



ÉCOLE SIR WILLIAM OSLER ADDITION TRAFFIC STUDY

FINAL Report

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Prepared by

MORR Transportation Consulting Ltd.
Winnipeg, Manitoba

Submitted to

Winnipeg School Division
Winnipeg, Manitoba

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Report Prepared by:



Steven Florko, P.Eng.

Report Reviewed by:



Stephen Chapman, P.Eng.

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1 INTRODUCTION

Winnipeg School Division (WSD) retained MORR Transportation Consulting Ltd. (MORR) to complete a traffic study for proposed major additions and renovations at École Sir William Osler (ESWO), located at the southwest quadrant of Grant Avenue at Brock Street in Winnipeg, Manitoba.

The purpose of the study was to:

- Assist in creating a site plan that provides safe and functional circulation within the site and on Grant Avenue and Brock Street.
- Identify measures required at the intersection of Grant Street and Brock Avenue to allow safe and functional access to the school once the addition is complete.

These purposes were fulfilled through the following scope of work:

- Review and comment on site plan concept drawings prepared by the project architect.
- Estimate how the addition will affect traffic volumes at the intersection of Grant Avenue and Brock Street. Conduct traffic analyses to determine if any modifications are required at the intersection.
- Review how the post-addition traffic may affect conditions for walking and cycling near the school.
- Estimate demand for parking and student pick-ups and drop-offs once the addition is complete. Compare forecast demand to provisions included in the site plan. Review By-law parking requirements.
- Summarize the study findings and recommendations in this report.

The study area encompassed the ESWO property plus Grant Avenue along the ESWO frontage, continuing through the intersection with Brock Street, and Brock Street from Grant Avenue to the south, along the ESWO frontage.

1.1 Report Outline

This report is organized into the following sections:

- **Study Context** details the relevant characteristics of ESWO and the study area.
- **Site Plan Review** summarizes analyses and reviews completed to determine the amount of parking and loading that needs to be accommodated within the site, and how the site should be laid out to provide safe circulation.
- **Traffic Analysis** describes analyses completed to identify needs for modifications to the intersection of Grant Avenue and Brock Street.
- **Active Transportation Review** documents considerations around active transportation within the site and in connections to the external sidewalk and cycling networks.
- **Conclusions and Recommendations** gives a summary of the study findings and the study team's recommendations.

2 STUDY CONTEXT

École Sir William Osler (ESWO) is in the River Heights neighbourhood, on the south side of Grant Avenue between Campbell Street and Brock Street. William Osler Park is located immediately south of the existing school. The existing school and park occupy the entire block between Grant Avenue and Mathers Avenue on the west side of Brock Street. Aside from the park, surrounding lands are developed with detached homes at least 600 m in all directions. Lands further to the west, south, and east include higher-density residential development and commercial uses.

2.1 Streets

Grant Avenue forms the north boundary of the existing school site. Grant Avenue is classified as an “Arterial Street” which is a street intended to prioritize movement along the street, with some limits on the ability to cross the street. This allows the street to provide for longer distance trips between neighbourhoods. The configuration of the street reflects this purpose: two lanes of travel in each direction allow motorists to bypass slower-moving vehicles, and long distances between traffic signals allow traffic to flow for a longer time without interruption¹. This allows for many motorists to use the street; as of 2019, average weekday daily traffic was approximately 20,000 vehicles per day.

Despite the emphasis on traffic flow, Grant Avenue is somewhat adapted to the environment that it passes through: the speed limit is 50 km/h, controlled pedestrian crossings are provided at more regular intervals (including directly in front of the existing school at Cordova Street), sidewalks are provided on both sides of the street, a raised median provides a refuge for people and vehicles to cross, and intersections are provided at tight intervals, typically every 100 m. These features allow the neighbourhoods north and south of the street to remain connected despite the high traffic volumes.

Grant Avenue also includes Winnipeg Transit service, with an eastbound stop west of Brock Street, and a westbound stop just west of the controlled pedestrian crossing west of Cordova Street. No stopping is allowed in the eastbound curb lane between 7:00 AM and 9:00 PM, and in the westbound curb lane between 3:30 PM and 5:30 PM.

Brock Street forms the east boundary of the existing school site. The street is one of many neighbourhood grid streets extending north-south between Taylor Avenue and Grant Avenue in River Heights. It is classified as a “Local Street”, meaning that it is intended for slower travel within the local area, and for property access. Brock Street adjacent to the existing school has a 30 km/h posted speed limit 07:00 to 17:30 Monday-Friday from September to June and a 50 km/h default speed limit outside of those times. The cross-section on Brock Street is consistent with the City of Winnipeg local street cross section template and has sidewalks on both sides. Parking is allowed along the east side (or northbound) curb along the residential home frontage. These features combine to make the street less suited for higher-speed or longer-distance vehicle travel. Single family homes front the east side of the street, across from ESWO.

The west edge of the existing school site abuts the Campbell Street back lane. The lane has tight geometry, with a pavement width of approximately 5 m, with frequent driveway and garage access on the west side. The lane includes Manitoba Hydro overhead lines and poles along the west edge of the pavement. ESWO’s only existing dedicated parking is located along the lane.

¹ The nearest signalized intersections are located approximately 800 m east of the existing school at Waverley Street, and 1 km west of the existing school at a commercial access west of Kenaston Boulevard

2.2 Transit and Active Transportation

Existing transit stops on Grant Avenue are served by Route 66: Grant – Downtown – City Hall. Route 66 provides service to Unicity, CF Polo Park Shopping Centre, and Downtown with a frequency of 15 minutes during weekday peak periods and every 20 – 30 minutes during weekends and off-peak periods.

Nearby active transportation infrastructure is limited to the sidewalk network, which includes sidewalks on both sides of Grant Avenue and the intersecting north-south streets, including Brock Street and Cordova Street. The nearest dedicated cycling infrastructure is a multi-use path to the south along Taylor Avenue, approximately 700 m from the existing school. The *Winnipeg Cycling Map* identifies several nearby streets as “low-stress informal on-street routes”, including Mathers Avenue just south of William Osler Park, Lindsay Street approximately 300 m west of the existing school, and Elm Street approximately 675 m east of the existing school. Those streets provide a low-traffic cycling environment with routes oriented east-west (Mathers Avenue) and north-south (Lindsay Street, Elm Street). The proposed school addition is not anticipated to have any impact on City cycling routes.

2.3 École Sir William Osler

École Sir William Osler is a N-6 French Immersion Milieu school with a current enrollment of 174 students, overseen by 11 teachers and 9 support, administration, and maintenance staff. Some of the teachers and other staff work part-time. The existing school also includes a daycare which provides before and after school care (75 spaces) and pre-school care (32 spaces). The daycare is staffed by 18 people.

The existing school building is located on the northwest corner of the site, fronting Grant Street. The site includes 15 parking spaces off the Campbell Street back lane. Thirteen of the spaces are reserved for staff, while two are available for visitors. Two spaces are marked as accessible spaces. The existing school site includes several path connections to the sidewalks on Grant Avenue and on Brock Street. Bike parking is provided near the existing school doors on Grant Avenue.

The existing school catchment area extends south to the Canadian National Railway (CNR) Rivers Subdivision south of Taylor Avenue, east to Cambridge Street, north to the Assiniboine River, and west to Edgeland Boulevard, west of Kenaston Boulevard.

Figure 1 shows the existing school N-6 catchment area, on an illustration from the Winnipeg School Division. Note that the figure also shows the catchment area for the nearby École LaVérendrye. The future Grade 7-8 catchment area for William Osler School will encompass both catchment areas.

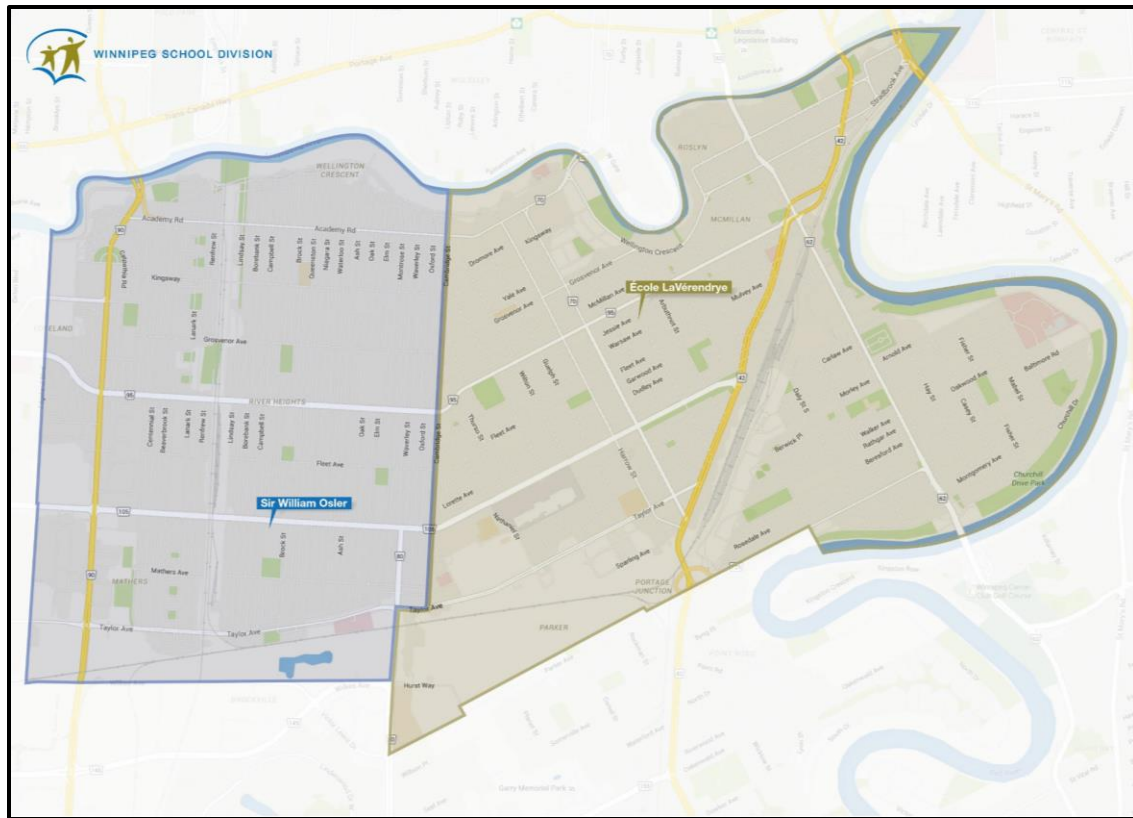


Figure 1: Existing N-6 Catchment Areas

The project Architect from Verne Reimer Architecture and the ESWO Principal provided the following comments on existing school travel activity:

- School bus pick-ups and drop-offs occur on eastbound Grant Avenue near the transit stop at Brock Street. The bus is currently used by only a few students.
- Approximately 30-35 students bike to school in the Spring months.
- Most students are dropped off and picked up by vehicle. There is no designated pick-up or drop-off area, so those activities occur ad-hoc in the Campbell Street back lane, on Brock Street, on Grant Avenue, and on Cordova Street north of Grant Avenue.
- All staff drive to work. Two staff occasionally bike to school in the Spring. All 13 staff parking spaces are reserved for staff paying for the privilege. All other staff parking on-street.

The proposed school addition would accommodate approximately 176 students in Grades 7 and 8, which would increase the total enrollment to approximately 350 students. This would expand the grades offered from N-6 to N-8 and may also change the catchment area. As of the writing of this report, no information was available on any changes to the catchment area. The school addition is scheduled to be complete in 2024-2025.

The school staff is forecast to increase by six to eight teaching staff plus another six to eight support and administration staff. The addition is also to include a new daycare to provide care for 20 infants and 54 preschool children. Based on the Harrow Co-op Children's Centre, which is an existing stand-alone daycare with 20 infants and 54 preschool children in the Winnipeg School Division roughly 2.5 km from ESWO, the new daycare is anticipated to include 19 full-time staff positions. The Harrow daycare is open from 7:00

a.m. to 6:00 p.m. and staff arrive in groups of 3 to 4 in 15-minute intervals for their 8-hour workday. Note that the new daycare is in addition to—and not a replacement for—the existing daycare.

Table 1 summarizes the enrollment and staff population for the existing school and the forecast condition once the addition is complete.

Table 1: Enrollment and Staff

| Item | Existing School | Forecast After Addition |
|----------------------------|---|---|
| School Enrollment (Grades) | 174 (N-6) | 174 (N-6) 176 (7-8) |
| Teaching Staff | 11 | 17-19 |
| Other School Staff | 9 | 15-17 |
| Daycare Spaces (Type) | 75 (Before and After School) 32 (Pre-School) | 75 (Before and After School) 32 (Pre-School, Existing Program) 20 (Infant, New Program) 54 (Pre-School, New Program) |
| Daycare Staff (Type) | 18 (Existing Program) | 18 (Existing Program) 19 (New Program) |

The addition includes a 36,000 ft² expansion of the existing school building to include new classrooms and a new gym, plus a separate, detached building for the new daycare.

The addition is also to include increased school bus service (two buses dropping off and picking up, vs the existing single-bus pick-ups and drop-offs) and increased bike parking.

Several site plans have been prepared showing different orientations of the building expansions and different options for a pick-up and drop-off loop. Site plan options are shown in the site plan review in Section 3.3.

2.4 Study Area

The study area encompassed the ESWO property plus Grant Avenue along the ESWO frontage, continuing through the intersection with Brock Street, and Brock Street from Grant Avenue to the south, along the ESWO frontage.

Figure 2 illustrates the study area, including the ESWO site in its existing form, prior to the addition.



3 SITE PLAN REVIEW

The site plan review considered:

- The estimated number of on-site parking stalls and bicycle parking spaces required.
- The estimated number of loading (pick-up and drop-off) spaces that would need to be included on site.
- The layout of the site, particularly as it pertains to safe circulation for pedestrians, cyclists, and vehicles.
- Need for changes to curb lane regulations on Grant Avenue and Brock Street adjacent to the school property.

The following sections summarize the considerations for each component.

3.1 Parking

Parking requirements were considered from two perspectives:

- Minimum requirements stated in Winnipeg's *Zoning By-law 200/2006*
- Empirical data from other, existing schools

It is good practice to consider empirical data, since By-law requirements don't always reflect actual demand for parking. Providing parking at the By-law required rate can lead to parking lots that are over or undersized relative to actual demand.

The resulting parking requirements were used to ensure that the site plan includes an appropriate number of vehicle and bicycle parking spaces.

3.1.1 Zoning By-law Minimum Parking Requirements

Winnipeg Zoning By-law Table 5-9 specifies minimum parking requirements for various types of land uses, organized into 24 land use categories. Further, By-law clause 171(2) states that the minimum parking requirements can be reduced by 20% for locations within the "Urban Infill Area" shown on a map in Schedule C of the By-law, provided that the location is on a street with regular daily transit service. The ESWO site is within the Urban Infill Area, and the Route 66 transit service is available every day, so the 20% reduction applies.

Table 2 shows the minimum parking requirements from the By-law, applied to ESWO once the addition is complete. Note that the figures include the 20% reduction. Requirements are shown separately for the school and the daycares, the school calculations use the high end of the potential teaching staff count from Table 1, and existing daycare calculations assume that one half of the total daycare staff from Table 1 are present during the maximum shift.

Table 2: By-law Parking Requirements – Post-Addition

| Component (By-law Parking Category #) | By-law Requirement, Before 20% Reduction | Relevant ESWO Parameters, Post- Addition | Applied to ESWO Post- Addition, After 20% Reduction |
|---|--|--|---|
| Existing ESWO N-6 (Category 7) | 1 space for each 2 faculty plus 1 for each 4 employees | 11 teachers 9 other staff | 12 spaces |
| New ESWO 7-8 (Category 7) | 1 space for each 2 faculty plus 1 for each 4 employees | 8 teachers 8 other staff | 8 spaces |
| Existing Daycare (Category 5) | 1 guest parking space per 10 children but not less than 1 space, plus 1 for each 3 employees on the maximum shift | 32 children 9 staff* | 6 spaces |
| New Daycare (Category 5) | 1 guest parking space per 10 children but not less than 1 space, plus 1 for each 3 employees on the maximum shift | 74 children 19 staff | 11 spaces |
| TOTAL | | | 37 spaces |

* Assumed one half of employees present at maximum shift

The By-law requires that the school should include at least 20 parking spaces in the post-addition condition, plus another 6 spaces for the existing daycare, and another 11 spaces for the new daycare, for a total of at least 37 parking spaces on-site. By-law Table 5-10 indicates that a site with 26 to 50 spaces should include at least two accessible spaces.

By-law Table 5-9 indicates that bicycle parking is required for the daycares, but not for the school. By-law clause 169 indicates that one lockable bicycle parking space should be provided for every 10 applicable (daycare) parking spaces. With 17 spaces required for the daycares, the By-law requires two bicycle parking stalls on-site.

For reference, when applied to the existing school and daycare the By-law gives a requirement for at least 18 parking spaces, three more than are available in the existing 15-space parking lot located along the Campbell Street back lane.

3.1.2 Empirical Data from Proxy Schools

Parking requirements were also considered using empirical data from two sources:

- The Institute of Transportation Engineers (ITE) *Parking Generation Manual, 4th Edition*. The *Parking Generation Manual* includes empirical parking data collected at existing sites across North America, categorized by land use type.
- Reports from eight schools in the Pembina Trails School Division.

