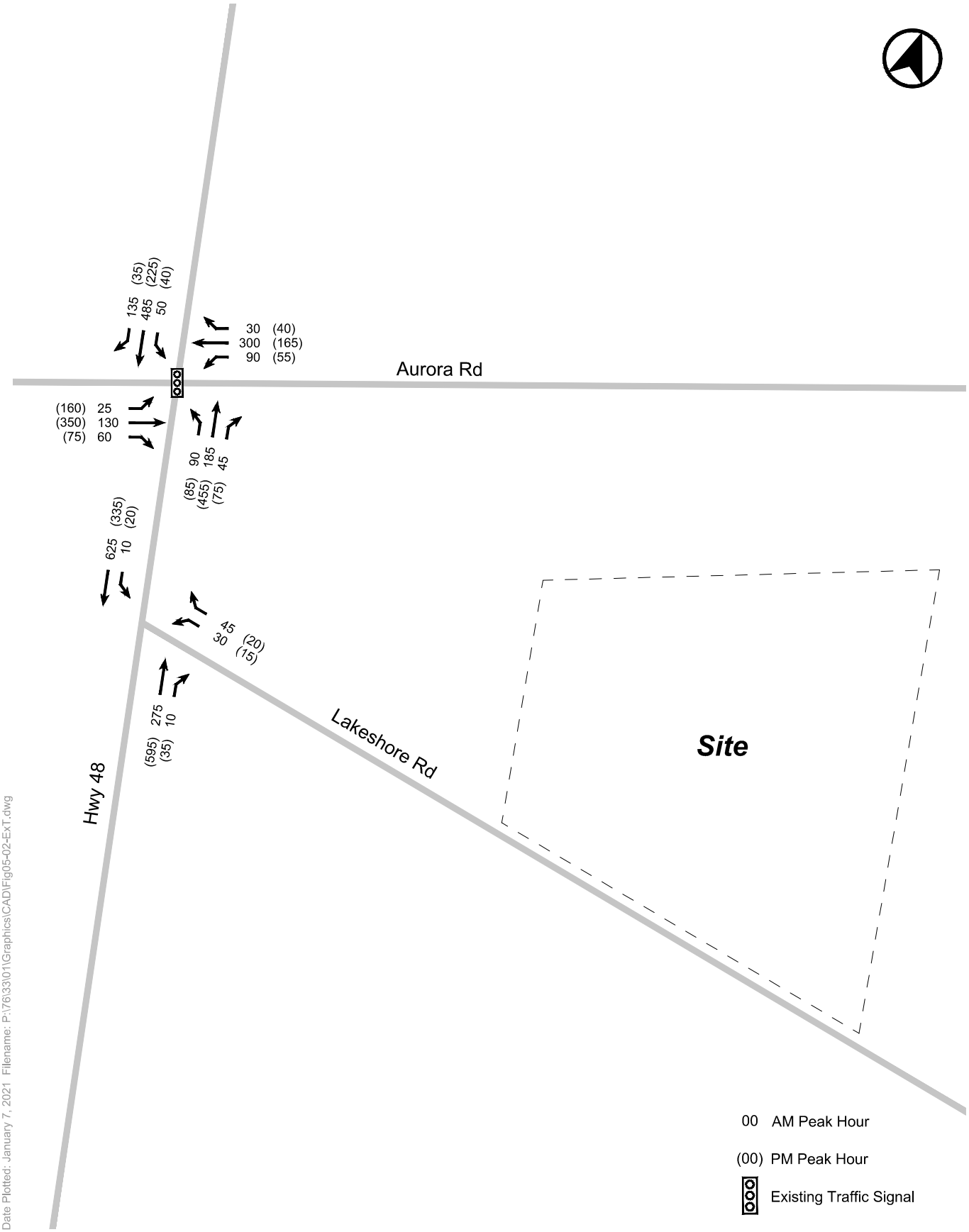
Notes:
1. Based upon morning peak period residential outbound trips.
2. Based upon afternoon peak period residential inbound trips.
3. TTS zones 2717 and 2718.

New traffic generated by the proposed development was assigned onto the area road network based on the directional distribution outlined in **Table 4**; with consideration given to local and collector street routing opportunities in the area as well as the existing / projected delays associated with specific turning movements.

Site traffic volumes for weekday morning and afternoon street peak hours are illustrated in **-Figure 11** with the north-south link and in **Figure 12** for the sensitivity analysis without the north-south link.

7.8 FUTURE TOTAL TRAFFIC VOLUMES

Future total traffic was developed by adding the Site traffic to future background traffic. Future total traffic volumes for weekday morning and afternoon street peak hours are illustrated in **Figure 13** with the north-south link and in **Figure 14** for the sensitivity analysis without the north-south link.



Date Plotted: January 7, 2021 Filename: P:\76\33\01\Graphics\CAD\Fig05-02-ExT.dwg

FIGURE 5 EXISTING TRAFFIC VOLUMES

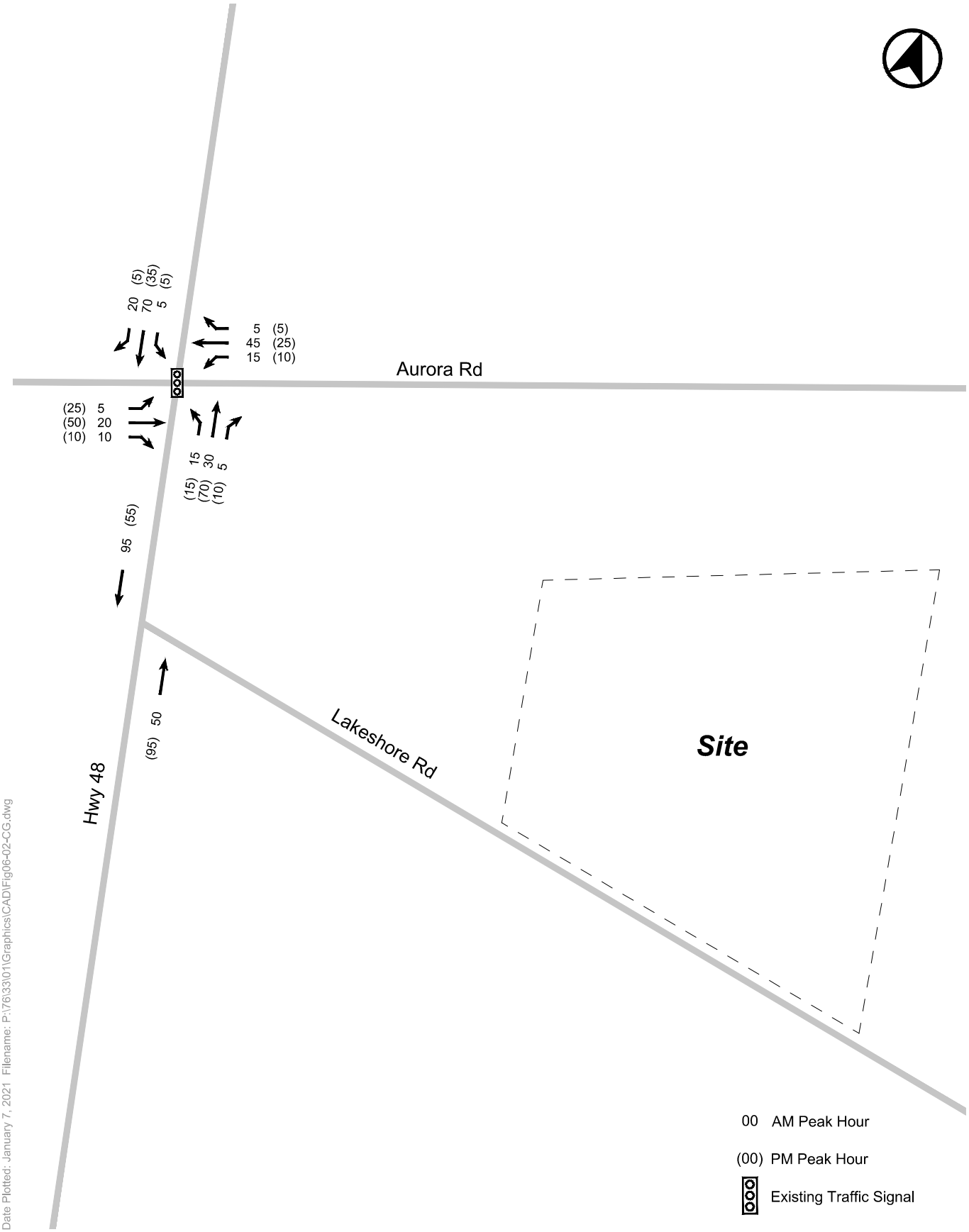


FIGURE 6 CORRIDOR GROWTH TRAFFIC FORECAST

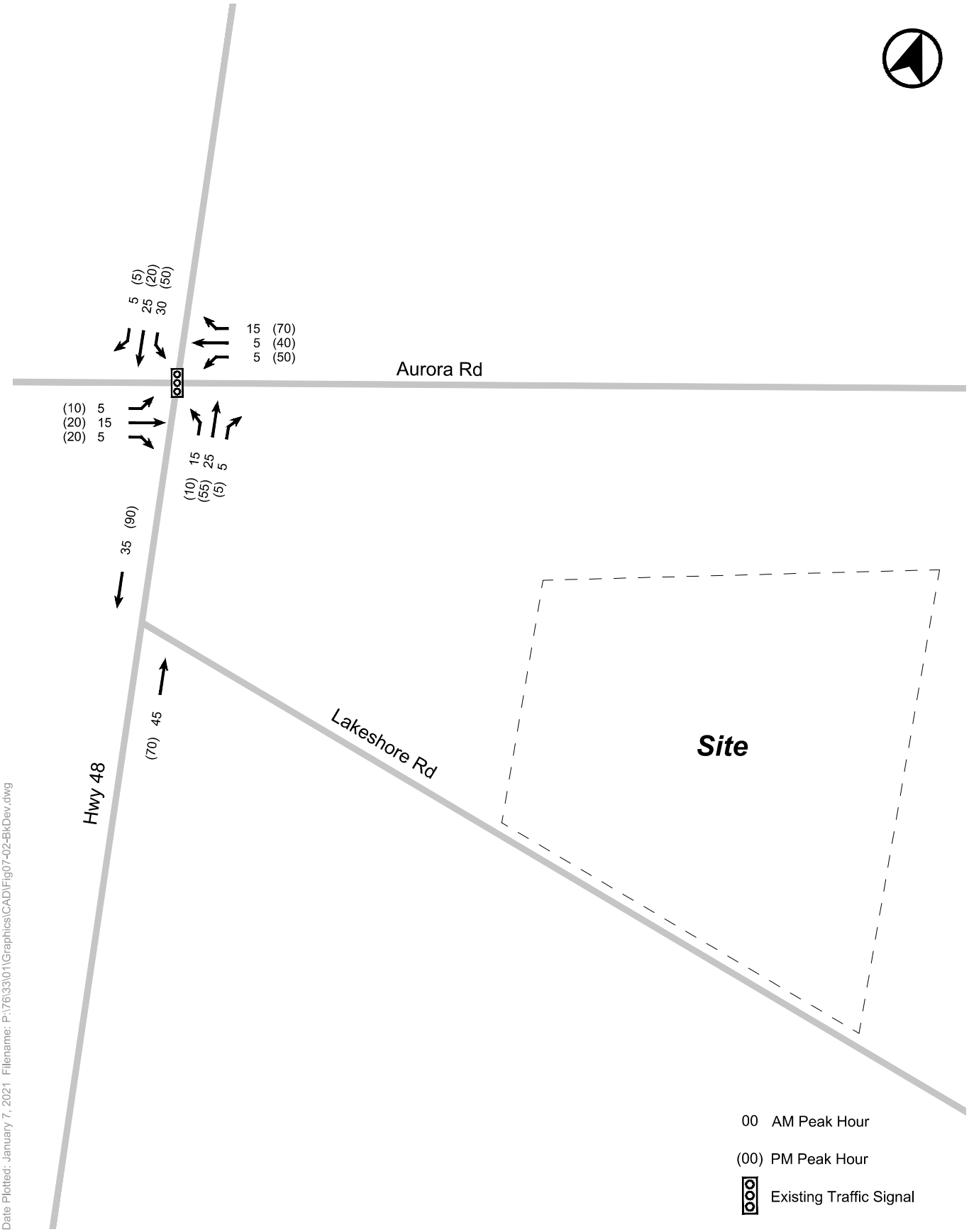


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FIGURE 7 SITE SPECIFIC BACKGROUND GROWTH

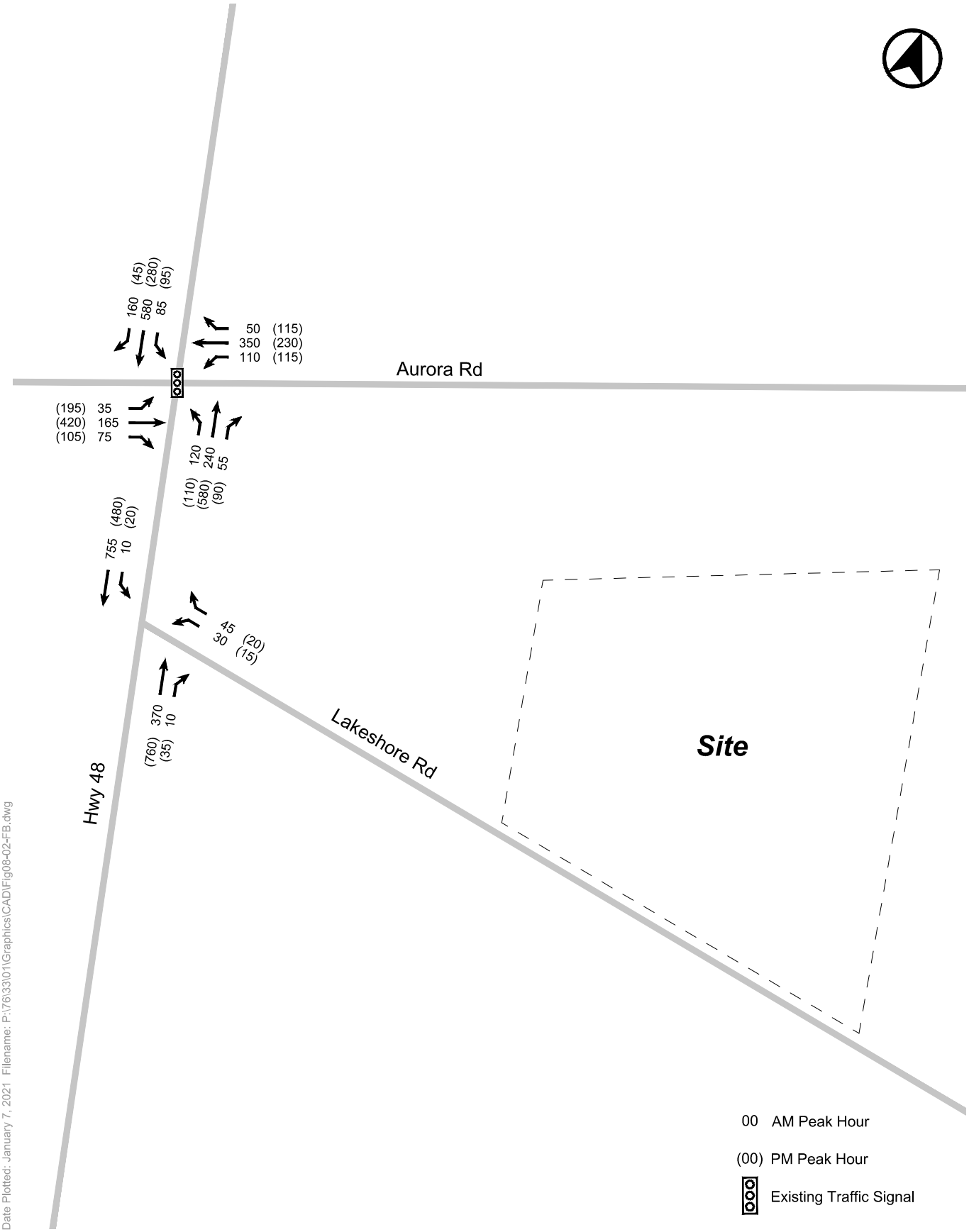


FIGURE 8 FUTURE BACKGROUND TRAFFIC VOLUMES

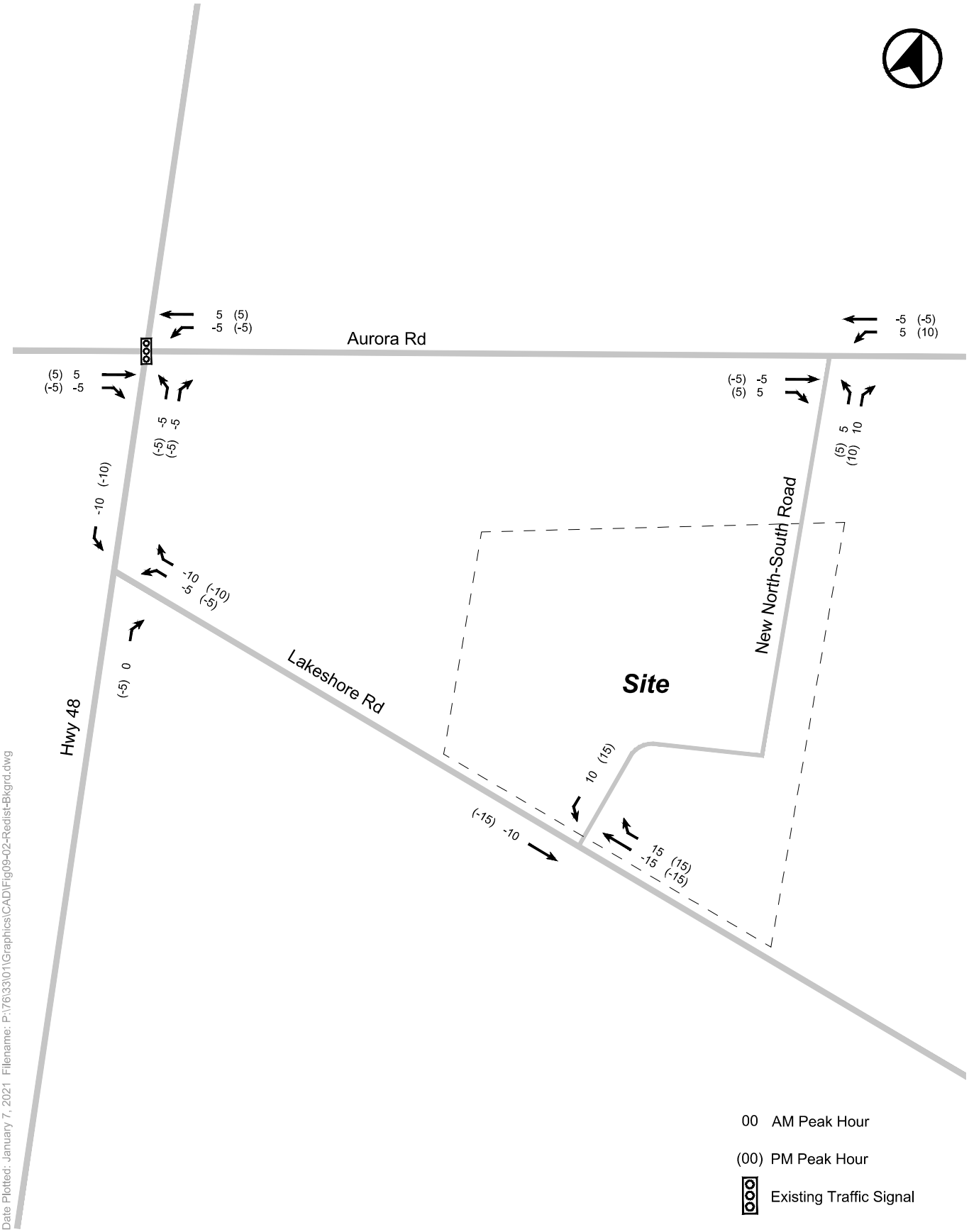


FIGURE 9 REDISTRIBUTION OF FUTURE BACKGROUND TRAFFIC - WITH NORTH-SOUTH LINK

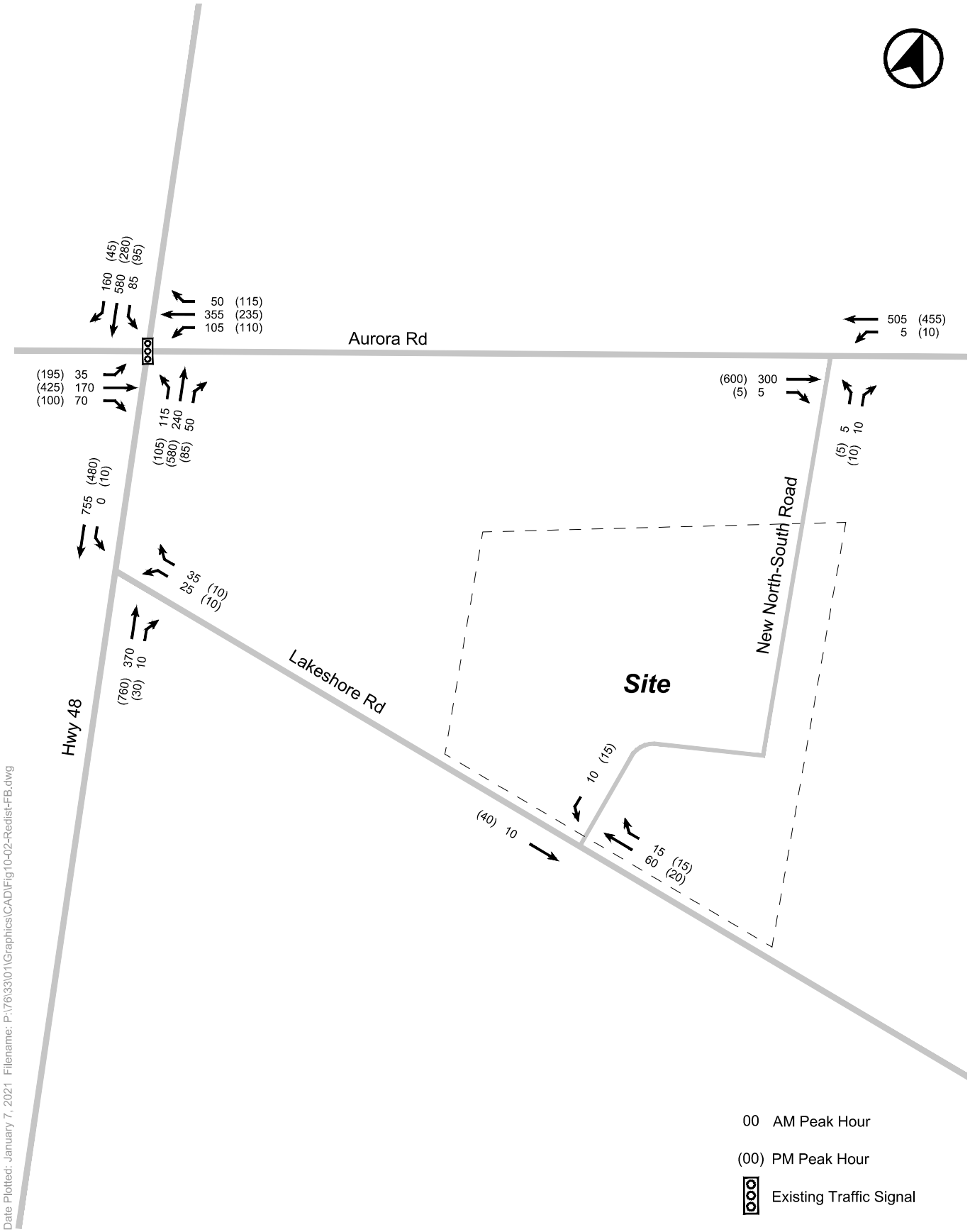
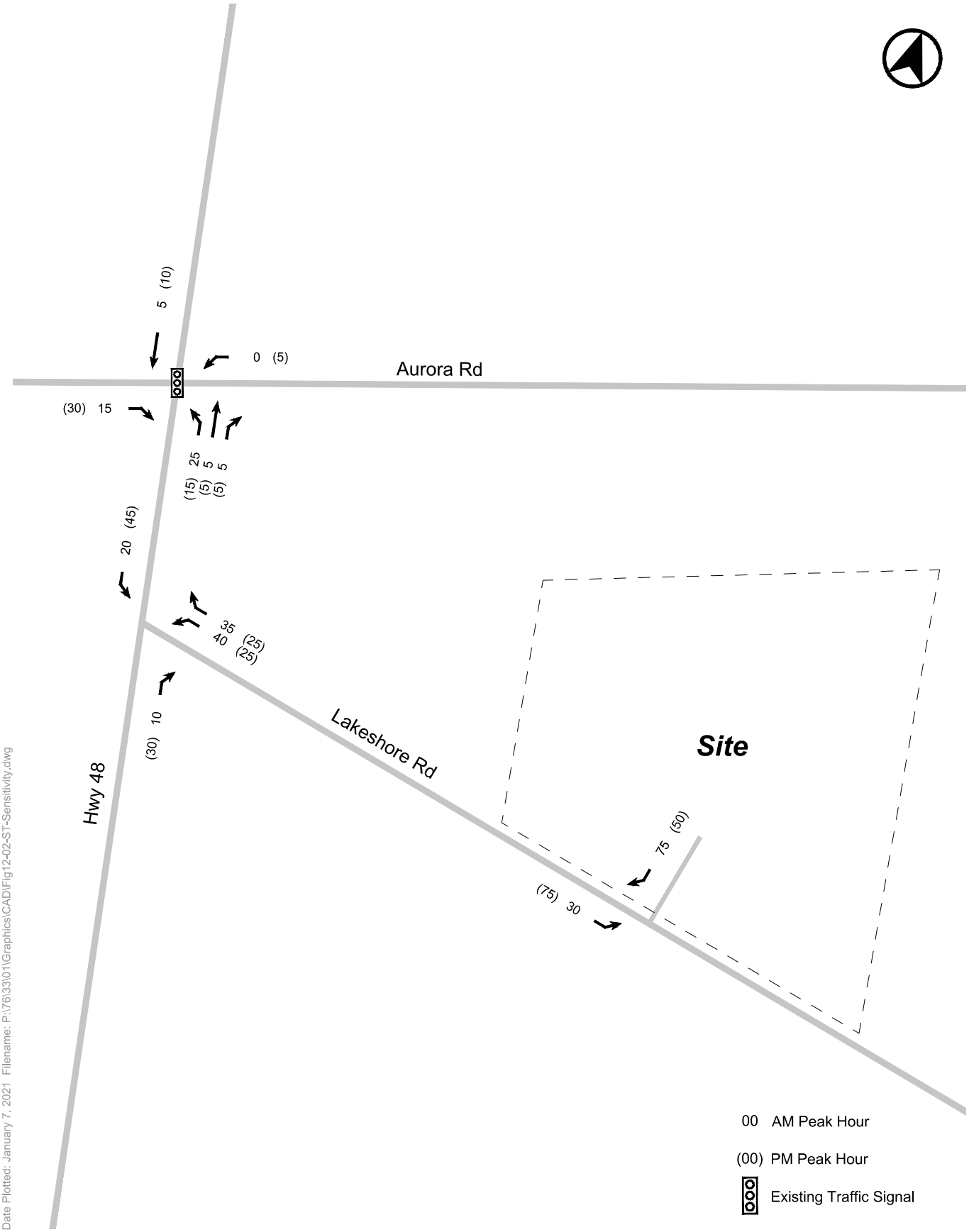


FIGURE 10 FUTURE BACKGROUND TRAFFIC VOLUMES - WITH NORTH-SOUTH LINK

FIGURE 11 SITE TRAFFIC VOLUMES - WITH NORTH-SOUTH LINK



Date Plotted: January 7, 2021 Filename: P:\76\33\01\Graphics\CAD\Fig12-02-ST-Sensitivity.dwg

FIGURE 12 SITE TRAFFIC VOLUMES - SENSITIVITY ANALYSIS - WITHOUT NORTH-SOUTH LINK

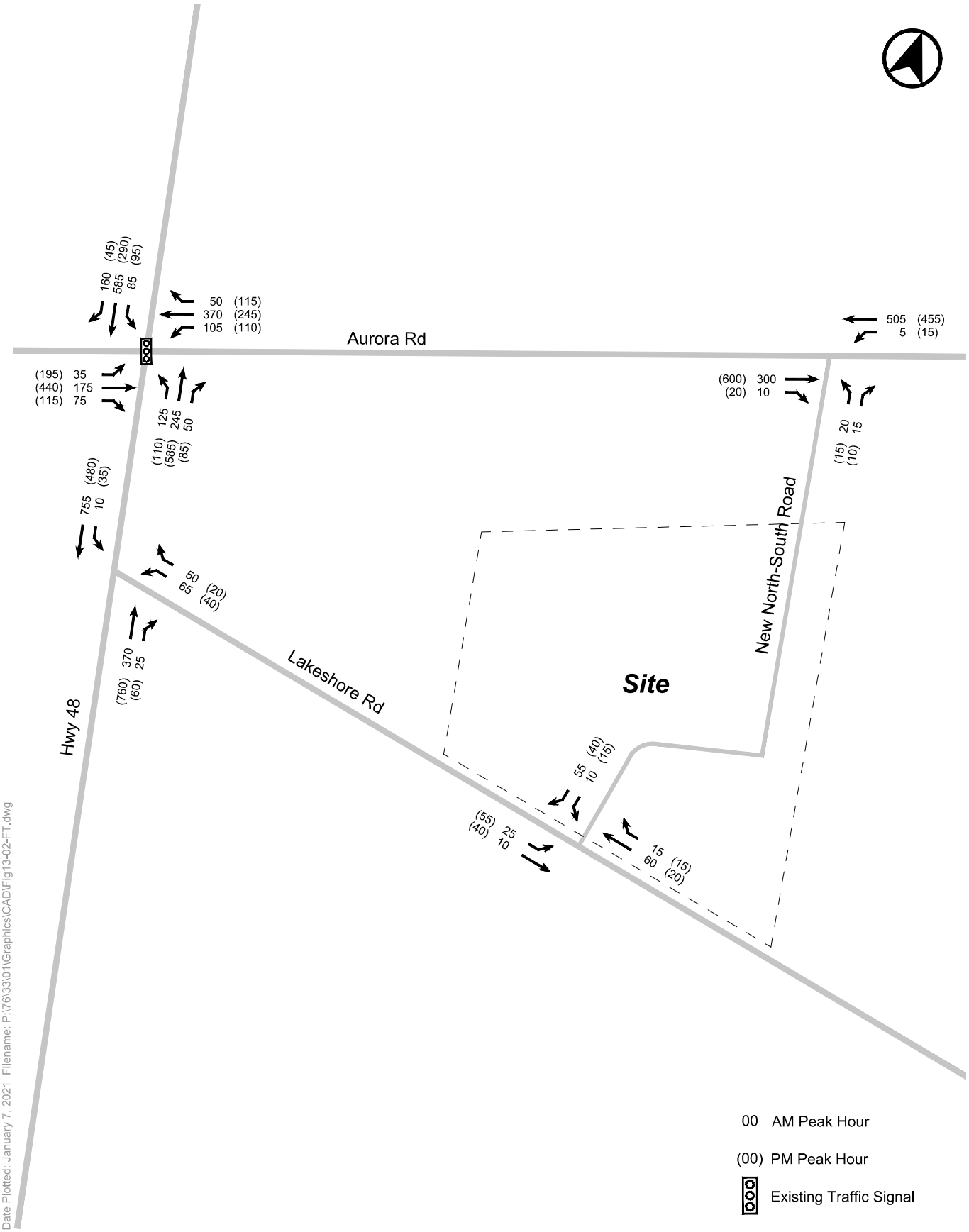


FIGURE 13 FUTURE TOTAL TRAFFIC VOLUMES - WITH NORTH-SOUTH LINK

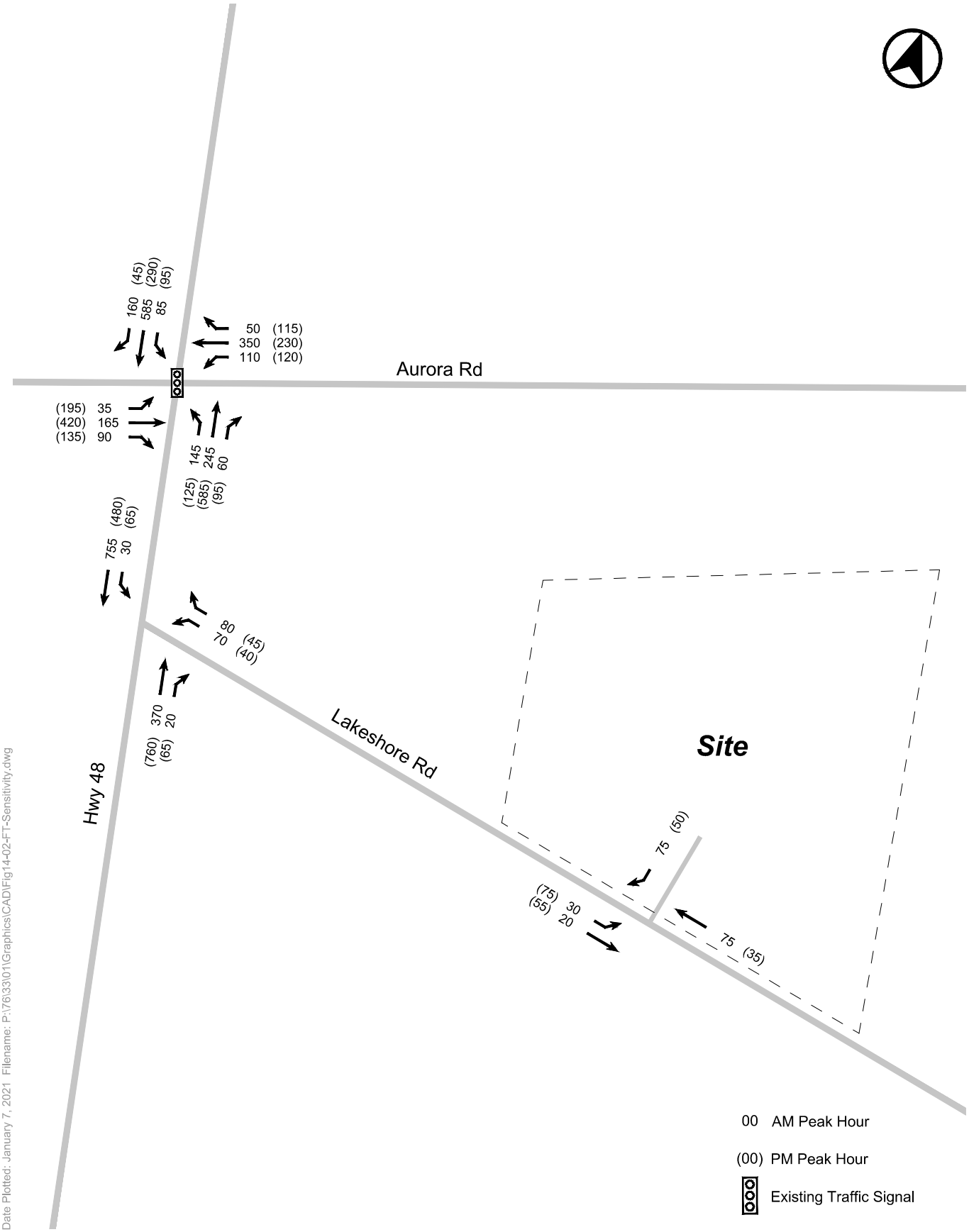


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FIGURE 14 FUTURE TOTAL TRAFFIC VOLUMES - SENSITIVITY ANALYSIS - WITHOUT NORTH-SOUTH LINK

8.0 TRAFFIC OPERATIONS ANALYSIS

8.1 METHODOLOGY

Traffic operations analyses have been completed using the Synchro 11 capacity analysis software in accordance with the methodologies outlined in the Highway Capacity Manual 2000 (HCM 2000).