The ITE data provides parking demand rates based on the number of students at the school and children at the daycare, similar to the By-law. Data was taken from five elementary schools in the United States between 1992 and 2007, three middle schools in the United States between 2001 and 2009, and 39 daycare centres in the United States between 1998 and 2003.

The data from the Pembina Trails schools does not report the actual number of vehicles parked, but instead includes data on the number of parking stalls provided relative to staffing and student numbers and indicates whether that level of supply was found to be sufficient or insufficient. Data from the eight schools was then aggregated to calculate average provisions at schools with good performance. No data was included for daycare centres.

The study team used both data sources to project potential parking requirements at ESWO in the post-renovation condition. Table 3 shows the relevant rates from ITE and the resulting estimated parking demand. Table 4 shows the relevant information from the Pembina Trails schools and the resulting parking requirements. Note that the data also included information on bike parking, which is absent from the ITE data.

Table 3: Estimated Parking Demand Based on ITE Data

| Component (ITE Land Use Category) | ITE Parking Generation Rate | Relevant ESWO Parameters, Post- Addition | Estimated Parking Demand |
|---|---------------------------------|--|-----------------------------|
| Existing ESWO N-6 (#520 – Elementary School) | 0.17 vehicle stalls per student | 174 students | 30 spaces |
| New ESWO 7-8 (#522 – Middle School) | 0.09 vehicle stalls per student | 176 students | 16 spaces |
| Existing Daycare (#565 – Daycare Centre) | 0.24 vehicle stalls per child | 32 children | 8 spaces |
| New Daycare (#565 – Daycare Centre) | 0.24 vehicle stalls per child | 74 children | 18 spaces |
| TOTAL | | | 72 spaces |

Table 4: Estimated Parking Requirements Based on Data from Pembina Trails Schools

| Component | Pembina Trails Schools with Good Performance | Relevant ESWO Parameters, Post-Addition | Estimated Parking Requirement |
|-------------------|--|---|---|
| Existing ESWO N-6 | 1.03 staff parking spaces per staff member + 0.006 visitor parking spaces per student + 0.22 bike parking spaces per student | 20 staff 174 students | 21 staff parking spaces 2 visitor parking spaces 39 bike spaces |
| New ESWO 7-8 | 1.03 staff parking spaces per staff member + 0.006 visitor parking spaces per student + 0.22 bike parking spaces per student | 16 staff 176 students | 17 staff parking spaces 2 visitor parking spaces 39 bike spaces |
| Existing Daycare | | N/A | |
| New Daycare | | N/A | |
| | | TOTAL (School Only) | 38 staff parking spaces 4 visitor parking spaces 78 bike spaces |

The ITE parking generation rates indicate that once the addition is complete, ESWO might generate demand for 72 parking spaces during peak periods. The data from Pembina Trails schools indicates that a supply of 42 vehicle spaces (38 for staff and 4 for visitors) and 78 bicycle spaces may provide acceptable parking performance.

3.1.3 Parking Summary

Table 5 summarizes the parking requirements based on the By-law, the ITE data, and the data from schools in Pembina Trails School Division. The rightmost column includes the study team's recommended parking supply.

Table 5: Parking Summary

| Component | By-law Minimum Parking Requirement | ITE Forecast Parking Demand | Estimated Parking Supply, Pembina Trails Schools | Recommended Parking Supply |
|--------------------------|---|-----------------------------|---|---|
| Existing ESWO N-6 | 12 vehicle spaces | 30 vehicle spaces | 21 staff spaces 2 visitor spaces 39 bike spaces | 20 staff spaces 2 visitor spaces 39 bike spaces |
| New ESWO 7-8 | 8 vehicle spaces | 16 vehicle spaces | 17 staff spaces 2 visitor spaces 39 bike spaces | 16 staff spaces 2 visitor spaces 39 bike spaces |
| Existing Daycare | 6 vehicle spaces | 8 vehicle spaces | N/A | N/A |
| New Daycare | 11 vehicle spaces | 18 vehicle spaces | N/A | 16 vehicle spaces |
| TOTAL | 37 vehicle spaces (including 2 accessible spaces and 2 bicycle spaces) | 72 vehicle spaces | 38 staff parking spaces 4 visitor parking spaces 78 bike spaces | 36 staff spaces 4 visitor spaces 16 daycare spaces (including 2 accessible spaces) 78 bike spaces |

In the study team's opinion, the data from schools in Pembina Trails School Division is most reliable, as it is recent and represents conditions in Winnipeg. The ITE data is less recent and from the United States, where conditions may be different than they are in Winnipeg.

The study team adjusted the recommendation from the Pembina Trails data such that the staff parking requirement is set to one space per staff member, rather than slightly more than one space per staff. Supplies for visitor and bike parking are unchanged from the Pembina Trails data. That yields a required parking supply of 36 staff parking spaces for the school, plus 4 visitor spaces and 78 bike parking spaces. The Pembina Trails data did not include daycares, so that supply can be set somewhere between the By-law requirement and the ITE forecast. The study team selected 16 stalls, three stalls less than the assumed staffing at maximum shift. This gave a total site supply of 56 spaces. Two of those spaces should be accessible, per the By-law. The 78 bike parking spaces per the Pembina Trails data is likely sufficient for the entire site, without additional bike parking for the daycares.

3.2 Loading

Loading (student pick-up and drop-off) considerations were based on the By-law and data from schools in Pembina Trails School Division.

By-law loading requirements are minimal: elementary and junior high schools must provide space for three buses and five passenger vehicles, per clause 69(1). Daycare centres are required to provide "a drop-off/pick-up area to ensure the safety of persons and to ensure that vehicles dropping off or picking up do not interfere with smooth traffic flow on adjacent public streets."

Schools in Pembina Trails that reported good loading performance had an average of one parent loading space per 33 students, plus one bus loading space per 140 students. If ESWO was supplied with similar loading in the post-addition condition, it would have 11 parent loading spaces and 3 bus loading spaces.

The data from Pembina Trails did not include information on daycare loading. It is important to consider that daycare drop-offs may generally occur earlier than school drop-offs, and that daycare pick-ups may generally occur later than school pick-ups. At the comparable Harrow Co-op Children's Centre, the daycare opens at 7:00 a.m. and busiest drop-off period begins at 7:30 a.m. while pick-up starts at around 4:15 p.m.

to 4:30 p.m. If the new daycare follows the Harrow example, a partial overlap with school drop-off would be anticipated in the morning and no overlap would be anticipated in the afternoon.

3.3 Site Plan

The initial school site plan is illustrated in Figure 3. This plan was presented at a project open house in January 2023.

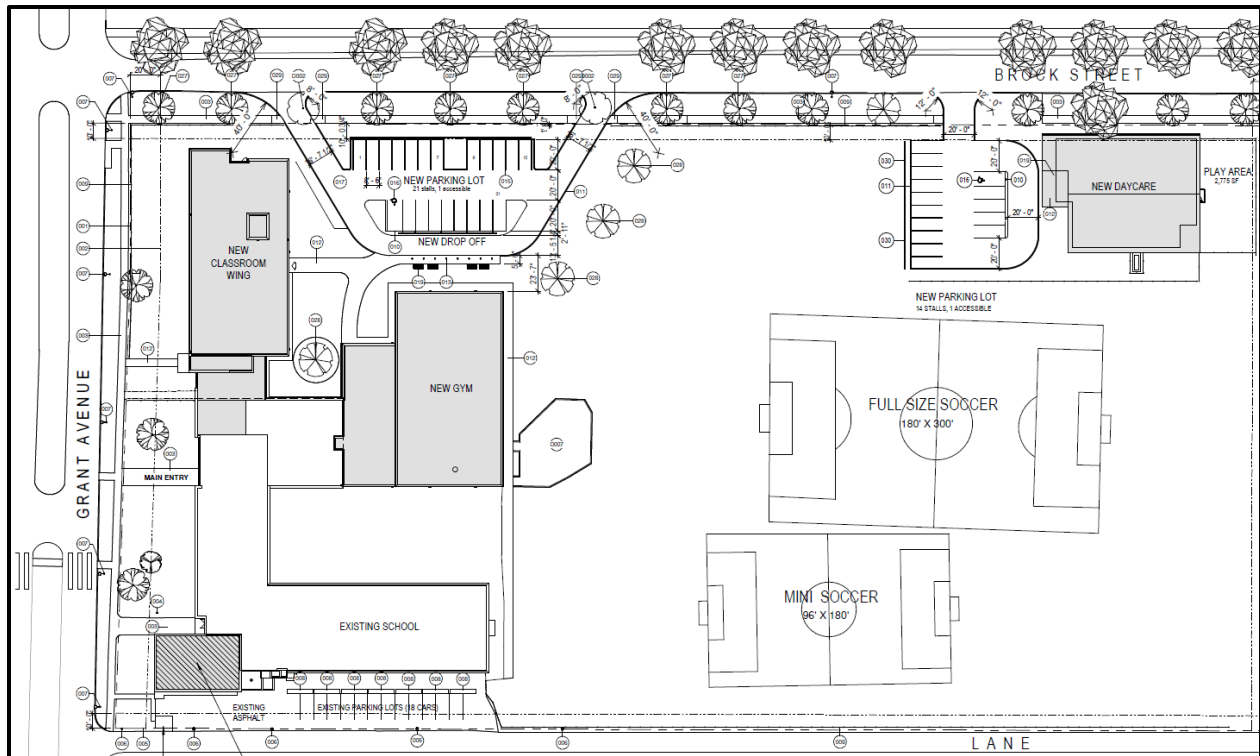


Figure 3: January 2023 Open House Site Plan

In response to comments received from the open house and input received from this traffic study, five site plan options were developed for review. Options 1 and 3 were based on a single vehicle access from Brock Street, Options 2 and 4 were based on vehicle access exclusively from the Campbell Street back lane, and Option 5 was a refinement of the open house site plan. Images of the options with review commentary are provided in Appendix D. The reviews looked to identify potential circulation issues and recommend a preferred site plan. Once the preferred plan was selected, the parking and loading requirements shown on the plan were compared against the requirements identified in the previous sections and the study team conducted a swept path review using AutoTURN software to confirm that the site plan geometry allowed for the required vehicle movements.

Note that all options considered included some form of drop-off/pick-up loop on the school site. The loading considerations discussed in Section 3.2 found that parent loading spaces should be provided on-site—due to the high turnover of student pick-up and drop-off maneuvers, increased loading demand due to increased enrollment, experience at other schools, and a desire to reduce potential conflicts between students and vehicles on the city street network. Other anticipated uses of the pick-up and drop-off loop are:

- Winnipeg Fire Paramedic Services require the drop-off loop to get their vehicles within 15 metres of the new addition doors because of the requirement for a fire wall between the existing school

and the new addition. This means that all site plan options need to efficiently accommodate fire truck movements to and from Grant Avenue.

- Children with wheelchair requirements will be bused to and from the pick-up/drop-off loop.
- Field trip buses will use the loop. Field trip buses typically arrive and depart outside the peak hours.
- Bus ridership training

The site plan options assumed that school buses will continue to pick-up and drop-off students via eastbound Grant Avenue, just west of Brock Street, at the start and end of the school day. Keeping daily school buses on Grant Avenue reduces the need to pave the school property for combined bus and parent accommodation and eliminates potential on-site conflicts between parent vehicles and school buses. The bus may conflict with Winnipeg Transit buses servicing the stop just west of Brock Street, but that is unlikely—the stop is serviced four times per hour, and two school buses will stop in that area in the morning and in the afternoon. If a bus arrives while another bus is at the stop, the second bus would likely be delayed for less than one minute.

Use of the Campbell Street back lane versus use of Brock Street was a key determinant in the viability of options. At less than 5 metres wide, the back lane is narrower than the 7.5-metre-wide pavement on Brock Street. Typically, a minimum clear width of 6 metres is required to maintain continuous two-way traffic. Fire truck access to the back lane would be very challenging given the narrow pavement width, presence of obstructions including utility poles and fences at the edge of pavement, and lack of a median opening at Grant for westbound emergency vehicle access. There are currently no private approaches on Brock Street between Grant Avenue and Mathers Avenue whereas, in the same block, the Campbell back lane has access for 20 homes, the existing school staff parking lot, and existing school garbage and recycling pickup. Furthermore, the property accesses along the back lane have garages and fences that limit visibility between drivers exiting the property and vehicles traveling in the back lane. The level of conflict is mitigated currently by low vehicle volumes; however, this would not be the case if parent pick-up and drop-off traffic was introduced. At Grant Avenue, visibility between northbound drivers in the Campbell back lane and pedestrians and vehicles west of the lane is restricted by a full height fence along the property line at 748 Campbell Street. For all the above reasons, options relying on the Campbell back lane for primary vehicle and fire access were not recommended for further development.

With respect to options with primary vehicle access on Brock Street, student safety in terms of potential conflicts between students and vehicles was an important determinant. Options that extend parking and drop-off areas east-west across the school site result in students having to walking across parking and loading areas to access the school greenspace and the park to the south. The conflict between parking and loading areas and pedestrian desire lines is a permanent conflict that cannot be fully mitigated by signs, pavement markings, and fences. Some options, like Option 1, also do not provide enough loading space to meet demand. This would be expected to result in drop-off/pick-up on the east side of Brock Street which would bring students into conflict with traffic on Brock Street.

The preferred plan, Option 5, is illustrated in Figure 4. Option 5 is an evolution of a concept presented at a project open house in January 2023. Relative to the January 2023 open house concept, Option 5 moves the new daycare northwards on the site and integrates its parking and loading with the school. These changes deleted a private approach and parking lot on Brock Street and moved the daycare building closer to the school. The geometry of the Option 5 pick-up/drop-off loop provides flexibility to adapt to changing conditions over time as its width and radii can accommodate passenger vehicles, school buses, and emergency vehicles and the curb space along the edge of the loop can be regulated for a variety of parking and loading uses throughout the day and outside of school hours.

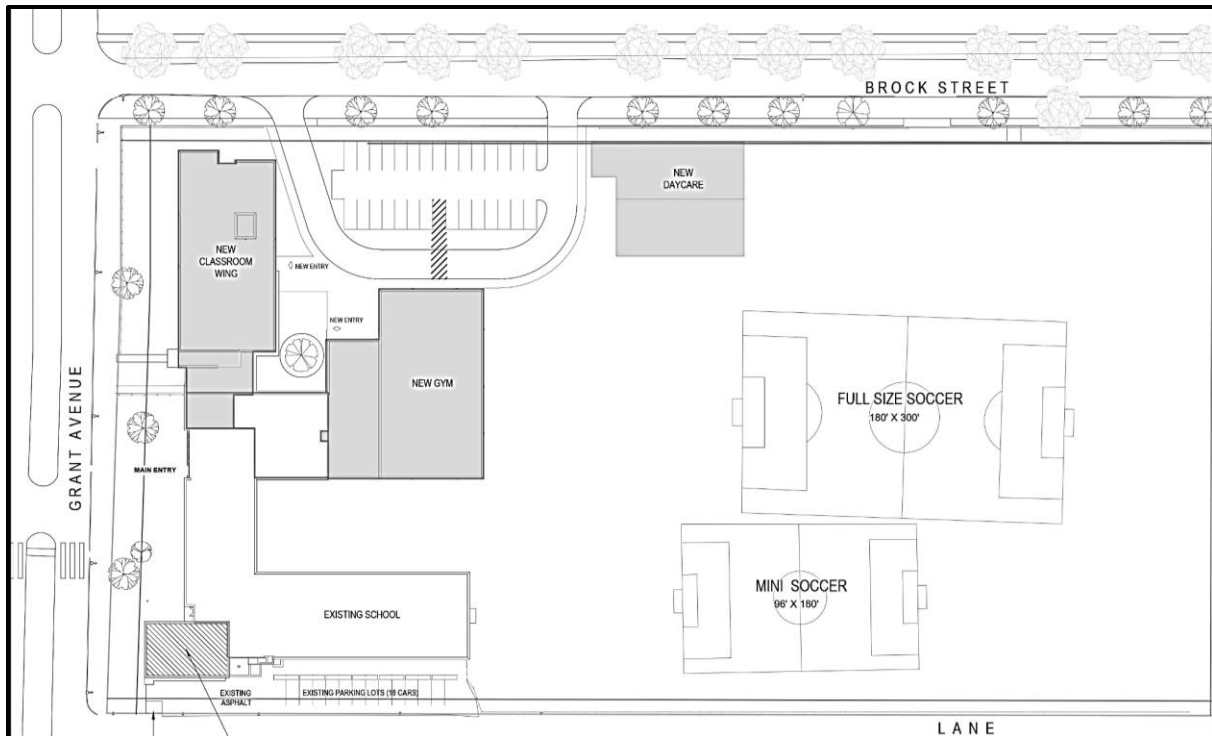


Figure 4: Option 5 – Recommended Site Plan

Option 5 had by far the fewest circulation issues of the options and minimized potential pedestrian conflicts. Some level of increased traffic on Brock Street is inevitable with the increased school enrollment. Use of Brock Street by school traffic is a far superior alternative to increasing traffic in the back lane, where sightlines are extremely limited, and the road width is insufficient for the expected volume of two-way vehicle traffic. Additionally, the site plan minimizes the extent of additional traffic on Brock Street by having southbound traffic enter the loading loop approximately 40 m south of Grant Avenue. Impacts on Brock Street can be further minimized by requiring all exiting traffic to turn left and go north on Brock Street to Grant Avenue. This would limit the traffic increase on Brock Street to the segment within 100 m of Grant Avenue, with the exception of vehicles arriving from the south on Brock Street (forecast at approximately 60 vehicles per day).

A northbound no-parking restriction can be added by the City to the east side of Brock Street between the loop and Grant Avenue from September to June during school pick-up and drop-off times, to provide more space for circulation and queueing on Brock Street. No changes are required for the curb lane regulations on Grant Avenue, on the basis that school buses will continue to make use of eastbound Grant Avenue for pick-ups and drop-offs, as per the existing arrangement.

There will be some conflicts between vehicles using the loading loop and vehicles accessing the parking area, but those will occur at low speed, with good sightlines, in an area with positive guidance and away from pedestrians.

The site plan shows a total supply of 45 stalls, with 30 in the new lot along Brock Street and 15 in the existing lot along the back lane. That is 11 stalls short of the recommended 56 stall supply. Note that the shortfall may be smaller in reality, as the loop can provide for visitor parking outside of drop-off and pick-up hours. If the parking supply is not increased, some vehicles could park on-street. This is forecast at up to 11 vehicles during peak periods.

The study team measured the length of the loading loop and found that it could accommodate 13 vehicles. That is more than the recommended 11 space provision. This additional loading capacity will help to limit potential for loading occurring on-street on Brock Street, Cordova Street, or Grant Avenue, all of which occur with the existing school.

The study team conducted a swept path check for a passenger vehicle exiting the loading loop and heading north on Brock Street, a 40-foot school bus traveling around the loop, and an aerial fire truck traveling around the loop. Figure 5, Figure 6, and Figure 7 illustrate the swept paths. Passenger vehicles can exit the site and turn left to go north on Brock Street, even if vehicles are parked along the east curb. The 40-foot school bus can negotiate the loop provided no vehicles are loading or parking around the loop curves. An aerial fire truck can negotiate the loop but requires the full width of pavement (i.e., no parked or loading vehicles) around the loop and no parked vehicles on the east side of Brock Street at the loop exit.

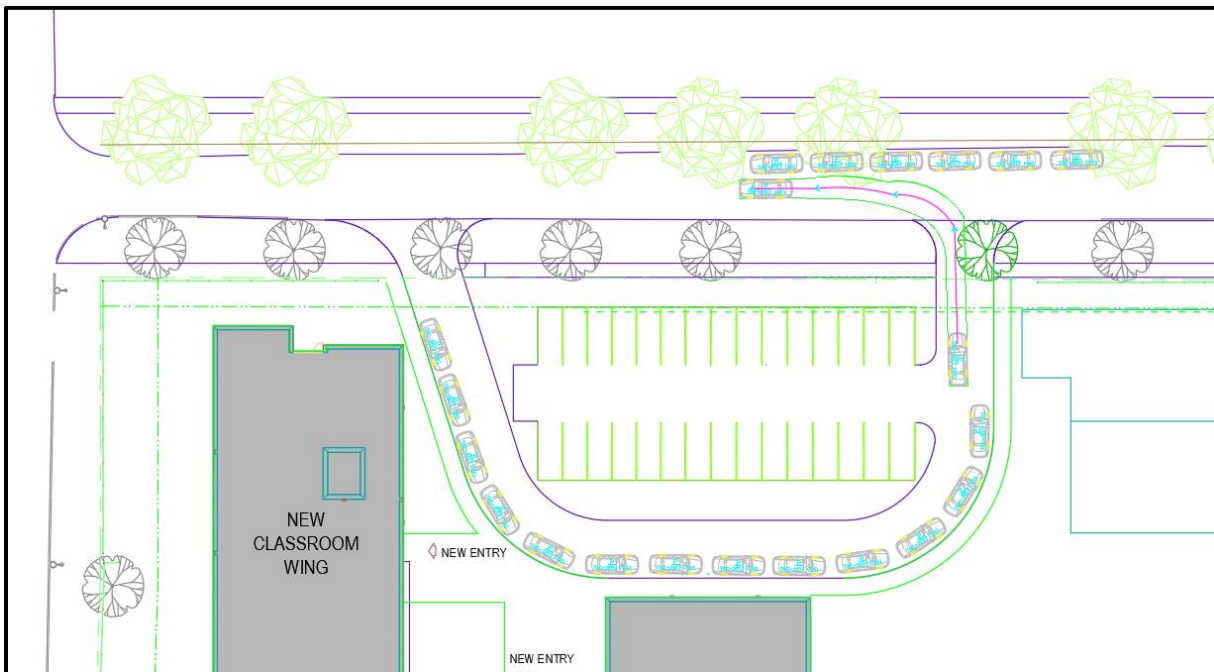


Figure 5: Exiting Loop Left Turn With Parking

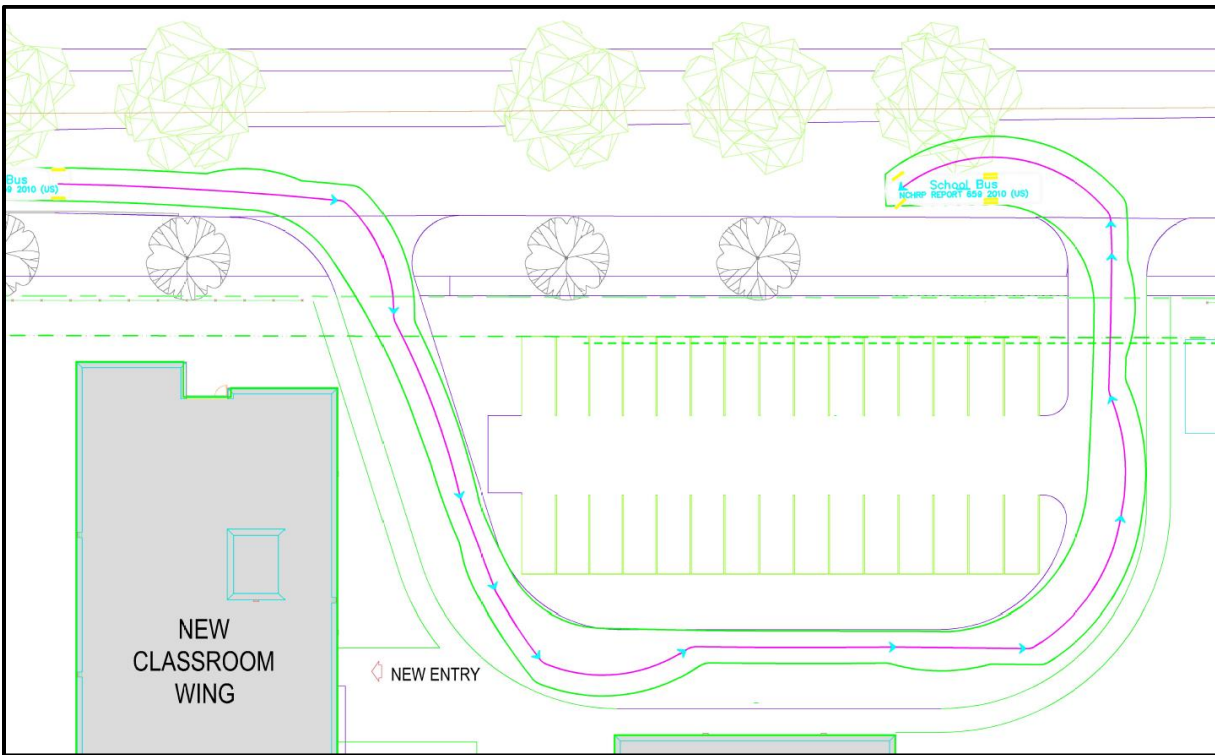


Figure 6: Loop Travel by 40' School Bus

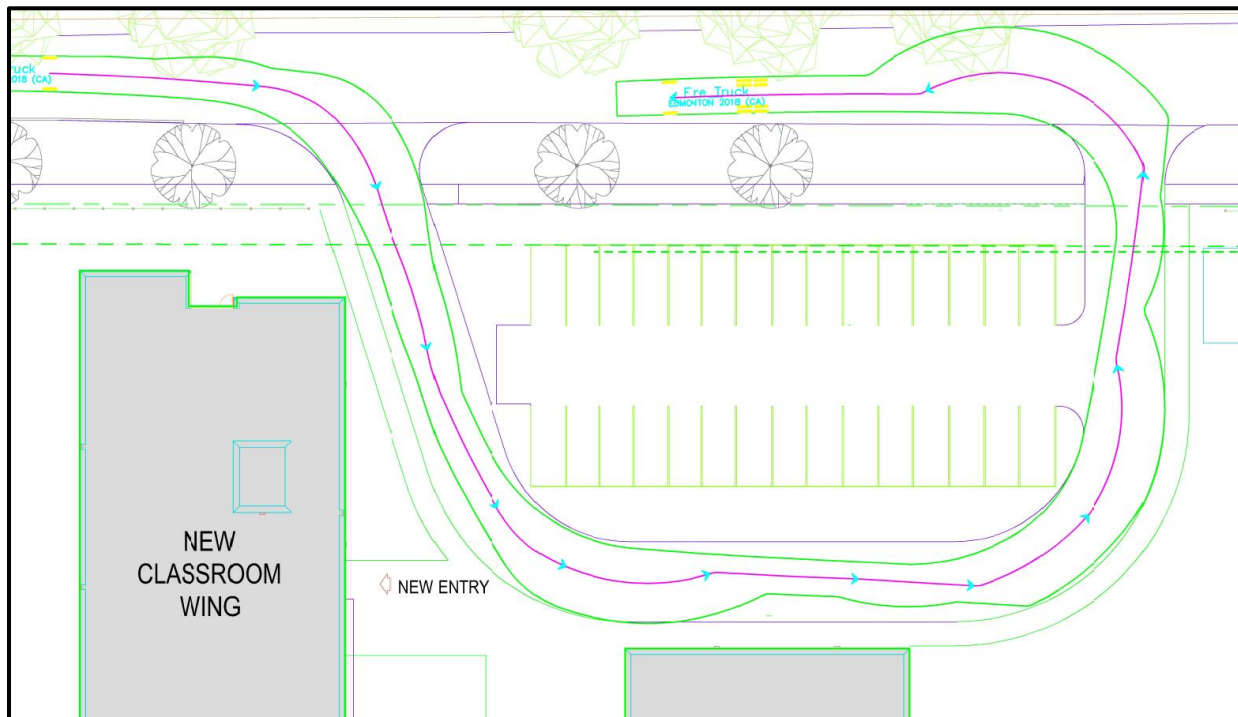


Figure 7: Loop Travel by Aerial Fire Truck

4 TRAFFIC ANALYSIS

The traffic analysis reviewed existing and forecast future traffic operations at the intersection of Grant Avenue and Brock Street, with a view to determining if the intersection requires additional turning lanes or signalization.

4.1 Traffic Volumes

The analysis requires information on traffic volumes, including existing traffic and new traffic from the school addition.

4.1.1 Existing Traffic

Traffic volumes were quantified for existing conditions via a traffic count conducted by MORR on Thursday, January 19th, 2023, from 7:00 to 9:00 AM and from 2:45 to 5:30 PM. The count was a “turning movement count”, where traffic volumes were recorded separately for each movement through the intersection (i.e., from the west on Grant to the south on Brock, from the south on Brock to the east on Grant, etc.) in 15-minute intervals. Figure 8 shows a sample of the data.

| Time | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | Total |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| 7:00 | | 2 | 1 | | | | | 99 | | | 82 | | 184 |
| 7:15 | 1 | | | 1 | 1 | | 1 | 79 | | | 70 | 1 | 154 |
| 7:30 | | 1 | 3 | | | | | 114 | | 1 | 122 | | 241 |
| 7:45 | | | 1 | | | | | 138 | | 2 | 124 | | 265 |
| 8:00 | 1 | 5 | 6 | 1 | | 3 | 2 | 134 | | 3 | 147 | 3 | 305 |
| 8:15 | 5 | 1 | 13 | | | | 1 | 143 | 1 | | 150 | 2 | 316 |
| 8:30 | 1 | | 4 | 1 | | 1 | 1 | 151 | | 1 | 146 | 1 | 307 |
| 8:45 | | 2 | 1 | 2 | 1 | | | 155 | | 1 | 146 | | 308 |
| 14:45 | 1 | 2 | 1 | | | | 1 | 153 | 1 | 1 | 175 | 3 | 338 |
| 15:00 | 5 | 1 | 5 | | 1 | | 1 | 114 | 1 | 2 | 172 | 1 | 303 |
| 15:15 | 1 | 1 | 2 | 1 | 2 | 1 | 1 | 168 | 0 | 2 | 175 | 1 | 355 |
| 15:30 | 1 | | 2 | 2 | | | 3 | 171 | | 1 | 185 | | 365 |
| 15:45 | 1 | | 1 | | | 1 | 2 | 168 | 1 | | 200 | | 374 |
| 16:00 | | 1 | 2 | | 1 | | 2 | 143 | 2 | 1 | 200 | 1 | 353 |
| 16:15 | | | 7 | | | 1 | 2 | 175 | | 3 | 220 | | 408 |
| 16:30 | | 1 | 4 | | | 1 | 4 | 200 | 1 | 2 | 225 | | 438 |
| 16:45 | 1 | | | 1 | | 1 | 2 | 195 | 2 | 6 | 224 | 3 | 435 |
| 17:00 | 1 | 3 | 1 | | | 1 | 1 | 178 | 1 | 1 | 177 | 2 | 366 |
| 17:15 | 1 | | 2 | 1 | 1 | | 1 | 155 | | 3 | 167 | 3 | 334 |

Note: NBL = Northbound Left, NBT = Northbound Through, NBR = Northbound Right, SB = Southbound, EB = Eastbound, WB = Westbound

Figure 8: Sample Count Data

Within those periods, the study team identified a peak hour (the 60-minute period with the greatest volume of traffic) in the morning from 8:00 to 9:00 AM, and in the afternoon from 4:15 to 5:15 PM. While the volumes in the afternoon peaked from 4:15 to 5:15 PM, the study team elected to use afternoon volumes from a period starting at 2:45 PM and ending at 3:45 PM—the hour when school traffic is likely most active. Those peak hour volumes were used in the analysis.

The study team also calculated average daily traffic (ADT) volumes for the weekday period as a helpful reference for the general level of activity on Grant Avenue and on Brock Street. The study team’s count did not cover a 24-hour period, so daily volumes were taken from the City’s *Open Data Portal*, which included a 2016 count on Grant Avenue between Borebank Street and Campbell Street (approximately 150 m west of the school). The count showed a 2016 volume of 20,640 vehicles per day as total (both directions)

volume on Grant Avenue. The study team used a compound annual growth rate² (CAGR) of 0.7% to expand that volume from 2016 to 2023. That gave a daily volume of 21,700 vehicles per day. While that volume is based on a count west of the existing school, the study team estimated that volumes on Grant Avenue in front of the existing school are likely similar.

No data was available for weekday daily traffic volumes on Brock Street, so the study team estimated a weekday daily volume as ten times the average of the morning and afternoon peak hour volumes. This is a typical practice for weekday daily volume estimation, and it yielded an existing weekday daily volume of 395 vehicles per day. The City of Winnipeg typically targets a volume of 1,000 vehicles per day for local streets like Brock Street. This is more of an environmental/neighbourhood target than a capacity target reflecting the City's experience that when local streets get above 1,000 vehicles a day to 2,000, 3,000, or more vehicles per day they are more likely to receive volume and/or speeding complaints from residents.

Figure 9 shows the peak hour turning movement volumes at the intersections. Volumes from the morning peak hour are shown first, with afternoon peak hour volumes following in parentheses. Daily volumes are noted as such.