For signalized intersections, the volume to capacity ratio (V/C ratio) is an indicator of the capacity utilization for the key movements in the intersection. A V/C ratio of 1.0 indicates that certain governing traffic movements through the intersection are operating at or near maximum capacity. The primary overall level of service (LOS) indicator is delay-based, both on individual movements and expressed as an average for all vehicles processed. Many busy urban intersections operate at LOS D to E, which reflect average (control) delays in the range of 35 to 80 seconds.

Existing signal timings adapted as the basis for the traffic operations analyses are provided in **Appendix J.**

For unsignalized intersections, level of service (LOS) characterizes operational conditions for key movements in terms of delay within the traffic stream. LOS A represents a good level of service with short delays. LOS F represents a poor level of service with long delays. The V/C ratio is an indicator of the capacity utilization for key movements at the intersection and resultant residual capacity potential.

Synchro 11 worksheets including detailed input parameters and output results are attached in **Appendix K**.

8.2 SIGNALIZED INTERSECTIONS

Table 5 summarizes capacity analysis results for the Highway 48 and Aurora Road intersection and **Table 6** provides queue length results.

TABLE 5 HIGHWAY 48 AND AURORA ROAD TRAFFIC OPERATIONS ANALYSIS RESULTS

Movement	Existing Traffic			Future Background Traffic			Future Total Traffic – With NS Link			Future Total Traffic – Sensitivity Analysis – Without NS Link		
	V/C	LOS	Delay (s)	V/C	LOS	Delay (s)	V/C	LOS	Delay (s)	V/C	LOS	Delay (s)
EBL	0.07 (0.33)	B (B)	10.9 (13.6)	0.11 (0.49)	B (B)	11.4 (17.2)	0.12 (0.51)	B (B)	11.5 (17.7)	0.11 (0.49)	B (B)	11.4 (17.2)
EBTR	0.24 (0.54)	B (B)	12.1 (15.9)	0.31 (0.66)	B (B)	12.9 (18.8)	0.32 (0.70)	B (B)	13.0 (20.0)	0.33 (0.70)	B (C)	13.1 (20.0)
WBL	0.18 (0.16)	B (B)	11.9 (12.0)	0.24 (0.45)	B (B)	12.5 (18.2)	0.23 (0.48)	B (B)	12.4 (19.5)	0.24 (0.52)	B (C)	12.6 (20.9)
WBTR	0.42 (0.25)	B (B)	14.1 (12.2)	0.51 (0.43)	B (B)	15.5 (14.3)	0.54 (0.45)	B (B)	15.9 (14.5)	0.51 (0.43)	B (B)	15.5 (14.3)
NBL	0.35 (0.24)	B (B)	20.0 (17.4)	0.56 (0.33)	C (B)	27.5 (18.9)	0.59 (0.34)	C (B)	28.9 (19.0)	0.68 (0.38)	C (B)	34.4 (19.8)
NBTR	0.20 (0.45)	B (B)	16.0 (18.4)	0.27 (0.58)	B (C)	16.6 (20.1)	0.27 (0.58)	B (C)	16.6 (20.1)	0.28 (0.58)	B (C)	16.6 (20.2)
SBL	0.14 (0.16)	B (B)	15.9 (16.6)	0.25 (0.51)	B (C)	17.5 (26.6)	0.25 (0.51)	B (C)	17.5 (26.6)	0.25 (0.52)	B (C)	17.6 (27.3)
SBT	0.45 (0.21)	B (B)	18.4 (16.0)	0.54 (0.26)	B (B)	19.5 (16.4)	0.54 (0.27)	B (B)	19.6 (16.5)	0.54 (0.27)	B (B)	19.6 (16.5)
SBR	0.11 (0.02)	B (B)	15.5 (14.6)	0.16 (0.03)	B (B)	16.0 (14.7)	0.16 (0.03)	B (B)	16.0 (14.7)	0.16 (0.03)	B (B)	16.0 (14.7)
Overall	**0.43 (0.50)**	**B (B)**	**15.7 (16.0)**	**0.53 (0.63)**	**B (B)**	**17.1 (18.3)**	**0.56 (0.65)**	**B (B)**	**17.3 (18.7)**	**0.58 (0.65)**	**B (B)**	**17.7 (18.8)**

Notes:
1. 00(00) – Weekday Morning Peak Hour (Weekday Afternoon Peak Hour)

TABLE 6 HIGHWAY 48 AND AURORA ROAD QUEUE LENGTH RESULTS

Movement	Approximate Storage Length (m)	Existing Traffic		Future Background Traffic		Future Total Traffic – With NS Link		Future Total Traffic – Sensitivity Analysis – Without NS Link	
		50%ile Queue (m)	95%ile Queue (m)	50%ile Queue (m)	95%ile Queue (m)	50%ile Queue (m)	95%ile Queue (m)	50%ile Queue (m)	95%ile Queue (m)
EBL	45	1.9 (13.5)	5.9 (26.9)	2.6 (17.9)	7.7 (36.7)	2.6 (18.1)	7.8 (37.5)	2.6 (17.9)	7.7 (36.7)
EBTR	-	11.6 (38.2)	23.8 (63.6)	16.2 (51.3)	31.3 (84.7)	17.3 (55.6)	32.9 (91.5)	16.9 (55.2)	32.7 (91.6)
WBL	55	7.1 (4.2)	15.7 (11.0)	8.8 (10.3)	19.0 (25.2)	8.3 (10.0)	18.2 (25.5)	8.9 (11.2)	19.1 (28.5)
WBTR	-	28.2 (14.6)	47.9 (27.6)	35.9 (26.1)	59.8 (46.6)	38.3 (28.0)	63.5 (49.4)	35.9 (26.1)	59.8 (46.6)
NBL	80	9.0 (8.2)	21.2 (18.7)	13.1 (11.0)	#34.1 (23.8)	13.8 (11.0)	#36.1 (23.8)	16.6 (12.6)	#44.2 (26.7)
NBTR	-	9.1 (27.4)	16.8 (40.7)	12.8 (37.1)	21.7 (53.5)	13.1 (37.2)	22.1 (53.6)	13.1 (37.7)	22.3 (54.3)
SBL	65	4.6 (3.8)	11.9 (10.6)	8.2 (10.1)	18.8 (#25.9)	8.2 (10.1)	18.8 (#25.9)	8.2 (10.2)	18.9 (#27.0)
SBT	-	26.5 (11.2)	39.4 (18.8)	32.9 (14.2)	47.8 (23.0)	33.2 (14.7)	48.2 (23.7)	33.2 (14.7)	48.2 (23.7)
SBR	20	1.4 (0.0)	12.1 (2.9)	3.8 (0.0)	15.8 (4.6)	3.9 (0.0)	16.1 (4.6)	3.9 (0.0)	16.1 (4.6)

Notes:
1. 00(00) – Weekday Morning Peak Hour (Weekday Afternoon Peak Hour)

Under existing, future background and future total conditions, the intersection operates at an acceptable level of service during the weekday morning and afternoon peak traffic hours with overall V/C ratios of 0.65 or less under all scenarios. No signal timing adjustments are required or recommended to accommodate forecast site traffic volumes.

Regarding projected queue lengths, all queues in dedicated turn lanes are projected to be accommodated within the available storage space.

Therefore, based on this analysis, the traffic generated by the proposed 5452 Lakeshore Road development can be acceptably accommodated at the Highway 48 and Aurora Road intersection.

8.3 UNSIGNALIZED INTERSECTIONS

The results of the capacity analysis performed for the unsignalized intersections in the study area are presented in **Table 7** and queue length results are provided in **Table 8**.

TABLE 7 UNSIGNALIZED INTERSECTION TRAFFIC OPERATIONS ANALYSIS RESULTS

Movement	Existing Traffic		Future Background Traffic		Future Total Traffic – With NS Link		Future Total Traffic – Sensitivity Analysis – Without NS Link	
	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS
Highway 48 and Lakeshore Rd								
WBLR	15.4 (16.8)	C (C)	21.3 (24.0)	C (C)	33.4 (37.5)	D (E)	39.9 (41.5)	E (E)
SBLT	0.3 (0.7)	A (A)	0.3 (0.7)	A (A)	0.3 (1.3)	A (A)	0.8 (2.3)	A (A)
Site Driveway and Lakeshore Rd								
EBLT	-- (--)	-- (--)	-- (--)	-- (--)	5.3 (4.4)	A (A)	4.5 (4.4)	A (A)
SBLR	-- (--)	-- (--)	-- (--)	-- (--)	9.0 (9.0)	A (A)	8.9 (8.6)	A (A)
Aurora Rd and NS Link								
WBLT	-- (--)	-- (--)	-- (--)	-- (--)	0.1 (0.5)	A (A)	-- (--)	-- (--)
NBLR	-- (--)	-- (--)	-- (--)	-- (--)	13.8 (18.3)	B (C)	-- (--)	-- (--)

Notes:
1. 00(00) – Weekday Morning Peak Hour (Weekday Afternoon Peak Hour)

TABLE 8 UNSIGNALIZED INTERSECTION QUEUE RESULTS

Movement	Existing Traffic	Future Background Traffic	Future Total Traffic – With NS Link	Future Total Traffic – Sensitivity Analysis – Without NS Link
	95%ile Queue (m)	95%ile Queue (m)	95%ile Queue (m)	95%ile Queue (m)
Highway 48 and Lakeshore Rd				
WBLR	5.5 (2.9)	8.4 (4.6)	20.4 (12.6)	30.2 (19.1)
SBLT	0.2 (0.6)	0.3 (0.6)	0.3 (1.2)	0.8 (2.3)
Site Driveway and Lakeshore Rd				
EBLT	-- (--)	-- (--)	0.4 (0.9)	0.5 (1.2)
SBLR	-- (--)	-- (--)	1.7 (1.5)	2.0 (1.2)
Aurora Rd and NS Link				
WBLT	-- (--)	-- (--)	0.1 (0.4)	-- (--)
NBLR	-- (--)	-- (--)	2.0 (2.2)	-- (--)

Notes:
1. 00(00) – Weekday Morning Peak Hour (Weekday Afternoon Peak Hour)

Under existing, future background and future total conditions, unsignalized intersections within the study area generally operate acceptably with levels of service ranging between LOS A and LOS E, whilst all projected queue lengths are less than 30.2 metres.

Therefore, based on this analysis, the traffic generated by the proposed development can be acceptably accommodated at all local area unsignalized intersections.

9.0 MULTIMODAL VOLUME PROJECTIONS

9.1 MODE SPLIT

As discussed in **Section 4.3**, the existing travel characteristics for the area around the site was reviewed using information provided by the 2016 Transportation Tomorrow Survey (TTS). The results are reproduced in **Table 9.**

TABLE 9 EXISTING AREA TRAVEL MODE SPLIT

Travel Mode	AM Peak	PM Peak
Auto Driver	73%	80%
Auto Passenger[2]	12%	12%
Transit[3]	14%	7%
Walk	1%	1%
Cycle	0%	0%
Total	**100%**	**100%**

Notes:
1. Reflects all trips made to/from residential land uses within 2006 TTS Zones 2716 and 2717 during the weekday morning and afternoon peak hour periods.
2. Includes auto passenger and taxi passenger.
3. Includes solely GO transit only, joint GO transit and local transit, and school bus.

It is noted that whilst some transit trips could be expected from the site, as there is no transit in the immediate vicinity of the site, any transit trips would largely originate or end as a driver trip at the site.

As such, for the purpose of this assessment, transit mode split has been incorporated into the driver mode split, as outlined in **Table 10**.

TABLE 10 ADOPTED RESIDENTIAL MODE SPLIT

Mode	AM Peak	PM Peak
Driver	87%	87%
Driver Only	*73%*	*80%*
Driver to Transit	*14%*	*7%*
Passenger	12%	12%
Walk	1%	1%
Cycle	0%	0%
Total	**100%**	**100%**

9.2 MULTIMODAL SITE TRIP GENERATION

Based on the existing mode splits and projected driver trips associated with the proposal, the projected multimodal trip generation for the development is provided in **Table 11**.

TABLE 11 SITE MULTIMODAL TRIP GENERATION

Mode	AM Peak Hour			PM Peak Hour		
	In	Out	2-Way	In	Out	2-Way
Driver	30	75	105	75	50	125
Driver Only	*25*	*65*	*90*	*70*	*45*	*115*
Driver to Transit	*5*	*10*	*15*	*5*	*5*	*10*
Passenger	5	10	15	10	10	20
Cycle	0	0	0	0	0	0
Walk	0	0	0	0	0	0
Total Person Trips	**35**	**85**	**120**	**85**	**60**	**145**

Note:
1. Volumes rounded to the nearest 5.

9.3 MULTIMODAL SITE TRIP DISTRIBUTION

9.3.1 Transit Trips

Based on the 2016 TTS and the availability of transit services in the proximity of the site, it is estimated that 100% of transit trips will be to/from Toronto via the Stouffville GO Train Line. The resultant transit trip assignment is summarized in **Table 12**. It is expected that the projected site transit trip assignment can be accommodated by the Stouffville GO Train.

TABLE 12 SITE TRANSIT TRIP ASSIGNMENT

Mode	AM Peak Hour			PM Peak Hour		
	In	Out	2-Way	In	Out	2-Way
GO Train – Stouffville Line	5	10	15	5	5	10
Total	**5**	**10**	**15**	**5**	**5**	**10**

9.3.2 Bicycle and Walking Trips

There are no bicycle or walking trips projected to be associated with the proposed development.

9.4 MULTIMODAL PERFORMANCE ANALYSIS

9.4.1 Overview

A multimodal performance assessment has been undertaken in accordance with the requirements of the York Region Transportation Mobility Plan Guidelines (TMPG), as provided below.

9.4.2 Transit Mode Performance

9.4.2.1 Criteria

The TMPG outlines LOS criteria for the assessment of transit performance. The criteria has been reproduced in **Table 13**.

TABLE 13 TRANSIT LEVEL OF SERVICE CRITERIA

Level of Service	Access to Transit Stops	Transit Headways	Intersection Approach (transit or curb lanes)	
			Delay (seconds/veh)	V/C
A	90% within ≤200m	≤5 minutes	≤10	0 to 0.60
B	90% within ≤500m and 70% within ≤200m	>5-10 minutes	>10-20	0.61 to 0.70
C	90% within ≤500m and 50% within ≤200m	>10-15 minutes	>20-35	0.71 to 0.80
D	100% within ≤600m	>15-20 minutes	>35-55	0.81 to 0.90
E	100% within ≤800m	>20-30 minutes	>55-80	0.91 to 1.00
F	100% >800m	>30 minutes	>80	>1.00

9.4.2.2 Performance Assessment – Existing Conditions

As outlined in **Section 4.1.2,** there are no transit services operating within the immediate study area. However, an assessment has been undertaken for the Stouffville GO Train Line with respect to the site and is provided in **Table 14**.

TABLE 14 TRANSIT PERFORMANCE ASSESSMENT – EXISTING CONDITIONS

Nearest Stop	Access to Transit Stops		Transit Headways		Study Area Intersections
	Site Access to Nearest Stop	LOS	Headways	LOS	
Stouffville GO Train Line					
Lincolnville Station	Approx 6 km from site	**F**	Approx 25-30 mins	**E**	**N/A**

Notes:
1. GO Train operates in peak direction only during AM and PM peak hours

9.4.2.3 Future Conditions

As outlined in **Section 4.2.2**, rural transit links are proposed along Highway 48 between Stouffville and Ballantrae, along Highway 48 between Ballantrae and Mount Albert to the north, and along Aurora Road between Ballantrae and Highway 404.

9.4.2.4 Conclusions

It is considered that Ballantrae would benefit from transit links to other nearby towns and cities, such as Stouffville to the south and Aurora to the west. This would provide transit access to the retail and commercial uses within these areas, as well as connections to other GO Transit and York Region Transit services. This would allow for trips to be made to and from outside of Ballantrae, without necessarily requiring access to an automobile.

In this respect, the rural transit links proposed by the TMP along Highway 48 and Aurora Road are considered beneficial.

9.4.3 Bicycle Mode Performance

9.4.3.1 Criteria

The TMPG outlines LOS criteria for the assessment of bicycle performance. The criteria has been reproduced in **Table 15**.

TABLE 15 BICYCLE LEVEL OF SERVICE CRITERIA

Level of Service	Segment	Intersection
A	Separated cycling facilities (e.g. cycle tracks, multi-use path)	• Separated cycling facilities • Bicycle box or clearly delineated bicycle treatment or bicycle signal head
B	≥1.8m dedicated cycling facilities (e.g. bicycle lanes with and without buffer)	• >1.8m dedicated cycling facilities (e.g. bicycle lanes with and without buffer) • Bicycle box, clearly delineated bicycle treatment or bicycle signal head
C	<1.8m dedicated cycling facilities with no buffer	• <1.8m dedicated cycling facilities with no buffer • Bicycle box, clearly delineated bicycle treatment or bicycle signal head
D	≤1.5m bicycle lane with no buffer	• ≤1.5m bicycle lane and no buffer • Bicycle treatment
E	Shared facilities (e.g. signed routes, sharrows or paved shoulder with minimum 1.2m in constrained area)	• Shared facilities (e.g. signed routes, sharrows or paved shoulder with minimum 1.2m in constrained area) • No clearly delineated bicycle treatment
F	No bicycle provision	• No bicycle provision

9.4.3.2 Performance Assessment – Existing Conditions

As discussed in **Section 4.1.3**, bicycle infrastructure within the study area is currently limited. There is a narrow paved shoulder along Aurora Road, however the width is less than 1.2 metres and therefore does not satisfy the requirements for LOS E, as outlined in **Table 15**. There is no other bicycle infrastructure within the study area.

As such, LOS F applies to all intersections and segments within the study area.

9.4.3.3 Future Conditions

As outlined in **Section 4.2.3**, improvements to the area bicycle network include:

- In-boulevard cycling facilities along Highway 48 between Pine Vista Avenue and Ballantrae Road;
- Construction of a region-wide Greenbelt route which will extend through Ballantrae along Aurora Road;
- A shared route along Lakeshore Road; and
- The proposed development includes a new trail through the site that will connect from Lake Shore Road to Aurora Road.

9.4.3.4 Conclusions

It is considered that the proposed bicycle facilities along Highway 48 and Lakeshore Road would improve connectivity within Ballantrae itself, whilst the Greenbelt route would improve connections to surrounding towns and cities.

9.4.4 Pedestrian Mode Performance

9.4.4.1 Criteria

The TMPG outlines LOS criteria for the assessment of pedestrian performance. The criteria has been reproduced in **Table 16**.

TABLE 16 PEDESTRIAN LEVEL OF SERVICE CRITERIA

Level of Service	Segment	Intersection
A	≥2.0m sidewalk with minimum 3.5m buffer including planting and edge zone; or ≥3.0m multi-use path	• ≥2.0m sidewalk with minimum 3.5m buffer including planting and edge zone; or ≥3.0m multi-use path • Pedestrian signal head with sufficient pedestrian clearance time • Clearly delineated cross-walk
B	≥1.5m sidewalk with minimum 1.0m buffer including edge zone; or <3.0m multi-use path	• ≥1.5m sidewalk with minimum 1.0m buffer including edge zone; or <3.0m multi-use path • Pedestrian signal head with sufficient pedestrian clearance time • Clearly delineated cross-walk
C	≥1.5m curb-faced sidewalk (no buffer)	• ≥1.5m curb-faced sidewalk (no buffer) • Pedestrian signal head with sufficient pedestrian clearance time • Clearly delineated cross-walk
D	<1.5m sidewalk	• <1.5m sidewalk • Pedestrian signal head with sufficient pedestrian clearance time • No clearly delineated cross-walk
E	Paved shoulder or no sidewalk provision	• Paved shoulder or no sidewalk provision • No pedestrian signal head • No clearly delineated cross-walk
F	No sidewalk provision	• No sidewalk provision • No pedestrian signal head • No clearly delineated cross-walk

9.4.4.2 Performance Assessment – Existing Conditions

As discussed in **Section 4.1.3**, there is currently no pedestrian infrastructure within the study area, with the exception of the narrow paved shoulder along Aurora Road discussed above, which results in LOS E along Aurora Road, as per the requirements outlined in **Table 16**.

LOS F applies to all other intersections and segments within the study area.

9.4.4.3 Future Conditions

As outlined in **Section 4.2.3**, improvements to the area pedestrian network are limited to the aforementioned off-road trails.

As part of the proposed development, sidewalks will be provided along one side of Street A and Street E, north of Street A.

9.4.4.4 Conclusions

The general character of all local streets in Ballantrae is rural in nature, with low speeds and low traffic volumes and pedestrians and vehicles sharing road space. The proposed development is consistent with the character of other streets in Ballantrae and given the low volume and low speeds expected within the development, the proposed pedestrian network is appropriate for the context.

10.0 TRANSPORTATION DEMAND MANAGEMENT (TDM)

Consistent with the York Region Mobility Plan Guidelines, the proposed development will include a Transportation Demand Management (TDM) Plan that will attempt to influence the way people travel to and from the site through a comprehensive suite of TDM strategies.

These measures will include the application of various strategies to reduce congestion and minimize the overall reliance on single-occupant vehicle (SOV) while promoting the use of more active and sustainable modes of transportation.

10.1 TRAVEL MODE CHARACTERISTICS

The existing travel characteristics for the area around the site was reviewed using information provided by the 2016 Transportation Tomorrow Survey (TTS). Modal choice travel characteristics for residential land uses in the area for the peak period inbound and outbound directions are summarized in **Table 17.**

TABLE 17 EXISTING AREA TRAVEL MODE SPLIT

Travel Mode	Morning Outbound	Afternoon Inbound
Auto Driver	73%	80%
Auto Passenger[2]	12%	12%
Transit[3]	14%	7%
Walk	1%	1%
Cycle	0%	0%
Total	**100%**	**100%**

Notes:
1. Reflects all trips made to/from residential land uses within 2006 TTS Zones 2716 and 2717 during the weekday morning and afternoon peak hour periods.
2. Includes auto passenger and taxi passenger.
3. Includes solely GO transit only, joint GO transit and local transit, and school bus.

Based on the most recent TTS data, 73% to 80% of the residents living in the area regularly drive during the peak travel period, meaning a great majority of the trips made during the peak hour is via car. This travel mode choice is due to the area's limited access to transit services, and cycling or pedestrian facilities. However, the planned region-wide trail system may help in encouraging residents to use alternative travel modes.

It is also noteworthy that 7-14% of peak period traffic in the surrounding area currently utilizes GO Transit which is an indication that there is an opportunity to encourage use of GO Transit for future residents of the development.

10.2 PROPOSED TDM PLAN

Strategies must be adopted to encourage the use of alternate sustainable travel modes, increase vehicle occupancy, and cooperate with the future region-wide trail system. Based upon the site transportation context and proposed land uses, the recommended TDM strategies have been selected for the proposed development.

10.2.1 Sustainable Transportation Information

The provision of information on trails, cycling and transit maps to residents encourages the use of these alternative modes by helping educate people about their options.

Proposed Strategy:
Marketing programs aimed at new residential unit purchasers should be implemented to ensure that new residents have comprehensive information on travel choices in the area now and in the future.

The developer proposes to coordinate with the Transportation Planning department of the Region of York, should they elect, to issue maps and travel information provided by the Region to new residents as part of a new homeowners package. These programs will also be made available at the sales centre for the new lots and will also be available to residents after the dwelling units are occupied.

10.2.2 Coordination / Distribution of Presto Cards

The York Region's current Development Charge By-law currently includes the provision of pre-loaded Presto Cards for any unit or household registered after January 1st 2013. The site is eligible to receive pre-loaded Presto Cards from the Region as part of the York Region's TDM credit in the current development charge.

Consistent with the above policy, the Region of York may provide pre-loaded Presto cards to the individual lots within the proposed development in order to encourage the use of GO Transit by future homeowners.

Proposed Strategy:
The developer will coordinate with the Region of York with respect to providing pre-loaded Presto cards to the purchasers of the homes, should the Region elect to provide them. The cards will be issued to new homeowners at, or soon after occupancy of the unit.

10.2.3 Pedestrian Connections

High quality pedestrian connections within the site and with pedestrian facilities outside of the site can be an important design feature in the effort to ensure viability of non-automotive modes of travel. Thus, it is critical for pedestrian and sidewalk infrastructure to enhance the pedestrian experience especially as it relates to safety and convenience. Children and elder residents should feel comfortable walking within the site. These good pedestrian connections will also connect with the future region-wide trail system.

Proposed Strategy:
The development will include a proposed new north-south walking trail that connects Lakeshore Road to Aurora Road. The proposed walking trail will generally run north-south in the middle of the site alongside the drainage course within the site. Two additional east-west trail connections will also be provided linking the residential areas in the northwest and northeast areas of the plan to the proposed main north-south trail.

10.3 TDM CHECKLIST

See **Table 18** for the preliminary TDM checklist for the site.

TABLE 18 PROPOSED TDM IMPLEMENTATION PLAN

Proposed TDM Strategy	Responsibility	Cost Estimate	Approximate Timing
Sustainable Commuting Information			
Provide sustainable transportation information to new home purchasers as part of home buyers package to promote sustainable travel options.	Developer to coordinate with York Region a venue to distribute	TBD	Occupancy
Presto Cards			
Provide one pre-loaded Presto card to each new unit owner / resident	Developer to coordinate with York Region a venue to distribute	TBD	Occupancy
Pedestrian Infrastructure			
Provide a north-south pedestrian trail/walkway through the site connecting Lakeshore Road to Aurora Road.	Developer	Included in Construction[1]	Construction

Notes:
1. Cost of infrastructure included as part of construction. To be constructed as part of the project.

11.0 EMERGENCY VEHICLE ACCESS CONSIDERATIONS

The development plan includes a single point of vehicle access to/from Lakeshore Road into the community. In order to ensure that appropriate emergency vehicle access is maintained, two secondary access points to/from Lakeshore Road will be provided for emergency vehicles only in order to ensure appropriate and safe access opportunities are provided into the site in the event the primary vehicle access is blocked.

The location of the emergency vehicle accesses will be confirmed through discussions with Town of Whitchurch-Stouffville Fire Services but are currently proposed through dedicated blocks in the plan (Blocks 153 and 154). The dedicated blocks are located at the southwest and southeast corners of the plan and will connect between Lakeshore Road and Streets C and B, respectively.

12.0 SUMMARY AND CONCLUSIONS

BA Group is retained by Alcorn and Associates to undertake a Transportation Study to review the impact of a proposed residential development on the north side of Lakeshore Road in the village of Ballantrae. The following provides a summary of the key conclusions arising from our review.

Context and Development Proposal

1. The proposed development is located on Lakeshore Road in the village of Ballantrae which is part of the Town of Whitchurch-Stouffville.

2. Mode split for the area based on the 2016 Transportation Tomorrow Survey indicates an approximate 73%-80% auto driver, 12% auto passenger, 7%-14% transit and 1% walk overall travel mode choice split for home-based trips.

3. The development proposal is for 142 detached residential homes located within a gated community consisting of private condominium roads.

4. Access to the site is proposed via a single driveway connection to/from Lakeshore Road, located approximately in the middle of the site.

5. The internal road network will be made up of private streets. A variety of street cross sections are proposed as follows:

    - a short 23.0m wide right-of-way with a 6.0m pavement on both the inbound and outbound side of a 4.0m wide median (Street A at site entrance)
    - a 15.5m wide right-of-way with a 8.5m pavement (Street A)
    - a 13.5m wide right-of-way with a 8.5m pavement width (Streets A and E); and
    - a 11.0m wide right-of-way with a 7.5m pavement width (Streets B, C, D and E).

6. In response to the potential north-south road link through the site as identified in the recent Whitchurch Stouffville TMP, it has been agreed with the Town of Whitchurch-Stouffville that an easement will be conveyed to the Town over Street A (its entire length) and Street E (the section with a 13.5m right-of-way). The provision of Block 155 at the north property limit allows for the future Town completion of the link through other lands. The easement will be confined to the pavement for public vehicular passage in emergencies only.

Parking Considerations

7. The Town of Whitchurch-Stouffville's Zoning By-Law 2010-001-ZO requires that each unit provide 2 parking spaces per unit.

8. Each unit within the development plan will have a two car garage with a two-car driveway. The resulting total parking supply is 568 spaces (4 spaces per unit). The proposed on-site parking supply is therefore sufficient to meet the Zoning By-law requirements.

Site Circulation

9. The Town of Whitchurch Stouffville Zoning By-law 2010-001-ZO does not require loading for the proposed detached residential units.

10. To ensure waste collection and snow plow vehicles can appropriately traverse the site, a vehicle manoeuvring analysis was undertaken using a typical refuse collection vehicle and a typical snow plow vehicle. Based on our review the proposed street design is sufficient to accommodate these vehicles.

11. In addition to the above, a review has been undertaken of the accessibility of the site by WB-20.5 tractor trailer. This assessment was done in response to a comment received during a peer review of the first submission of this study. Recognizing a WB-20.5 represents an extremely conservative and infrequent design vehicle, the manoeuvring analysis confirmed that a WB-20.5 vehicle can manoeuvre in and out of the site, including consideration of the vehicle to occupy the entire road space (crossing the centreline) and using correction manoeuvres and reversing manoeuvres as required. This is considered to be appropriate given that the standards for public local roads rely upon a similar approach for accommodating the same design vehicle. Moreover the proposed turnaround facilities within the site are designed in accordance with Town of Whitchurch-Stouffville requirements thereby accommodating WB-20.5 turn around manoeuvres in the same way.

Traffic Volumes

12. Existing traffic activity levels on the area road network surrounding the site were established based upon traffic count information conducted by BA Group in June 2019.

13. Future background traffic was determined using an annual corridor traffic growth rate of 2.0% applied for a 7 year time horizon to 2027 and inclusion of site specific background development traffic.

Site Traffic Forecast

14. The proposed development will generate in the order of 105 and 125 two-way vehicle trips during the morning and afternoon peak hour periods, respectively.