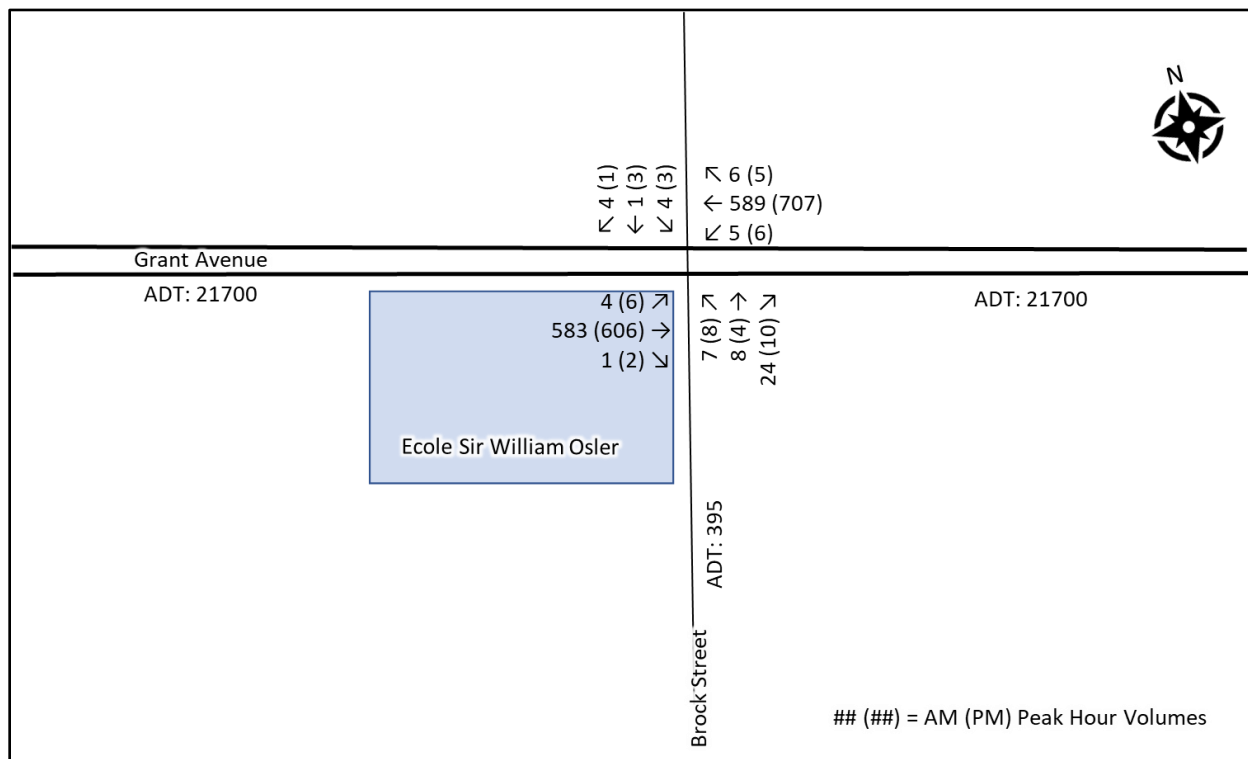


Figure 9: Existing Traffic Volumes

The study also considered the temporal distribution of traffic within the peak hours. This is important, as a given volume of traffic per hour requires different treatments if it is concentrated in 15 minutes rather than spread evenly over the hour.

The term to express this distribution is a peak hour factor (PHF). Peak hour factors are defined as:

² The City of Winnipeg provided the 0.7% growth rate as typical for arterial streets outside of rapidly developing areas at the edge of the City.

$$PHF = \frac{\text{Peak Hour Volume}}{4 \times \text{Peak 15 Minute Volume}}$$

Peak hour factors range from 0.01 to 1.00, with lower values indicating that traffic is concentrated into a single 15-minute interval, and higher values indicating that traffic is spread evenly throughout the peak hour. Major streets typically see values between 0.85 and 0.95, while streets near generators that cause surges in demand (such as factories at shift change) can see values in the range of 0.40 to 0.50.

Peak hour factors were calculated separately for the movements on Grant Avenue vs the movements on Brock Street. Table 6 shows the results.

Table 6: Peak Hour Factor

| Street | AM Peak Hour Factor | PM Peak Hour Factor |
|--------------|---------------------|---------------------|
| Grant Avenue | 0.98 | 0.94 |
| Brock Street | 0.60 | 0.60 |

Peak Hour Factors on Grant Avenue were high, indicating an even spread of volume within the peak hours. In contrast, Brock Street had low PHFs, at 0.60 for both the morning and afternoon peak hour. This is equivalent to 42% of the peak hour volume occurring in one 15-minute interval.

4.1.2 Increased Traffic Resulting from the École Sir William Osler Addition

The recommended site plan includes a new drop-off loop on Brock Street. The study team conservatively assumed that all school traffic—both from the existing N-6 classes and the new Grades 7 and 8 classes—would use the drop-off loop. As such, the study team estimated how much traffic would be generated by both the existing school and the new addition. Traffic from the new daycare was also assumed to access the parking lot on Brock Street.

School traffic was estimated using trip generation rates from the Institute of Transportation Engineers (ITE) *Trip Generation Manual, 11th Edition*. The *Manual* includes empirical vehicle trip generation rates derived from traffic counts at existing developments, referenced to characteristics of the development such as unit counts for residential developments, floor area for commercial developments, or students for schools and children for daycares.

The rates are categorized by land use, and the study team selected the following land uses to represent the school and daycares:

- Category #520 *Elementary School* to represent the existing William Osler School
- Category #522 *Middle School* to represent the Grade 7 and 8 additions
- Category #565 *Day Care Center* to represent the existing daycare and the new daycare

Recall that the existing daycare includes both before and after school care (BASC) and pre-school care. It is unnecessary to calculate trips for the BASC care, as children using that service are also going to school. Trip generation for the existing pre-school was thus limited to the pre-school spaces.

Table 7 shows the vehicle trip generation rates and the resulting vehicle trip generation estimates for the proposed development. Note that a parent dropping off a student in the morning and picking-up a student in the afternoon is generating four trips in a day. One inbound trip and one outbound trip in both the morning and afternoon.

Table 7: Vehicle Trip Generation Estimates

| Land Use (Category #) | Quantity | Trip Generation Rate | In/Out Split | Trip Generation Estimate |
|-----------------------------------|-----------------|------------------------------|------------------|---|
| Existing N-6 School (#520) | 174 students | 0.74 AM trips per student | 55% in / 45% out | 129 AM trips (71 in, 58 out) |
| | | 0.45 AM trips per student | 46% in / 54% out | 78 PM trips (36 in, 42 out) |
| | | 2.10 Daily trips per student | 50% in / 50% out | 394 Daily trips (197 in, 197 out) |
| Grade 7 & 8 Addition (#522) | 176 students | 0.67 AM trips per student | 54% in / 46% out | 118 AM trips (64 in, 54 out) |
| | | 0.36 PM trips per student | 46% in / 54% out | 63 PM trips (29 in, 34 out) |
| | | 2.10 Daily trips per student | 50% in / 50% out | 370 Daily trips (185 in, 185 out) |
| Existing Day Care (#565) | 32 students | 0.78 AM trips per student | 53% in / 47% out | 25 AM trips (13 in, 12 out) |
| | | 0.79 PM trips per student | 47% in / 53% out | 25 PM trips (12 in, 13 out) |
| | | 4.09 Daily trips per student | 50% in / 50% out | 130 Daily trips (65 in, 65 out) |
| New Day Care (#565) | 74 students | 0.78 AM trips per student | 53% in / 47% out | 58 AM trips (31 in, 27 out) |
| | | 0.79 PM trips per student | 47% in / 53% out | 58 PM trips (27 in, 31 out) |
| | | 4.09 Daily trips per student | 50% in / 50% out | 302 Daily trips (151 in, 151 out) |
| Total | | | | 330 AM trips (179 in, 151 out) 224 PM trips (104 in, 120 out) 1,196 Daily trips (598 in, 598 out) |

In the post-addition condition, ESWO and the daycares are forecast to generate 330 vehicle trips during the weekday morning peak hour, 224 vehicle trips during the weekday afternoon peak hour, and 1,196 weekday daily vehicle trips.

While all trips were assumed to access the school and daycares via the loop on Brock Street, not all trips would travel through the intersection at Grant Avenue, and not all trips would make the same movements through the intersection. The study team assumed that the vehicle trips would be distributed as follows:

- 42.5% to/from the east on Grant Avenue
- 42.5% to/from the west on Grant Avenue
- 10% to/from the south on Brock Street
- 5% to/from the north on Brock Street

This assumed that most vehicle trips to and from the school would be coming from/going to Grant Avenue, with an even split between east and west on Grant Avenue.

Once the volumes were distributed the study team assigned them to the appropriate movements at the intersection of Grant Avenue and Brock Street.

Figure 10 shows the school traffic volumes assigned to the intersection. Note that this only represents traffic generated by ESWO and the daycares—existing traffic is not included. Volumes are shown first for the AM peak hour, with PM peak hour volumes following in parentheses and daily volumes noted as such.

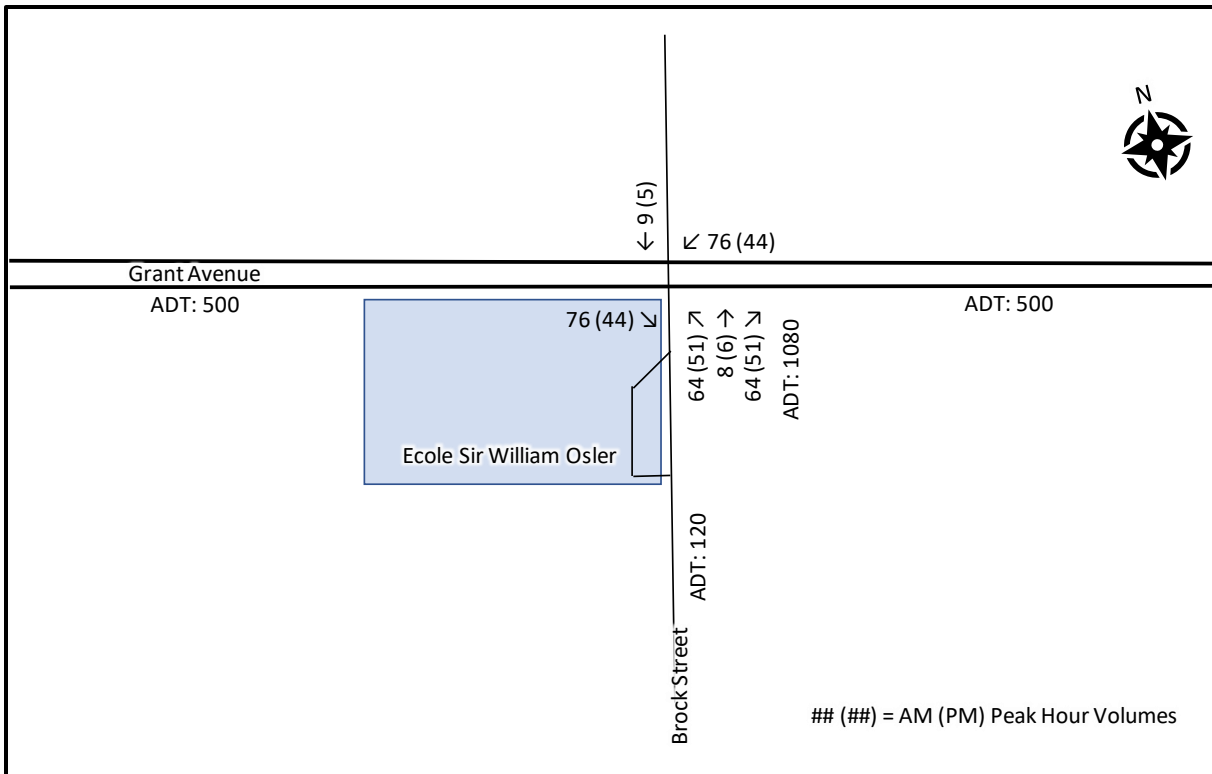


Figure 10: Development Generated Traffic Volumes

The proposed school development is forecast to generate 1,080 trips per day on Brock Street south of Grant Avenue to the school – of which 510 trips per day each are forecasted onto Grant Avenue east and west of Brock Street, with 60 trips per day forecasted on Brock Street north of Grant Avenue. South of the school, volumes on Brock Street are forecast to increase by 120 vehicles per day.

During the AM peak hour, Brock Street south of Grant Avenue is forecast to see a school related vehicle every 25 seconds, Grant Avenue east and west of Brock Street is expected to see a school related vehicle every 45 seconds, and Brock Street north of Grant Avenue is expected to see a school related vehicle every 7 minutes.

During the PM peak hour, Brock Street south of Grant Avenue is forecast to see a school related vehicle every 35 seconds, Grant Avenue east and west of Brock Street is expected to see a school related vehicle every 80 seconds, and Brock Street north of Grant Avenue is expected to see a school related vehicle every 12 minutes.

4.1.3 Total Post-Addition Traffic

The traffic analyses required total, post-addition traffic volumes. Those volumes represent conditions in 2024, which is the earliest potential timeframe for the addition to be complete. This required marginal expansion of the 2023 existing traffic volumes to account for growth in traffic on Grant Avenue from 2023 to 2024. The study team applied growth rates of 0.2% for the morning peak hour and 0.1% for the afternoon peak hour, based on guidance from the City of Winnipeg.

Figure 11 shows the resulting 2024 post-addition traffic volumes, as the sum of the existing volumes expanded to 2024, plus the school traffic, assuming all school traffic uses a drop-off loop or parking lots accessed from Brock Street.

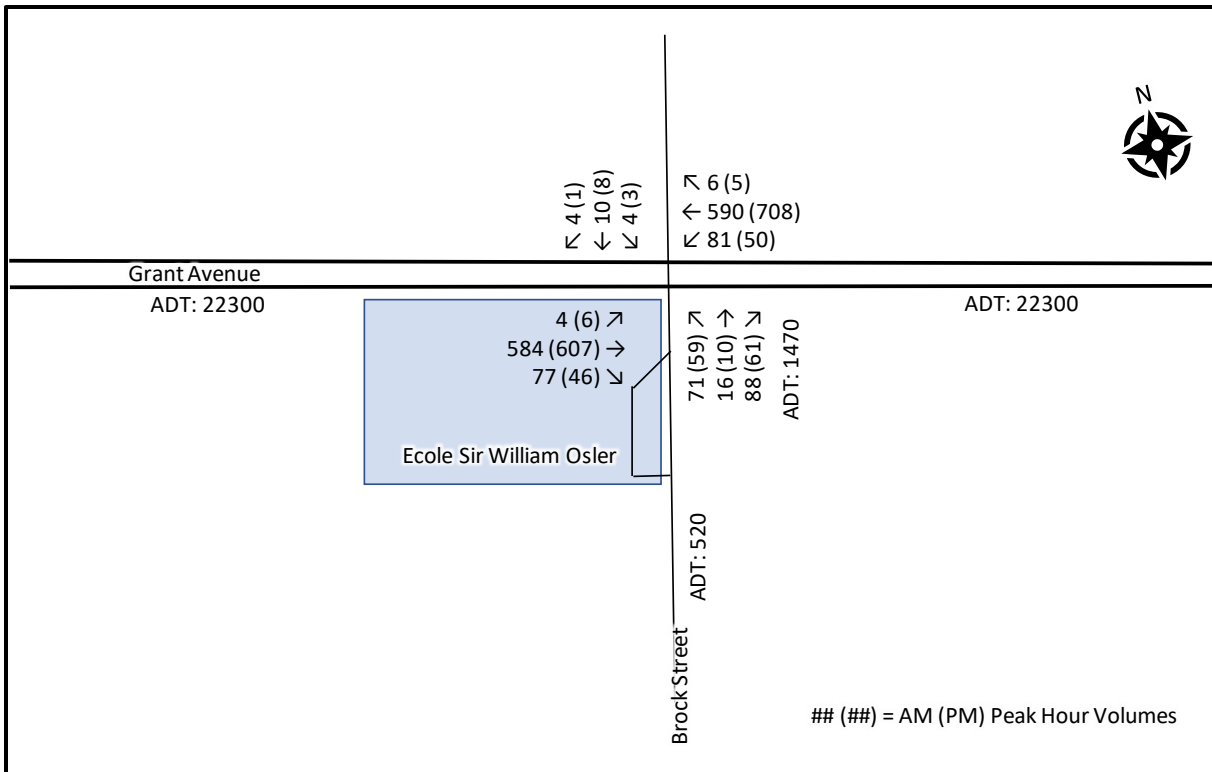


Figure 11: 2024 Post-Addition Traffic Volumes

In post development conditions, Grant Avenue west and east of Brock Street is anticipated to see an average of 22,330 trips per day, while Brock Street south of Grant Avenue is anticipated to be 1,470 vehicles per day.

4.2 Traffic Operations Analysis

Traffic operations were analyzed at the intersection of Grant Avenue and Brock Street. Analyses were completed for the weekday AM and PM peak hours for the post-addition scenario, and for existing conditions, as a baseline reference. The analysis was completed using *Synchro Studio 9* traffic analysis software.

The analysis considered the traffic volumes described in the previous section, plus the capacity of the intersection based on the number of lanes and traffic control.

Figure 12 shows the analysis model of the intersection.

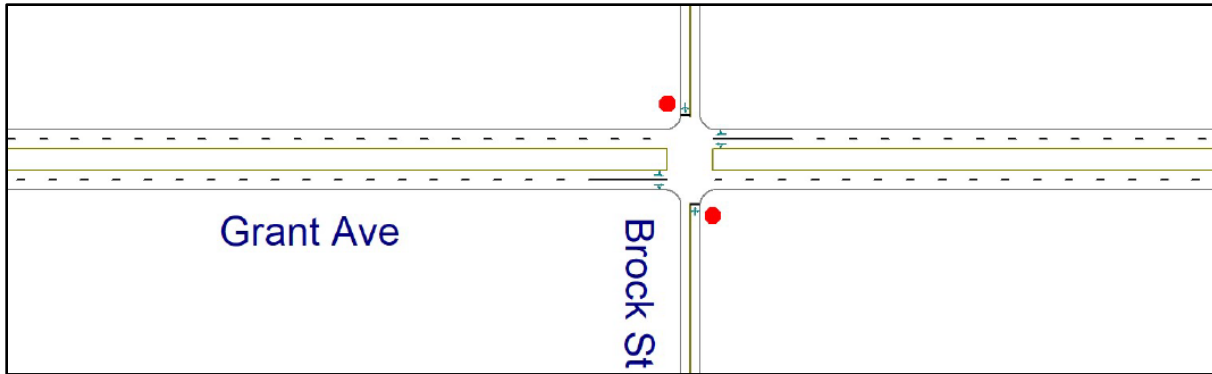


Figure 12: Intersection Configurations

The intersection was modelled in its existing configuration, with two lanes in each direction on Grant Avenue and one lane in each direction on Brock Street. No dedicated turning lanes are provided. The traffic control is two-way stop-control, with Grant Avenue free-flowing. Note that the model accounted for the ability for vehicles to wait in the median while crossing Grant Avenue.

The software returned detailed analysis results indicating how close the intersection was to its capacity, the average delay experienced by motorists travelling through the intersection, and the number of vehicles that are likely to be queued at the intersection under typical conditions, and in a worst-case (95th percentile) condition.

Table 8 shows the analysis results for the existing, baseline condition.

Table 8: Traffic Operations Analysis Results – Existing Baseline Conditions

| Item | AM Peak Hour Results | PM Peak Hour Results |
|---|--|--|
| Operations on Grant Avenue | Well-below capacity (18% utilized) Minimal delays No queues | Well-below capacity (21% utilized) Minimal delay No queues |
| Operations on Brock Street – Northbound, South of Grant Avenue | Well-below capacity (15% utilized) Average 15 second delay Worst-case 1 vehicle queued | Well-below capacity (10% utilized) Average 15 second delay Worst-case 1 vehicle queued |
| Operations on Brock Street – Southbound, North of Grant Avenue | Well-below capacity (6% utilized) Average 15 second delay Worst-case 1 vehicle queued | Well-below capacity (3% utilized) Average 20 second delay Worst-case 1 vehicle queued |

In the existing condition the intersection is well-below capacity, with delays averaging no more than 20 seconds per vehicle, and worst-case queues of only one vehicle. The analysis proceeded to the 2024 post-addition scenario.

In the post-addition analysis, it was important to consider how school pick-up and drop-off traffic may be concentrated in a shorter period within the AM and PM peak hours. The analysis considered this through peak hour factors (PHFs), which were introduced in Section 4.1.1. The existing counts showed PHFs of 0.60 on Brock Street in the morning and in the afternoon, indicating that 42% of the traffic in those peak hours was concentrated within a single 15-minute interval in each hour. Conversely, Grant Avenue had a very even distribution of traffic throughout each peak hour.

School traffic is typically concentrated in a half hour timeframe around start and end times. At ESWO all classes start at the same time currently and will continue to do so post-addition. To reflect the common start time a peak hour factor of 0.50 was used on Brock Street—slightly more concentrated than the existing condition.

Table 9 shows the analysis results. In response to capacity and delay results northbound on Brock Street at Grant Avenue, particularly during the AM Peak Hour, additional analysis was run to assess an alternative operation where all northbound vehicles on Brock Street during school peak demand would be required to make a northbound right turn (i.e., northbound left and through movements would be prohibited). Expected traffic volumes with the forced right turn are summarized in Figure 13 and the results are provided in Table 9.

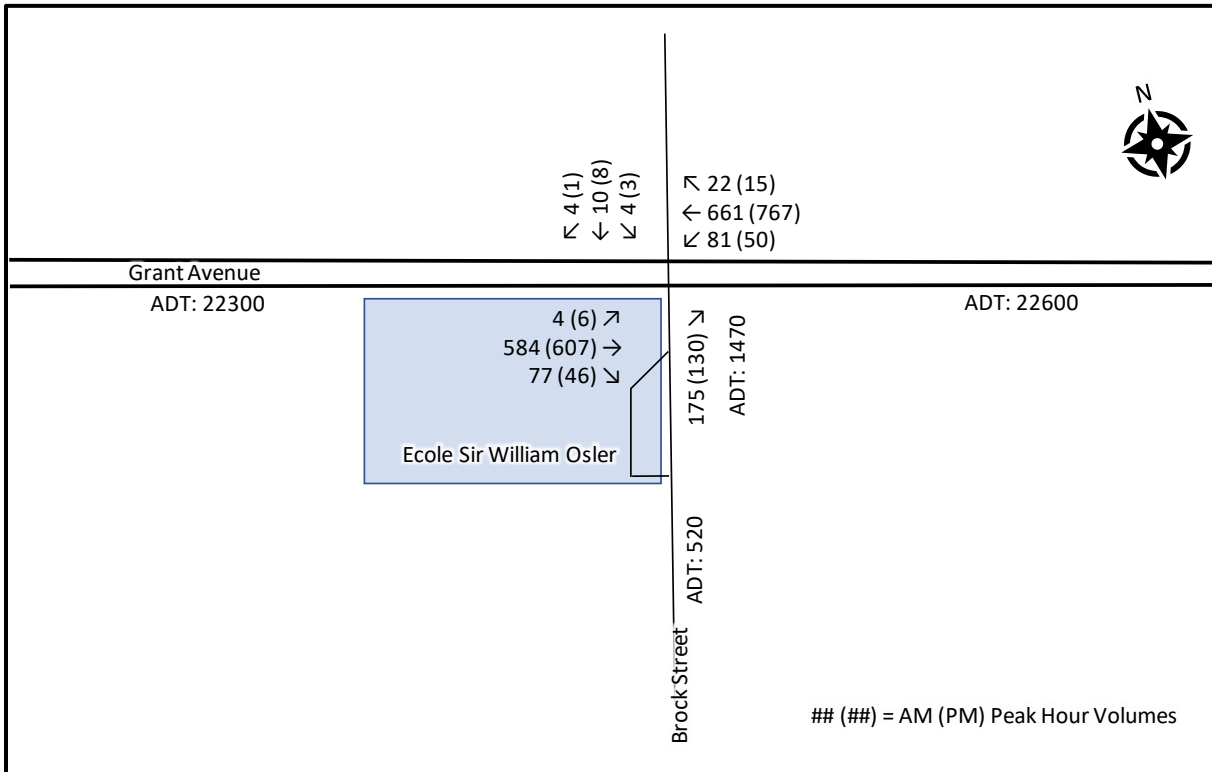


Figure 13: 2024 Post-Addition Traffic Volumes – Northbound Right-Turn Only

Table 9: Traffic Operations Analysis Results – Post-Addition Scenario

| Item | AM Peak Hour Results | PM Peak Hour Results |
|---|--|--|
| All Movements Permitted on Northbound Brock Street at Grant Avenue | | |
| Operations on Grant Avenue | Well-below capacity (27% utilized) Minimal delays No queues | Well-below capacity (24% utilized) Minimal delay No queues |
| Operations on Brock Street – Northbound, South of Grant Avenue | Over capacity (122% utilized) Excessive delays (~3 minutes) Worst-case 17 vehicles queued | Nearly at capacity (84% utilized) Significant delays (60 seconds) Worst-case 8 vehicles queued |
| Operations on Brock Street – Southbound, North of Grant Avenue | Well-below capacity (18% utilized) Typical delays (35 seconds) Worst-case 1 vehicle queued | Well-below capacity (11% utilized) Typical delays (30 seconds) Worst-case 1 vehicle queued |
| Forced Right Turn from Northbound Brock Street onto Eastbound Grant Avenue | | |
| Operations on Grant Avenue | Well-below capacity (27% utilized) Minimal delays No queues | Well-below capacity (24% utilized) Minimal delay No queues |
| Operations on Brock Street – Northbound Right, South of Grant Avenue | Below capacity (61%) Typical delays (20 seconds) Worst-case 5 vehicles queued | Well-below capacity (44% utilized) Typical delays (16 seconds) Worst-case 3 vehicles queued |
| Operations on Brock Street – Southbound, North of Grant Avenue | Well-below capacity (36% utilized) Typical delays (75 seconds) Worst-case 2 vehicle queued | Well-below capacity (13% utilized) Typical delays (30 seconds) Worst-case 1 vehicle queued |

With classes starting and ending at the same time and all vehicle movements permitted at Grant and Brock, the resulting concentration in traffic in a short period of time is forecast to exceed the available capacity northbound on Brock Street in the AM peak hour. This would result in a queue of vehicles forecast to reach up to 17 vehicles, which would extend south on Brock Street and back to the loading loop, disrupting morning drop-offs. Operations are forecast to be better in the PM peak hour, but delays would still be significant.

Those issues can be mitigated by introducing a forced right turn movement northbound on Brock Street and Grant Avenue during the school peak periods. With northbound left and through movements prohibited and all traffic making northbound right turns, delays on northbound Brock Street at Grant Avenue are forecast at an average of 20 seconds per vehicle, up from the existing average of 15 seconds, but still well within the typical range. Northbound left and through traffic displaced by a forced right turn would have multiple options to head west via the River Heights street grid or via an eastbound u-turn on Grant Avenue depending on their ultimate destination.

Note that from a capacity, delay, and queuing perspective, there is no need for a westbound left-turn lane on Grant Avenue. However, considering the intended function of Grant Avenue as an arterial street providing smooth traffic flow for longer distance travel (see Section 2.1) and the forecast westbound left-turn volume (81 vehicles per hour in the AM peak hour) a westbound left-turn lane is an appropriate treatment. This would allow through traffic on Grant Avenue to continue in the median lane, without having to change to the curb lane to avoid vehicles slowing down or waiting to make left turns onto Brock Street. Some disruption from left-turns would be tolerable, but at 81 vehicles per hour (one vehicle every 45 seconds, on average), the disruption to through traffic would be too regular for an arterial street.

Additional analyses with a westbound left-turn showed forecast westbound left-turn queues of only one vehicle. As such, the lane can be designed with a short 15 m length at full-width, followed by a standard 45 m taper. This geometry can fit within the existing median on Grant Street east of Brock Street, without extending to the median opening at Queenston Street.

Detailed traffic analysis reports are included in Appendix B.

4.3 Traffic Signal Warrant Analysis

In addition to the traffic operations analysis, the study team also conducted a traffic signal warrant analysis (TSWA) for the intersection of Grant Avenue and Brock Street. This analysis only evaluates the need for traffic signals; it does not consider any need for turning lanes. The TSWA considered traffic volumes over a six-hour period (two hours in the morning, two at mid-day, and two in the afternoon), in contrast to the traffic operations analysis which only considered one hour in the morning and one hour in the afternoon.

The analysis was completed using the procedure developed by the Transportation Association of Canada (TAC) and outlined in the *Traffic Signal Warrant Handbook*. The analysis returns a number of “warrant points”. Where the warrant points exceed 100, traffic signals can be considered warranted. However, this does not necessarily mean that traffic signals must be installed: the warrant provides only one perspective on signalization, and it can be overruled by considerations around spacing to other intersections, geometry, and traffic volume distribution between the major street and the minor street.

Analyses were completed for the 2023 existing condition scenario and the 2024 post-addition scenario. The resulting warrant points are shown in Table 10.

Table 10: Traffic Signal Warrant Analysis Results

| Scenario | Warrant Points | Notes |
|----------------------------------|----------------|-------------------------------|
| 2023 Existing Condition Scenario | 14 | Traffic signals not warranted |
| 2024 Post-Addition Scenario | 68 | Traffic signals not warranted |

In both scenarios, the TSWA returned fewer than 100 warrant points, indicating that traffic signals were not warranted.

Traffic signal warrant analysis spreadsheets are included in Appendix C. Traffic volume calculations for the analysis are included in Appendix A.

5 ACTIVE TRANSPORTATION REVIEW

The primary impact to active transportation from the new addition and on-site changes is to move current and future pick-up and drop-off movements from off-site locations to on-site at the loop on Brock Street. Relocating pedestrian movements related to pick-up and drop-off on-site removes the need for those pedestrians to cross Grant Avenue or Brock Street and instead allows pedestrians to connect between the school and their vehicle without crossing the path of any vehicles.

The presence of a sidewalk around the outside edge of the drop-off/pick-up loop enables pedestrians or students cycling on the sidewalk on the west side of Brock Street to enter the school without crossing a vehicle approach.

The study team mapped points where people may be coming from to walk or cycle to the school or daycare. The study team then drew lines between those points and the main building doors to identify “desire lines” where people may be wanting to walk or cycle.

Figure 14 shows the desire lines.

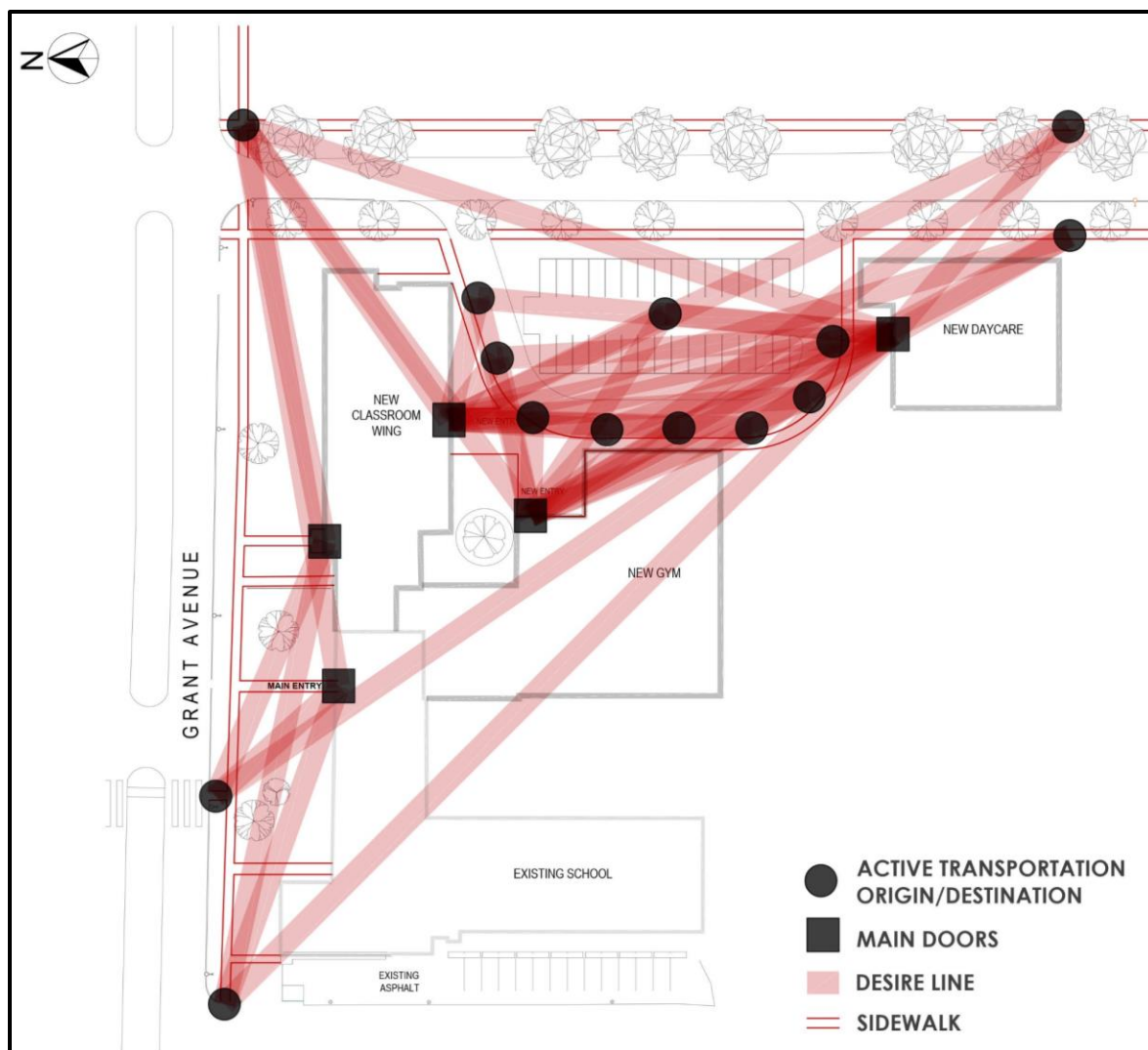


Figure 14: Active Transportation Desire Lines

Most pedestrian activity is likely to occur between the drop off loop and the building doors, free from conflicts with vehicles. However, staff coming from the staff parking lot will need to cross the loading loop. The desire line for staff bound for the new daycare runs straight through the entrance to the staff parking lot, taking them through the area where vehicles may be turning in and out of the lot. The site plan includes a crossing to simplify conflicts with pedestrians walking to/from the staff parking lot. Fencing for the parking stall plugs can help to direct pedestrians to that crossing. It will be impossible to stop pedestrians bound for the daycare from simply walking on the vehicle pavement, but that can be somewhat addressed by providing guidance to parents and staff, asking them to cross the loop at the crossing.

Figure 15 shows the crossing.