Traffic Operations

15. Signalized and unsignalized intersections within the study area operate acceptably today and will continue to do so in the future considering net new traffic from other area developments and the FarSight Lands development. Site related impacts at the area intersections are small.

16. Traffic volumes generated by the proposed development can, based upon the above, be acceptably accommodated on the area street intersections and street system without the need for any road infrastructure improvements.

Transportation Demand Management

17. A Transportation Demand Management (TDM) plan has been developed for the site to encourage sustainable transportation patterns to the extent possible for the site. The following list summarizes the TDM strategies that are proposed.

    - Should the Region of York Transportation Planning department choose to provide mobility transportation information as part of its residential TDM program, the developer will mail and/or provide the information pamphlets to new owners at the time of unit purchase (or shortly thereafter) to make new residents aware of the mobility options in the area.
    - Should the Region of York Transportation Planning department choose to provide pre-loaded PRESTO cards to new purchasers, the developer will distribute the PRESTO cards to unit purchasers to encourage residents to try GO Transit.
    - The developer is proposing to provide a new north-south walking trail through the site connecting Lakeshore Road to Aurora Road.

Emergency Vehicle Access

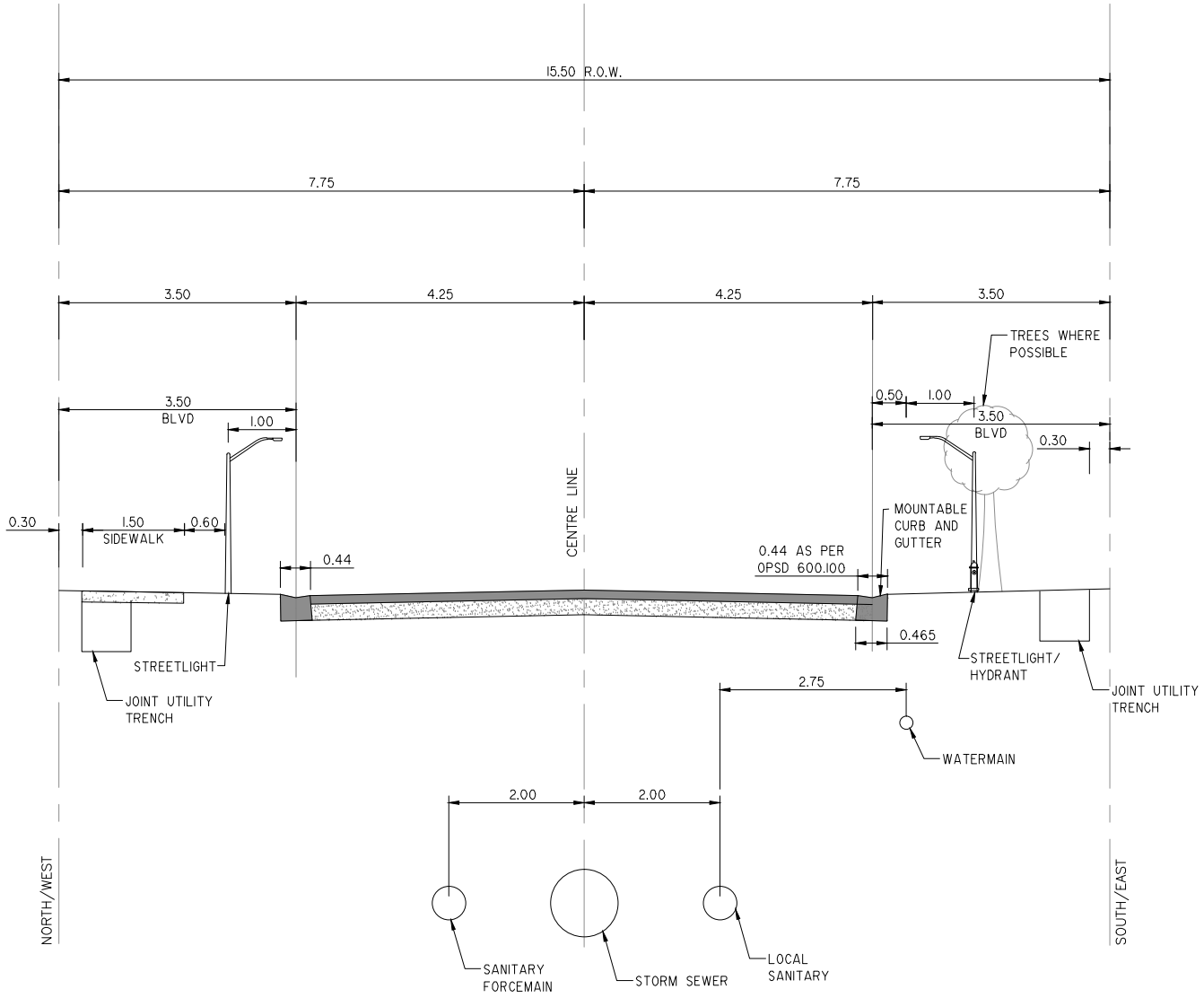
18. The development plan includes a single point of vehicle access to/from Lakeshore Road into the community. In order to ensure that appropriate emergency vehicle access is maintained, two secondary access points to/from Lakeshore Road will be provided for emergency vehicles only in order to ensure appropriate and safe access opportunities are provided into the site in the event the primary vehicle access is blocked.

19. The location of the emergency vehicle accesses will be confirmed through discussions with Town of Whitchurch-Stouffville Fire Services but are currently proposed through dedicated blocks in the plan (Blocks 153 and 154). The dedicated blocks are located at the southwest and southeast corners of the plan and will connect between Lakeshore Road and Streets C and B, respectively.

Overall

20. Based on the foregoing, it is our opinion that the proposed development will function well in terms of traffic access and circulation. Traffic volumes attributable to the subject development can be accommodated on the existing road network.

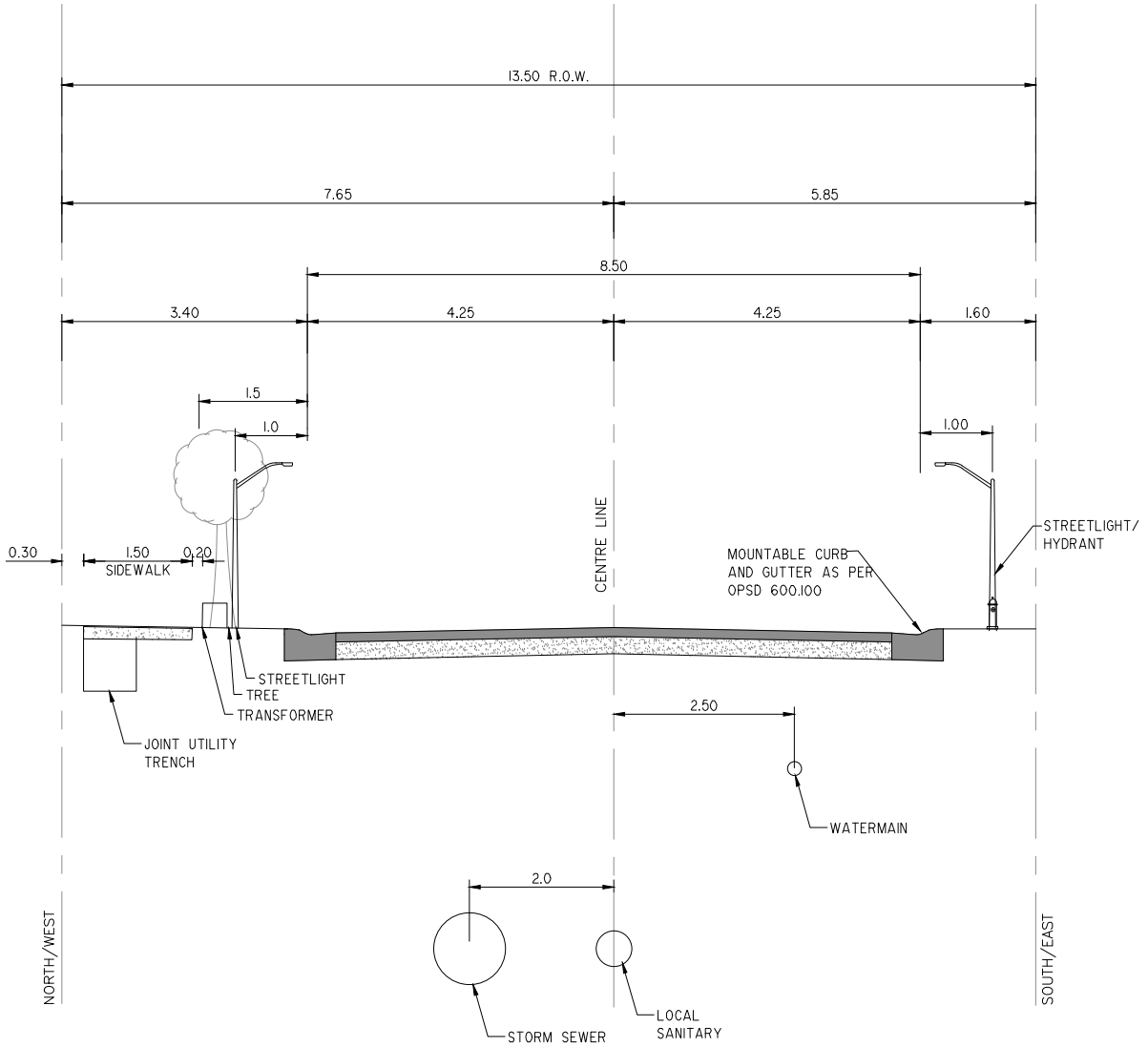
APPENDIX A:
Proposed Street Cross Sections



SABOURIN KIMBLE & ASSOCIATES LTD.
CONSULTING ENGINEERS

15.50m PRIVATE COLLECTOR ROADWAY
STREET A
CROSS SECTION DETAIL

FIGURE No.
1

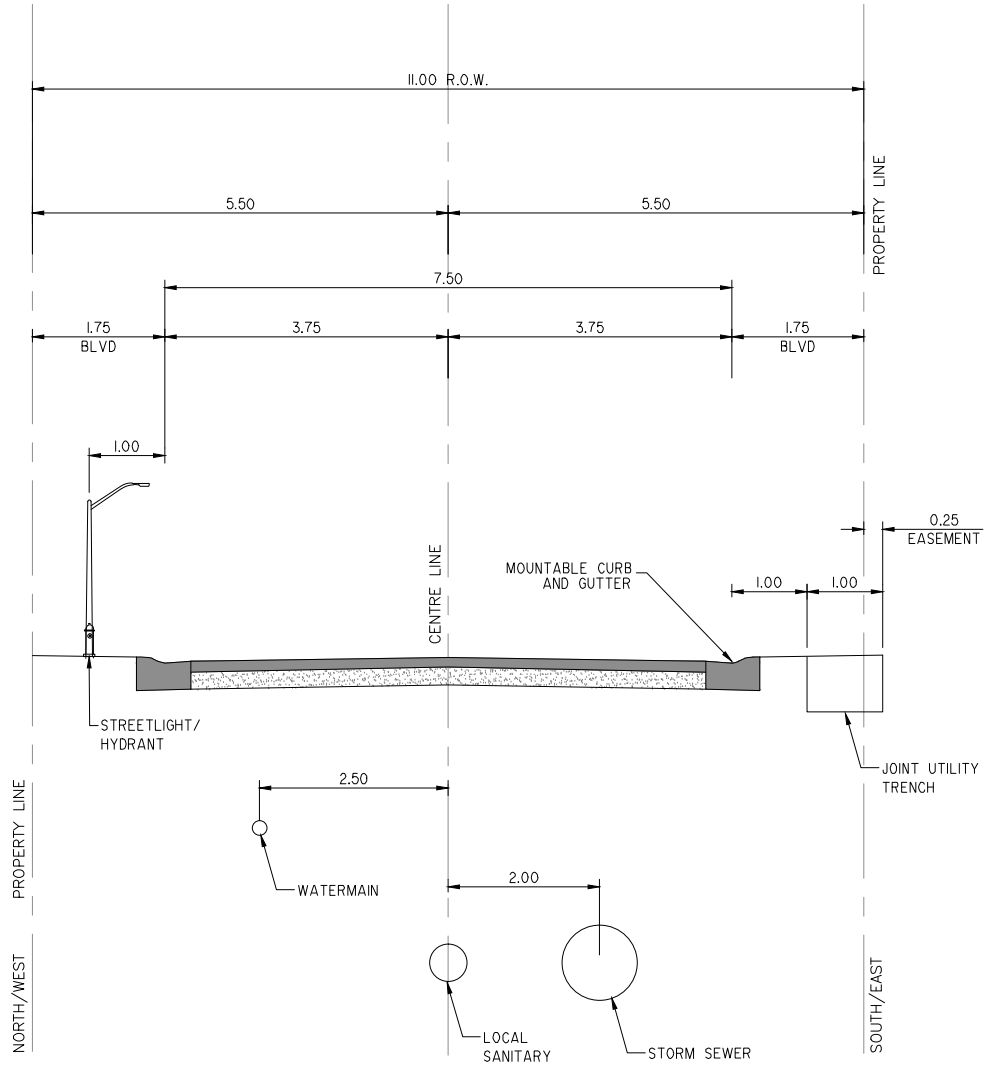


SABOURIN KIMBLE
& ASSOCIATES LTD.
CONSULTING ENGINEERS

13.50m PRIVATE COLLECTOR ROADWAY
STREET A/E
CROSS SECTION DETAIL

FIGURE No.

1



SABOURIN KIMBLE
& ASSOCIATES LTD.
CONSULTING ENGINEERS

11.0m LOCAL PRIVATE ROADWAY
STREET B/C/D/E
CROSS SECTION DETAIL

FIGURE No.

1

APPENDIX B:
Road Plan

Filename: J:\7633-01\BA\Site Plan Review\9. Mar-02-2021\BA-FarSightHomes-Allwaystop-Mar02-21.dwg

Date Plotted: March 4, 2021

BA Group

BALLANTRAE DEVELOPMENT

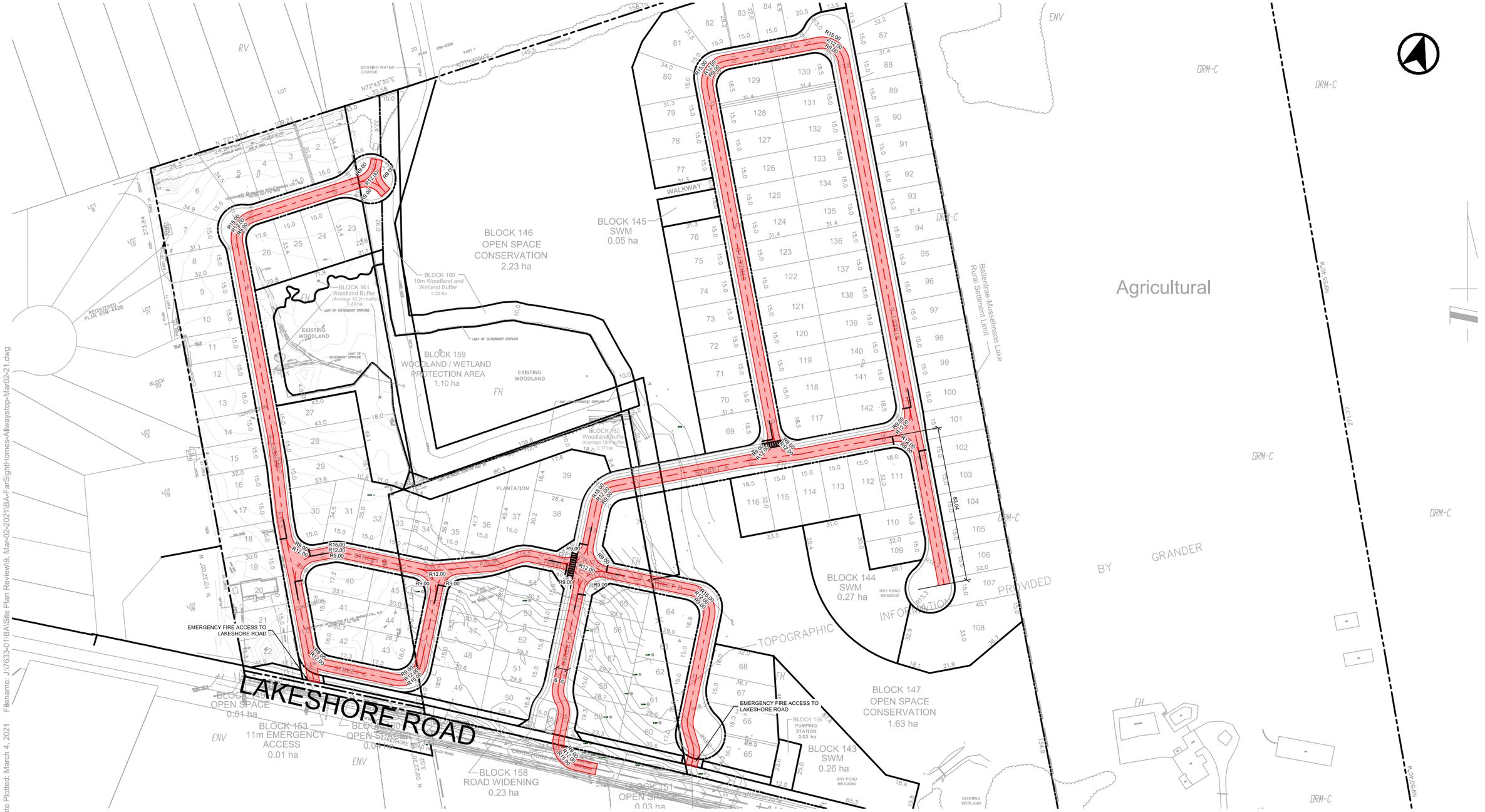
ROAD PLAN

Project:	FAR SIGHT HOMES
Project No.	7633-01
Date:	March 02, 2021
Revised:	--

Scale 1:2,000 (0, 50, 100m)

Drawing No. RP-01

APPENDIX C:
Fire Route Plan and Fire Truck Movement



Date Plotted: March 4, 2021 Filename: J:\7633-01\BA\Site Plan Review\9. Mar-02-2021\BA-FarSightHomes-Allwaystop-Mar02-21.dwg

BA Group

BALLANTRAE DEVELOPMENT

PROPOSED FIRE ROUTE AND PLAN OF SUBDIVISION REVIEW

Project:	FAR SIGHT HOMES
Project No.	7633-01
Date:	March 02, 2021
Revised:	–

Scale 1:2,000 (0 – 50 – 100m)

Drawing No. FR-01

Proxy Aerial Fire Truck

Overall Length	14.960m
Overall Width	2.590m
Overall Body Height	3.662m
Min Body Ground Clearance	0.371m
Track Width	2.400m
Lock-to-lock time	5.00s
Wall to Wall Turning Radius	15.860m

Date Plotted: March 2, 2021 Filename: J:\7633-01\BA\Site Plan Review\9_Mar-02-2021\BA-FarSightHomes-Allwaystop-Mar02-21.dwg

BA Group

BALLANTRAE

VEHICLE MANOEUVRING DIAGRAM
STREET 'C' CUL-DE-SAC
PROXY AERIAL FIRE TRUCK TURN AROUND

Project:	FAR SIGHT HOMES
Project No.	7633-01
Date:	APRIL 11, 2017
Revised:	March 02, 2021

Scale 1:500 (0 5 10 15 20m)

Drawing No. FRVMD-01

APPENDIX D:
Excerpts from Whitchurch-Stouffville 2018 TMP

6.3.2.1 RECOMMENDATION

Recommendation #11:

Advance discussions with the appropriate transit agency (YRT or GO/Metrolinx):

1. Dial-a-Ride 'Zone Bus' for in-Town services, particularly within Stouffville
2. Maintain Regional Transit connections via YRT Routes 9 and 15:
3. Expand Regional Express Rail (RER) for all-way 2-way GO Rail service to Stouffville and Lincolnville GO stations

Timing: Short-term

6.3.3 New Connection from Lakeshore Road to Aurora Road

A new connection has been proposed between Lakeshore Road and Aurora Road to provide an alternate connection to the arterial road network from Lakeshore Road. The potential location of the proposed road is illustrated in **Exhibit 6-8** and **Exhibit 6-9** relative to aerial imagery and the Ballantrae-Musselman Lake Secondary Plan, respectively. As seen in **Exhibit 6-8**, there is currently no north-south connection to Aurora Road from the Musselman Lake community, with access provided via Highway 48 or 9th Line. In **Exhibit 6-9**, the new connection is illustrated in relation to the Ballantrae-Musselman Lake and Environs Secondary Plan, which identifies a future residential area. The proposed road would pass through and provide access to Aurora Road for the future residential area identified in light yellow in the Plan. **Exhibit 6-9** also shows the proposed road connecting to Aurora Road at an existing unsignalized intersection. Should the lands identified in the Secondary Plan be developed, a future traffic impact study would determine the required intersection controls.

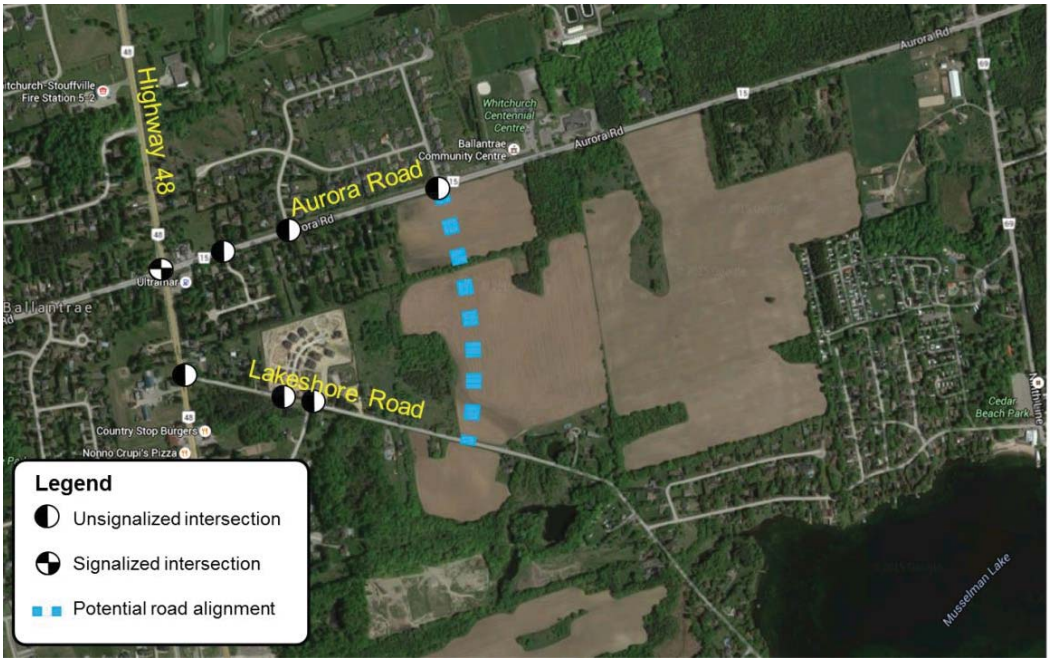


Exhibit 6-8: New Connection between Lakeshore Road and Aurora Road

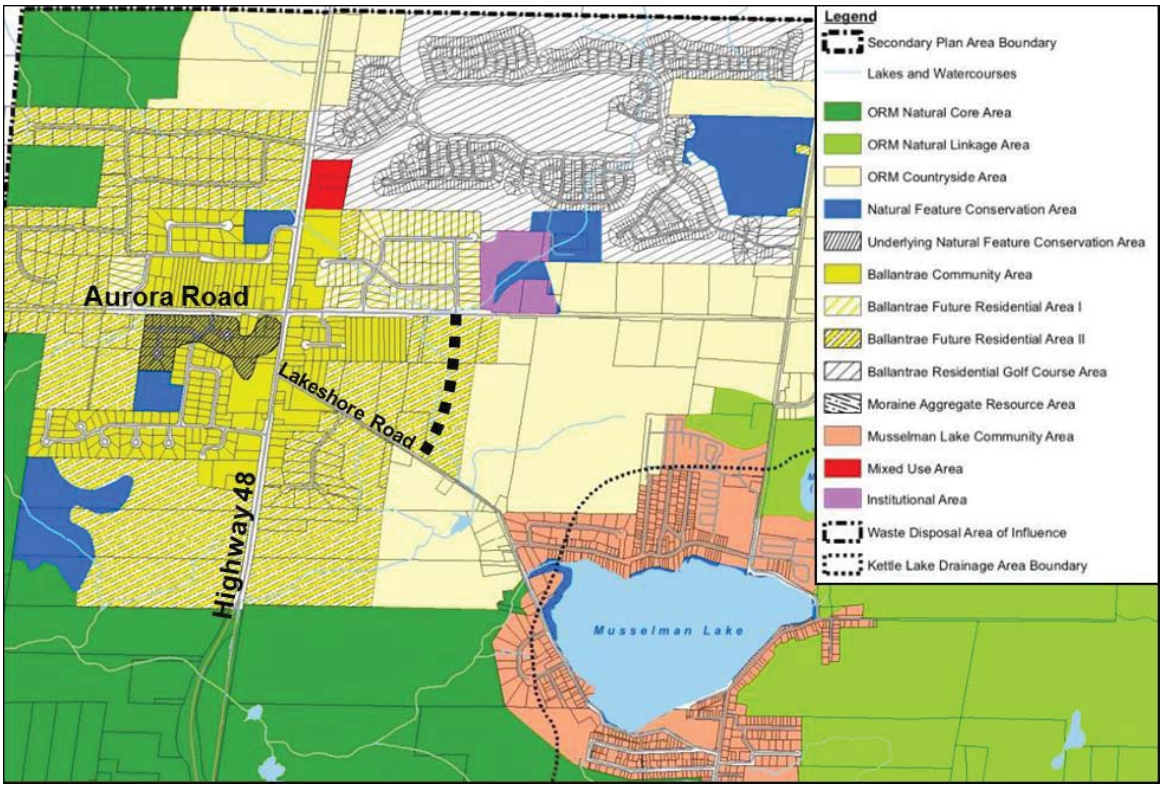


Exhibit 6-9: Lakeshore Road Connection in relation to Ballantrae Secondary Plan

Preliminary travel demand forecasting estimates a 16% reduction in trips towards Highway 48 with the new connection. Excluding any potential new development adjacent to the new connection, it is anticipated that about 700 vehicles per day would use it to access Aurora Road. The intersection capacity for both scenarios was further assessed by applying the 16% reduction to 2031 intersection turning movements (calculated based upon a growth factor being applied to existing turning movement counts – details in **Appendix C** – 2031 Traffic Analysis). The analysis is summarized in **Table 6-6**.

Table 6-6: Highway 48 at Lakeshore Road – New Link Sensitivity

Intersection and Movement	AM Peak Hour			PM Peak Hour		
	Delay	LOS	v/c	Delay	LOS	v/c
Highway 48 @ Lakeshore Road						
Westbound Left-right	**44.3**	**E**	0.49	27.1	D	0.19
Southbound Left-through	0.4	A	0.01	1.7	A	0.06
Highway 48 @ Lakeshore Road – with new connection (16% diversion)						
Westbound Left-right	**39.1**	**E**	0.40	25.4	D	0.16
Southbound Left-through	0.4	A	0.01	1.4	A	0.05

Key: Delay – Average delay per vehicle shown in seconds
LOS – Level of Service
v/c – Volume to Capacity Ratio

Based on this analysis, the reduced volumes will result in a marginal improvement to unsignalized intersection operations at Highway 48 and Lakeshore Road, as estimated by the traffic model. However it is important to note that the traffic model does not account for the lack of gaps in southbound traffic to safely make a westbound left-turn in the AM peak. As such we would anticipate a higher diversion of traffic to the new connection at Aurora Road should the westbound left-turn continue to be challenging in the future.

6.3.3.1 RECOMMENDATION

Recommendation #12:

Because of these benefits to the transportation network within Ballantrae-Musselman Lake and the benefit to potential future development, the new connection between Lakeshore Road and Aurora Road is recommended to be added to the Town's list of road improvements for Development Charges. A Schedule C Class EA should also be completed to confirm the need and justification, preliminary design and potential environmental impacts.

Timing: To be included in the Town's next Development Charges Study, and Schedule C Class EA to be completed by 2021.

6.3.4 Tenth Line Capacity Improvements

As identified in **Section 3.6.4**, 10th Line south of Hoover Park Drive is approaching capacity. Improving this section of 10th Line will allow traffic wishing to access Highway 404 or Highway 7 or 407, to disperse along 19th Avenue instead of driving through Stouffville. Improving 10th Line here will generally improve travel choices and reduce congestion for traffic in this part of Stouffville. Volume to capacity ratios with and without a capacity improvement (in this case a widening to four lanes was modeled) are illustrated in **Exhibit 6-10**.

Exhibit 6-10: 2031 Traffic Forecast with and without 10th Line Widening

December 06, 2016

Michele Kennedy, Clerk
Town of Whitchurch-Stouffville
111 Sandiford Drive,
Stouffville, ON
L4A 0z8

RE: Review of Proposed New Ballantrae Road Link in the Stouffville Transportation Master Plan

Dear Mr. Alcorn:

BA Group has been retained by Farsight Homes provide transportation advisory services in relation to a property owned by Farsight Homes in Town of Whitchurch-Stouffville, Ontario. The site is located at 5426, 5452, and 5584 Lakeshore Road (herein referred to as 'Farsight lands') in the village of Ballantrae.

The subject 16.26 hectare site is designated Residential within the Ballantrae-Musselman Lake Secondary Plan with available water and sewer services. The planning for these lands by the owner has been ongoing since 2014. A pre-application consultation process was commenced with the Town in August 2016 with required studies confirmed which are underway support the required planning approval applications.

A plan of subdivision of 130 single detached units has been prepared for the site and has been presented to the Town. The planned development has been prepared substantially in conformity with the present Town Official Plan and approved Transportation plan.

The Town of Whitchurch Stouffville recently is in the process of seeking feedback on an updated Transportation Master Plan (TMP) prepared by HDR. The draft TMP was issued for public review in May 2016. This letter provides a review and comment on the components of the TMP that relate to the above noted land holdings owned by Farsight Homes.

That draft TMP includes a recommendation to construct a new north-south public street in Ballantrae between Lakeshore Road and Aurora Road. The conceptual road would be located approximately 700m east of Highway 48. The potential public road, as illustrated in the TMP, would bisect the lands owned by Farsight Homes. It is noted that this road alignment is mostly situated within the regional flood plain between Lakeshore Road and Aurora Road.

BA Group has reviewed the draft TMP report and the appendices that are available on the Town's website. Our comments with respect to the proposed new road link based on our review of the TMP documentation are set out below.

1. The primary rationale for the new road connection appears to be to provide an alternative connection to the external arterial road network in order to relieve the delays experienced by the westbound left turn on Lakeshore Road at Highway 48. In this regard, the unsignalized capacity analysis in the TMP estimated by 2031, without the road link, the westbound left turn delays will be 44 seconds and 27 seconds during the weekday morning and weekday afternoon peak hours, respectively. This level of delay, which corresponds to a Level of Service (LOS) of E in the morning and D in the afternoon, is not in our opinion overly concerning or in need of mitigation considering the result is being presented for a peak hour condition at the built-out state (i.e. at 2031). In our opinion, the new road link is not required.

2. Notwithstanding whether the overall delays are indicative of a need for improvement, the TMP report further estimates that the new connection would only result in a delay reduction of 5 second in the morning peak hour and 2 seconds in the weekday afternoon peak hour. As noted in Appendix C of the draft TMP, this represents a very marginal improvement compared to the scenario without the new road link. Our opinion is that this road link delivers minimal benefit for multi-million Town expenditure, and is not required.

3. Page 5 of Appendix C in the TMP notes that the 2031 traffic forecasts without the new road link were presented without factoring calibration. In this regard the 2031 forecast identified a westbound peak hour volume of 165 vehicles whereas the TMP notes that volumes are more likely to be in the order of 105 vehicles per hour, or roughly 36% lower than what was estimated by the model. We concur that the 2031 model results are overly conservative. We would supplement this however by noting that the model may be even more overestimated than indicated above. A review of the peak hour volumes shown on Page 2 of Appendix C indicates that westbound traffic under existing conditions is actually 77 vehicles per hour. Given that the model explicitly did not account for future development in the area, the 2031 volumes along Lakeshore Road should approximate existing volumes. As such it is our opinion that the 2031 "without" road link traffic forecast could be more than 50% overstated. Seeing that the model forecasts were used to identify the reduction of traffic on Lakeshore (estimated to be a 16% reduction in the TMP), this would imply that the new road link would be diverting only 10-15 peak-direction hourly vehicles. Again it is our opinion that the potential new road link will deliver minimal benefit and is not warranted.