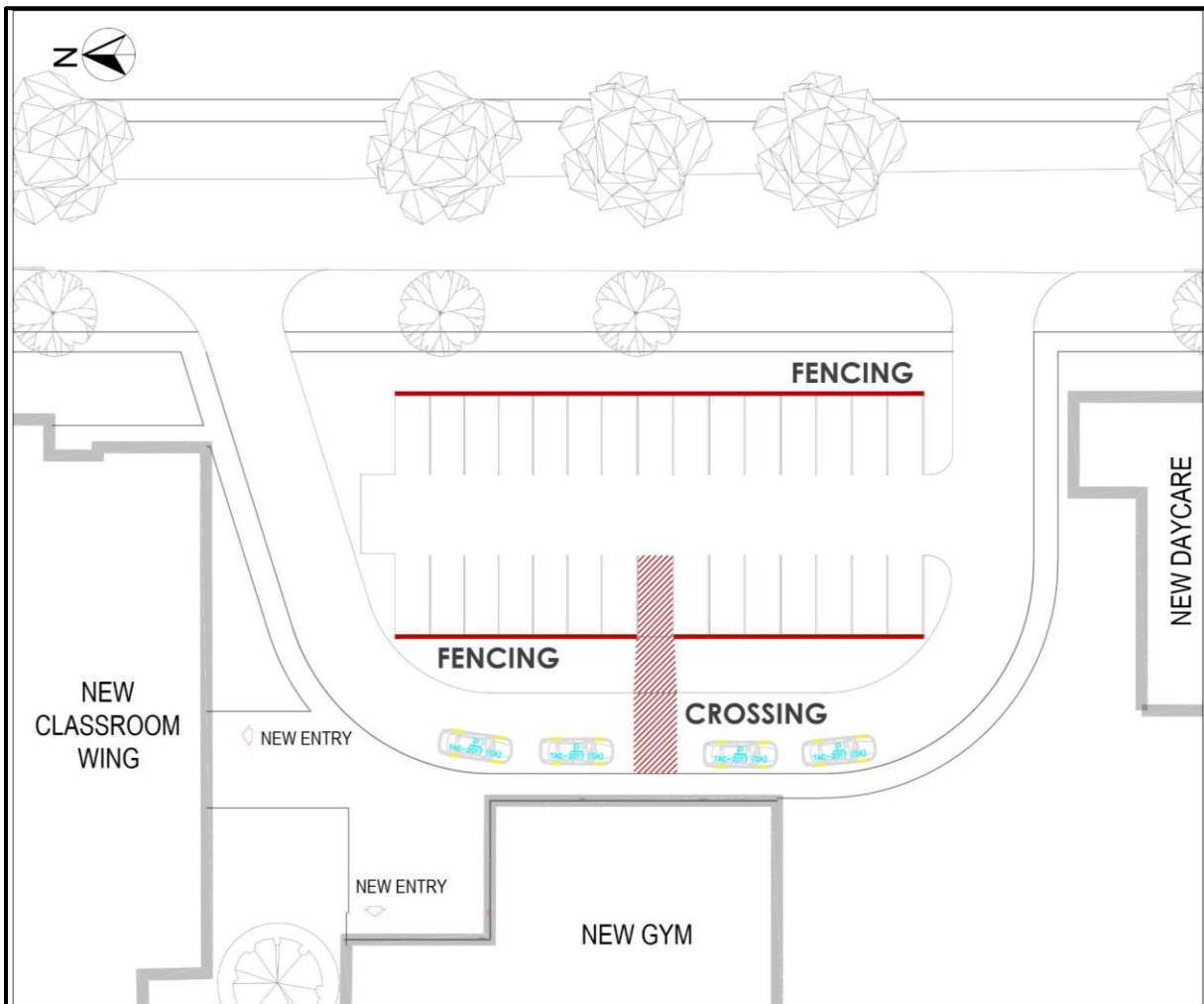


Figure 15: Crossing to Parking Lot

Note that vehicles should be prohibited from loading on the crossing. This may reduce the capacity of the loading loop by one vehicle. However, recall from Section 3.3 that the loop has more than the forecast minimum required loading capacity.

The one area where the level of interaction between vehicles and pedestrians/cyclists is expected to increase is at the sidewalk on the south side of Grant Avenue where it crosses Brock Street. Pedestrian volumes crossing this location from the count are in the order of 20 people per hour during morning and afternoon peak hours. With the addition of vehicle access to Brock Street the volume of vehicles turning

on and off Brock Street will increase. At this point of interaction, northbound vehicles are stop controlled. Though northbound driver visibility to the east is somewhat restricted by a fence and landscaping on private property the speed of vehicle movements will be low due to the stop control. Vehicles making westbound left turns from Grant onto Brock Street will have better sight lines to pedestrians; however, the speed of the left turn movement will be higher. Overall, the pedestrian/vehicle context at Grant and Brock is not unlike intersections adjacent to many other schools throughout the city. It is not uncommon for those intersections to have crossing guards assist with directing traffic at those intersections—a similar arrangement would be prudent at Grant Avenue and Brock Street as operations are monitored after the addition is complete.

6 CONCLUSIONS AND RECOMMENDATIONS

The study team reached the following conclusions based on the results of the traffic study:

- Of the five concept site plans, Option 5—with a drop-off loop oriented along Brock Street—is the best option from a transportation perspective. The full impact in terms of volume on Brock Street will only be seen in the first 40 m south of Grant Avenue to the point where vehicles will enter the site. Vehicles will exit the site approximately 100 m south of Grant Avenue. Residences more than 100 m south of Grant Avenue are forecast to see a much smaller increase in traffic on their portion of Brock Street, on the order of an additional 120 vehicles per day. That impact can be reduced to 60 vehicles per day if vehicles exiting the school loop are forced to turn left to return to Grant Avenue.
 - Traffic operations on Brock Street along the school frontage can be simplified by restricting parking northbound on Brock Street from Grant Avenue to the loading loop exit (approximately 100 m south of Grant Avenue) from September to June, during school pick-up and drop-off hours. This change to parking regulations would be under the authority and at the discretion of the City of Winnipeg.
 - Further consideration of options that have pick-up and drop-off loop access via the Campbell Street back lane is not recommended. The back lane is too narrow for an increase in two-way traffic, creates limitations on emergency vehicle access, has poor sightlines to vehicles exiting driveways and garages, and has insufficient sight lines to Grant Avenue traffic and pedestrians.
- Parking forecasts indicate that the site may require 56 parking stalls during periods of peak demand. The preferred site plan includes 45 stalls with new stalls accessed via the loop and existing stalls accessed from the Campbell back lane, 11 short of the forecast requirement. This may be mitigated by use of the loading loop for parking outside of pick-up and drop-off times. However, if the parking supply is not increased, there may be instances of vehicles parking on-street.
- The site is forecast to require 11 positions for students to be picked-up or dropped-off via personal vehicles. The preferred site plan includes 13 loading spaces—more than sufficient based on the projected requirement.
- Existing weekday daily volume on Brock Street between Grant Avenue and Mathers Avenue is estimated to be 395 vehicles per day based on a projection of morning and afternoon peak hour counts to a 24-hour period. The proposed addition to École Sir William Osler is forecast to increase weekday daily traffic volumes on Brock Street between Grant Avenue and a point 100 m south of Grant Avenue (at the proposed loop exit) to 1,470 vehicle per day and from a point 100 m south of Grant Avenue to Mathers Avenue to 515 vehicles per day.
 - Existing weekday volumes on Brock and projected weekday volumes on Brock Street from a point 100 m south of Grant Avenue to Mathers Avenue post-addition are well below the typical target of 1,000 vehicles per day for local streets in Winnipeg.
 - The weekday daily volume on Brock Street in the first 100 metres south of Grant Avenue post-addition are above 1,000 vehicles per day and were analyzed during the morning and afternoon periods of peak use for the school.
- There is potential for congestion on northbound Brock Street south of Grant Avenue, particularly in the morning peak hour. This can be mitigated by requiring all northbound traffic on Brock Street

to make a right turn onto Grant Avenue during school peak periods (i.e., prohibiting northbound left and through movements).

- A westbound left-turn lane is not required on Grant Avenue at Brock Street based on capacity or delay considerations, but it is appropriate given the intended function of Grant Avenue, and the projected traffic volume on that movement. The lane could have a full width of 15 m, plus a standard 45 m taper.
- The preferred site plan will relocate many student pick-ups and drop-offs from adjacent streets to the loading loop on-site, which will allow the students to walk between the buildings and their vehicles without crossing traffic. This is a significant benefit to pedestrian safety relative to the existing condition at the school which sees students crossing Grant Avenue and/or Brock Street as part of vehicle drop-off or pick-up. Staff will have to cross the loading loop on foot, and thus conflict with vehicle traffic on the loop. Those conflicts can be simplified by directing pedestrians to a more formalized loop crossing. This may reduce the loading capacity of the loop, by one vehicle. Additionally, the increased traffic on Brock Street south of Grant Avenue will increase conflicts with pedestrians crossing Brock Street. That condition will be similar to other intersections near schools in Winnipeg, and it can be improved with crossing guards helping to direct traffic at the intersection.
- No changes are required for the curb lane regulations on Grant Avenue, assuming that daily school buses can continue to make use of eastbound Grant Avenue for pick-ups and drop-offs, as is the existing arrangement.

Based on these conclusions, the study team recommends:

- Develop the addition according to concept plan Option 5, with the following modifications:
 - Work with the City regarding restricting parking on a portion of northbound Brock Street from the loading loop exit (100 m south of Grant Avenue) to Grant Avenue, from September to June, during school pick-up and drop-off hours. Setting the extent of parking regulations is anticipated to be an iterative process as enrollment increases at the school. Initially, a time limited parking restriction could be installed northbound from a point opposite the loop entrance to Grant Avenue and then adjusted based on observed operation.
 - Require all vehicles exiting the loading loop to turn left to return to Grant Avenue. This would limit the impact of school traffic on Brock Street south of the loading loop.
 - Ensure that at least 78 secure bike parking spaces are provided on-site.
 - Ensure that at least two of the parking stalls are accessible.
- Construct a westbound left-turn lane on Grant Avenue at Brock Street in conjunction with construction of the Brock loop. The lane should be 15 m long, plus a 45 m taper.
- Work with the City to introduce a forced right turn (Must Turn Right) regulation northbound on Brock Street at Grant Avenue during the morning and afternoon peak of school traffic to improve traffic operations and reduce delay and queuing at the intersection.
- Use crossing guards at the intersection of Grant Avenue and Brock Street to help direct traffic and help pedestrians to cross Brock Street safely.

Figure 16 illustrates the recommendations.

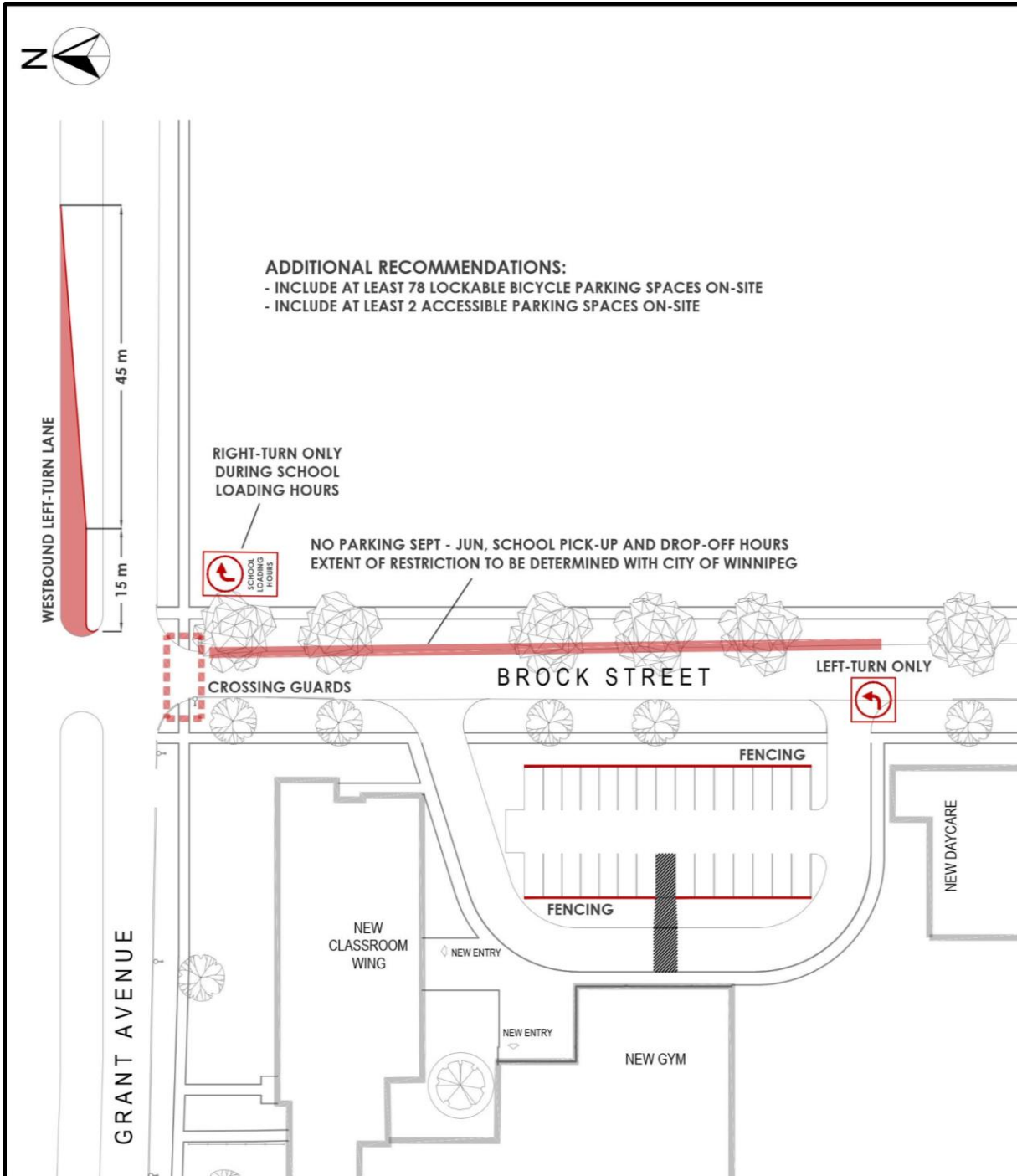


Figure 16: Recommendations

Appendix A: Traffic Data and Calculations



| | |
|--|--------------|
| | Input Needed |
| | Formulated |

| AM Peak | | | | | | | | | | | | | | | | | |
|------------|-----------------------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|--|
| Raw Counts | | | | | | | | | | | | | | | | | |
| ID | Intersection | Year | Time | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | Total | |
| 1 | Grant Ave at Brock St | 2023 | 8:00 | 7 | 8 | 24 | 4 | 1 | 4 | 4 | 583 | 1 | 5 | 589 | 6 | 1236 | |

| Peak Hour Factor | | | | | | | | | | | | | | | | | |
|------------------|-----------------------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|--|
| ID | Intersection | Year | Time | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | Total | |
| 1 | Grant Ave at Brock St | 2023 | 8:00 | | | | | | | | | | | | | 0.98 | |

| Heavy Vehicle Counts | | | | | | | | | | | | | | | | | |
|----------------------|-----------------------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|--|
| ID | Intersection | Year | Time | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | Total | |
| 1 | Grant Ave at Brock St | 2023 | 8:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 18 | 0 | 0 | 24 | 0 | 42 | |

| Heavy Vehicle % | | | | | | | | | | | | | | | | | |
|-----------------|-----------------------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|--|
| ID | Intersection | Year | Time | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | Total | |
| 1 | Grant Ave at Brock St | 2023 | 8:00 | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 3% | 0% | 0% | 4% | 0% | | |

| Pedestrian Counts | | | | | | | | | | | | | | | | | |
|-------------------|-----------------------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|--|
| ID | Intersection | Year | Time | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | Total | |
| 1 | Grant Ave at Brock St | 2023 | 8:00 | 9 | | 7 | 7 | | 9 | 5 | | 18 | 18 | | 5 | 78 | |

| Cyclist Counts | | | | | | | | | | | | | | | | | |
|----------------|-----------------------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|--|
| ID | Intersection | Year | Time | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | Total | |
| 1 | Grant Ave at Brock St | 2023 | 8:00 | | | | | | | | | | | | | 0 | |

| Future CAGR | | | | | | | | | | | | | | | | | |
|-------------|-----------------------|------|------|-----|-----|-----|-----|-----|-----|-----|-------|-----|-----|-------|-----|-------|--|
| ID | Intersection | Year | Time | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | Total | |
| 1 | Grant Ave at Brock St | 2023 | 8:00 | | | | | | | | 0.20% | | | 0.20% | | | |

| 2023 Background | | | | | | | | | | | | | | | | | |
|-----------------|-----------------------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|--|
| ID | Intersection | Year | Time | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | Total | |
| 1 | Grant Ave at Brock St | 2023 | 8:00 | 7 | 8 | 24 | 4 | 1 | 4 | 4 | 583 | 1 | 5 | 589 | 6 | 1236 | |

| 2024 Background | | | | | | | | | | | | | | | | | |
|-----------------|-----------------------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|--|
| ID | Intersection | Year | Time | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | Total | |
| 1 | Grant Ave at Brock St | 2024 | 8:00 | 7 | 8 | 24 | 4 | 1 | 4 | 4 | 584 | 1 | 5 | 590 | 6 | 1238 | |

| Trips Generated | | | | | | | | | | | | | | | | | |
|-----------------|-----------------------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|--|
| ID | Intersection | Year | Time | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | Total | |
| 1 | Grant Ave at Brock St | | | 64 | 8 | 64 | 0 | 9 | 0 | 0 | 0 | 76 | 76 | 0 | 0 | 297 | |

| 2024 Post Development | | | | | | | | | | | | | | | | | |
|-----------------------|-----------------------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|--|
| ID | Intersection | Year | Time | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | Total | |
| 1 | Grant Ave at Brock St | 2024 | 8:00 | 71 | 16 | 88 | 4 | 10 | 4 | 4 | 584 | 77 | 81 | 590 | 6 | 1535 | |

| | |
|--|--------------|
| | Input Needed |
| | Formulated |

PM Peak

Raw Counts

| ID | Intersection | Year | Time | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | Total |
|----|-----------------------|------|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| 1 | Grant Ave at Brock St | 2023 | 14:45 | 8 | 4 | 10 | 3 | 3 | 1 | 6 | 606 | 2 | 6 | 707 | 5 | 1361 |