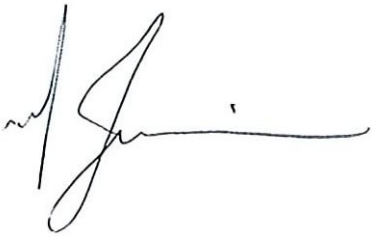
4. Based upon traffic counts undertaken by BA Group on Lake Shore Road in 2012, we estimate that existing daily traffic on that portion of Lakeshore Road is in the order of 700-1000 vehicles per day. Assuming that, without accounting for any new development, future volumes on Lakeshore Road should remain relatively stable. As such the TMP's estimate that 700 daily trips would use the new road link implies that virtually all existing traffic on Lake Shore Road would utilize the new connection. In our opinion it is unlikely that this level of diversion would be the case as Lakeshore Road will remain the most direct route for many of those using it (i.e. more than half of traffic travels to the north and is not affected by the delays for the westbound left turn).

Based on our analysis of the materials provided in the TMP it is our opinion that the new road link between Lakeshore Road and Aurora Road is unwarranted as it would provide, at best, minimal benefit to the existing network, at substantive Town cost and negative impact to the Farsight project. It should therefore not be a required piece of infrastructure in the TMP.

Any need/justification for the new road link attributable to the proposed development should (and will) be reviewed as part of the site specific technical analysis / planning that will be undertaken in support of those lands.

We trust that the above analysis is helpful and will receive the appropriate consideration when finalizing the TMP policies. Should there be any questions with respect to the foregoing, please feel free to contact the undersigned.

Sincerely,
BA Consulting Group Ltd.

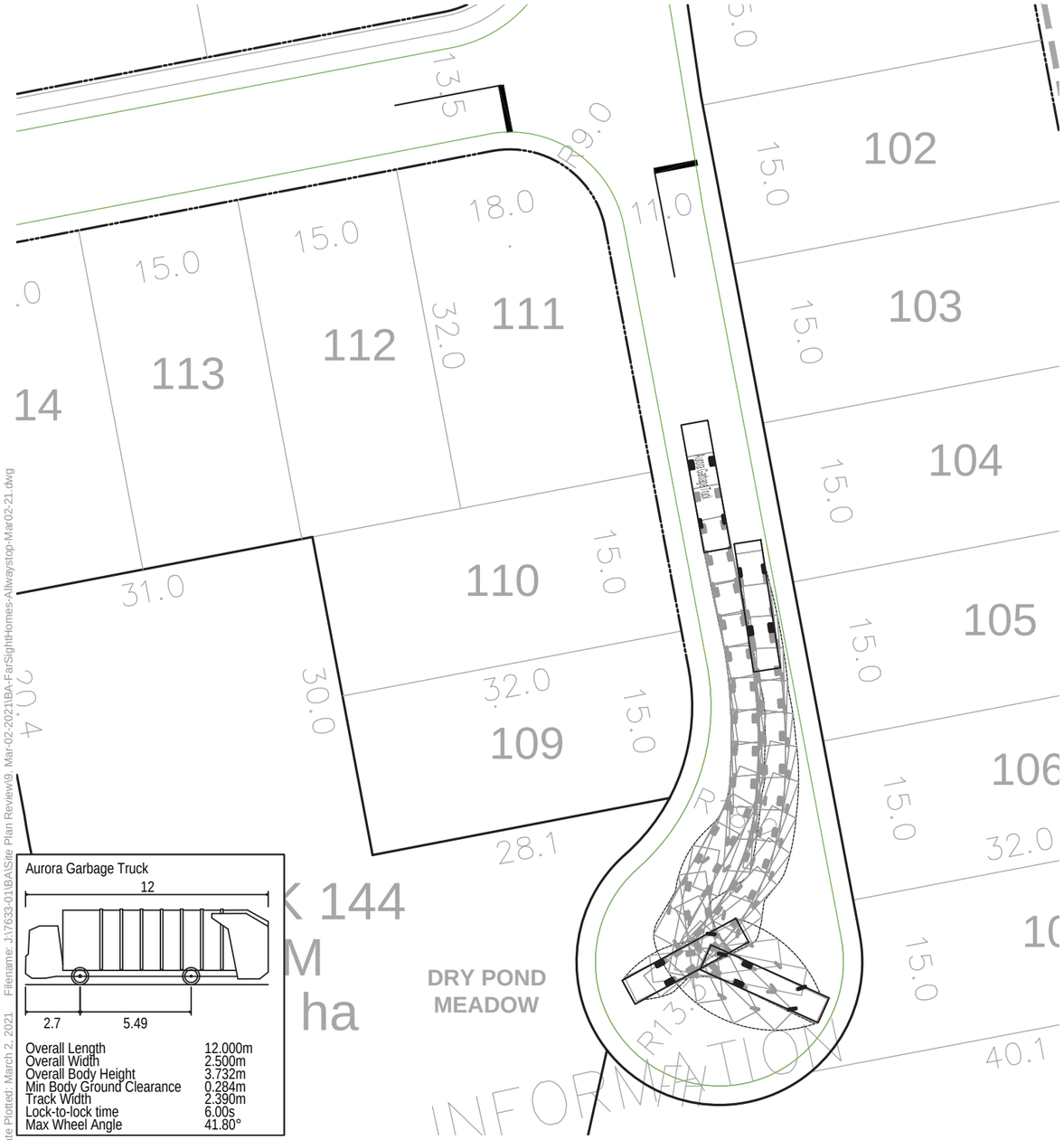


Mark Jamieson, P. Eng., MBA
Senior Associate

Copy: Sahar Tolami, BA Consulting Group

APPENDIX E:
Vehicle Manoeuvring Diagrams

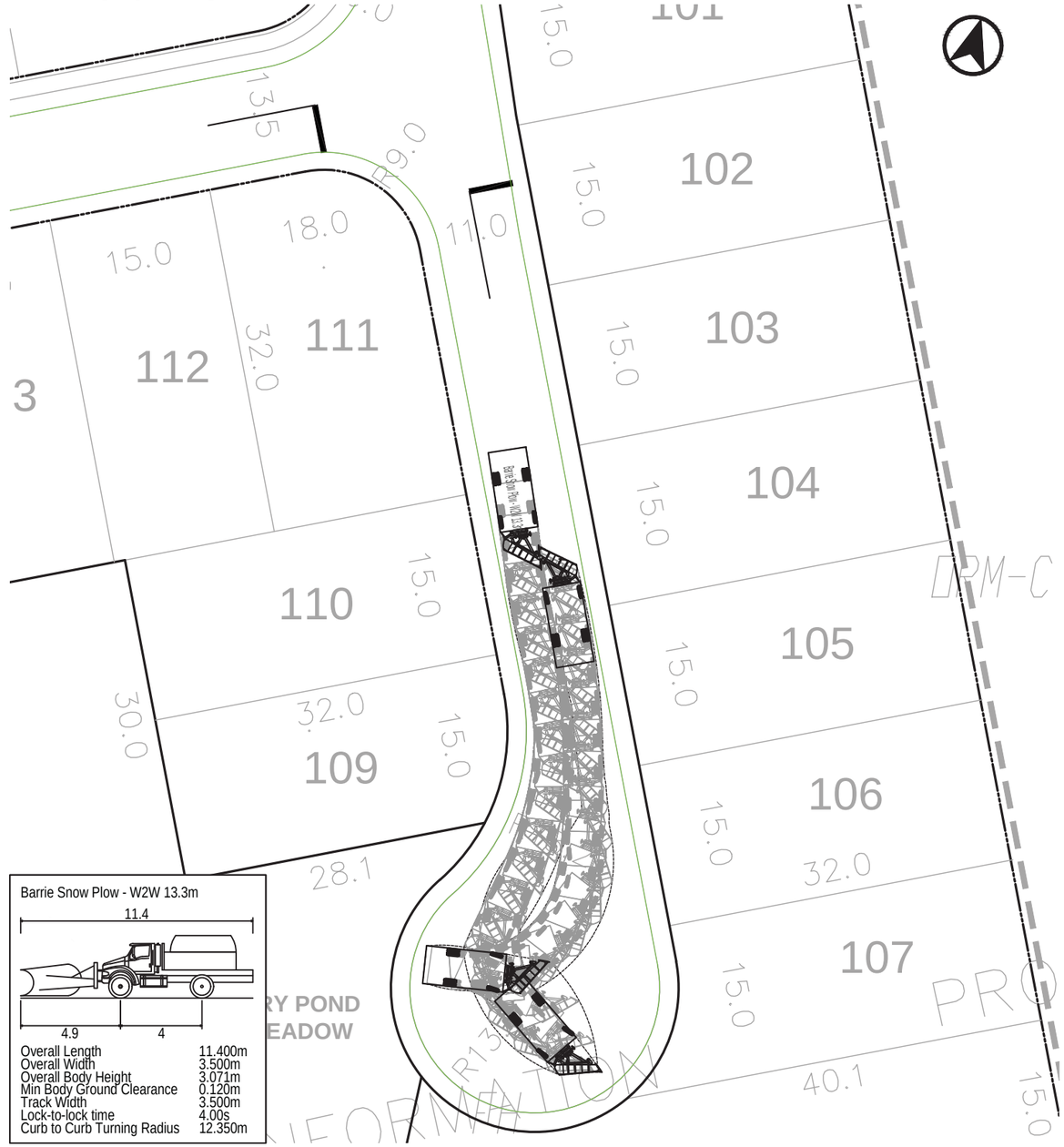
AURORA GARBAGE TRUCK



Aurora Garbage Truck

Overall Length	12.000m
Overall Width	2.500m
Overall Body Height	3.732m
Min Body Ground Clearance	0.284m
Track Width	2.390m
Lock-to-lock time	6.00s
Max Wheel Angle	41.80°

BARRIE SNOW PLOW



Barrie Snow Plow - W2W 13.3m

Overall Length	11.400m
Overall Width	3.500m
Overall Body Height	3.071m
Min Body Ground Clearance	0.120m
Track Width	3.500m
Lock-to-lock time	4.00s
Curb to Curb Turning Radius	12.350m

Date Plotted: March 2, 2021 Filename: J:\7633-01\BA\Site Plan Review\9. Mar-02-2021\BA-FarSightHomes-Allwaystop-Mar02-21.dwg

BA Group

BALLANTRAE

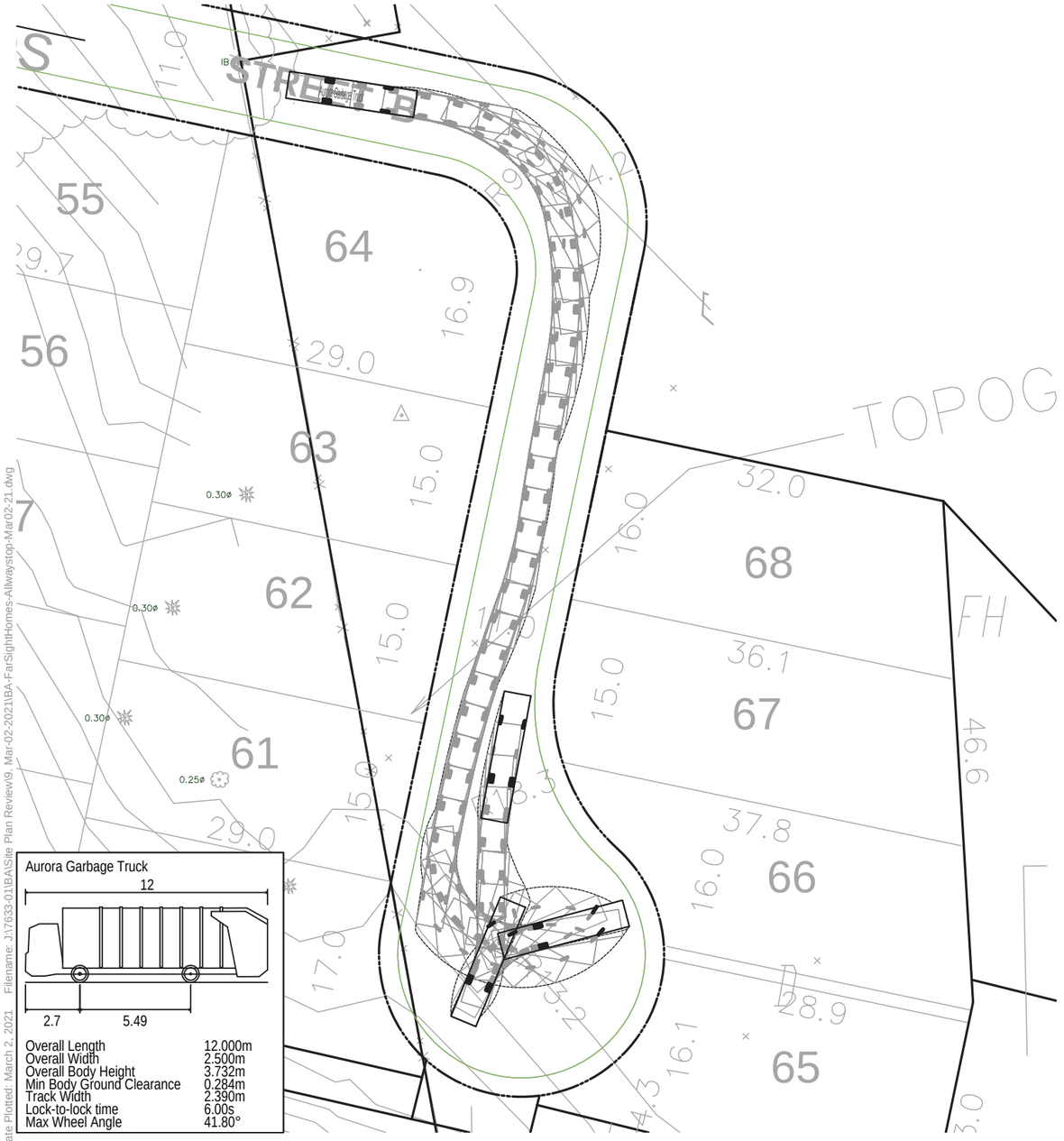
VEHICLE MANOEUVRING DIAGRAM
STREET 'A' CUL-DE-SAC
GARBAGE TRUCK / SNOW PLOW ACCESS

Project:	FAR SIGHT HOMES
Project No.	7633-01
Date:	APRIL 11, 2017
Revised:	March 02, 2021

Scale 1:500 (0 5 10 15 20m)

Drawing No. VMD-01

AURORA GARBAGE TRUCK

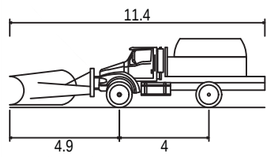


Aurora Garbage Truck

Overall Length	12.000m
Overall Width	2.500m
Overall Body Height	3.732m
Min Body Ground Clearance	0.284m
Track Width	2.390m
Lock-to-lock time	6.00s
Max Wheel Angle	41.80°

BARRIE SNOW PLOW

Barrie Snow Plow - W2W 13.3m



Overall Length	11.400m
Overall Width	3.500m
Overall Body Height	3.071m
Min Body Ground Clearance	0.120m
Track Width	3.500m
Lock-to-lock time	4.00s
Curb to Curb Turning Radius	12.350m

Date Plotted: March 2, 2021 Filename: J:\7633-01\BA\Site Plan Review\9. Mar-02-2021\BA-FarSightHomes-Allwaystop-Mar02-21.dwg

BA Group

BALLANTRAE

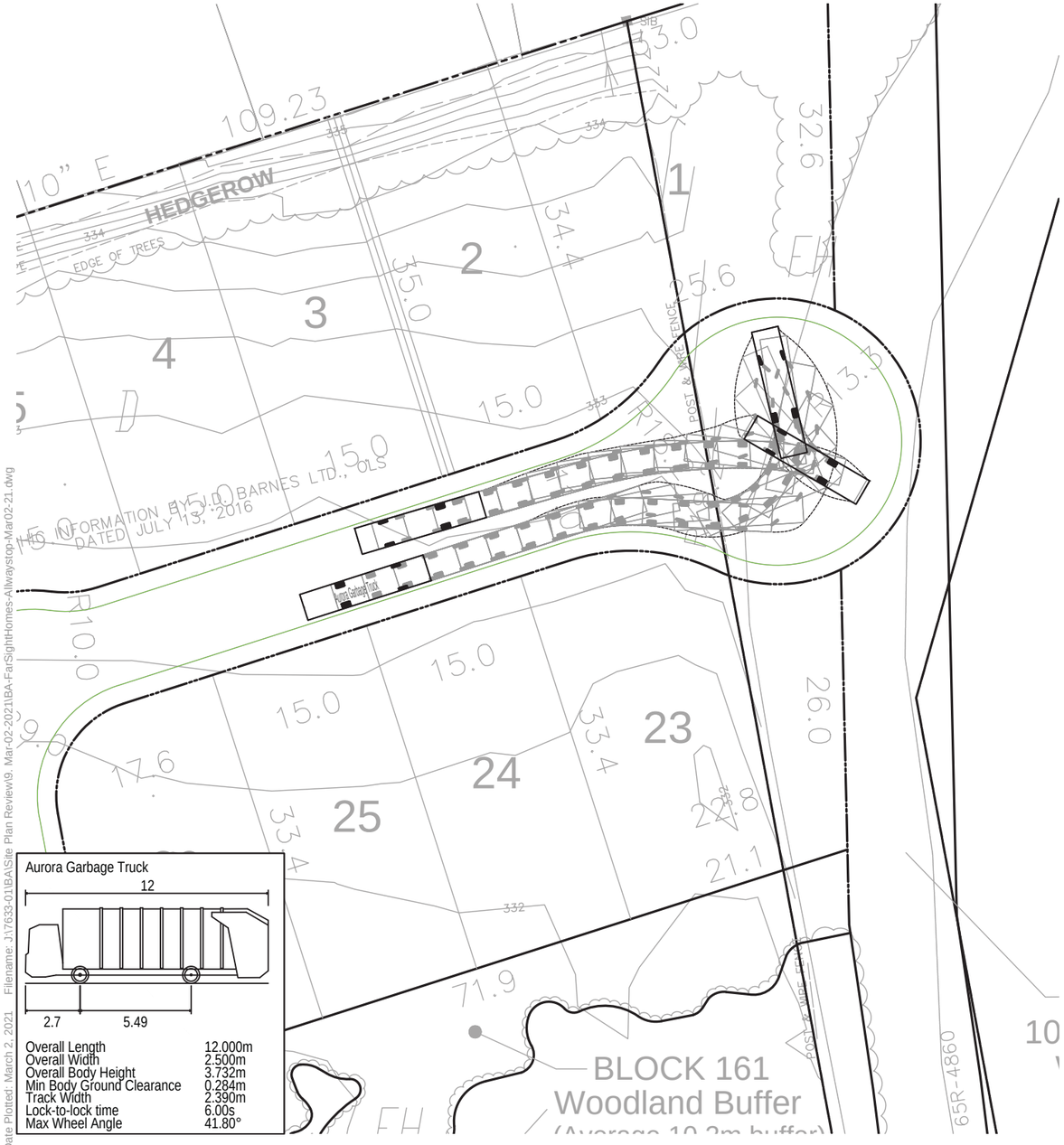
VEHICLE MANOEUVRING DIAGRAM
STREET 'B' CUL-DE-SAC
GARBAGE TRUCK / SNOW PLOW ACCESS

Project:	FAR SIGHT HOMES
Project No.	7633-01
Date:	APRIL 11, 2017
Revised:	March 02, 2021

Scale 1:500 — 0 5 10 15 20m

Drawing No. VMD-02

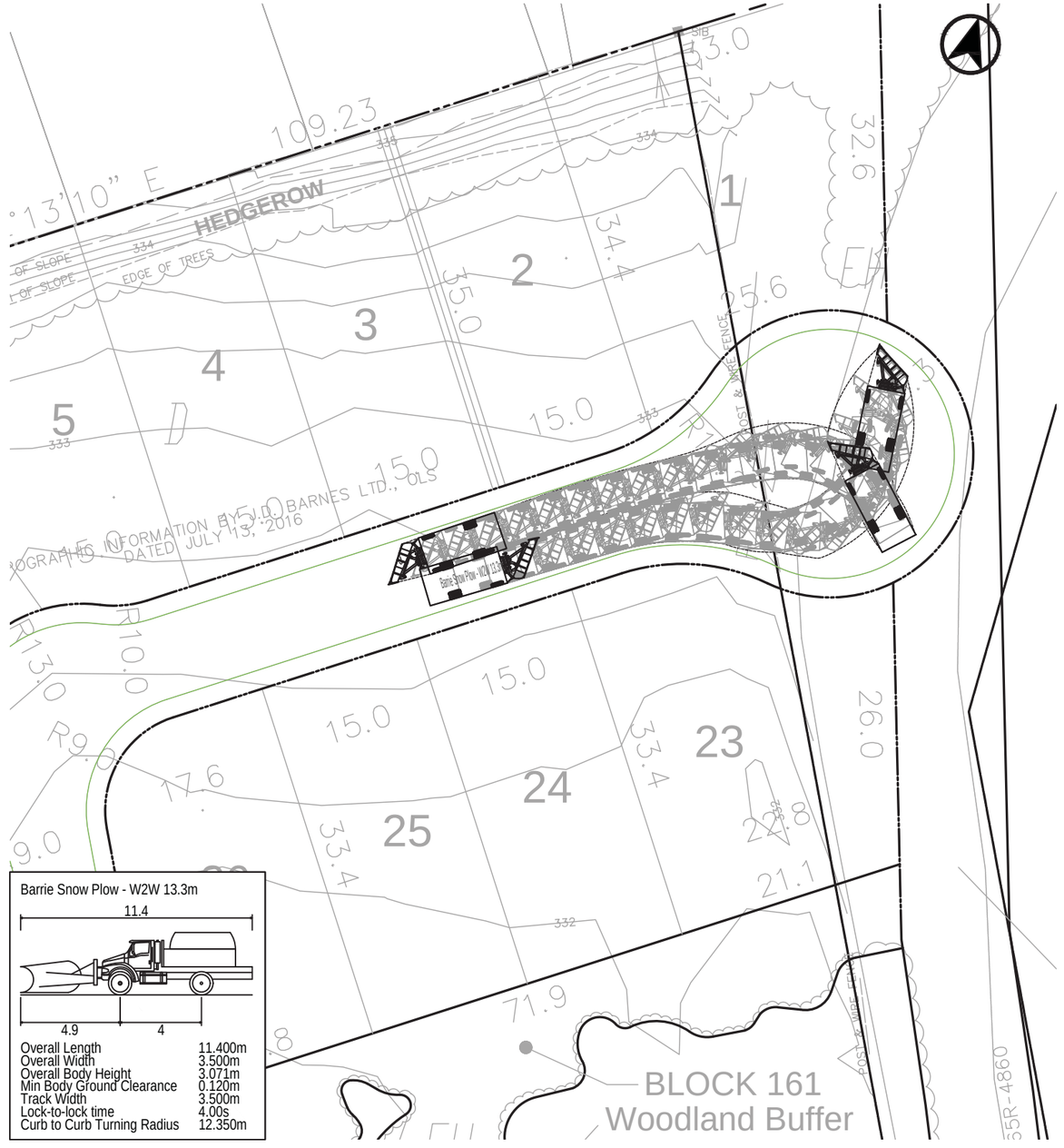
AURORA GARBAGE TRUCK



Aurora Garbage Truck

Overall Length	12.000m
Overall Width	2.500m
Overall Body Height	3.732m
Min Body Ground Clearance	0.284m
Track Width	2.390m
Lock-to-lock time	6.00s
Max Wheel Angle	41.80°

BARRIE SNOW PLOW



Barrie Snow Plow - W2W 13.3m

Overall Length	11.400m
Overall Width	3.500m
Overall Body Height	3.071m
Min Body Ground Clearance	0.120m
Track Width	3.500m
Lock-to-lock time	4.00s
Curb to Curb Turning Radius	12.350m

BA Group

BALLANTRAE

VEHICLE MANOEUVRING DIAGRAM
STREET 'C' CUL-DE-SAC
GARBAGE TRUCK / SNOW PLOW ACCESS

Project:	FAR SIGHT HOMES
Project No.	7633-01
Date:	APRIL 11, 2017
Revised:	March 02, 2021

Scale 1:500 — 0 5 10 15 20m

Drawing No. VMD-03

Date Plotted: March 2, 2021 Filename: J:\7633-01\BA\Site Plan Review\9. Mar-02-2021\BA-FarSightHomes-Allwaystop-Mar02-21.dwg

BA Group

BALLANTRAE

VEHICLE MANOEUVRING DIAGRAM
STREET 'A' / STREET 'B' CUL-DE-SAC
HEAVY SINGLE UNIT TRUCK

Project:	FAR SIGHT HOMES
Project No.	7633-01
Date:	APRIL 11, 2017
Revised:	March 02, 2021

Scale 1:750 (0, 15, 30m)

Drawing No. VMD-04

BLOCK 162
Woodland Buffer
(Average 12m buffer)
0.17 ha

PLANTATION

STREET A

STREET B

STREET D

STREET E

BLOCK 157
PRIVATE ROADS
0.18 ha

BLOCK 144
SWM
0.27 ha
DRY POND
MEADOW

BLOCK 147
OPEN SPACE
CONSERVATION
1.63 ha

BLOCK 156
PUMPING
STATION
0.03 ha

BLOCK 143
SWM
0.26 ha
DRY POND
MEADOW

BLOCK 158
ROAD WIDENING
0.23 ha

BLOCK 151
OPEN SPACE
0.03 ha

EXISTING
WETLAND

LAKESHORE ROAD (TRAVELLED ROAD)

LIMIT BETWEEN LOTS 19 AND 20

N76°06'20"W

N 09°22'20" E 3.02

Design Vehicle - TAC HSU (Heavy Single Unit)

Overall Length	11.50m
Overall Width	2.60m
Overall Body Height	4.11m
Outside Turning Radius	14.56m
Inside Turning Radius	8.69m

BA Group

BALLANTRAE

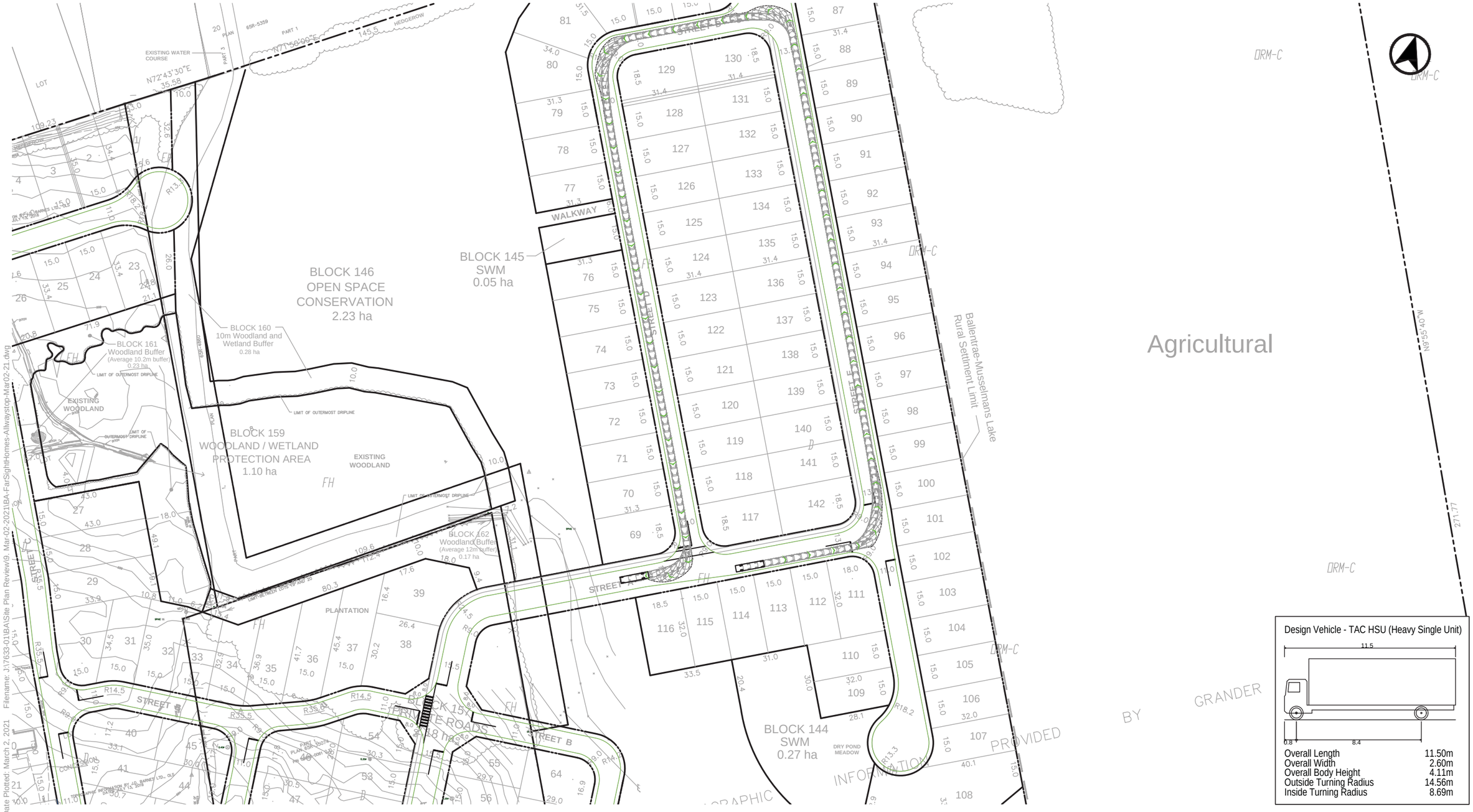
VEHICLE MANOEUVRING DIAGRAM
STREET 'A' / STREET 'E' CUL-DE-SAC
HEAVY SINGLE UNIT TRUCK

Project:	FAR SIGHT HOMES
Project No.	7633-01
Date:	APRIL 11, 2017
Revised:	March 02, 2021

Scale 1:1,000 (0 10 20 30 40 50m)

Drawing No. VMD-05

Filename: J:\7633-01\BA\Site Plan Review\9. Mar-02-2021\BA-FarSightHomes-Allwaystop-Mar02-21.dwg
Date Plotted: March 2, 2021



Date Plotted: March 2, 2021 Filename: J:\7633-01\BA\Site Plan Review\9. Mar-02-2021\BA-FarSightHomes-Allwaystop-Mar02-21.dwg

BA Group

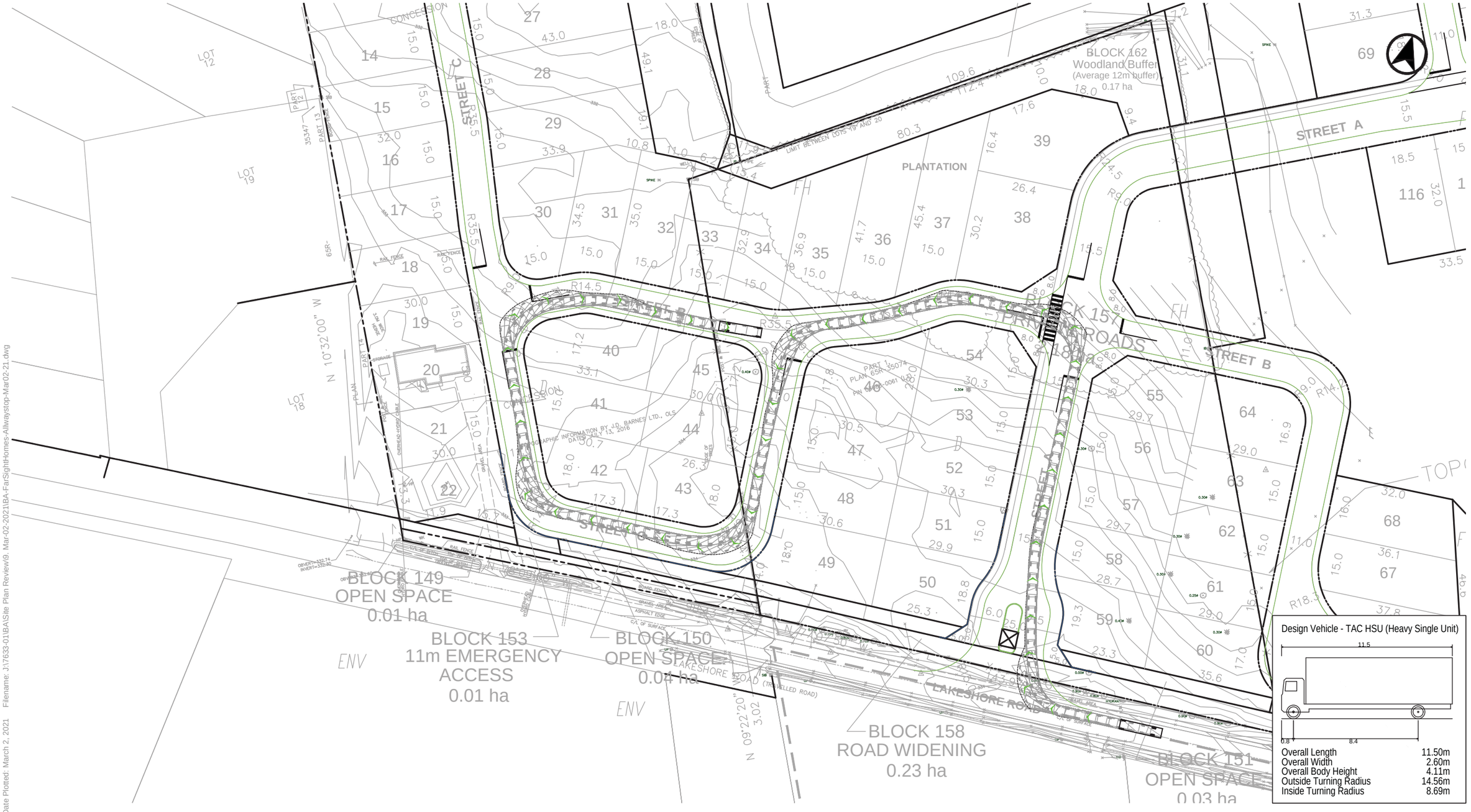
BALLANTRAE

VEHICLE MANOEUVRING DIAGRAM
STREET 'A' / STREET 'E' / STREET 'D'
HEAVY SINGLE UNIT TRUCK

Project:	FAR SIGHT HOMES
Project No.	7633-01
Date:	APRIL 11, 2017
Revised:	March 02, 2021

Scale 1:1,500 (0 25 50m)

Drawing No. VMD-06



Date Plotted: March 2, 2021 Filename: J:\7633-01\BA\Site Plan Review\9. Mar-02-2021\BA-FarSightHomes-Allwaystop-Mar02-21.dwg

BA Group

BALLANTRAE

VEHICLE MANOEUVRING DIAGRAM
STREET 'A' / STREET 'B' / STREET 'C'
HEAVY SINGLE UNIT TRUCK

Project:	FAR SIGHT HOMES
Project No.	7633-01
Date:	APRIL 11, 2017
Revised:	March 02, 2021

Scale 1:1,000 (0 10 20 30 40 50m)

Drawing No. VMD-07

BLOCK 146
OPEN SPACE
CONSERVATION
2.23 ha

BLOCK 145
SWM
0.05 ha

BLOCK 160
10m Woodland and
Wetland Buffer
0.28 ha

BLOCK 161
Woodland Buffer
(Average 10.2m buffer)
0.23 ha

BLOCK 159
WOODLAND / WETLAND
PROTECTION AREA
1.10 ha

BLOCK 162
Woodland Buffer
(Average 12m buffer)
0.17 ha

BLOCK 144
SWM
0.27 ha

BLOCK 156
PUMPING
STATION
0.03 ha

BLOCK 149
OPEN SPACE
0.01 ha

BLOCK 153
11m EMERGENCY
ACCESS

BLOCK 150
OPEN SPACE

STREET A
STREET B
STREET C
STREET D
STREET E
WALKWAY

EXISTING
WOODLAND

PLANTATION

DRY POND
MEADOW

Ballentrae-Musselmans Lake
Rural Settlment Limit

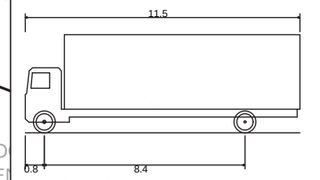
TOPOGRAPHIC

REGISTERED
PLAN 65M-4428

LOT 9
LOT 10
LOT 11
LOT 12
LOT 18
LOT 19
LOT 20

DRM-C

Design Vehicle - TAC HSU (Heavy Single Unit)



Overall Length	11.50m
Overall Width	2.60m
Overall Body Height	4.11m
Outside Turning Radius	14.56m
Inside Turning Radius	8.69m

Date Plotted: March 2, 2021 Filename: J:\7633-01\BA\Site Plan Review\9. Mar-02-2021\BA-FarSightHomes-Allwaystop-Mar02-21.dwg

BA Group

BALLANTRAE

VEHICLE MANOEUVRING DIAGRAM
STREET 'A' / STREET 'B' / STREET 'C' CUL-DE-SAC
HEAVY SINGLE UNIT TRUCK

Project:	FAR SIGHT HOMES
Project No.	7633-01
Date:	APRIL 11, 2017
Revised:	March 02, 2021

Scale 1:1,500 (0 — 25 — 50m)

Drawing No. VMD-08

Design Vehicle - TAC HSU (Heavy Single Unit)

Overall Length	11.50m
Overall Width	2.60m
Overall Body Height	4.11m
Outside Turning Radius	14.56m
Inside Turning Radius	8.69m

BA Group

BALLANTRAE

VEHICLE MANOEUVRING DIAGRAM
OUTBOUND
HEAVY SINGLE UNIT TRUCK

Project:	FAR SIGHT HOMES
Project No.	7633-01
Date:	APRIL 11, 2017
Revised:	March 02, 2021

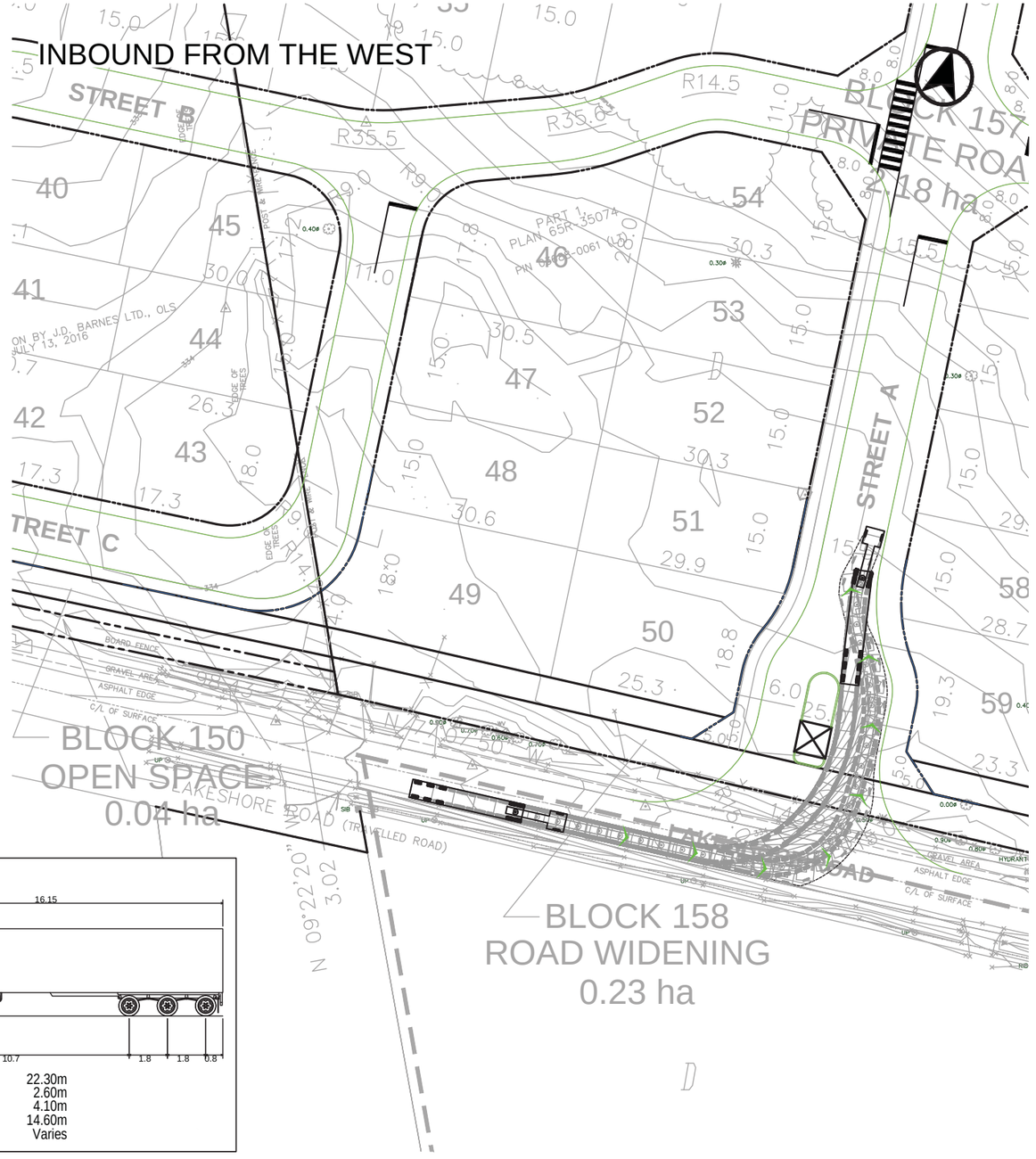
Scale 1:750 (0 — 15 — 30m)

Drawing No. VMD-09

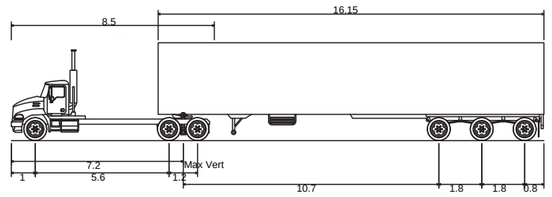
Date Plotted: March 2, 2021 Filename: J:\7633-01\BA\Site Plan Review\9. Mar-02-2021\BA-FarSight-Homes-Allwaystop-Mar02-21.dwg

INBOUND FROM THE EAST

INBOUND FROM THE WEST



Design Vehicle - MTO WB-20.5



Overall Length	22.30m
Overall Width	2.60m
Overall Body Height	4.10m
Outside Turning Radius	14.60m
Inside Turning Radius	Varies

Filename: J:\7633-01\BA\Site Plan Review\9. Mar-02-2021\BA-FarSightHomes-Allwaystop-Mar02-21.dwg

Date Plotted: March 2, 2021

BA Group

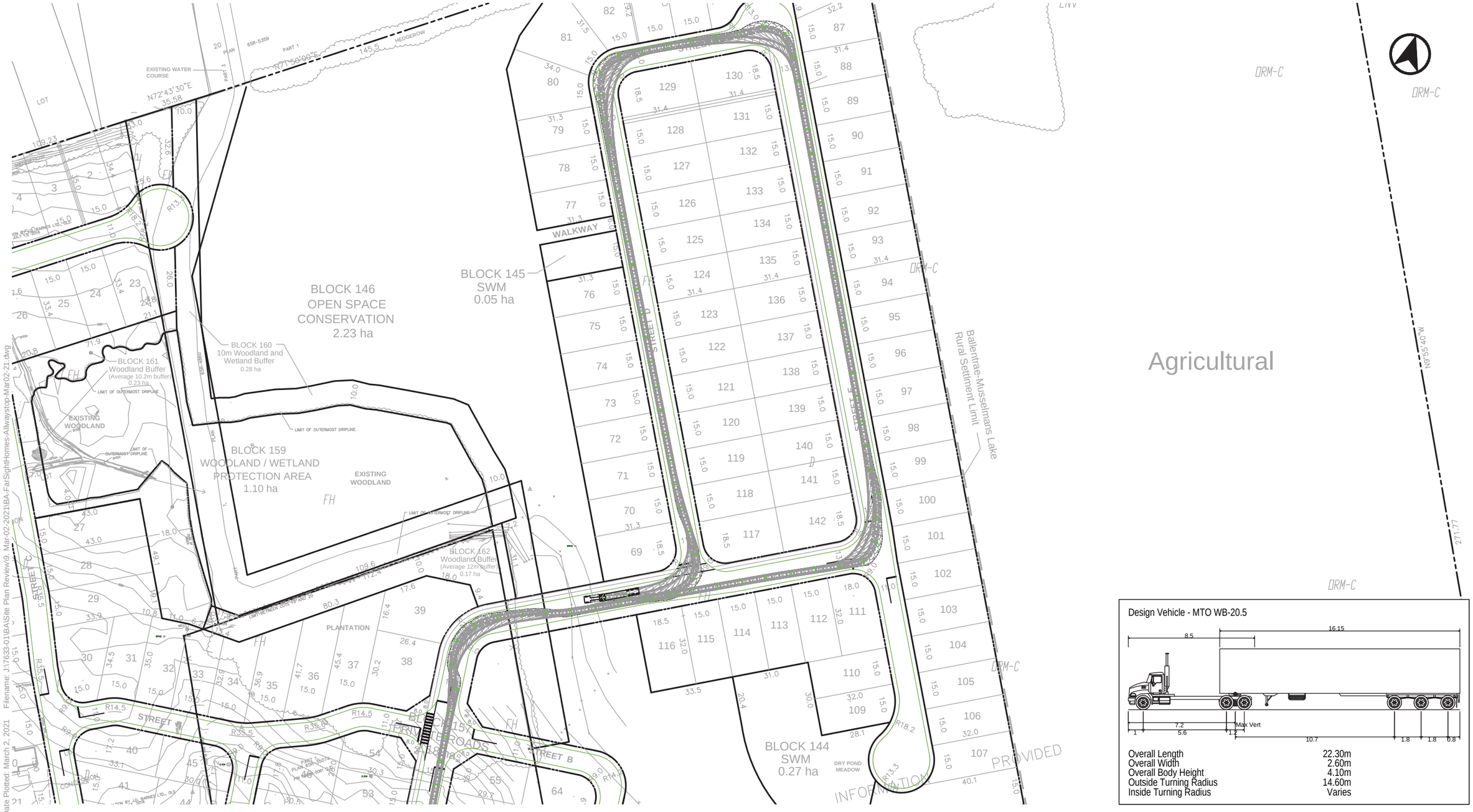
BALLANTRAE

VEHICLE MANOEUVRING DIAGRAM
WB-20.5 TRACTOR TRAILER

Project:	FAR SIGHT HOMES
Project No.	7633-01
Date:	APRIL 11, 2017
Revised:	March 02, 2021

Scale 1:750 (0 — 15 — 30m)

Drawing No. VMD-10



Design Vehicle - MTO WB-20.5

Overall Length	22.30m
Overall Width	2.60m
Overall Body Height	4.10m
Outside Turning Radius	14.60m
Inside Turning Radius	Varies

BA Group

BALLANTRAE

VEHICLE MANOEUVRING DIAGRAM
STREET 'A' / STREET 'E' / STREET 'D'
WB 20.5 TRACTOR TRAILER

Project:	FAR SIGHT HOMES
Project No.	7633-01
Date:	APRIL 11, 2017
Revised:	March 02, 2021

Scale 1:1,500 (0 25 50m)

Drawing No. VMD-11

BLOCK 149
OPEN SPACE
0.01 ha

BLOCK 153
11m EMERGENCY
ACCESS
0.01 ha

BLOCK 150
OPEN SPACE
0.04 ha

BLOCK 158
ROAD WIDENING
0.23 ha

BLOCK 157
ROADS

STREET A

STREET B

STREET C

LAKESHORE ROAD (TRAVELLED ROAD)

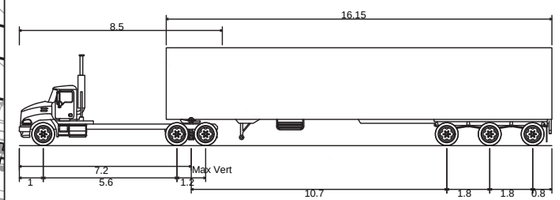
LAKESHORE ROAD

CONCESSION

TOPOGRAPHIC INFORMATION BY J.D. BARNES LTD., OLS
DATED JULY 13, 2016

PART 1, PLAN 65R-35074
PIN 24...-0061 (LT)

Design Vehicle - MTO WB-20.5



Overall Length	22.30m
Overall Width	2.60m
Overall Body Height	4.10m
Outside Turning Radius	14.60m
Inside Turning Radius	Varies

BA Group

BALLANTRAE

VEHICLE MANOEUVRING DIAGRAM
STREET 'A' / STREET 'B' / STREET 'C'
WB-20.5 TRACTOR TRAILER

Project:	FAR SIGHT HOMES
Project No.	7633-01
Date:	APRIL 11, 2017
Revised:	March 02, 2021

Scale 1:750 (0 – 15 – 30m)

Drawing No. VMD-12

Date Plotted: March 2, 2021 Filename: J:\7633-01\BA\Site Plan Review\9. Mar-02-2021\BA-FarSight Homes-Allwaystop-Mar02-21.dwg

BLOCK 146
OPEN SPACE
CONSERVATION
2.23 ha

BLOCK 145
SWM
0.05 ha

BLOCK 160
10m Woodland and
Wetland Buffer
0.28 ha

BLOCK 161
Woodland Buffer
(Average 10.2m buffer)
0.23 ha

BLOCK 159
WOODLAND / WETLAND
PROTECTION AREA
1.10 ha

BLOCK 162
Woodland Buffer
(Average 12m buffer)
0.17 ha

EXISTING WOODLAND

PLANTATION

WALKWAY

STREET A

STREET B

STREET C

STREET D

STREET E

BLOCK 144
SWM

BLOCK 149
OPEN SPACE
0.01 ha

BLOCK 153
11m EMERGENCY
ACCESS

BLOCK 150
OPEN SPACE

Ballentrae-Musselmans Lake
Rural Settlment Limit

REGISTERED
PLAN 65M-4428

LOT 20

LOT 10

LOT 11

LOT 12

LOT 18

LOT 19

BLOCK 20

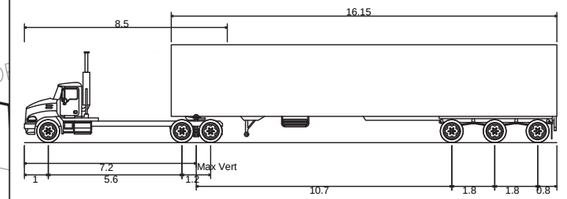
CONCESSION 1

DRM-C

ENV

FH

Design Vehicle - MTO WB-20.5



Overall Length	22.30m
Overall Width	2.60m
Overall Body Height	4.10m
Outside Turning Radius	14.60m
Inside Turning Radius	Varies

BA Group

BALLANTRAE

VEHICLE MANOEUVRING DIAGRAM
STREET 'A' / STREET 'B' / STREET 'C'
WB 20.5 TRACTOR TRAILER

Project:	FAR SIGHT HOMES
Project No.	7633-01
Date:	APRIL 11, 2017
Revised:	March 02, 2021

Scale 1:1,500 (0 — 25 — 50m)

Drawing No. VMD-13

Date Plotted: March 2, 2021 Filename: J:\7633-01\BA\Site Plan Review\9. Mar-02-2021\BA-FarSightHomes-Allwaystop-Mar02-21.dwg

BLOCK 157
PRIVATE ROADS
2.18 ha

STREET A

STREET B

BLOCK 144
SWM
0.27 ha
DRY POND
MEADOW

BLOCK 147
OPEN SPACE
CONSERVATIO
1.63 ha

BLOCK 156
PUMPING
STATION
0.03 ha

BLOCK 143

BLOCK 158
ROAD WIDENING
0.23 ha

BLOCK 151
OPEN SPACE
0.03 ha

BLOCK 154

BLOCK 150
SPACE
1 ha

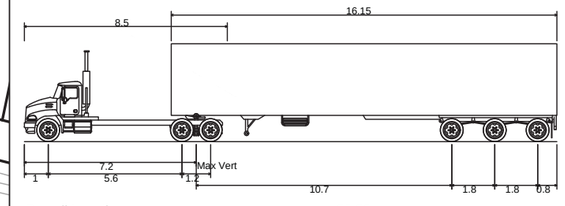
LAKESHORE ROAD (TRAVELLED ROAD)

LAKESHORE ROAD

TOPOGRAPHIC

INFORMA

Design Vehicle - MTO WB-20.5



Overall Length	22.30m
Overall Width	2.60m
Overall Body Height	4.10m
Outside Turning Radius	14.60m
Inside Turning Radius	Varies

Date Plotted: March 2, 2021 Filename: J:\7633-01\BA\Site Plan Review\9. Mar-02-2021\BA-FarSightHomes-Allwaystop-Mar02-21.dwg

BA Group

BALLANTRAE

VEHICLE MANOEUVRING DIAGRAM
OUTBOUND
WB-20.5 TRACTOR TRAILER

Project:	FAR SIGHT HOMES
Project No.	7633-01
Date:	APRIL 11, 2017
Revised:	March 02, 2021

Scale 1:750 (0 – 15 – 30m)

Drawing No. VMD-14

APPENDIX F:
Turning Movement Counts

Turning Movement Count (1 . HWY 48 & AURORA RD)

Start Time	N Approach HWY 48						E Approach AURORA RD						S Approach HWY 48						W Approach AURORA RD						Int. Total (15 min)	Int. Total (1 hr)
	Right N:W	Thru N:S	Left N:E	U-Turn N:N	Peds N:	Approach Total	Right E:N	Thru E:W	Left E:S	U-Turn E:E	Peds E:	Approach Total	Right S:E	Thru S:N	Left S:W	U-Turn S:S	Peds S:	Approach Total	Right W:S	Thru W:E	Left W:N	U-Turn W:W	Peds W:	Approach Total		
07:00:00	26	101	8	0	0	135	2	45	21	0	0	68	8	23	17	1	0	49	11	23	3	0	0	37	289	
07:15:00	44	128	13	0	0	185	6	73	22	0	0	101	4	34	23	0	0	61	9	31	9	0	0	49	396	
07:30:00	38	87	10	0	0	135	8	89	30	0	0	127	8	61	24	0	0	93	13	25	3	0	0	41	396	
07:45:00	31	138	11	0	0	180	3	65	16	0	0	84	11	52	16	0	0	79	19	38	8	0	0	65	408	1489
08:00:00	22	129	14	0	0	165	11	73	22	0	0	106	21	38	27	0	0	86	21	37	6	0	0	64	421	1621
08:15:00	29	99	12	0	0	140	6	68	24	0	0	98	6	49	18	0	0	73	15	22	12	0	0	49	360	1585
08:30:00	30	92	9	0	0	131	8	70	20	0	0	98	8	41	22	0	0	71	21	34	7	0	0	62	362	1551
08:45:00	16	54	11	0	0	81	8	52	9	0	1	69	6	49	31	0	0	86	16	27	10	0	0	53	289	1432
BREAK																										
16:00:00	8	48	4	0	0	60	9	30	16	0	0	55	18	117	27	0	0	162	16	56	34	0	0	106	383	
16:15:00	12	70	7	0	0	89	12	36	5	0	0	53	13	115	23	0	0	151	21	87	41	0	0	149	442	
16:30:00	9	55	10	0	0	74	10	40	13	0	0	63	15	99	18	0	0	132	27	88	42	0	0	157	426	
16:45:00	9	46	10	0	0	65	8	45	12	0	0	65	26	106	17	0	0	149	17	94	42	0	0	153	432	1683
17:00:00	9	64	5	0	0	78	12	41	21	0	0	74	12	111	21	0	0	144	14	75	48	0	0	137	433	1733
17:15:00	10	62	14	0	0	86	8	39	7	0	0	54	23	130	29	0	0	182	15	91	27	0	0	133	455	1746
17:30:00	9	40	6	0	0	55	10	43	9	0	0	62	9	85	28	0	0	122	21	69	38	0	0	128	367	1687
17:45:00	13	55	9	0	0	77	7	38	8	0	0	53	14	79	24	0	0	117	16	48	14	0	0	78	325	1580
Grand Total	315	1268	153	0	0	1736	128	847	255	0	1	1230	202	1189	365	1	0	1757	272	845	344	0	0	1461	**6184**	-
Approach%	18.1%	73%	8.8%	0%		-	10.4%	68.9%	20.7%	0%		-	11.5%	67.7%	20.8%	0.1%		-	18.6%	57.8%	23.5%	0%		-	**-**	-
Totals %	5.1%	20.5%	2.5%	0%		28.1%	2.1%	13.7%	4.1%	0%		19.9%	3.3%	19.2%	5.9%	0%		28.4%	4.4%	13.7%	5.6%	0%		23.6%	**-**	-
Heavy	17	121	10	0		-	5	33	8	0		-	9	98	33	0		-	20	43	24	0		-	**-**	-
Heavy %	5.4%	9.5%	6.5%	0%		-	3.9%	3.9%	3.1%	0%		-	4.5%	8.2%	9%	0%		-	7.4%	5.1%	7%	0%		-	**-**	-
Bicycles	0	0	0	0		-	0	2	0	0		-	1	2	1	0		-	1	1	0	0		-	**-**	-
Bicycle %	0%	0%	0%	0%		-	0%	0.2%	0%	0%		-	0.5%	0.2%	0.3%	0%		-	0.4%	0.1%	0%	0%		-	**-**	-

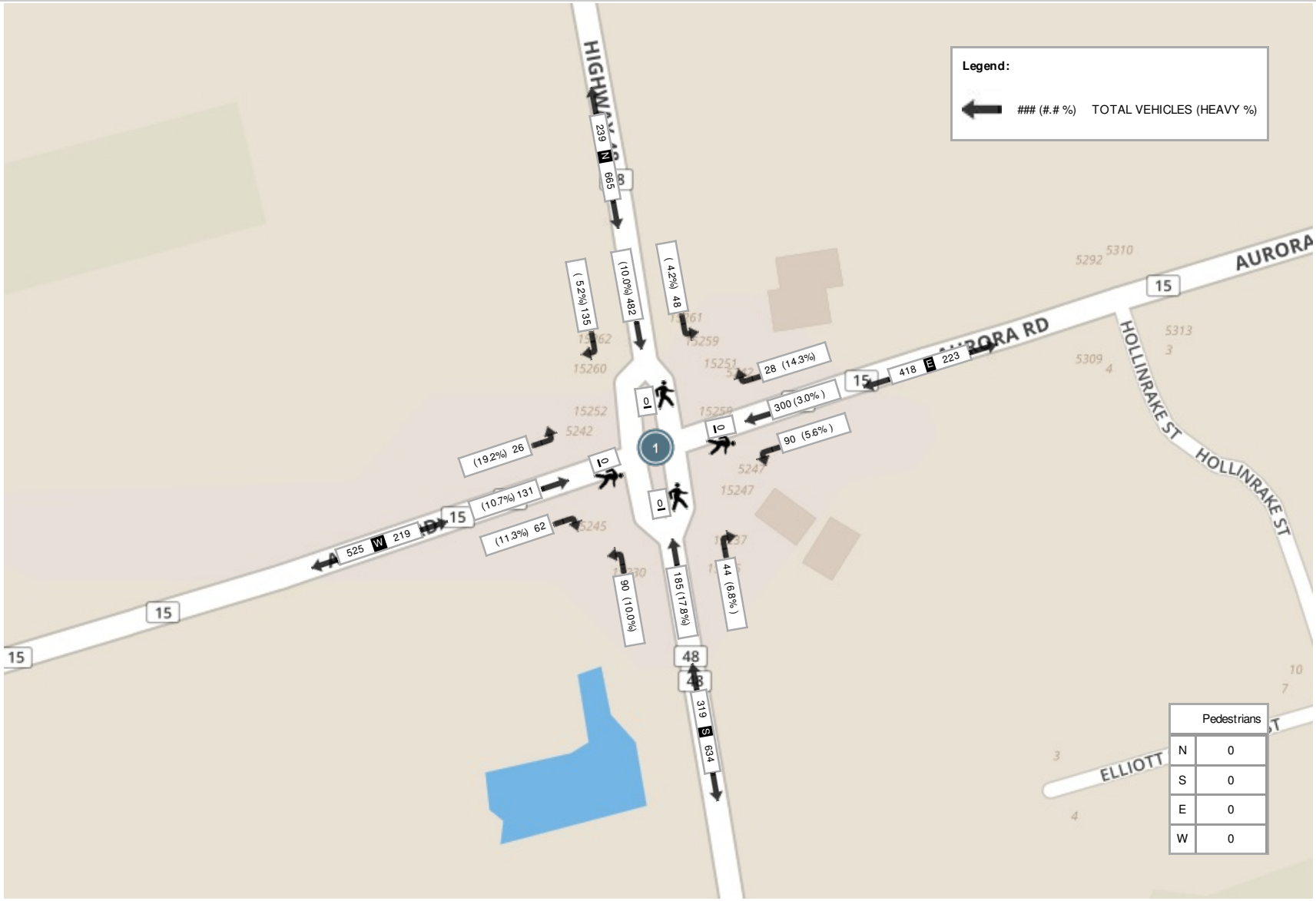
Peak Hour: 07:15 AM - 08:15 AM Weather: Mist (17.94 °C)

Start Time	N Approach HWY 48						E Approach AURORA RD						S Approach HWY 48						W Approach AURORA RD						Int. Total (15 min)
	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	
07:15:00	44	128	13	0	0	185	6	73	22	0	0	101	4	34	23	0	0	61	9	31	9	0	0	49	396
07:30:00	38	87	10	0	0	135	8	89	30	0	0	127	8	61	24	0	0	93	13	25	3	0	0	41	396
07:45:00	31	138	11	0	0	180	3	65	16	0	0	84	11	52	16	0	0	79	19	38	8	0	0	65	408
08:00:00	22	129	14	0	0	165	11	73	22	0	0	106	21	38	27	0	0	86	21	37	6	0	0	64	421
Grand Total	135	482	48	0	0	665	28	300	90	0	0	418	44	185	90	0	0	319	62	131	26	0	0	219	**1621**
Approach%	20.3%	72.5%	7.2%	0%		-	6.7%	71.8%	21.5%	0%		-	13.8%	58%	28.2%	0%		-	28.3%	59.8%	11.9%	0%		-	-
Totals %	8.3%	29.7%	3%	0%		41%	1.7%	18.5%	5.6%	0%		25.8%	2.7%	11.4%	5.6%	0%		19.7%	3.8%	8.1%	1.6%	0%		13.5%	-
PHF	0.77	0.87	0.86	0		0.9	0.64	0.84	0.75	0		0.82	0.52	0.76	0.83	0		0.86	0.74	0.86	0.72	0		0.84	-
Heavy	7	48	2	0		57	4	9	5	0		18	3	33	9	0		45	7	14	5	0		26	-
Heavy %	5.2%	10%	4.2%	0%		8.6%	14.3%	3%	5.6%	0%		4.3%	6.8%	17.8%	10%	0%		14.1%	11.3%	10.7%	19.2%	0%		11.9%	-
Lights	128	434	46	0		608	24	291	85	0		400	41	152	81	0		274	55	117	21	0		193	-
Lights %	94.8%	90%	95.8%	0%		91.4%	85.7%	97%	94.4%	0%		95.7%	93.2%	82.2%	90%	0%		85.9%	88.7%	89.3%	80.8%	0%		88.1%	-
Single-Unit Trucks	5	29	0	0		34	0	8	1	0		9	1	23	3	0		27	4	6	4	0		14	-
Single-Unit Trucks %	3.7%	6%	0%	0%		5.1%	0%	2.7%	1.1%	0%		2.2%	2.3%	12.4%	3.3%	0%		8.5%	6.5%	4.6%	15.4%	0%		6.4%	-
Buses	2	1	2	0		5	4	1	4	0		9	2	3	1	0		6	1	4	1	0		6	-
Buses %	1.5%	0.2%	4.2%	0%		0.8%	14.3%	0.3%	4.4%	0%		2.2%	4.5%	1.6%	1.1%	0%		1.9%	1.6%	3.1%	3.8%	0%		2.7%	-
Articulated Trucks	0	18	0	0		18	0	0	0	0		0	0	7	5	0		12	2	4	0	0		6	-
Articulated Trucks %	0%	3.7%	0%	0%		2.7%	0%	0%	0%	0%		0%	0%	3.8%	5.6%	0%		3.8%	3.2%	3.1%	0%	0%		2.7%	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
Pedestrians%	-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-
Bicycles on Road	0	0	0	0	0	-	0	0	0	0	0	-	1	0	0	0	0	-	0	0	0	0	0	-	-
Bicycles on Road%	-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-