Peak Hour Factor

| ID | Intersection | Year | Time | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | Total |
|----|-----------------------|------|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| 1 | Grant Ave at Brock St | 2023 | 14:45 | | | | | | | | | | | | | 0.78 |

Heavy Vehicle Counts

| ID | Intersection | Year | Time | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | Total |
|----|-----------------------|------|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| 1 | Grant Ave at Brock St | 2023 | 14:45 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 17 | 0 | 0 | 18 | 0 | 35 |

Heavy Vehicle %

| ID | Intersection | Year | Time | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | Total |
|----|-----------------------|------|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| 1 | Grant Ave at Brock St | 2023 | 14:45 | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 3% | 0% | 0% | 3% | 0% | |

Pedestrian Counts

| ID | Intersection | Year | Time | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | Total |
|----|-----------------------|------|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| 1 | Grant Ave at Brock St | 2023 | 14:45 | 3 | | 1 | 1 | | 3 | 8 | | 4 | 4 | | 8 | 32 |

Cyclist Counts

| ID | Intersection | Year | Time | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | Total |
|----|-----------------------|------|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| 1 | Grant Ave at Brock St | 2023 | 14:45 | | | | | | | | | | | | | 0 |

Future CAGR

| ID | Intersection | Year | Time | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | Total |
|----|-----------------------|------|-------|-----|-----|-----|-----|-----|-----|-----|-------|-----|-----|-------|-----|-------|
| 1 | Grant Ave at Brock St | 2023 | 14:45 | | | | | | | | 0.10% | | | 0.10% | | |

2023 Background

| ID | Intersection | Year | Time | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | Total |
|----|-----------------------|------|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| 1 | Grant Ave at Brock St | 2023 | 14:45 | 8 | 4 | 10 | 3 | 3 | 1 | 6 | 606 | 2 | 6 | 707 | 5 | 1361 |

2024 Background

| ID | Intersection | Year | Time | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | Total |
|----|-----------------------|------|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| 1 | Grant Ave at Brock St | 2024 | 14:45 | 8 | 4 | 10 | 3 | 3 | 1 | 6 | 607 | 2 | 6 | 708 | 5 | 1363 |

Trips Generated

| ID | Intersection | Year | Time | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | Total |
|----|-----------------------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| 1 | Grant Ave at Brock St | | | 51 | 6 | 51 | 0 | 5 | 0 | 0 | 0 | 44 | 44 | 0 | 0 | 201 |

2024 Post Development

| ID | Intersection | Year | Time | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | Total |
|----|-----------------------|------|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| 1 | Grant Ave at Brock St | 2024 | 14:45 | 59 | 10 | 61 | 3 | 8 | 1 | 6 | 607 | 46 | 50 | 708 | 5 | 1564 |

| | |
|--|--------------|
| | Input Needed |
| | Formulated |

Assumed Brock St ADT is 10x Peak AM + PM

Daily Volumes

Raw Counts

| ID | Intersectio Year | Time | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | Total |
|----|------------------|------|-----|-----|-----|-----|-----|-----|-----|-------|-----|-----|-------|-----|-------|
| 1 | Grant Ave | 2016 | | 395 | | | | | | 10058 | | | 10583 | | 21036 |

Peak Hour Factor

| ID | Intersectio Year | Time | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | Total |
|----|------------------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| 1 | Grant Ave | 2016 | | | | | | | | | | | | | |

Heavy Vehicle Counts

| ID | Intersectio Year | Time | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | Total |
|----|------------------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| 1 | Grant Ave | 2016 | | | | | | | | | | | | | 0 |

Heavy Vehicle %

| ID | Intersectio Year | Time | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | Total |
|----|------------------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| 1 | Grant Ave | 2016 | | 0% | | | | | | 0% | | | 0% | | |

Pedestrian Counts

| ID | Intersectio Year | Time | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | Total |
|----|------------------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| 1 | Grant Ave | 2016 | | | | | | | | | | | | | 0 |

Cyclist Counts

| ID | Intersectio Year | Time | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | Total |
|----|------------------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| 1 | Grant Ave | 2016 | | | | | | | | | | | | | 0 |

Future CAGR

| ID | Intersectio Year | Time | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | Total |
|----|------------------|------|------|-----|-----|-----|-----|-----|-----|-------|-----|-----|-------|-----|-------|
| 1 | Grant Ave | 2016 | 0:00 | | | | | | | 0.70% | | | 0.70% | | |

2023 Background

| ID | Intersectio Year | Time | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | Total |
|----|------------------|------|------|-----|-----|-----|-----|-----|-----|-------|-----|-----|-------|-----|-------|
| 1 | Grant Ave | 2023 | 0:00 | 0 | 395 | 0 | 0 | 0 | 0 | 10561 | 0 | 0 | 11113 | 0 | 22069 |

2024 Background

| ID | Intersectio Year | Time | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | Total | |
|----|------------------|------|------|-----|-----|-----|-----|-----|-----|-----|-------|-----|-----|-------|-------|-------|
| 1 | Grant Ave | 2024 | 0:00 | 0 | 395 | 0 | 0 | 0 | 0 | 0 | 10635 | 0 | 0 | 11191 | 0 | 22221 |

Trips Generated

| ID | Intersectio Year | Time | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | Total |
|----|-----------------------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| 1 | Grant Ave at Brock St | | 254 | 30 | 254 | 0 | 30 | 0 | 0 | 0 | 254 | 254 | 0 | 0 | 1076 |

2024 Post Development

| ID | Intersectio Year | Time | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR | Total | |
|----|------------------|------|------|-----|-----|-----|-----|-----|-----|-----|-------|-----|-----|-------|-------|-------|
| 1 | Grant Ave | 2024 | 0:00 | 254 | 425 | 254 | 0 | 30 | 0 | 0 | 10635 | 254 | 254 | 11191 | 0 | 23297 |

| ITE Rates | | | | | | | | | | | | | | | |
|-------------------------|----------|-----------------|-----------|-----------|---------|---------|---------|---------|---------|----------|-------|--------|-------|--------|--|
| Type | ITE Code | Independent Var | Week Rate | Week % In | AM Rate | AM % In | PM Rate | PM % In | Week In | Week Out | AM In | AM Out | PM In | PM Out | |
| Middle School | 522 | 176 | 2.10 | 50% | 0.67 | 54% | 0.36 | 46% | 185 | 185 | 64 | 54 | 29 | 34 | |
| Elementary School | 520 | 174 | 2.27 | 50% | 0.74 | 55% | 0.45 | 46% | 197 | 197 | 71 | 58 | 36 | 42 | |
| Daycare Centre | 565 | 74 | 4.09 | 50% | 0.78 | 53% | 0.79 | 47% | 151 | 151 | 31 | 27 | 27 | 31 | |
| Daycare Centre Existing | 565 | 32 | 4.09 | 50% | 0.78 | 53% | 0.79 | 47% | 65 | 65 | 13 | 12 | 12 | 13 | |
| Total | | | | | | | | | 598 | 598 | 179 | 151 | 104 | 120 | |

Added existing school, assuming all staff and parent traffic via Brock St loop

This is a worst case scenario for Grant/Brock. Architect indicated existing parent drop offs happen in back lane west side of ex school, and on Cordova north of the school

PM peak hour of generator rates

| Directional Distribution | | | | | | | |
|--------------------------|-------|---------|----------|-------|--------|-------|--------|
| Movements | % | Week In | Week Out | AM In | AM Out | PM In | PM Out |
| Grant East | 42.5% | 254 | 254 | 76 | 64 | 44 | 51 |
| Grant West | 42.5% | 254 | 254 | 76 | 64 | 44 | 51 |
| Brock North | 5% | 30 | 30 | 9 | 8 | 5 | 6 |
| Brock South | 10% | 60 | 60 | 18 | 15 | 10 | 12 |

*Assumed all traffic will use Grant/Brock (worst case), some trips likely to continue to Taylor Ave

| Origin | Destination | Intersection | Movement | Portion | AM Out | PM Out | Week Out | Movement | AM In | PM In | Week In |
|--------|-------------|----------------------|----------|---------|--------|--------|----------|----------|-------|-------|---------|
| School | Grant East | rant Ave at Brock | NBR | 1 | 64 | 51 | 254 | WBL | 76 | 44 | 254 |
| | Grant West | rant Ave at Brock | NBL | 1 | 64 | 51 | 254 | EBR | 76 | 44 | 254 |
| | Brock North | rant Ave at Brock | NBT | 1 | 8 | 6 | 30 | SBT | 9 | 5 | 30 |
| | Brock South | rant Ave at Brock St | | 1 | 15 | 12 | 60 | | 18 | 10 | 60 |

| Route Assignment - AM | | | | | | | | | | | | | | | | | | |
|-----------------------|-----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| ID | Intersection | NBU | NBL | NBT | NBR | SBU | SBL | SBT | SBR | EBU | EBL | EBT | EBR | WBU | WBL | WBT | WBR | Total |
| 1 | Grant Ave at Brock St | 0 | 64 | 8 | 64 | 0 | 0 | 9 | 0 | 0 | 0 | 0 | 76 | 0 | 76 | 0 | 0 | 297 |

| Route Assignment - PM | | | | | | | | | | | | | | | | | | |
|-----------------------|-----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| ID | Intersection | NBU | NBL | NBT | NBR | SBU | SBL | SBT | SBR | EBU | EBL | EBT | EBR | WBU | WBL | WBT | WBR | Total |
| 1 | Grant Ave at Brock St | 0 | 51 | 6 | 51 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 44 | 0 | 44 | 0 | 0 | 201 |

| Route Assignment - Weekday | | | | | | | | | | | | | | | | | | |
|----------------------------|-----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| ID | Intersection | NBU | NBL | NBT | NBR | SBU | SBL | SBT | SBR | EBU | EBL | EBT | EBR | WBU | WBL | WBT | WBR | Total |
| 1 | Grant Ave at Brock St | 0 | 254 | 30 | 254 | 0 | 0 | 30 | 0 | 0 | 0 | 0 | 254 | 0 | 254 | 0 | 0 | 1076 |

















Appendix B: Synchro Traffic Analysis Reports



HCM Unsignalized Intersection Capacity Analysis

3: Brock St & Grant Ave

















01-31-2023

| | | | | | | | | | | | | |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| |  |  |  |  |  |  |  |  |  |  |  |  |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | |  | | |  | | |  | | |  | |
| Traffic Volume (veh/h) | 4 | 583 | 1 | 5 | 589 | 6 | 7 | 8 | 24 | 4 | 1 | 4 |
| Future Volume (Veh/h) | 4 | 583 | 1 | 5 | 589 | 6 | 7 | 8 | 24 | 4 | 1 | 4 |
| Sign Control | | Free | | | Free | | | Stop | | | Stop | |
| Grade | | 0% | | | 0% | | | 0% | | | 0% | |
| Peak Hour Factor | 0.98 | 0.98 | 0.60 | 0.60 | 0.98 | 0.98 | 0.60 | 0.60 | 0.60 | 0.98 | 0.60 | 0.98 |
| Hourly flow rate (vph) | 4 | 595 | 2 | 8 | 601 | 6 | 12 | 13 | 40 | 4 | 2 | 4 |
| Pedestrians | | 10 | | | 10 | | | 20 | | | 10 | |
| Lane Width (m) | | 3.7 | | | 3.7 | | | 3.7 | | | 3.7 | |
| Walking Speed (m/s) | | 1.1 | | | 1.1 | | | 1.1 | | | 1.1 | |
| Percent Blockage | | 1 | | | 1 | | | 2 | | | 1 | |
| Right turn flare (veh) | | | | | | | | | | | | |
| Median type | | Raised | | | Raised | | | | | | | |
| Median storage veh) | | 1 | | | 1 | | | | | | | |
| Upstream signal (m) | | | | | | | | | | | | |
| pX, platoon unblocked | | | | | | | | | | | | |
| vC, conflicting volume | 617 | | | 617 | | | 956 | 1257 | 328 | 992 | 1255 | 324 |
| vC1, stage 1 conf vol | | | | | | | 624 | 624 | | 630 | 630 | |
| vC2, stage 2 conf vol | | | | | | | 332 | 633 | | 362 | 625 | |
| vCu, unblocked vol | 617 | | | 617 | | | 956 | 1257 | 328 | 992 | 1255 | 324 |
| tC, single (s) | 4.1 | | | 4.1 | | | 7.5 | 6.5 | 6.9 | 7.5 | 6.5 | 6.9 |
| tC, 2 stage (s) | | | | | | | 6.5 | 5.5 | | 6.5 | 5.5 | |
| tF (s) | 2.2 | | | 2.2 | | | 3.5 | 4.0 | 3.3 | 3.5 | 4.0 | 3.3 |
| p0 queue free % | 100 | | | 99 | | | 96 | 95 | 94 | 99 | 99 | 99 |
| cM capacity (veh/h) | 950 | | | 940 | | | 318 | 285 | 648 | 298 | 285 | 659 |
| Direction, Lane # | EB 1 | EB 2 | WB 1 | WB 2 | NB 1 | SB 1 | | | | | | |
| Volume Total | 302 | 300 | 308 | 306 | 65 | 10 | | | | | | |
| Volume Left | 4 | 0 | 8 | 0 | 12 | 4 | | | | | | |
| Volume Right | 0 | 2 | 0 | 6 | 40 | 4 | | | | | | |
| cSH | 950 | 1700 | 940 | 1700 | 448 | 377 | | | | | | |
| Volume to Capacity | 0.00 | 0.18 | 0.01 | 0.18 | 0.15 | 0.03 | | | | | | |
| Queue Length 95th (m) | 0.1 | 0.0 | 0.2 | 0.0 | 3.8 | 0.6 | | | | | | |
| Control Delay (s) | 0.2 | 0.0 | 0.3 | 0.0 | 14.4 | 14.8 | | | | | | |
| Lane LOS | A | | A | | B | B | | | | | | |
| Approach Delay (s) | 0.1 | | 0.2 | | 14.4 | 14.8 | | | | | | |
| Approach LOS | | | | | B | B | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Average Delay | | | 1.0 | | | | | | | | | |
| Intersection Capacity Utilization | | | 32.8% | | ICU Level of Service | | A | | | | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis

3: Brock St & Grant Ave

















01-31-2023

| | | | | | | | | | | | | |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| |  |  |  |  |  |  |  |  |  |  |  |  |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | |  | | |  | | |  | | |  | |
| Traffic Volume (veh/h) | 6 | 602 | 2 | 6 | 707 | 5 | 8 | 4 | 10 | 3 | 3 | 1 |
| Future Volume (Veh/h) | 6 | 602 | 2 | 6 | 707 | 5 | 8 | 4 | 10 | 3 | 3 | 1 |
| Sign Control | | Free | | | Free | | | Stop | | | Stop | |
| Grade | | 0% | | | 0% | | | 0% | | | 0% | |
| Peak Hour Factor | 0.98 | 0.98 | 0.60 | 0.60 | 0.98 | 0.98 | 0.60 | 0.60 | 0.60 | 0.98 | 0.60 | 0.98 |
| Hourly flow rate (vph) | 6 | 614 | 3 | 10 | 721 | 5 | 13 | 7 | 17 | 3 | 5 | 1 |
| Pedestrians | | 10 | | | 10 | | | 20 | | | 10 | |
| Lane Width (m) | | 3.7 | | | 3.7 | | | 3.7 | | | 3.7 | |
| Walking Speed (m/s) | | 1.1 | | | 1.1 | | | 1.1 | | | 1.1 | |
| Percent Blockage | | 1 | | | 1 | | | 2 | | | 1 | |
| Right turn flare (veh) | | | | | | | | | | | | |
| Median type | | Raised | | | Raised | | | | | | | |
| Median storage veh) | | 1 | | | 1 | | | | | | | |
| Upstream signal (m) | | | | | | | | | | | | |
| pX, platoon unblocked | | | | | | | | | | | | |
| vC, conflicting volume | 736 | | | 637 | | | 1042 | 1404 | 338 | 1103 | 1402 | 383 |
| vC1, stage 1 conf vol | | | | | | | 648 | 648 | | 754 | 754 | |
| vC2, stage 2 conf vol | | | | | | | 394 | 756 | | 350 | 649 | |
| vCu, unblocked vol | 736 | | | 637 | | | 1042 | 1404 | 338 | 1103 | 1402 | 383 |
| tC, single (s) | 4.1 | | | 4.1 | | | 7.5 | 6.5 | 6.9 | 7.5 | 6.5 | 6.9 |
| tC, 2 stage (s) | | | | | | | 6.5 | 5.5 | | 6.5 | 5.5 | |
| tF (s) | 2.2 | | | 2.2 | | | 3.5 | 4.0 | 3.3 | 3.5 | 4.0 | 3.3 |
| p0 queue free % | 99 | | | 99 | | | 96 | 97 | 97 | 99 | 98 | 100 |
| cM capacity (veh/h) | 857 | | | 924 | | | 294 | 254 | 638 | 267 | 253 | 603 |
| Direction, Lane # | EB 1 | EB 2 | WB 1 | WB 2 | NB 1 | SB 1 | | | | | | |
| Volume Total | 313 | 310 | 370 | 366 | 37 | 9 | | | | | | |
| Volume Left | 6 | 0 | 10 | 0 | 13 | 3 | | | | | | |
| Volume Right | 0 | 3 | 0 | 5 | 17 | 1 | | | | | | |
| cSH | 857 | 1700 | 924 | 1700 | 376 | 276 | | | | | | |
| Volume to Capacity | 0.01 | 0.18 | 0.01 | 0.21 | 0.10 | 0.03 | | | | | | |
| Queue Length 95th (m) | 0.2 | 0.0 | 0.2 | 0.0 | 2.5 | 0.8 | | | | | | |
| Control Delay (s) | 0.3 | 0.0 | 0.4 | 0.0 | 15.6 | 18.5 | | | | | | |
| Lane LOS | A | | A | | C | C | | | | | | |
| Approach Delay (s) | 0.1 | | 0.2 | | 15.6 | 18.5 | | | | | | |
| Approach LOS | | | | | C | C | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Average Delay | | | 0.7 | | | | | | | | | |
| Intersection Capacity Utilization | | | 36.8% | | ICU Level of Service | | A | | | | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis