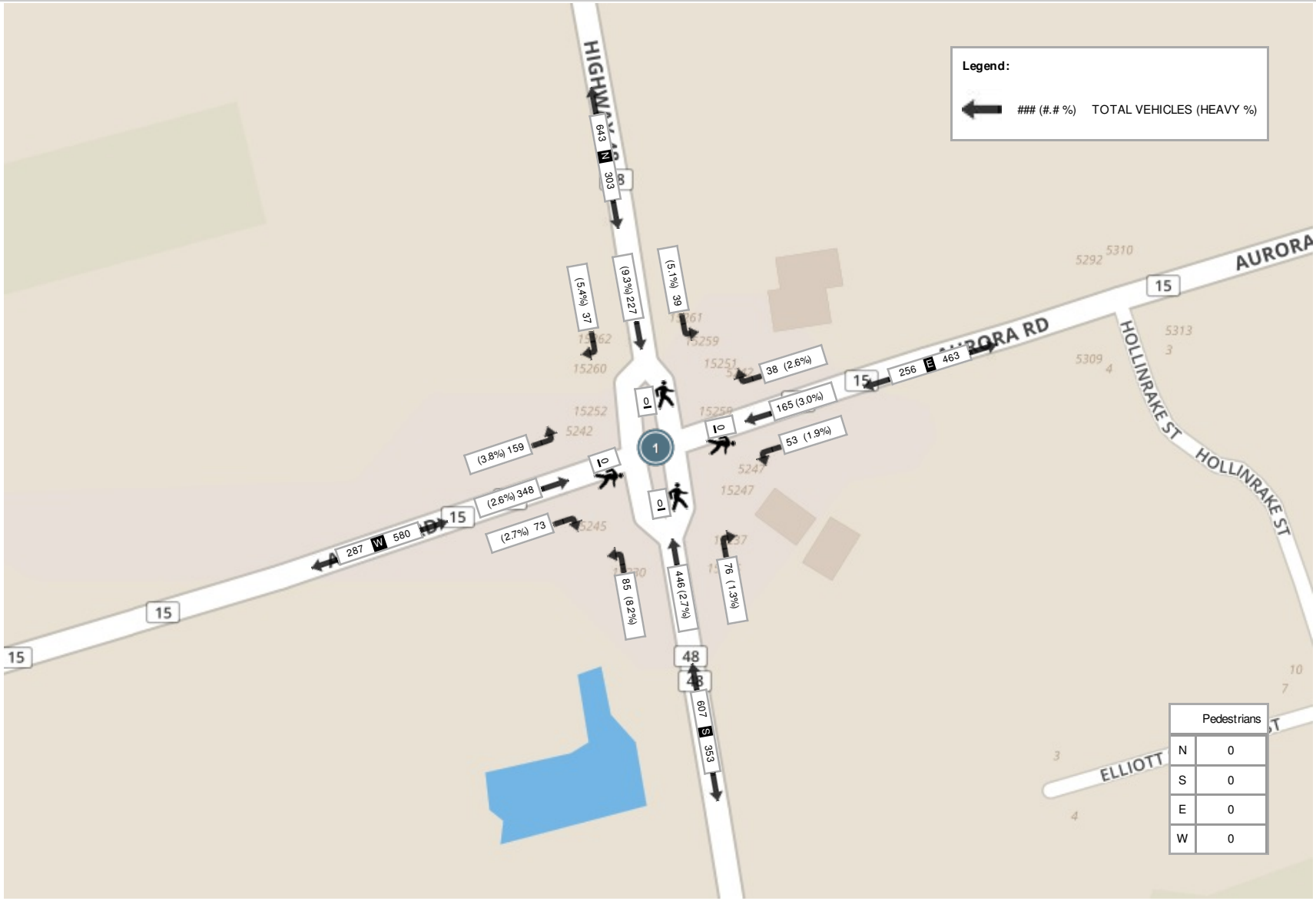
Peak Hour: 04:30 PM - 05:30 PM Weather: Few Clouds (26.97 °C)

Start Time	N Approach HWY 48						E Approach AURORA RD						S Approach HWY 48						W Approach AURORA RD						Int. Total (15 min)
	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	
16:30:00	9	55	10	0	0	74	10	40	13	0	0	63	15	99	18	0	0	132	27	88	42	0	0	157	426
16:45:00	9	46	10	0	0	65	8	45	12	0	0	65	26	106	17	0	0	149	17	94	42	0	0	153	432
17:00:00	9	64	5	0	0	78	12	41	21	0	0	74	12	111	21	0	0	144	14	75	48	0	0	137	433
17:15:00	10	62	14	0	0	86	8	39	7	0	0	54	23	130	29	0	0	182	15	91	27	0	0	133	455
Grand Total	37	227	39	0	0	303	38	165	53	0	0	256	76	446	85	0	0	607	73	348	159	0	0	580	**1746**
Approach%	12.2%	74.9%	12.9%	0%		-	14.8%	64.5%	20.7%	0%		-	12.5%	73.5%	14%	0%		-	12.6%	60%	27.4%	0%		-	**-**
Totals %	2.1%	13%	2.2%	0%		17.4%	2.2%	9.5%	3%	0%		14.7%	4.4%	25.5%	4.9%	0%		34.8%	4.2%	19.9%	9.1%	0%		33.2%	**-**
PHF	0.93	0.89	0.7	0		0.88	0.79	0.92	0.63	0		0.86	0.73	0.86	0.73	0		0.83	0.68	0.93	0.83	0		0.92	**-**
Heavy	2	21	2	0		25	1	5	1	0		7	1	12	7	0		20	2	9	6	0		17	**-**
Heavy %	5.4%	9.3%	5.1%	0%		8.3%	2.6%	3%	1.9%	0%		2.7%	1.3%	2.7%	8.2%	0%		3.3%	2.7%	2.6%	3.8%	0%		2.9%	**-**
Lights	35	206	37	0		278	37	160	52	0		249	75	434	78	0		587	71	339	153	0		563	**-**
Lights %	94.6%	90.7%	94.9%	0%		91.7%	97.4%	97%	98.1%	0%		97.3%	98.7%	97.3%	91.8%	0%		96.7%	97.3%	97.4%	96.2%	0%		97.1%	**-**
Single-Unit Trucks	2	15	2	0		19	1	2	1	0		4	1	7	7	0		15	2	5	5	0		12	**-**
Single-Unit Trucks %	5.4%	6.6%	5.1%	0%		6.3%	2.6%	1.2%	1.9%	0%		1.6%	1.3%	1.6%	8.2%	0%		2.5%	2.7%	1.4%	3.1%	0%		2.1%	**-**
Buses	0	2	0	0		2	0	1	0	0		1	0	1	0	0		1	0	2	1	0		3	**-**
Buses %	0%	0.9%	0%	0%		0.7%	0%	0.6%	0%	0%		0.4%	0%	0.2%	0%	0%		0.2%	0%	0.6%	0.6%	0%		0.5%	**-**
Articulated Trucks	0	4	0	0		4	0	2	0	0		2	0	4	0	0		4	0	2	0	0		2	**-**
Articulated Trucks %	0%	1.8%	0%	0%		1.3%	0%	1.2%	0%	0%		0.8%	0%	0.9%	0%	0%		0.7%	0%	0.6%	0%	0%		0.3%	**-**
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	**-**
Pedestrians%	-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		**-**
Bicycles on Road	0	0	0	0	0	-	0	1	0	0	0	-	0	2	0	0	0	-	0	0	0	0	0	-	**-**
Bicycles on Road%	-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		**-**

Peak Hour: 07:15 AM - 08:15 AM Weather: Mist (17.94 °C)



Peak Hour: 04:30 PM - 05:30 PM Weather: Few Clouds (26.97 °C)



Turning Movement Count (2 . HWY 48 & LAKESHORE RD)

Start Time	N Approach HWY 48					E Approach LAKESHORE RD					S Approach HWY 48					Int. Total (15 min)	Int. Total (1 hr)
	Thru N:S	Left N:E	U-Turn N:N	Peds N:	Approach Total	Right E:N	Left E:S	U-Turn E:E	Peds E:	Approach Total	Right S:E	Thru S:N	U-Turn S:S	Peds S:	Approach Total		
07:00:00	138	3	0	0	141	5	6	0	0	11	1	39	0	0	40	192	
07:15:00	159	0	0	0	159	10	9	0	0	19	5	48	1	0	54	232	
07:30:00	132	3	0	0	135	7	4	0	0	11	2	82	0	0	84	230	
07:45:00	170	3	0	0	173	11	8	0	0	19	2	69	0	0	71	263	917
08:00:00	165	6	0	0	171	15	9	0	0	24	1	65	0	0	66	261	986
08:15:00	133	3	0	0	136	4	7	0	0	11	3	71	0	0	74	221	975
08:30:00	134	3	0	0	137	13	7	0	0	20	4	63	0	0	67	224	969
08:45:00	74	6	0	0	80	6	2	0	0	8	3	72	0	0	75	163	869
BREAK																	
16:00:00	75	5	0	0	80	5	2	0	0	7	7	159	0	0	166	253	
16:15:00	92	4	0	0	96	4	4	0	0	8	7	152	0	0	159	263	
16:30:00	88	8	0	0	96	4	7	0	1	11	10	133	0	0	143	250	
16:45:00	74	2	0	0	76	4	2	0	1	6	7	146	0	0	153	235	1001
17:00:00	93	3	0	0	96	6	1	0	0	7	12	149	0	0	161	264	1012
17:15:00	77	9	0	0	86	5	3	0	0	8	8	169	0	0	177	271	1020
17:30:00	59	11	0	0	70	2	4	0	0	6	6	118	0	0	124	200	970
17:45:00	72	12	0	0	84	9	8	0	0	17	7	106	0	0	113	214	949
Grand Total	1735	81	0	0	1816	110	83	0	2	193	85	1641	1	0	1727	**3736**	-
Approach%	95.5%	4.5%	0%		-	57%	43%	0%		-	4.9%	95%	0.1%		-	-	-
Totals %	46.4%	2.2%	0%		48.6%	2.9%	2.2%	0%		5.2%	2.3%	43.9%	0%		46.2%	-	-
Heavy	146	7	0		-	2	2	0		-	1	135	0		-	-	-
Heavy %	8.4%	8.6%	0%		-	1.8%	2.4%	0%		-	1.2%	8.2%	0%		-	-	-
Bicycles	0	1	0		-	4	0	0		-	1	1	0		-	-	-
Bicycle %	0%	1.2%	0%		-	3.6%	0%	0%		-	1.2%	0.1%	0%		-	-	-

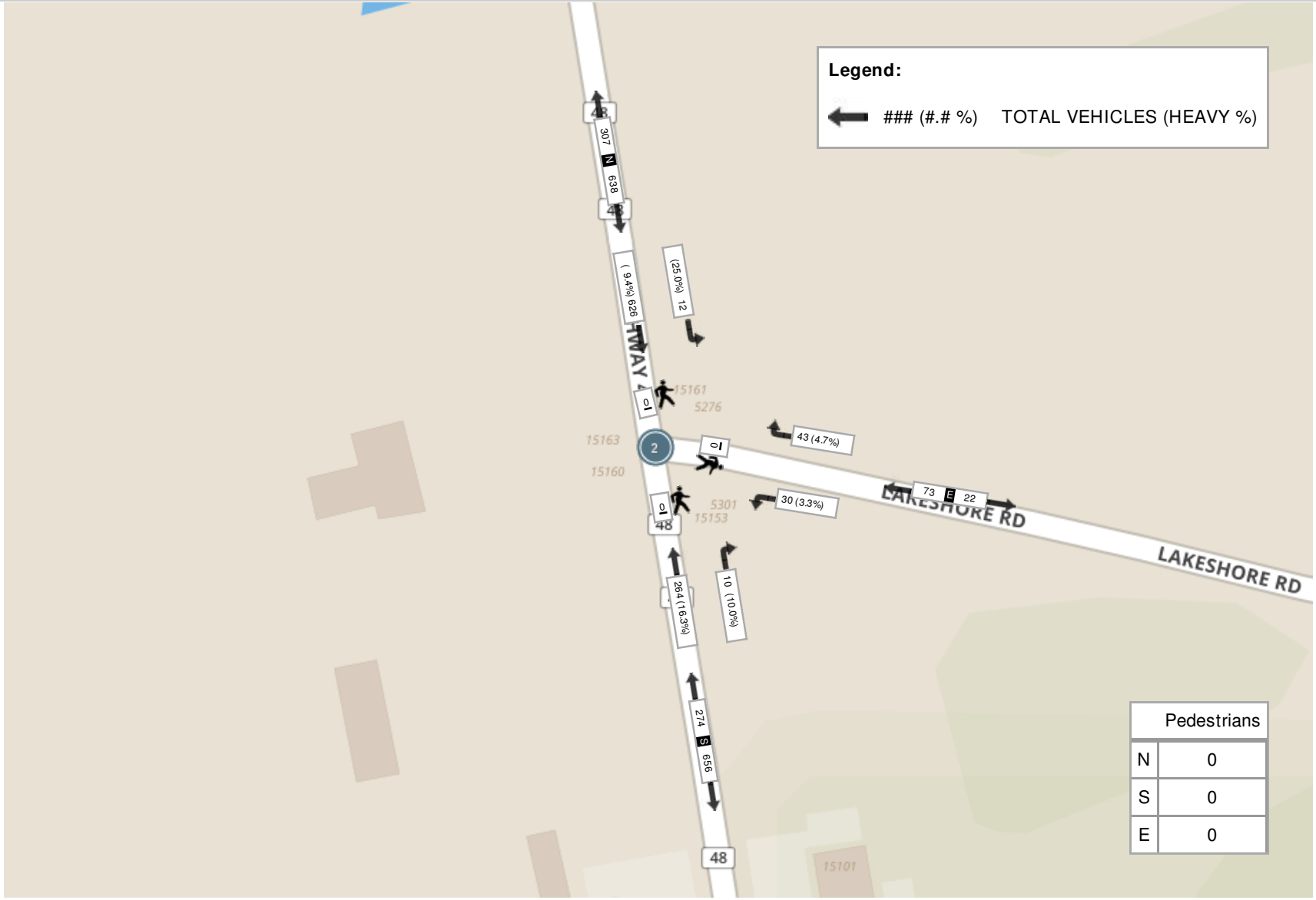
Peak Hour: 07:15 AM - 08:15 AM Weather: Mist (17.94 °C)

Start Time	N Approach HWY 48					E Approach LAKESHORE RD					S Approach HWY 48					Int. Total (15 min)
	Thru	Left	U-Turn	Peds	Approach Total	Right	Left	U-Turn	Peds	Approach Total	Right	Thru	U-Turn	Peds	Approach Total	
07:15:00	159	0	0	0	159	10	9	0	0	19	5	48	1	0	54	232
07:30:00	132	3	0	0	135	7	4	0	0	11	2	82	0	0	84	230
07:45:00	170	3	0	0	173	11	8	0	0	19	2	69	0	0	71	263
08:00:00	165	6	0	0	171	15	9	0	0	24	1	65	0	0	66	261
Grand Total	626	12	0	0	638	43	30	0	0	73	10	264	1	0	275	**986**
Approach%	98.1%	1.9%	0%		-	58.9%	41.1%	0%		-	3.6%	96%	0.4%		-	-
Totals %	63.5%	1.2%	0%		64.7%	4.4%	3%	0%		7.4%	1%	26.8%	0.1%		27.9%	-
PHF	0.92	0.5	0		0.92	0.72	0.83	0		0.76	0.5	0.8	0.25		0.82	-
Heavy	59	3	0		62	2	1	0		3	1	43	0		44	-
Heavy %	9.4%	25%	0%		9.7%	4.7%	3.3%	0%		4.1%	10%	16.3%	0%		16%	-
Lights	567	9	0		576	41	29	0		70	9	221	1		231	-
Lights %	90.6%	75%	0%		90.3%	95.3%	96.7%	0%		95.9%	90%	83.7%	100%		84%	-
Single-Unit Trucks	35	2	0		37	0	0	0		0	0	28	0		28	-
Single-Unit Trucks %	5.6%	16.7%	0%		5.8%	0%	0%	0%		0%	0%	10.6%	0%		10.2%	-
Buses	6	0	0		6	2	1	0		3	1	4	0		5	-
Buses %	1%	0%	0%		0.9%	4.7%	3.3%	0%		4.1%	10%	1.5%	0%		1.8%	-
Articulated Trucks	18	1	0		19	0	0	0		0	0	11	0		11	-
Articulated Trucks %	2.9%	8.3%	0%		3%	0%	0%	0%		0%	0%	4.2%	0%		4%	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
Pedestrians%	-	-	-	0%		-	-	-	0%		-	-	-	0%		-
Bicycles on Road	0	0	0	0	-	1	0	0	0	-	0	0	0	0	-	-
Bicycles on Road%	-	-	-	0%		-	-	-	0%		-	-	-	0%		-

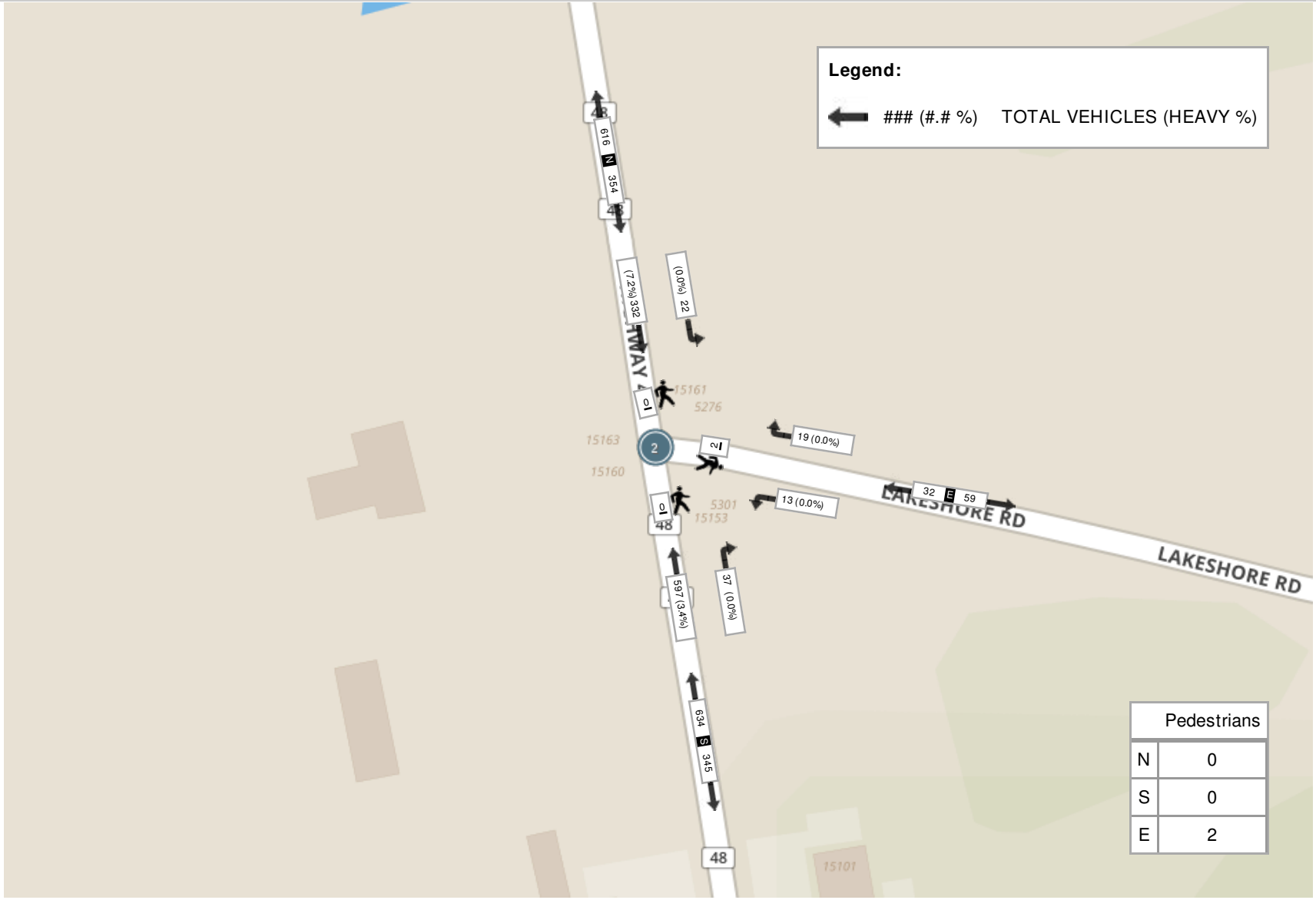
Peak Hour: 04:30 PM - 05:30 PM Weather: Few Clouds (26.97 °C)

Start Time	N Approach HWY 48					E Approach LAKESHORE RD					S Approach HWY 48					Int. Total (15 min)
	Thru	Left	U-Turn	Peds	Approach Total	Right	Left	U-Turn	Peds	Approach Total	Right	Thru	U-Turn	Peds	Approach Total	
16:30:00	88	8	0	0	96	4	7	0	1	11	10	133	0	0	143	250
16:45:00	74	2	0	0	76	4	2	0	1	6	7	146	0	0	153	235
17:00:00	93	3	0	0	96	6	1	0	0	7	12	149	0	0	161	264
17:15:00	77	9	0	0	86	5	3	0	0	8	8	169	0	0	177	271
Grand Total	332	22	0	0	354	19	13	0	2	32	37	597	0	0	634	**1020**
Approach%	93.8%	6.2%	0%		-	59.4%	40.6%	0%		-	5.8%	94.2%	0%		-	-
Totals %	32.5%	2.2%	0%		34.7%	1.9%	1.3%	0%		3.1%	3.6%	58.5%	0%		62.2%	-
PHF	0.89	0.61	0		0.92	0.79	0.46	0		0.73	0.77	0.88	0		0.9	-
Heavy	24	0	0		24	0	0	0		0	0	20	0		20	-
Heavy %	7.2%	0%	0%		6.8%	0%	0%	0%		0%	0%	3.4%	0%		3.2%	-
Lights	308	22	0		330	19	13	0		32	37	577	0		614	-
Lights %	92.8%	100%	0%		93.2%	100%	100%	0%		100%	100%	96.6%	0%		96.8%	-
Single-Unit Trucks	18	0	0		18	0	0	0		0	0	14	0		14	-
Single-Unit Trucks %	5.4%	0%	0%		5.1%	0%	0%	0%		0%	0%	2.3%	0%		2.2%	-
Buses	1	0	0		1	0	0	0		0	0	1	0		1	-
Buses %	0.3%	0%	0%		0.3%	0%	0%	0%		0%	0%	0.2%	0%		0.2%	-
Articulated Trucks	5	0	0		5	0	0	0		0	0	5	0		5	-
Articulated Trucks %	1.5%	0%	0%		1.4%	0%	0%	0%		0%	0%	0.8%	0%		0.8%	-
Pedestrians	-	-	-	0	-	-	-	-	2	-	-	-	-	0	-	-
Pedestrians%	-	-	-	0%		-	-	-	100%		-	-	-	0%		-
Bicycles on Road	0	0	0	0	-	2	0	0	0	-	0	0	0	0	-	-
Bicycles on Road%	-	-	-	0%		-	-	-	0%		-	-	-	0%		-

Peak Hour: 07:15 AM - 08:15 AM Weather: Mist (17.94 °C)



Peak Hour: 04:30 PM - 05:30 PM Weather: Few Clouds (26.97 °C)



APPENDIX G:
Background Development Traffic Volume Excerpts

6.3 Site access

Access to the proposed site is provided via a single full moves driveway approximately 200 metres west of Highway 48. The driveway will be stop controlled on the minor approach.

6.4 Site trip distribution and assignment

The site traffic is likely to exhibit similar travel patterns as the existing east-west orientations on Aurora Road during the am and pm peak periods.

Table 3 summarizes the residential trip distribution adopted in the study to assign the site trips to the road network for both the weekday am and pm peak hours.

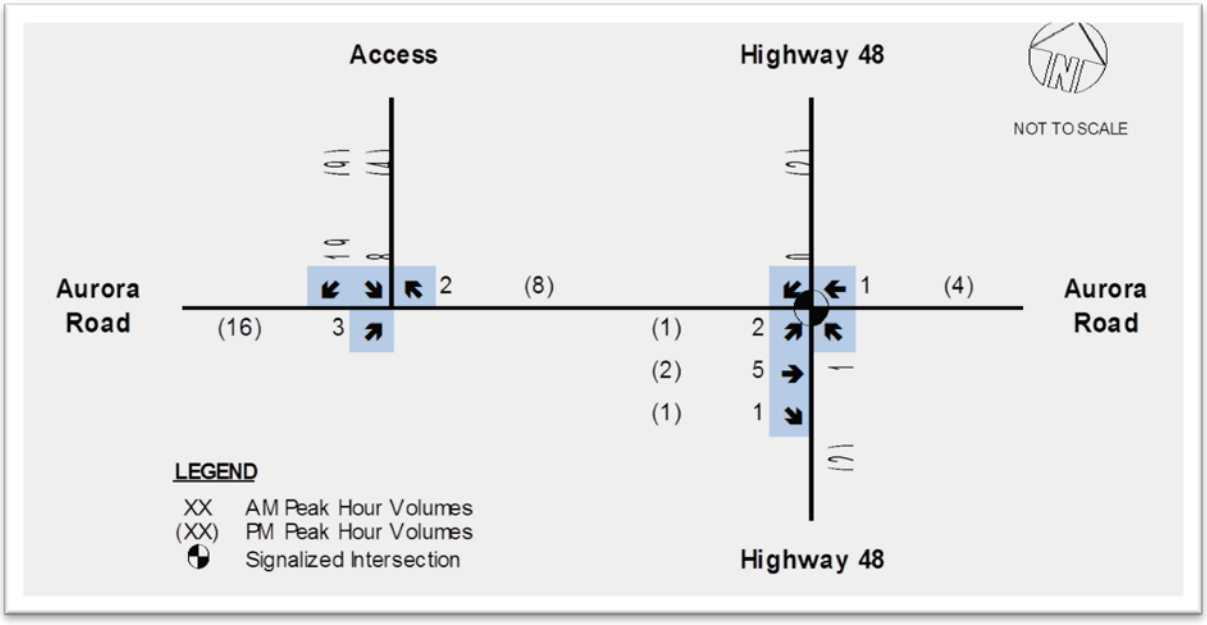
Site traffic assignment to the intersection of Highway 48 and Aurora Road assumed the same distribution as existing traffic on each approach.

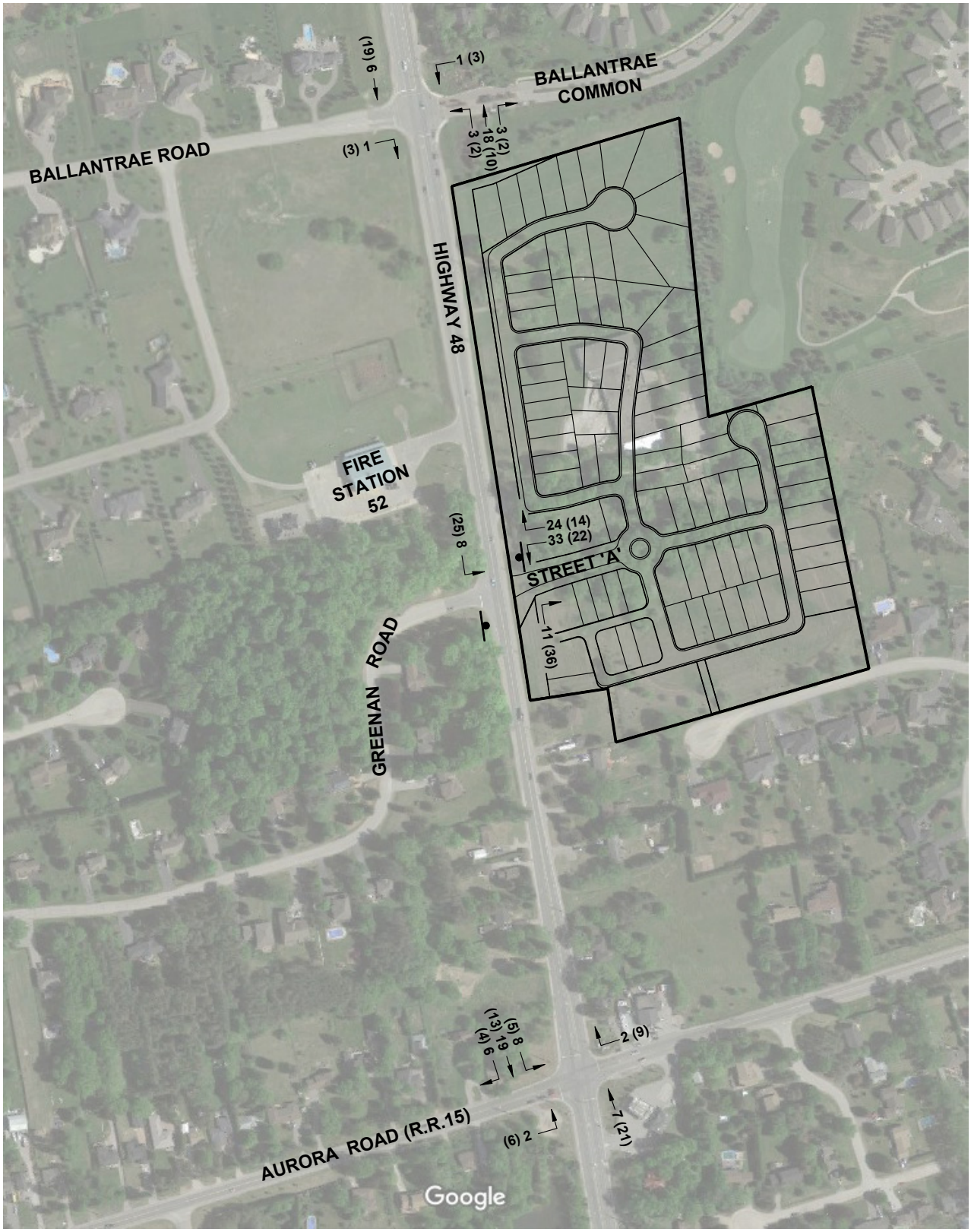
Table 3 Site trip distribution

TO/FROM	AM	PM
West on Aurora Road	70%	33%
East on Aurora Road	30%	67%
Total	100%	100%

The estimated site trips generated by the proposed development, as assigned to the nearby road network for the weekday am and pm peak hours, is shown in **Figure 5**.

Figure 5 Estimated site traffic





Map data © 2015 Google

DIONNE BACCHUS & ASSOCIATES CONSULTING ENGINEERS

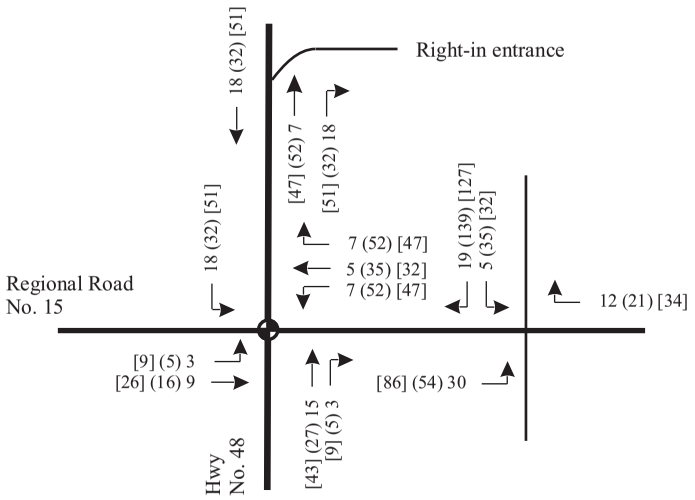
BALLANTRAE RESIDENTIAL
SUBJECT SITE GENERATED
TRAFFIC VOLUMES

N

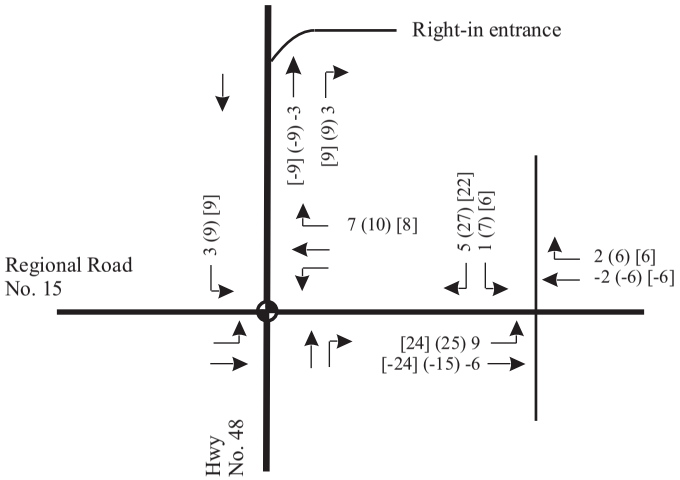
PROJECT No:
T15-116

DATE:
9/FEB/17

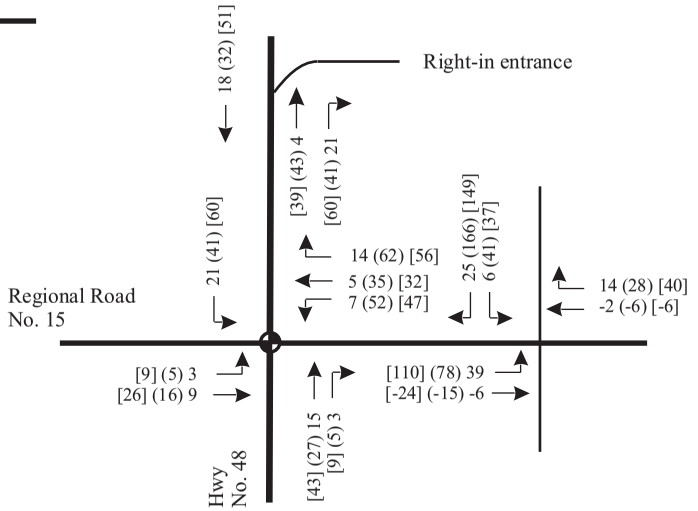
FIGURE
9



New Site Traffic



Pass-by Site Traffic



Total Site Traffic
(New Trips + Pass-by Trips)

Poulos Chung

Legend:

[123] (45) 67

[Saturday Peak] (PM Peak) AM Peak

Site Traffic Volumes
Figure 8

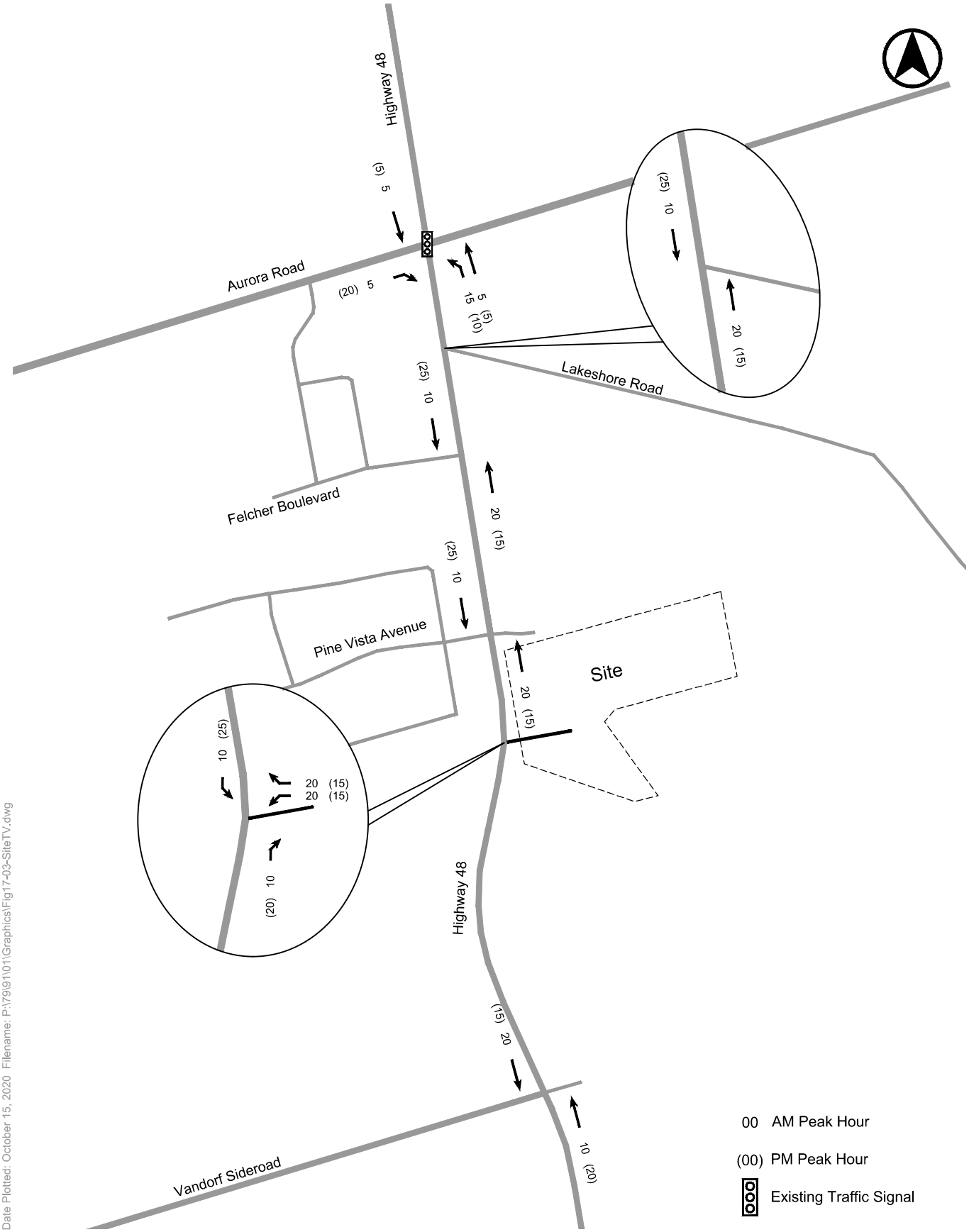


FIGURE 17 SITE TRAFFIC VOLUMES

APPENDIX H:
Trip Generation Proxy Survey Data

Project No: **6860.18**
Project: **Ballantrae - Lakeshore**
Study Location: **Lakeshore Rd / Treeview Ave**
Study Date: **Thursday, May 24, 2012**
Study Time: **7:00-9:00 AM and 4: 00-6:00 PM**

Trip Generation

Period Ending	Left In	Thu In	Right In	Total In	Left Out	Thru Out	Right Out	Total Out	2-Way
7:15	0	0	0	0	3	0	0	3	3
7:30	0	0	0	0	3	0	0	3	3
7:45	0	0	0	0	4	0	0	4	4
8:00	0	0	2	2	3	0	0	3	5
8:15	0	0	0	0	2	0	0	2	2
8:30	0	0	1	1	4	0	0	4	5
8:45	1	0	1	2	0	0	0	0	2
9:00	0	0	1	1	5	0	0	5	6
Total	1	0	5	6	24	0	0	24	30
Peak Hour 7:45-8:45	1	0	4	5	9	0	0	9	14
Trip Gen				0.31				0.56	0.88
16:15	1	0	1	2	0	0	0	0	2
16:30	1	0	1	2	0	0	0	0	2
16:45	0	0	1	1	1	0	0	1	2
17:00	0	0	2	2	0	0	1	1	3
17:15	0	0	4	4	1	0	0	1	5
17:30	0	0	0	0	2	0	0	2	2
17:45	1	0	2	3	1	0	1	2	5
18:00	0	0	1	1	2	0	0	2	3
Total	3	0	12	15	7	0	2	9	24
Peak Hour 16:45-17:45	1	0	8	9	4	0	2	6	15
Trip Gen				0.56				0.38	0.94

Trip Generation based on 16 houses.

Project No.: 7633.02
Project Name: 4597 Aurora Rd Subdivision
Location: Fletcher Blvd S of Aurora Side Rd Rd & Fletcher Blvd W of Hwy 48
Municipality: York
Study Date: Wed Mar 21, 2018
Study Time: 7 - 9 & 4 - 6

Study Type:

	In			Out			Two Way	Hourly
Direction	**SB**	**WB**	**Total**	**NB**	**EB**	**Total**	**Total**	
Start Time								
7:00	1	1	2	4	6	10	12	
7:15	0	1	1	4	5	9	10	
7:30	1	4	5	7	9	16	21	
7:45	2	0	2	5	9	14	16	59
8:00	3	1	4	7	3	10	14	61
8:15	2	5	7	4	4	8	15	66
8:30	1	1	2	5	6	11	13	58
8:45	3	1	4	1	4	5	9	51
Total	13	14	27	37	46	83	110	
Peak Hour 7:30-8:30	8	10	18	23	25	48	66	
Trip Generation			**0.17**			**0.44**	**0.61**	

16:00	5	7	12	5	1	6	18	
16:15	2	9	11	4	2	6	17	
16:30	3	3	6	1	8	9	15	
16:45	7	10	17	1	7	8	25	75
17:00	3	7	10	5	0	5	15	72
17:15	7	11	18	0	2	2	20	75
17:30	1	4	5	1	4	5	10	70
17:45	8	7	15	1	2	3	18	63
Total	36	58	94	18	26	44	138	
Peak Hour 16:00-17:00	17	29	46	11	18	29	75	
Trip Generation			**0.43**			**0.27**	**0.69**	

Trip Generation based on 108 Single Family Dwellings.
See link for map of Residents:
P:\76\33\02\Data Collection\Trip Generation\Residential Map.pdf

APPENDIX I:
Transportation Tomorrow Survey (TTS) Worksheets

Thu Jul 05 2018 15:41:02 GMT-0400 (Eastern Daylight Time) - Run Time: 2149ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Planning district of destination - pd_dest
Column: 2006 GTA zone of origin - gta06_orig

Filters:
(2006 GTA zone of origin - gta06_orig In 2717,
and
Start time of trip - start_time In 630-930
and
Trip purpose of origin - purp_orig In H

Trip 2016
Table:

					Route Selections						Route Selections						
	2717	2718	Combined	%	SB HWY 48	NB HWY 48	WB Aurora	EB Aurora	SB 9th	NB 9th	SB HWY 48	NB HWY 48	WB Aurora	EB Aurora	SB 9th	NB 9th	Comments
PD 1 of Toronto	200	14	214	10%	70%		30%				7%	0%	3%	0%	0%	0%	Most by GO
PD 3 of Toronto	19	0	19	1%	80%		20%				1%	0%	0%	0%	0%	0%	Most by GO
PD 4 of Toronto	0	9	9	0%	80%		20%				0%	0%	0%	0%	0%	0%	
PD 9 of Toronto	0	53	53	2%	30%		70%				1%	0%	2%	0%	0%	0%	
PD 10 of Toronto	28	0	28	1%	30%		70%				0%	0%	1%	0%	0%	0%	
PD 11 of Toronto	27	0	27	1%	30%		70%				0%	0%	1%	0%	0%	0%	
PD 13 of Toronto	0	56	56	3%	30%		70%				1%	0%	2%	0%	0%	0%	
PD 16 of Toronto	115	0	115	5%	30%		70%				2%	0%	4%	0%	0%	0%	
Uxbridge	55	14	69	3%				100%			0%	0%	0%	3%	0%	0%	
Newmarket	30	36	66	3%		80%	20%				0%	2%	1%	0%	0%	0%	
Aurora	71	56	127	6%			100%				0%	0%	6%	0%	0%	0%	
Richmond Hill	104	0	104	5%	30%		70%				1%	0%	3%	0%	0%	0%	
Whitchurch-Stouffville				0%							0%	0%	0%	0%	0%	0%	
2708	34	89	123	6%	100%						6%	0%	0%	0%	0%	0%	
2709	67	0	67	3%	100%						3%	0%	0%	0%	0%	0%	
2712	41	0	41	2%	100%						2%	0%	0%	0%	0%	0%	
2714	19	0	19	1%	100%						1%	0%	0%	0%	0%	0%	
2715	41	22	63	3%	100%						3%	0%	0%	0%	0%	0%	
2717	120	0	120	6%	35%	50%	15%				2%	3%	1%	0%	0%	0%	
2718	115	15	130	6%		10%	50%	40%			0%	1%	3%	2%	0%	0%	
Markham	175	275	450	21%	100%						21%	0%	0%	0%	0%	0%	
Vaughan	194	0	194	9%	20%		80%				2%	0%	7%	0%	0%	0%	
Mississauga	79	0	79	4%	80%		20%				3%	0%	1%	0%	0%	0%	
			2173	100%							55%	5%	35%	5%	0%	0%	100%

Whitchurch-Stouffville	437	126	563	Does equal sum of zones in the PD

Mon Apr 17 2017 10:56:59 GMT-0400 (Eastern Daylight Time) - Run Time: 3411ms

Cross Tabulation Query Form - Trip - 2011
Row: Planning district of origin - pd_orig
Column: 2006 GTA zone of destination - gta06_dest

Filters:
2006 GTA zone of destination - gta06_dest In 2717,2718
and
Start time of trip - start_time In 1530-1829
and
Trip purpose of destination - purp_dest In H,

Trip 2011
Table:

					Route Selections						Route Selections						
	2717	2718	Combined	%	SB HWY 48	NB HWY 48	WB Aurora	EB Aurora	SB 9th	NB 9th	SB HWY 48	NB HWY 48	WB Aurora	EB Aurora	SB 9th	NB 9th	Comments
PD 1 of Toronto	232	14	246	13%			100%				0%	0%	13%	0%	0%	0%	Most by GO
PD 4 of Toronto	7	39	46	2%			100%				0%	0%	2%	0%	0%	0%	Most by GO
PD 10 of Toronto	17	0	17	1%	50%		50%				0%	0%	0%	0%	0%	0%	
PD 11 of Toronto	27	0	27	1%	40%		60%				1%	0%	1%	0%	0%	0%	
PD 13 of Toronto	57	84	141	7%	40%		60%				3%	0%	4%	0%	0%	0%	
PD 16 of Toronto	115	0	115	6%	60%		40%				4%	0%	2%	0%	0%	0%	
Uxbridge	44	0	44	2%		50%		50%			0%	1%	0%	1%	0%	0%	
Scugog	0	9	9	0%				100%			0%	0%	0%	0%	0%	0%	
Pickering	0	15	15	1%	50%			50%			0%	0%	0%	0%	0%	0%	
East Gwillimbury	5	0	5	0%		90%	10%				0%	0%	0%	0%	0%	0%	
Newmarket	0	19	19	1%		100%					0%	1%	0%	0%	0%	0%	
Aurora	17	9	26	1%	30%		70%				0%	0%	1%	0%	0%	0%	
Richmond Hill	101	14	115	6%	50%	50%					3%	3%	0%	0%	0%	0%	
Whitchurch-Stouffville											0%	0%	0%	0%	0%	0%	
2703	19	0	19	1%	50%		50%				0%	0%	0%	0%	0%	0%	
2704	19	0	19	1%	50%		50%				0%	0%	0%	0%	0%	0%	
2708	0	125	125	6%	100%						6%	0%	0%	0%	0%	0%	
2709	113	35	148	8%	100%						8%	0%	0%	0%	0%	0%	
2712	24	0	24	1%	100%						1%	0%	0%	0%	0%	0%	
2717	114	0	114	6%	30%	30%	30%	10%			2%	2%	2%	1%	0%	0%	
2718	115	45	160	8%		50%	20%	30%			0%	4%	2%	2%	0%	0%	
Mississauga	79	0	79	4%	50%		50%				2%	0%	2%	0%	0%	0%	
Markham	212	200	412	21%	50%		50%				11%	0%	11%	0%	0%	0%	
King	17	0	17	1%	50%		50%				0%	0%	0%	0%	0%	0%	
			1942	100%							40%	15%	40%	5%	0%	0%	100%

Whitchurch-Stouffville	404	205	609	Does equal sum of zones in the PD

APPENDIX J:
Signal Timing Plans

TRAFFIC CONTROL TECHNOLOGIES - LMD 9200

INTERSECTION NAME: **Highway 48 & Aurora Rd. (YR 15)**
PROGRAMMED BY: D.Rumble
CONTOLLER SERIAL #:
INTERSECTION TELEPHONE (IF DIRECT DIAL):
SECTION:

CTCS #: 432
ADDRESS: 10
SECURITY CODE:
PROGRAM DATE: FEB 6, 2014
INSTALLATION DATE: October 9, 1998

INTERVAL	PHASE (ON/OFF)							
	1	2	3	4	5	6	7	8
MEMORY	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
EXT RECALL	OFF	ON	OFF	OFF	OFF	ON	OFF	OFF
MAX RECALL	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
PED RECALL	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
CNA I	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
CNA II	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
FL WALK	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
SOFT RECALL	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
WALK REST	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
COND PED	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
FWTPCL	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

1 - Not Used
2 - Northbound
3 - Not Used
4 - Eastbound
5 - Not Used
6 - Southbound
7 - Not Used
8 - Westbound

INTERVAL	PHASE TIMINGS							
	1	2	3	4	5	6	7	8
MIN GREEN	0	20	0	10	0	20	0	10
PASSAGE	0	5.7	0	3.0	0	5.7	0	3.0
YELLOW	0	5.0	0	5.0	0	5.0	0	5.0
RED	0	2.0	0	1.9	0	2.0	0	1.9
MAX I	0	30	0	37	0	30	0	37
MAX II	0		0		0		0	
WALK	0	0	0	0	0	0	0	0
PED CLEAR	0	0	0	0	0	0	0	0
S/A	0	2.1	0	0	0	2.1	0	0
TBR	0	0	0	0	0	0	0	0
TTR	0	0	0	0	0	0	0	0
MIN GAP	0	0	0	0	0	0	0	0
MAX VI	0	33	0	0	0	33	0	0
MAX EXT	0	0	0	0	0	0	0	0
AUTO MAX	0	0	0	0	0	0	0	0
AMR	0	0	0	0	0	0	0	0

PHASES USED								
	1	2	3	4	5	6	7	8
ON/OFF	OFF	ON	OFF	ON	OFF	ON	OFF	ON
SEQUENCE	2	1 = SEQ, 2 = DUAL RING, 3-7 = LEAD/LAG						
LEAD/LAG CODES (ONLY USED IF "8" WAS ENTERED FOR SEQUENCE)								
PAIRS	1 AND 2		3 AND 4		5 AND 6		7 AND 8	
CODE								
LEAD/LAG CODE - 1= NO REV, 2 = ALWAYS REV, 3 = REV BY C/S/O OR CLOCK/INPUT								

INITIALIZE/FLASH				
	INITIALIZE	ENTER FLASH	EXIT FLASH	INTERVAL CODES:
RING 1 PHASE	2	2	2	1 = RED
RING 2 PHASE	6	6	6	2 = YELLOW
INTERVAL	2	1	2	3 = GREEN

POWER UP/RESTART TIMINGS		
MINIMUM FLASH		(0-127 SECONDS)
1ST ALL RED AFTER FLASH		(0-127 SECONDS)

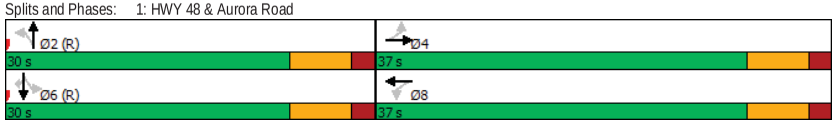
APPENDIX K:
Synchro Outputs

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	25	130	90	300	90	185	50	485	135
Future Volume (vph)	25	130	90	300	90	185	50	485	135
Lane Group Flow (vph)	26	198	94	344	94	240	52	505	141
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases		4		8		2		6	
Permitted Phases	4		8		2		6		6
Detector Phase	4	4	8	8	2	2	6	6	6
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.9	24.9	24.9	24.9	25.0	25.0	25.0	25.0	25.0
Total Split (s)	37.0	37.0	37.0	37.0	30.0	30.0	30.0	30.0	30.0
Total Split (%)	55.2%	55.2%	55.2%	55.2%	44.8%	44.8%	44.8%	44.8%	44.8%
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
All-Red Time (s)	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.9	6.9	6.9	6.9	7.0	7.0	7.0	7.0	7.0
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max	Max
v/c Ratio	0.07	0.26	0.18	0.42	0.35	0.23	0.14	0.45	0.23
Control Delay	11.2	9.8	12.3	14.2	21.1	13.1	16.4	18.7	5.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.2	9.8	12.3	14.2	21.1	13.1	16.4	18.7	5.4
Queue Length 50th (m)	1.9	11.6	7.1	28.2	9.0	9.1	4.6	26.5	1.4
Queue Length 95th (m)	5.9	23.8	15.7	47.9	21.2	16.8	11.9	39.4	12.1
Internal Link Dist (m)		243.6		1398.6		118.4		602.0	
Turn Bay Length (m)	45.0		55.0		80.0		65.0		15.0
Base Capacity (vph)	373	757	509	814	269	1066	378	1126	610
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.26	0.18	0.42	0.35	0.23	0.14	0.45	0.23

Intersection Summary

Cycle Length: 67
Actuated Cycle Length: 67
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 50
Control Type: Pretimed

Splits and Phases: 1: HWY 48 & Aurora Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	130	60	90	300	30	90	185	45	50	485	135
Future Volume (vph)	25	130	60	90	300	30	90	185	45	50	485	135
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.9	6.9		6.9	6.9		7.0	7.0		7.0	7.0	7.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.95		1.00	0.99		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1517	1630		1703	1802		1641	3017		1736	3282	1538
Flt Permitted	0.52	1.00		0.63	1.00		0.45	1.00		0.60	1.00	1.00
Satd. Flow (perm)	831	1630		1135	1802		784	3017		1101	3282	1538
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	26	135	62	94	312	31	94	193	47	52	505	141
RTOR Reduction (vph)	0	25	0	0	6	0	0	31	0	0	0	82
Lane Group Flow (vph)	26	173	0	94	338	0	94	209	0	52	505	59
Confl. Bikes (#/hr)									1			
Heavy Vehicles (%)	19%	11%	11%	6%	3%	14%	10%	18%	6%	4%	10%	5%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	30.1	30.1		30.1	30.1		23.0	23.0		23.0	23.0	23.0
Effective Green, g (s)	30.1	30.1		30.1	30.1		23.0	23.0		23.0	23.0	23.0
Actuated g/C Ratio	0.45	0.45		0.45	0.45		0.34	0.34		0.34	0.34	0.34
Clearance Time (s)	6.9	6.9		6.9	6.9		7.0	7.0		7.0	7.0	7.0
Lane Grp Cap (vph)	373	732		509	809		269	1035		377	1126	527
v/s Ratio Prot		0.11			c0.19			0.07			c0.15	
v/s Ratio Perm	0.03			0.08			0.12			0.05		0.04
v/c Ratio	0.07	0.24		0.18	0.42		0.35	0.20		0.14	0.45	0.11
Uniform Delay, d1	10.5	11.4		11.1	12.5		16.4	15.5		15.2	17.1	15.0
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.4	0.8		0.8	1.6		3.6	0.4		0.8	1.3	0.4
Delay (s)	10.9	12.1		11.9	14.1		20.0	16.0		15.9	18.4	15.5
Level of Service	B	B		B	B		B	B		B	B	B
Approach Delay (s)		12.0			13.6			17.1			17.6	
Approach LOS		B			B			B			B	

Intersection Summary

HCM 2000 Control Delay	15.7	HCM 2000 Level of Service		B	
HCM 2000 Volume to Capacity ratio	0.43				
Actuated Cycle Length (s)	67.0	Sum of lost time (s)		13.9	
Intersection Capacity Utilization	63.3%	ICU Level of Service		B	
Analysis Period (min)	15				

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	30	45	275	10	10	625
Future Volume (Veh/h)	30	45	275	10	10	625
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)	32	48	293	11	11	665
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						258
pX, platoon unblocked	0.79					
vC, conflicting volume	980	293			304	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	845	293			304	
tC, single (s)	6.4	6.2			4.3	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.4	
p0 queue free %	88	94			99	
cM capacity (veh/h)	261	739			1137	

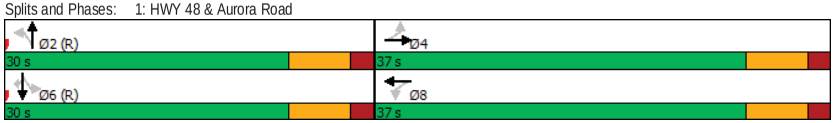
Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	80	293	11	676
Volume Left	32	0	0	11
Volume Right	48	0	11	0
cSH	426	1700	1700	1137
Volume to Capacity	0.19	0.17	0.01	0.01
Queue Length 95th (m)	5.5	0.0	0.0	0.2
Control Delay (s)	15.4	0.0	0.0	0.3
Lane LOS	C			A
Approach Delay (s)	15.4	0.0		0.3
Approach LOS	C			

Intersection Summary			
Average Delay		1.3	
Intersection Capacity Utilization		52.0%	ICU Level of Service A
Analysis Period (min)		15	

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	160	350	55	165	85	455	40	225	35
Future Volume (vph)	160	350	55	165	85	455	40	225	35
Lane Group Flow (vph)	167	443	57	214	89	552	42	234	36
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases		4		8		2		6	
Permitted Phases	4		8		2		6		6
Detector Phase	4	4	8	8	2	2	6	6	6
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.9	24.9	24.9	24.9	25.0	25.0	25.0	25.0	25.0
Total Split (s)	37.0	37.0	37.0	37.0	30.0	30.0	30.0	30.0	30.0
Total Split (%)	55.2%	55.2%	55.2%	55.2%	44.8%	44.8%	44.8%	44.8%	44.8%
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
All-Red Time (s)	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.9	6.9	6.9	6.9	7.0	7.0	7.0	7.0	7.0
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max	Max
v/c Ratio	0.33	0.54	0.16	0.26	0.24	0.46	0.16	0.21	0.06
Control Delay	14.2	15.8	12.5	11.2	18.1	17.7	17.4	16.2	2.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.2	15.8	12.5	11.2	18.1	17.7	17.4	16.2	2.3
Queue Length 50th (m)	13.5	38.2	4.2	14.6	8.2	27.4	3.8	11.2	0.0
Queue Length 95th (m)	26.9	63.6	11.0	27.6	18.7	40.7	10.6	18.8	2.9
Internal Link Dist (m)		243.6		1398.6		234.0		602.0	
Turn Bay Length (m)	45.0		55.0		80.0		65.0		15.0
Base Capacity (vph)	512	818	351	816	365	1197	259	1136	570
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.33	0.54	0.16	0.26	0.24	0.46	0.16	0.21	0.06

Intersection Summary
Cycle Length: 67
Actuated Cycle Length: 67
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 50
Control Type: Pretimed

Splits and Phases: 1: HWY 48 & Aurora Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	160	350	75	55	165	40	85	455	75	40	225	35
Future Volume (vph)	160	350	75	55	165	40	85	455	75	40	225	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.9	6.9		6.9	6.9		7.0	7.0		7.0	7.0	7.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.97		1.00	0.97		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1736	1796		1770	1786		1671	3429		1719	3312	1538
Flt Permitted	0.62	1.00		0.42	1.00		0.61	1.00		0.42	1.00	1.00
Satd. Flow (perm)	1140	1796		782	1786		1066	3429		755	3312	1538
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	167	365	78	57	172	42	89	474	78	42	234	36
RTOR Reduction (vph)	0	12	0	0	13	0	0	20	0	0	0	24
Lane Group Flow (vph)	167	431	0	57	201	0	89	532	0	42	234	12
Confl. Bikes (#/hr)						1			2			
Heavy Vehicles (%)	4%	3%	3%	2%	3%	3%	8%	3%	1%	5%	9%	5%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	30.1	30.1		30.1	30.1		23.0	23.0		23.0	23.0	23.0
Effective Green, g (s)	30.1	30.1		30.1	30.1		23.0	23.0		23.0	23.0	23.0
Actuated g/C Ratio	0.45	0.45		0.45	0.45		0.34	0.34		0.34	0.34	0.34
Clearance Time (s)	6.9	6.9		6.9	6.9		7.0	7.0		7.0	7.0	7.0
Lane Grp Cap (vph)	512	806		351	802		365	1177		259	1136	527
v/s Ratio Prot		c0.24			0.11			c0.16			0.07	
v/s Ratio Perm	0.15			0.07			0.08			0.06		0.01
v/c Ratio	0.33	0.54		0.16	0.25		0.24	0.45		0.16	0.21	0.02
Uniform Delay, d1	11.9	13.4		11.0	11.4		15.8	17.1		15.3	15.5	14.6
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	1.7	2.5		1.0	0.7		1.6	1.3		1.3	0.4	0.1
Delay (s)	13.6	15.9		12.0	12.2		17.4	18.4		16.6	16.0	14.6
Level of Service	B	B		B	B		B	B		B	B	B
Approach Delay (s)		15.3			12.1			18.2			15.9	
Approach LOS		B			B			B			B	

Intersection Summary				
HCM 2000 Control Delay	16.0	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.50			
Actuated Cycle Length (s)	67.0	Sum of lost time (s)	13.9	
Intersection Capacity Utilization	69.4%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	15	20	595	35	20	335
Future Volume (Veh/h)	15	20	595	35	20	335
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)	16	21	633	37	21	356
Pedestrians	2					
Lane Width (m)	3.6					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						258
pX, platoon unblocked	0.94					
vC, conflicting volume	1033	635			672	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1004	635			672	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	94	96			98	
cM capacity (veh/h)	248	481			927	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	37	633	37	377
Volume Left	16	0	0	21
Volume Right	21	0	37	0
cSH	342	1700	1700	927
Volume to Capacity	0.11	0.37	0.02	0.02
Queue Length 95th (m)	2.9	0.0	0.0	0.6
Control Delay (s)	16.8	0.0	0.0	0.7
Lane LOS	C			A
Approach Delay (s)	16.8	0.0		0.7
Approach LOS	C			

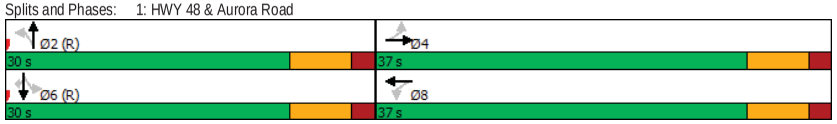
Intersection Summary				
Average Delay	0.8			
Intersection Capacity Utilization	44.0%	ICU Level of Service	A	
Analysis Period (min)	15			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	35	165	110	350	120	240	85	580	160
Future Volume (vph)	35	165	110	350	120	240	85	580	160
Lane Group Flow (vph)	36	250	115	417	125	307	89	604	167
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases		4		8		2		6	
Permitted Phases	4		8		2		6		6
Detector Phase	4	4	8	8	2	2	6	6	6
Switch Phase									
Minimum Initial (s)	3.0	3.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.9	24.9	24.9	24.9	25.0	25.0	25.0	25.0	25.0
Total Split (s)	37.0	37.0	37.0	37.0	30.0	30.0	30.0	30.0	30.0
Total Split (%)	55.2%	55.2%	55.2%	55.2%	44.8%	44.8%	44.8%	44.8%	44.8%
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
All-Red Time (s)	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.9	6.9	6.9	6.9	7.0	7.0	7.0	7.0	7.0
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max	Max
v/c Ratio	0.11	0.33	0.24	0.51	0.56	0.29	0.25	0.54	0.27
Control Delay	11.9	11.2	13.0	15.6	29.5	14.5	18.3	19.9	6.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.9	11.2	13.0	15.6	29.5	14.5	18.3	19.9	6.8
Queue Length 50th (m)	2.6	16.2	8.8	35.9	13.1	12.8	8.2	32.9	3.8
Queue Length 95th (m)	7.7	31.3	19.0	59.8	#34.1	21.7	18.8	47.8	15.8
Internal Link Dist (m)		243.6		1398.6		118.4		602.0	
Turn Bay Length (m)	45.0		55.0		80.0		65.0		15.0
Base Capacity (vph)	319	756	486	810	224	1065	354	1126	609
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.33	0.24	0.51	0.56	0.29	0.25	0.54	0.27

Intersection Summary

Cycle Length: 67
Actuated Cycle Length: 67
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 50
Control Type: Pretimed
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: HWY 48 & Aurora Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	165	75	110	350	50	120	240	55	85	580	160
Future Volume (vph)	35	165	75	110	350	50	120	240	55	85	580	160
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.9	6.9		6.9	6.9		7.0	7.0		7.0	7.0	7.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.95		1.00	0.98		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1517	1632		1703	1786		1641	3019		1736	3282	1538
Flt Permitted	0.45	1.00		0.60	1.00		0.38	1.00		0.56	1.00	1.00
Satd. Flow (perm)	711	1632		1083	1786		654	3019		1032	3282	1538
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	36	172	78	115	365	52	125	250	57	89	604	167
RTOR Reduction (vph)	0	24	0	0	8	0	0	29	0	0	0	81
Lane Group Flow (vph)	36	226	0	115	409	0	125	278	0	89	604	86
Confl. Bikes (#/hr)									1			
Heavy Vehicles (%)	19%	11%	11%	6%	3%	14%	10%	18%	6%	4%	10%	5%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	30.1	30.1		30.1	30.1		23.0	23.0		23.0	23.0	23.0
Effective Green, g (s)	30.1	30.1		30.1	30.1		23.0	23.0		23.0	23.0	23.0
Actuated g/C Ratio	0.45	0.45		0.45	0.45		0.34	0.34		0.34	0.34	0.34
Clearance Time (s)	6.9	6.9		6.9	6.9		7.0	7.0		7.0	7.0	7.0
Lane Grp Cap (vph)	319	733		486	802		224	1036		354	1126	527
v/s Ratio Prot		0.14			c0.23			0.09			0.18	
v/s Ratio Perm	0.05			0.11			c0.19			0.09		0.06
v/c Ratio	0.11	0.31		0.24	0.51		0.56	0.27		0.25	0.54	0.16
Uniform Delay, d1	10.7	11.8		11.4	13.2		17.9	15.9		15.8	17.7	15.3
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.7	1.1		1.1	2.3		9.7	0.6		1.7	1.8	0.7
Delay (s)	11.4	12.9		12.5	15.5		27.5	16.6		17.5	19.5	16.0
Level of Service	B	B		B	B		C	B		B	B	B
Approach Delay (s)		12.7			14.9			19.7			18.6	
Approach LOS		B			B			B			B	

Intersection Summary

HCM 2000 Control Delay	17.1	HCM 2000 Level of Service		B	
HCM 2000 Volume to Capacity ratio	0.53				
Actuated Cycle Length (s)	67.0	Sum of lost time (s)		13.9	
Intersection Capacity Utilization	70.6%	ICU Level of Service		C	
Analysis Period (min)	15				

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	30	45	370	10	10	755
Future Volume (Veh/h)	30	45	370	10	10	755
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)	32	48	394	11	11	803
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						258
pX, platoon unblocked	0.74					
vC, conflicting volume	1219	394			405	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1120	394			405	
tC, single (s)	6.4	6.2			4.3	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.4	
p0 queue free %	81	93			99	
cM capacity (veh/h)	166	649			1040	

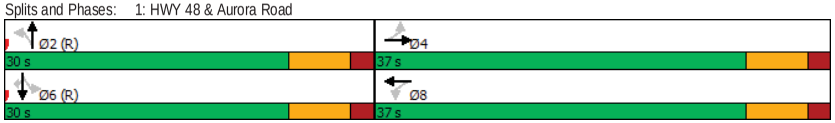
Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	80	394	11	814
Volume Left	32	0	0	11
Volume Right	48	0	11	0
cSH	300	1700	1700	1040
Volume to Capacity	0.27	0.23	0.01	0.01
Queue Length 95th (m)	8.4	0.0	0.0	0.3
Control Delay (s)	21.3	0.0	0.0	0.3
Lane LOS	C			A
Approach Delay (s)	21.3	0.0		0.3
Approach LOS	C			

Intersection Summary			
Average Delay		1.5	
Intersection Capacity Utilization		58.8%	ICU Level of Service B
Analysis Period (min)		15	

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	195	420	115	230	110	580	95	280	45
Future Volume (vph)	195	420	115	230	110	580	95	280	45
Lane Group Flow (vph)	203	547	120	360	115	698	99	292	47
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases		4		8		2		6	
Permitted Phases	4		8		2		6		6
Detector Phase	4	4	8	8	2	2	6	6	6
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.9	24.9	24.9	24.9	25.0	25.0	25.0	25.0	25.0
Total Split (s)	37.0	37.0	37.0	37.0	30.0	30.0	30.0	30.0	30.0
Total Split (%)	55.2%	55.2%	55.2%	55.2%	44.8%	44.8%	44.8%	44.8%	44.8%
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
All-Red Time (s)	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.9	6.9	6.9	6.9	7.0	7.0	7.0	7.0	7.0
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max	Max
v/c Ratio	0.49	0.67	0.45	0.44	0.33	0.58	0.51	0.26	0.08
Control Delay	18.1	18.9	19.6	13.0	19.7	19.7	28.7	16.6	3.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.1	18.9	19.6	13.0	19.7	19.7	28.7	16.6	3.6
Queue Length 50th (m)	17.9	51.3	10.3	26.1	11.0	37.1	10.1	14.2	0.0
Queue Length 95th (m)	36.7	84.7	25.2	46.6	23.8	53.5	#25.9	23.0	4.6
Internal Link Dist (m)		243.6		1398.6		234.0		602.0	
Turn Bay Length (m)	45.0		55.0		80.0		65.0		15.0
Base Capacity (vph)	413	816	266	810	346	1196	194	1136	570
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.49	0.67	0.45	0.44	0.33	0.58	0.51	0.26	0.08

Intersection Summary
Cycle Length: 67
Actuated Cycle Length: 67
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 60
Control Type: Pretimed
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: HWY 48 & Aurora Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	195	420	105	115	230	115	110	580	90	95	280	45
Future Volume (vph)	195	420	105	115	230	115	110	580	90	95	280	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.9	6.9		6.9	6.9		7.0	7.0		7.0	7.0	7.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.97		1.00	0.95		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1736	1790		1770	1745		1671	3433		1719	3312	1538
Flt Permitted	0.50	1.00		0.32	1.00		0.57	1.00		0.31	1.00	1.00
Satd. Flow (perm)	921	1790		594	1745		1008	3433		569	3312	1538
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	203	438	109	120	240	120	115	604	94	99	292	47
RTOR Reduction (vph)	0	13	0	0	27	0	0	18	0	0	0	31
Lane Group Flow (vph)	203	534	0	120	333	0	115	680	0	99	292	16
Confl. Bikes (#/hr)						1			2			
Heavy Vehicles (%)	4%	3%	3%	2%	3%	3%	8%	3%	1%	5%	9%	5%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	30.1	30.1		30.1	30.1		23.0	23.0		23.0	23.0	23.0
Effective Green, g (s)	30.1	30.1		30.1	30.1		23.0	23.0		23.0	23.0	23.0
Actuated g/C Ratio	0.45	0.45		0.45	0.45		0.34	0.34		0.34	0.34	0.34
Clearance Time (s)	6.9	6.9		6.9	6.9		7.0	7.0		7.0	7.0	7.0
Lane Grp Cap (vph)	413	804		266	783		346	1178		195	1136	527
v/s Ratio Prot		c0.30			0.19			c0.20			0.09	
v/s Ratio Perm	0.22			0.20			0.11			0.17		0.01
v/c Ratio	0.49	0.66		0.45	0.43		0.33	0.58		0.51	0.26	0.03
Uniform Delay, d1	13.0	14.5		12.7	12.6		16.3	18.0		17.5	15.8	14.6
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	4.1	4.3		5.4	1.7		2.6	2.1		9.1	0.5	0.1
Delay (s)	17.2	18.8		18.2	14.3		18.9	20.1		26.6	16.4	14.7
Level of Service	B	B		B	B		B	C		C	B	B
Approach Delay (s)		18.3			15.2			19.9			18.5	
Approach LOS		B			B			B			B	

Intersection Summary				
HCM 2000 Control Delay	18.3	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.63			
Actuated Cycle Length (s)	67.0	Sum of lost time (s)	13.9	
Intersection Capacity Utilization	82.2%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	15	20	760	35	20	480
Future Volume (Veh/h)	15	20	760	35	20	480
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)	16	21	809	37	21	511
Pedestrians	2					
Lane Width (m)	3.6					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						258
pX, platoon unblocked	0.91					
vC, conflicting volume	1364	811			848	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1350	811			848	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	89	95			97	
cM capacity (veh/h)	148	382			797	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	37	809	37	532
Volume Left	16	0	0	21
Volume Right	21	0	37	0
cSH	227	1700	1700	797
Volume to Capacity	0.16	0.48	0.02	0.03
Queue Length 95th (m)	4.6	0.0	0.0	0.6
Control Delay (s)	24.0	0.0	0.0	0.7
Lane LOS	C			A
Approach Delay (s)	24.0	0.0		0.7
Approach LOS	C			

Intersection Summary				
Average Delay	0.9			
Intersection Capacity Utilization	51.5%	ICU Level of Service	A	
Analysis Period (min)	15			

Queues
1: HWY 48 & Aurora Road

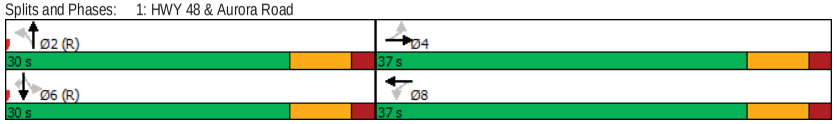
Future Total - AM

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	35	175	105	370	125	245	85	585	160
Future Volume (vph)	35	175	105	370	125	245	85	585	160
Lane Group Flow (vph)	36	260	109	437	130	307	89	609	167
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases		4		8		2		6	
Permitted Phases	4		8		2		6		6
Detector Phase	4	4	8	8	2	2	6	6	6
Switch Phase									
Minimum Initial (s)	3.0	3.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.9	24.9	24.9	24.9	25.0	25.0	25.0	25.0	25.0
Total Split (s)	37.0	37.0	37.0	37.0	30.0	30.0	30.0	30.0	30.0
Total Split (%)	55.2%	55.2%	55.2%	55.2%	44.8%	44.8%	44.8%	44.8%	44.8%
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
All-Red Time (s)	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.9	6.9	6.9	6.9	7.0	7.0	7.0	7.0	7.0
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max	Max
v/c Ratio	0.12	0.34	0.23	0.54	0.59	0.29	0.25	0.54	0.27
Control Delay	12.1	11.5	12.9	16.0	31.3	14.8	18.3	19.9	6.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.1	11.5	12.9	16.0	31.3	14.8	18.3	19.9	6.9
Queue Length 50th (m)	2.6	17.3	8.3	38.3	13.8	13.1	8.2	33.2	3.9
Queue Length 95th (m)	7.8	32.9	18.2	63.5	#36.1	22.1	18.8	48.2	16.1
Internal Link Dist (m)		243.6		755.0		118.4		602.0	
Turn Bay Length (m)	45.0		55.0		80.0		65.0		15.0
Base Capacity (vph)	305	757	482	810	222	1063	354	1126	608
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.12	0.34	0.23	0.54	0.59	0.29	0.25	0.54	0.27

Intersection Summary

Cycle Length: 67
Actuated Cycle Length: 67
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 50
Control Type: Pretimed
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: HWY 48 & Aurora Road



HCM Signalized Intersection Capacity Analysis
1: HWY 48 & Aurora Road

Future Total - AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	175	75	105	370	50	125	245	50	85	585	160
Future Volume (vph)	35	175	75	105	370	50	125	245	50	85	585	160
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.9	6.9		6.9	6.9		7.0	7.0		7.0	7.0	7.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.95		1.00	0.98		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1517	1635		1703	1789		1641	3023		1736	3282	1538
Flt Permitted	0.43	1.00		0.60	1.00		0.37	1.00		0.56	1.00	1.00
Satd. Flow (perm)	679	1635		1073	1789		648	3023		1032	3282	1538
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	36	182	78	109	385	52	130	255	52	89	609	167
RTOR Reduction (vph)	0	23	0	0	7	0	0	26	0	0	0	80
Lane Group Flow (vph)	36	237	0	109	430	0	130	281	0	89	609	87
Confl. Bikes (#/hr)									1			
Heavy Vehicles (%)	19%	11%	11%	6%	3%	14%	10%	18%	6%	4%	10%	5%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	30.1	30.1		30.1	30.1		23.0	23.0		23.0	23.0	23.0
Effective Green, g (s)	30.1	30.1		30.1	30.1		23.0	23.0		23.0	23.0	23.0
Actuated g/C Ratio	0.45	0.45		0.45	0.45		0.34	0.34		0.34	0.34	0.34
Clearance Time (s)	6.9	6.9		6.9	6.9		7.0	7.0		7.0	7.0	7.0
Lane Grp Cap (vph)	305	734		482	803		222	1037		354	1126	527
v/s Ratio Prot		0.14			c0.24			0.09			0.19	
v/s Ratio Perm	0.05			0.10			c0.20			0.09		0.06
v/c Ratio	0.12	0.32		0.23	0.54		0.59	0.27		0.25	0.54	0.16
Uniform Delay, d1	10.7	11.9		11.3	13.4		18.1	15.9		15.8	17.7	15.3
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.8	1.2		1.1	2.6		10.8	0.6		1.7	1.9	0.7
Delay (s)	11.5	13.0		12.4	15.9		28.9	16.6		17.5	19.6	16.0
Level of Service	B	B		B	B		C	B		B	B	B
Approach Delay (s)		12.9			15.2			20.2			18.7	
Approach LOS		B			B			C			B	

Intersection Summary

HCM 2000 Control Delay	17.3	HCM 2000 Level of Service		B	
HCM 2000 Volume to Capacity ratio	0.56				
Actuated Cycle Length (s)	67.0	Sum of lost time (s)		13.9	
Intersection Capacity Utilization	72.1%	ICU Level of Service		C	
Analysis Period (min)	15				

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	65	50	370	25	10	755
Future Volume (Veh/h)	65	50	370	25	10	755
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)	69	53	394	27	11	803
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						258
pX, platoon unblocked	0.74					
vC, conflicting volume	1219	394			421	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1119	394			421	
tC, single (s)	6.4	6.2			4.3	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.4	
p0 queue free %	58	92			99	
cM capacity (veh/h)	166	649			1025	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	122	394	27	814
Volume Left	69	0	0	11
Volume Right	53	0	27	0
cSH	245	1700	1700	1025
Volume to Capacity	0.50	0.23	0.02	0.01
Queue Length 95th (m)	20.4	0.0	0.0	0.3
Control Delay (s)	33.4	0.0	0.0	0.3
Lane LOS	D			A
Approach Delay (s)	33.4	0.0		0.3
Approach LOS	D			

Intersection Summary				
Average Delay		3.2		
Intersection Capacity Utilization		61.1%	ICU Level of Service	B
Analysis Period (min)		15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	25	10	60	15	10	55
Future Volume (Veh/h)	25	10	60	15	10	55
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	25	10	60	15	10	55
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	75				128	68
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	75				128	68
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				99	94
cM capacity (veh/h)	1524				853	996

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	35	75	65
Volume Left	25	0	10
Volume Right	0	15	55
cSH	1524	1700	971
Volume to Capacity	0.02	0.04	0.07
Queue Length 95th (m)	0.4	0.0	1.7
Control Delay (s)	5.3	0.0	9.0
Lane LOS	A		A
Approach Delay (s)	5.3	0.0	9.0
Approach LOS			A

Intersection Summary				
Average Delay		4.4		
Intersection Capacity Utilization		19.2%	ICU Level of Service	A
Analysis Period (min)		15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	300	10	5	505	20	15
Future Volume (Veh/h)	300	10	5	505	20	15
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	300	10	5	505	20	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			310		820	305
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			310		820	305
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		94	98
cM capacity (veh/h)			1250		343	735

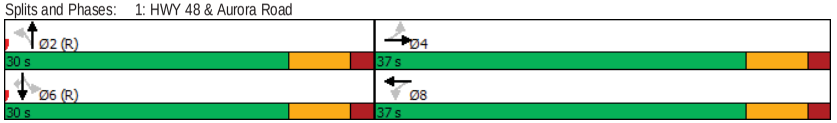
Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	310	510	35
Volume Left	0	5	20
Volume Right	10	0	15
cSH	1700	1250	445
Volume to Capacity	0.18	0.00	0.08
Queue Length 95th (m)	0.0	0.1	2.0
Control Delay (s)	0.0	0.1	13.8
Lane LOS		A	B
Approach Delay (s)	0.0	0.1	13.8
Approach LOS			B

Intersection Summary			
Average Delay		0.6	
Intersection Capacity Utilization		40.6%	ICU Level of Service A
Analysis Period (min)		15	

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	195	440	110	245	110	585	95	290	45
Future Volume (vph)	195	440	110	245	110	585	95	290	45
Lane Group Flow (vph)	203	578	115	375	115	698	99	302	47
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases		4		8		2		6	
Permitted Phases	4		8		2		6		6
Detector Phase	4	4	8	8	2	2	6	6	6
Switch Phase									
Minimum Initial (s)	3.0	3.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.9	24.9	24.9	24.9	25.0	25.0	25.0	25.0	25.0
Total Split (s)	37.0	37.0	37.0	37.0	30.0	30.0	30.0	30.0	30.0
Total Split (%)	55.2%	55.2%	55.2%	55.2%	44.8%	44.8%	44.8%	44.8%	44.8%
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
All-Red Time (s)	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.9	6.9	6.9	6.9	7.0	7.0	7.0	7.0	7.0
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max	Max
v/c Ratio	0.51	0.71	0.48	0.46	0.34	0.58	0.51	0.27	0.08
Control Delay	18.7	20.0	21.1	13.4	19.8	19.7	28.7	16.7	3.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.7	20.0	21.1	13.4	19.8	19.7	28.7	16.7	3.6
Queue Length 50th (m)	18.1	55.6	10.0	28.0	11.0	37.2	10.1	14.7	0.0
Queue Length 95th (m)	37.5	91.5	25.5	49.4	23.8	53.6	#25.9	23.7	4.6
Internal Link Dist (m)		243.6		755.0		118.4		602.0	
Turn Bay Length (m)	45.0		55.0		80.0		65.0		15.0
Base Capacity (vph)	400	817	242	811	342	1196	194	1136	570
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.51	0.71	0.48	0.46	0.34	0.58	0.51	0.27	0.08

Intersection Summary
Cycle Length: 67
Actuated Cycle Length: 67
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 55
Control Type: Pretimed
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: HWY 48 & Aurora Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	195	440	115	110	245	115	110	585	85	95	290	45
Future Volume (vph)	195	440	115	110	245	115	110	585	85	95	290	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.9	6.9		6.9	6.9		7.0	7.0		7.0	7.0	7.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.97		1.00	0.95		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1736	1787		1770	1749		1671	3437		1719	3312	1538
Flt Permitted	0.49	1.00		0.29	1.00		0.57	1.00		0.31	1.00	1.00
Satd. Flow (perm)	892	1787		540	1749		999	3437		569	3312	1538
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	203	458	120	115	255	120	115	609	89	99	302	47
RTOR Reduction (vph)	0	14	0	0	25	0	0	17	0	0	0	31
Lane Group Flow (vph)	203	564	0	115	350	0	115	681	0	99	302	16
Confl. Bikes (#/hr)						1			2			
Heavy Vehicles (%)	4%	3%	3%	2%	3%	3%	8%	3%	1%	5%	9%	5%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	30.1	30.1		30.1	30.1		23.0	23.0		23.0	23.0	23.0
Effective Green, g (s)	30.1	30.1		30.1	30.1		23.0	23.0		23.0	23.0	23.0
Actuated g/C Ratio	0.45	0.45		0.45	0.45		0.34	0.34		0.34	0.34	0.34
Clearance Time (s)	6.9	6.9		6.9	6.9		7.0	7.0		7.0	7.0	7.0
Lane Grp Cap (vph)	400	802		242	785		342	1179		195	1136	527
v/s Ratio Prot		c0.32			0.20			c0.20			0.09	
v/s Ratio Perm	0.23			0.21			0.12			0.17		0.01
v/c Ratio	0.51	0.70		0.48	0.45		0.34	0.58		0.51	0.27	0.03
Uniform Delay, d1	13.2	14.9		12.9	12.7		16.3	18.0		17.5	15.9	14.6
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	4.5	5.1		6.6	1.8		2.6	2.1		9.1	0.6	0.1
Delay (s)	17.7	20.0		19.5	14.5		19.0	20.1		26.6	16.5	14.7
Level of Service	B	B		B	B		B	C		C	B	B
Approach Delay (s)		19.4			15.7			19.9			18.5	
Approach LOS		B			B			B			B	

Intersection Summary				
HCM 2000 Control Delay	18.7	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.65			
Actuated Cycle Length (s)	67.0	Sum of lost time (s)	13.9	
Intersection Capacity Utilization	83.6%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	40	20	760	60	35	480
Future Volume (Veh/h)	40	20	760	60	35	480
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)	43	21	809	64	37	511
Pedestrians	2					
Lane Width (m)	3.6					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						258
pX, platoon unblocked	0.90					
vC, conflicting volume	1396	811			875	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1385	811			875	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	69	95			95	
cM capacity (veh/h)	137	382			779	

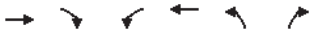
Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	64	809	64	548
Volume Left	43	0	0	37
Volume Right	21	0	64	0
cSH	173	1700	1700	779
Volume to Capacity	0.37	0.48	0.04	0.05
Queue Length 95th (m)	12.6	0.0	0.0	1.2
Control Delay (s)	37.5	0.0	0.0	1.3
Lane LOS	E			A
Approach Delay (s)	37.5	0.0		1.3
Approach LOS	E			

Intersection Summary				
Average Delay	2.1			
Intersection Capacity Utilization	64.2%	ICU Level of Service	C	
Analysis Period (min)	15			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	55	40	20	15	15	40
Future Volume (Veh/h)	55	40	20	15	15	40
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	55	40	20	15	15	40
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	35				178	28
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	35				178	28
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				98	96
cM capacity (veh/h)	1576				784	1048

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	95	35	55
Volume Left	55	0	15
Volume Right	0	15	40
cSH	1576	1700	960
Volume to Capacity	0.03	0.02	0.06
Queue Length 95th (m)	0.9	0.0	1.5
Control Delay (s)	4.4	0.0	9.0
Lane LOS	A		A
Approach Delay (s)	4.4	0.0	9.0
Approach LOS			A

Intersection Summary			
Average Delay	4.9		
Intersection Capacity Utilization	21.8%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	600	20	15	455	15	10
Future Volume (Veh/h)	600	20	15	455	15	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	600	20	15	455	15	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			620		1095	610
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			620		1095	610
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		94	98
cM capacity (veh/h)			960		233	494

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	620	470	25
Volume Left	0	15	15
Volume Right	20	0	10
cSH	1700	960	295
Volume to Capacity	0.36	0.02	0.08
Queue Length 95th (m)	0.0	0.4	2.2
Control Delay (s)	0.0	0.5	18.3
Lane LOS		A	C
Approach Delay (s)	0.0	0.5	18.3
Approach LOS			C

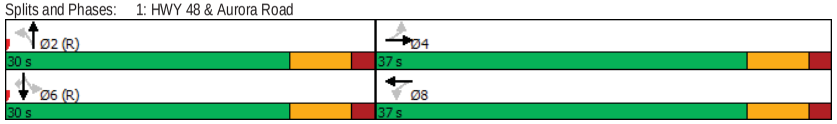
Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	46.1%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	35	165	110	350	145	245	85	585	160
Future Volume (vph)	35	165	110	350	145	245	85	585	160
Lane Group Flow (vph)	36	266	115	417	151	318	89	609	167
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases		4		8		2		6	
Permitted Phases	4		8		2		6		6
Detector Phase	4	4	8	8	2	2	6	6	6
Switch Phase									
Minimum Initial (s)	3.0	3.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.9	24.9	24.9	24.9	25.0	25.0	25.0	25.0	25.0
Total Split (s)	37.0	37.0	37.0	37.0	30.0	30.0	30.0	30.0	30.0
Total Split (%)	55.2%	55.2%	55.2%	55.2%	44.8%	44.8%	44.8%	44.8%	44.8%
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
All-Red Time (s)	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.9	6.9	6.9	6.9	7.0	7.0	7.0	7.0	7.0
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max	Max
v/c Ratio	0.11	0.35	0.24	0.51	0.68	0.30	0.25	0.54	0.27
Control Delay	11.9	11.1	13.1	15.6	37.8	14.4	18.3	19.9	6.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.9	11.1	13.1	15.6	37.8	14.4	18.3	19.9	6.9
Queue Length 50th (m)	2.6	16.9	8.9	35.9	16.6	13.1	8.2	33.2	3.9
Queue Length 95th (m)	7.7	32.7	19.1	59.8	#44.2	22.3	18.9	48.2	16.1
Internal Link Dist (m)		243.6		755.0		118.4		602.0	
Turn Bay Length (m)	45.0		55.0		80.0		65.0		15.0
Base Capacity (vph)	319	757	479	810	222	1068	350	1126	608
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.35	0.24	0.51	0.68	0.30	0.25	0.54	0.27

Intersection Summary

Cycle Length: 67
Actuated Cycle Length: 67
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 50
Control Type: Pretimed
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: HWY 48 & Aurora Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	165	90	110	350	50	145	245	60	85	585	160
Future Volume (vph)	35	165	90	110	350	50	145	245	60	85	585	160
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.9	6.9		6.9	6.9		7.0	7.0		7.0	7.0	7.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.95		1.00	0.98		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1517	1621		1703	1786		1641	3017		1736	3282	1538
Flt Permitted	0.45	1.00		0.60	1.00		0.37	1.00		0.56	1.00	1.00
Satd. Flow (perm)	711	1621		1067	1786		648	3017		1021	3282	1538
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	36	172	94	115	365	52	151	255	62	89	609	167
RTOR Reduction (vph)	0	29	0	0	8	0	0	33	0	0	0	80
Lane Group Flow (vph)	36	237	0	115	409	0	151	285	0	89	609	87
Confl. Bikes (#/hr)									1			
Heavy Vehicles (%)	19%	11%	11%	6%	3%	14%	10%	18%	6%	4%	10%	5%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	30.1	30.1		30.1	30.1		23.0	23.0		23.0	23.0	23.0
Effective Green, g (s)	30.1	30.1		30.1	30.1		23.0	23.0		23.0	23.0	23.0
Actuated g/C Ratio	0.45	0.45		0.45	0.45		0.34	0.34		0.34	0.34	0.34
Clearance Time (s)	6.9	6.9		6.9	6.9		7.0	7.0		7.0	7.0	7.0
Lane Grp Cap (vph)	319	728		479	802		222	1035		350	1126	527
v/s Ratio Prot		0.15			c0.23			0.09			0.19	
v/s Ratio Perm	0.05			0.11			c0.23			0.09		0.06
v/c Ratio	0.11	0.33		0.24	0.51		0.68	0.28		0.25	0.54	0.16
Uniform Delay, d1	10.7	11.9		11.4	13.2		18.8	16.0		15.8	17.7	15.3
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.7	1.2		1.2	2.3		15.6	0.7		1.7	1.9	0.7
Delay (s)	11.4	13.1		12.6	15.5		34.4	16.6		17.6	19.6	16.0
Level of Service	B	B		B	B		C	B		B	B	B
Approach Delay (s)		12.9			14.9			22.3			18.7	
Approach LOS		B			B			C			B	

Intersection Summary

HCM 2000 Control Delay	17.7	HCM 2000 Level of Service		B	
HCM 2000 Volume to Capacity ratio	0.58				
Actuated Cycle Length (s)	67.0	Sum of lost time (s)		13.9	
Intersection Capacity Utilization	72.2%	ICU Level of Service		C	
Analysis Period (min)	15				

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	70	80	370	20	30	755
Future Volume (Veh/h)	70	80	370	20	30	755
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)	74	85	394	21	32	803
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						258
pX, platoon unblocked	0.74					
vC, conflicting volume	1261	394			415	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1176	394			415	
tC, single (s)	6.4	6.2			4.3	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.4	
p0 queue free %	51	87			97	
cM capacity (veh/h)	150	649			1031	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	159	394	21	835
Volume Left	74	0	0	32
Volume Right	85	0	21	0
cSH	255	1700	1700	1031
Volume to Capacity	0.62	0.23	0.01	0.03
Queue Length 95th (m)	30.2	0.0	0.0	0.8
Control Delay (s)	39.9	0.0	0.0	0.8
Lane LOS	E			A
Approach Delay (s)	39.9	0.0		0.8
Approach LOS	E			

Intersection Summary				
Average Delay		5.0		
Intersection Capacity Utilization		79.5%	ICU Level of Service	D
Analysis Period (min)		15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	30	20	75	0	0	75
Future Volume (Veh/h)	30	20	75	0	0	75
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	30	20	75	0	0	75
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	75				155	75
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	75				155	75
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				100	92
cM capacity (veh/h)	1524				820	986

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	50	75	75
Volume Left	30	0	0
Volume Right	0	0	75
cSH	1524	1700	986
Volume to Capacity	0.02	0.04	0.08
Queue Length 95th (m)	0.5	0.0	2.0
Control Delay (s)	4.5	0.0	8.9
Lane LOS	A		A
Approach Delay (s)	4.5	0.0	8.9
Approach LOS			A

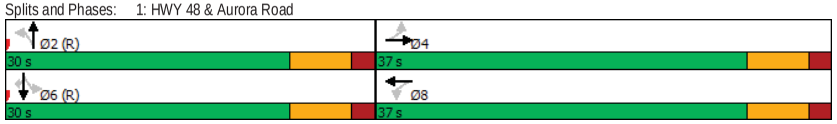
Intersection Summary				
Average Delay		4.5		
Intersection Capacity Utilization		20.7%	ICU Level of Service	A
Analysis Period (min)		15		

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	195	420	120	230	125	585	95	290	45
Future Volume (vph)	195	420	120	230	125	585	95	290	45
Lane Group Flow (vph)	203	579	125	360	130	708	99	302	47
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases		4		8		2		6	
Permitted Phases	4		8		2		6		6
Detector Phase	4	4	8	8	2	2	6	6	6
Switch Phase									
Minimum Initial (s)	3.0	3.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.9	24.9	24.9	24.9	25.0	25.0	25.0	25.0	25.0
Total Split (s)	37.0	37.0	37.0	37.0	30.0	30.0	30.0	30.0	30.0
Total Split (%)	55.2%	55.2%	55.2%	55.2%	44.8%	44.8%	44.8%	44.8%	44.8%
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
All-Red Time (s)	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.9	6.9	6.9	6.9	7.0	7.0	7.0	7.0	7.0
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max	Max
v/c Ratio	0.49	0.71	0.52	0.44	0.38	0.59	0.52	0.27	0.08
Control Delay	18.1	20.0	22.8	13.0	20.7	19.8	29.4	16.7	3.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.1	20.0	22.8	13.0	20.7	19.8	29.4	16.7	3.6
Queue Length 50th (m)	17.9	55.2	11.2	26.1	12.6	37.7	10.2	14.7	0.0
Queue Length 95th (m)	36.7	91.6	28.5	46.6	26.7	54.3	#27.0	23.7	4.6
Internal Link Dist (m)		243.6		755.0		118.4		602.0	
Turn Bay Length (m)	45.0		55.0		80.0		65.0		15.0
Base Capacity (vph)	413	814	241	810	342	1197	191	1136	570
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.49	0.71	0.52	0.44	0.38	0.59	0.52	0.27	0.08

Intersection Summary

Cycle Length: 67
Actuated Cycle Length: 67
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 55
Control Type: Pretimed
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: HWY 48 & Aurora Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	195	420	135	120	230	115	125	585	95	95	290	45
Future Volume (vph)	195	420	135	120	230	115	125	585	95	95	290	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.9	6.9		6.9	6.9		7.0	7.0		7.0	7.0	7.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.96		1.00	0.95		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1736	1777		1770	1745		1671	3430		1719	3312	1538
Flt Permitted	0.50	1.00		0.29	1.00		0.57	1.00		0.31	1.00	1.00
Satd. Flow (perm)	921	1777		539	1745		999	3430		557	3312	1538
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	203	438	141	125	240	120	130	609	99	99	302	47
RTOR Reduction (vph)	0	17	0	0	27	0	0	20	0	0	0	31
Lane Group Flow (vph)	203	562	0	125	333	0	130	688	0	99	302	16
Confl. Bikes (#/hr)						1			2			
Heavy Vehicles (%)	4%	3%	3%	2%	3%	3%	8%	3%	1%	5%	9%	5%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	30.1	30.1		30.1	30.1		23.0	23.0		23.0	23.0	23.0
Effective Green, g (s)	30.1	30.1		30.1	30.1		23.0	23.0		23.0	23.0	23.0
Actuated g/C Ratio	0.45	0.45		0.45	0.45		0.34	0.34		0.34	0.34	0.34
Clearance Time (s)	6.9	6.9		6.9	6.9		7.0	7.0		7.0	7.0	7.0
Lane Grp Cap (vph)	413	798		242	783		342	1177		191	1136	527
v/s Ratio Prot		c0.32			0.19			c0.20			0.09	
v/s Ratio Perm	0.22			0.23			0.13			0.18		0.01
v/c Ratio	0.49	0.70		0.52	0.43		0.38	0.58		0.52	0.27	0.03
Uniform Delay, d1	13.0	14.9		13.2	12.6		16.6	18.1		17.6	15.9	14.6
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	4.1	5.2		7.7	1.7		3.2	2.1		9.7	0.6	0.1
Delay (s)	17.2	20.0		20.9	14.3		19.8	20.2		27.3	16.5	14.7
Level of Service	B	C		C	B		B	C		C	B	B
Approach Delay (s)		19.3			16.0			20.1			18.7	
Approach LOS		B			B			C			B	

Intersection Summary

HCM 2000 Control Delay	18.8	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.65			
Actuated Cycle Length (s)	67.0	Sum of lost time (s)	13.9	
Intersection Capacity Utilization	84.6%	ICU Level of Service	E	
Analysis Period (min)	15			

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	40	45	760	65	65	480
Future Volume (Veh/h)	40	45	760	65	65	480
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)	43	48	809	69	69	511
Pedestrians	2					
Lane Width (m)	3.6					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						258
pX, platoon unblocked	0.90					
vC, conflicting volume	1460	811			880	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1456	811			880	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	64	87			91	
cM capacity (veh/h)	118	382			775	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	91	809	69	580
Volume Left	43	0	0	69
Volume Right	48	0	69	0
cSH	186	1700	1700	775
Volume to Capacity	0.49	0.48	0.04	0.09
Queue Length 95th (m)	19.1	0.0	0.0	2.3
Control Delay (s)	41.5	0.0	0.0	2.3
Lane LOS	E			A
Approach Delay (s)	41.5	0.0		2.3
Approach LOS	E			

Intersection Summary				
Average Delay	3.3			
Intersection Capacity Utilization	83.8%	ICU Level of Service	E	
Analysis Period (min)	15			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	75	55	35	0	0	50
Future Volume (Veh/h)	75	55	35	0	0	50
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	75	55	35	0	0	50
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	35				240	35
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	35				240	35
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	95				100	95
cM capacity (veh/h)	1576				713	1038

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	130	35	50
Volume Left	75	0	0
Volume Right	0	0	50
cSH	1576	1700	1038
Volume to Capacity	0.05	0.02	0.05
Queue Length 95th (m)	1.2	0.0	1.2
Control Delay (s)	4.4	0.0	8.6
Lane LOS	A		A
Approach Delay (s)	4.4	0.0	8.6
Approach LOS			A

Intersection Summary				
Average Delay	4.7			
Intersection Capacity Utilization	23.7%	ICU Level of Service	A	
Analysis Period (min)	15			