3: Brock St & Grant Ave

















02-15-2023

| | | | | | | | | | | | | |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| |  |  |  |  |  |  |  |  |  |  |  |  |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | |  | | |  | | |  | | |  | |
| Traffic Volume (veh/h) | 4 | 584 | 77 | 81 | 590 | 6 | 71 | 16 | 88 | 4 | 10 | 4 |
| Future Volume (Veh/h) | 4 | 584 | 77 | 81 | 590 | 6 | 71 | 16 | 88 | 4 | 10 | 4 |
| Sign Control | | Free | | | Free | | | Stop | | | Stop | |
| Grade | | 0% | | | 0% | | | 0% | | | 0% | |
| Peak Hour Factor | 0.98 | 0.98 | 0.50 | 0.50 | 0.98 | 0.98 | 0.50 | 0.50 | 0.50 | 0.98 | 0.50 | 0.98 |
| Hourly flow rate (vph) | 4 | 596 | 154 | 162 | 602 | 6 | 142 | 32 | 176 | 4 | 20 | 4 |
| Pedestrians | | 10 | | | 10 | | | 20 | | | 10 | |
| Lane Width (m) | | 3.7 | | | 3.7 | | | 3.7 | | | 3.7 | |
| Walking Speed (m/s) | | 1.1 | | | 1.1 | | | 1.1 | | | 1.1 | |
| Percent Blockage | | 1 | | | 1 | | | 2 | | | 1 | |
| Right turn flare (veh) | | | | | | | | | | | | |
| Median type | | Raised | | | Raised | | | | | | | |
| Median storage (veh) | | 1 | | | 1 | | | | | | | |
| Upstream signal (m) | | | | | | | | | | | | |
| pX, platoon unblocked | | | | | | | | | | | | |
| vC, conflicting volume | 618 | | | 770 | | | 1350 | 1643 | 405 | 1447 | 1717 | 324 |
| vC1, stage 1 conf vol | | | | | | | 701 | 701 | | 939 | 939 | |
| vC2, stage 2 conf vol | | | | | | | 649 | 942 | | 508 | 778 | |
| vCu, unblocked vol | 618 | | | 770 | | | 1350 | 1643 | 405 | 1447 | 1717 | 324 |
| tC, single (s) | 4.1 | | | 4.1 | | | 7.5 | 6.5 | 6.9 | 7.5 | 6.5 | 6.9 |
| tC, 2 stage (s) | | | | | | | 6.5 | 5.5 | | 6.5 | 5.5 | |
| tF (s) | 2.2 | | | 2.2 | | | 3.5 | 4.0 | 3.3 | 3.5 | 4.0 | 3.3 |
| p0 queue free % | 100 | | | 80 | | | 26 | 82 | 70 | 96 | 86 | 99 |
| cM capacity (veh/h) | 949 | | | 824 | | | 191 | 182 | 578 | 107 | 146 | 659 |
| Direction, Lane # | EB 1 | EB 2 | WB 1 | WB 2 | NB 1 | SB 1 | | | | | | |
| Volume Total | 302 | 452 | 463 | 307 | 350 | 28 | | | | | | |
| Volume Left | 4 | 0 | 162 | 0 | 142 | 4 | | | | | | |
| Volume Right | 0 | 154 | 0 | 6 | 176 | 4 | | | | | | |
| cSH | 949 | 1700 | 824 | 1700 | 286 | 155 | | | | | | |
| Volume to Capacity | 0.00 | 0.27 | 0.20 | 0.18 | 1.22 | 0.18 | | | | | | |
| Queue Length 95th (m) | 0.1 | 0.0 | 5.5 | 0.0 | 122.4 | 4.8 | | | | | | |
| Control Delay (s) | 0.2 | 0.0 | 5.3 | 0.0 | 164.7 | 33.3 | | | | | | |
| Lane LOS | A | | A | | F | D | | | | | | |
| Approach Delay (s) | 0.1 | | 3.2 | | 164.7 | 33.3 | | | | | | |
| Approach LOS | | | | | F | D | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Average Delay | | | 32.1 | | | | | | | | | |
| Intersection Capacity Utilization | | | 65.2% | | ICU Level of Service | | | | C | | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis

3: Brock St & Grant Ave

















02-28-2023

| |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | |  | | |  | | | |  | |  | |
| Traffic Volume (veh/h) | 4 | 584 | 77 | 81 | 660 | 23 | 0 | 0 | 175 | 4 | 10 | 4 |
| Future Volume (Veh/h) | 4 | 584 | 77 | 81 | 660 | 23 | 0 | 0 | 175 | 4 | 10 | 4 |
| Sign Control | | Free | | | Free | | | Stop | | | Stop | |
| Grade | | 0% | | | 0% | | | 0% | | | 0% | |
| Peak Hour Factor | 0.98 | 0.98 | 0.50 | 0.50 | 0.98 | 0.98 | 0.50 | 0.50 | 0.50 | 0.98 | 0.50 | 0.98 |
| Hourly flow rate (vph) | 4 | 596 | 154 | 162 | 673 | 23 | 0 | 0 | 350 | 4 | 20 | 4 |
| Pedestrians | | 10 | | | 10 | | | 20 | | | 10 | |
| Lane Width (m) | | 3.7 | | | 3.7 | | | 3.7 | | | 3.7 | |
| Walking Speed (m/s) | | 1.1 | | | 1.1 | | | 1.1 | | | 1.1 | |
| Percent Blockage | | 1 | | | 1 | | | 2 | | | 1 | |
| Right turn flare (veh) | | | | | | | | | | | | |
| Median type | | Raised | | | Raised | | | | | | | |
| Median storage veh | | 1 | | | 1 | | | | | | | |
| Upstream signal (m) | | | | | | | | | | | | |
| pX, platoon unblocked | | | | | | | | | | | | |
| vC, conflicting volume | 706 | | | 770 | | | 1386 | 1731 | 405 | 1684 | 1796 | 368 |
| vC1, stage 1 conf vol | | | | | | | 701 | 701 | | 1018 | 1018 | |
| vC2, stage 2 conf vol | | | | | | | 684 | 1030 | | 666 | 778 | |
| vCu, unblocked vol | 706 | | | 770 | | | 1386 | 1731 | 405 | 1684 | 1796 | 368 |
| tC, single (s) | 4.1 | | | 4.1 | | | 7.5 | 6.5 | 6.9 | 7.5 | 6.5 | 6.9 |
| tC, 2 stage (s) | | | | | | | 6.5 | 5.5 | | 6.5 | 5.5 | |
| tF (s) | 2.2 | | | 2.2 | | | 3.5 | 4.0 | 3.3 | 3.5 | 4.0 | 3.3 |
| p0 queue free % | 100 | | | 80 | | | 100 | 100 | 39 | 80 | 85 | 99 |
| cM capacity (veh/h) | 879 | | | 824 | | | 184 | 169 | 578 | 20 | 138 | 617 |
| Direction, Lane # | EB 1 | EB 2 | WB 1 | WB 2 | NB 1 | SB 1 | | | | | | |
| Volume Total | 302 | 452 | 498 | 360 | 350 | 28 | | | | | | |
| Volume Left | 4 | 0 | 162 | 0 | 0 | 4 | | | | | | |
| Volume Right | 0 | 154 | 0 | 23 | 350 | 4 | | | | | | |
| cSH | 879 | 1700 | 824 | 1700 | 578 | 79 | | | | | | |
| Volume to Capacity | 0.00 | 0.27 | 0.20 | 0.21 | 0.61 | 0.36 | | | | | | |
| Queue Length 95th (m) | 0.1 | 0.0 | 5.5 | 0.0 | 30.7 | 10.4 | | | | | | |
| Control Delay (s) | 0.2 | 0.0 | 5.1 | 0.0 | 20.3 | 74.1 | | | | | | |
| Lane LOS | A | | A | | C | F | | | | | | |
| Approach Delay (s) | 0.1 | | 3.0 | | 20.3 | 74.1 | | | | | | |
| Approach LOS | | | | | C | F | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Average Delay | | | 5.9 | | | | | | | | | |
| Intersection Capacity Utilization | | | 57.4% | | ICU Level of Service | | | | B | | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis

3: Brock St & Grant Ave

















02-15-2023

| |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | |  | | |  | | |  | | |  | |
| Traffic Volume (veh/h) | 6 | 607 | 46 | 50 | 708 | 5 | 59 | 10 | 61 | 3 | 8 | 1 |
| Future Volume (Veh/h) | 6 | 607 | 46 | 50 | 708 | 5 | 59 | 10 | 61 | 3 | 8 | 1 |
| Sign Control | | Free | | | Free | | | Stop | | | Stop | |
| Grade | | 0% | | | 0% | | | 0% | | | 0% | |
| Peak Hour Factor | 0.98 | 0.98 | 0.50 | 0.50 | 0.98 | 0.98 | 0.50 | 0.50 | 0.50 | 0.98 | 0.50 | 0.98 |
| Hourly flow rate (vph) | 6 | 619 | 92 | 100 | 722 | 5 | 118 | 20 | 122 | 3 | 16 | 1 |
| Pedestrians | | 10 | | | 10 | | | 20 | | | 10 | |
| Lane Width (m) | | 3.7 | | | 3.7 | | | 3.7 | | | 3.7 | |
| Walking Speed (m/s) | | 1.1 | | | 1.1 | | | 1.1 | | | 1.1 | |
| Percent Blockage | | 1 | | | 1 | | | 2 | | | 1 | |
| Right turn flare (veh) | | | | | | | | | | | | |
| Median type | | Raised | | | Raised | | | | | | | |
| Median storage (veh) | | 1 | | | 1 | | | | | | | |
| Upstream signal (m) | | | | | | | | | | | | |
| pX, platoon unblocked | | | | | | | | | | | | |
| vC, conflicting volume | 737 | | | 731 | | | 1277 | 1634 | 386 | 1398 | 1678 | 384 |
| vC1, stage 1 conf vol | | | | | | | 697 | 697 | | 934 | 934 | |
| vC2, stage 2 conf vol | | | | | | | 580 | 937 | | 464 | 743 | |
| vCu, unblocked vol | 737 | | | 731 | | | 1277 | 1634 | 386 | 1398 | 1678 | 384 |
| tC, single (s) | 4.1 | | | 4.1 | | | 7.5 | 6.5 | 6.9 | 7.5 | 6.5 | 6.9 |
| tC, 2 stage (s) | | | | | | | 6.5 | 5.5 | | 6.5 | 5.5 | |
| tF (s) | 2.2 | | | 2.2 | | | 3.5 | 4.0 | 3.3 | 3.5 | 4.0 | 3.3 |
| p0 queue free % | 99 | | | 88 | | | 46 | 90 | 79 | 98 | 91 | 100 |
| cM capacity (veh/h) | 856 | | | 852 | | | 220 | 196 | 595 | 155 | 175 | 603 |
| Direction, Lane # | EB 1 | EB 2 | WB 1 | WB 2 | NB 1 | SB 1 | | | | | | |
| Volume Total | 316 | 402 | 461 | 366 | 260 | 20 | | | | | | |
| Volume Left | 6 | 0 | 100 | 0 | 118 | 3 | | | | | | |
| Volume Right | 0 | 92 | 0 | 5 | 122 | 1 | | | | | | |
| cSH | 856 | 1700 | 852 | 1700 | 308 | 178 | | | | | | |
| Volume to Capacity | 0.01 | 0.24 | 0.12 | 0.22 | 0.84 | 0.11 | | | | | | |
| Queue Length 95th (m) | 0.2 | 0.0 | 3.0 | 0.0 | 55.5 | 2.8 | | | | | | |
| Control Delay (s) | 0.3 | 0.0 | 3.3 | 0.0 | 56.8 | 27.8 | | | | | | |
| Lane LOS | A | | A | | F | D | | | | | | |
| Approach Delay (s) | 0.1 | | 1.8 | | 56.8 | 27.8 | | | | | | |
| Approach LOS | | | | | F | D | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Average Delay | | | 9.3 | | | | | | | | | |
| Intersection Capacity Utilization | | | 63.5% | | ICU Level of Service | | | | B | | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis

3: Brock St & Grant Ave

02-28-2023

| |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | |  | | |  | | | |  | |  | |
| Traffic Volume (veh/h) | 6 | 607 | 46 | 50 | 767 | 15 | 0 | 0 | 130 | 3 | 8 | 1 |
| Future Volume (Veh/h) | 6 | 607 | 46 | 50 | 767 | 15 | 0 | 0 | 130 | 3 | 8 | 1 |
| Sign Control | | Free | | | Free | | | Stop | | | Stop | |
| Grade | | 0% | | | 0% | | | 0% | | | 0% | |
| Peak Hour Factor | 0.98 | 0.98 | 0.50 | 0.50 | 0.98 | 0.98 | 0.50 | 0.50 | 0.50 | 0.98 | 0.50 | 0.98 |
| Hourly flow rate (vph) | 6 | 619 | 92 | 100 | 783 | 15 | 0 | 0 | 260 | 3 | 16 | 1 |
| Pedestrians | | 10 | | | 10 | | | 20 | | | 10 | |
| Lane Width (m) | | 3.7 | | | 3.7 | | | 3.7 | | | 3.7 | |
| Walking Speed (m/s) | | 1.1 | | | 1.1 | | | 1.1 | | | 1.1 | |
| Percent Blockage | | 1 | | | 1 | | | 2 | | | 1 | |
| Right turn flare (veh) | | | | | | | | | | | | |
| Median type | | Raised | | | Raised | | | | | | | |
| Median storage (veh) | | 1 | | | 1 | | | | | | | |
| Upstream signal (m) | | | | | | | | | | | | |
| pX, platoon unblocked | | | | | | | | | | | | |
| vC, conflicting volume | 808 | | | 731 | | | 1308 | 1705 | 386 | 1592 | 1744 | 419 |
| vC1, stage 1 conf vol | | | | | | | 697 | 697 | | 1000 | 1000 | |
| vC2, stage 2 conf vol | | | | | | | 610 | 1008 | | 592 | 743 | |
| vCu, unblocked vol | 808 | | | 731 | | | 1308 | 1705 | 386 | 1592 | 1744 | 419 |
| tC, single (s) | 4.1 | | | 4.1 | | | 7.5 | 6.5 | 6.9 | 7.5 | 6.5 | 6.9 |
| tC, 2 stage (s) | | | | | | | 6.5 | 5.5 | | 6.5 | 5.5 | |
| tF (s) | 2.2 | | | 2.2 | | | 3.5 | 4.0 | 3.3 | 3.5 | 4.0 | 3.3 |
| p0 queue free % | 99 | | | 88 | | | 100 | 100 | 56 | 97 | 90 | 100 |
| cM capacity (veh/h) | 805 | | | 852 | | | 213 | 184 | 595 | 99 | 167 | 572 |
| Direction, Lane # | EB 1 | EB 2 | WB 1 | WB 2 | NB 1 | SB 1 | | | | | | |
| Volume Total | 316 | 402 | 492 | 406 | 260 | 20 | | | | | | |
| Volume Left | 6 | 0 | 100 | 0 | 0 | 3 | | | | | | |
| Volume Right | 0 | 92 | 0 | 15 | 260 | 1 | | | | | | |
| cSH | 805 | 1700 | 852 | 1700 | 595 | 156 | | | | | | |
| Volume to Capacity | 0.01 | 0.24 | 0.12 | 0.24 | 0.44 | 0.13 | | | | | | |
| Queue Length 95th (m) | 0.2 | 0.0 | 3.0 | 0.0 | 16.8 | 3.3 | | | | | | |
| Control Delay (s) | 0.3 | 0.0 | 3.2 | 0.0 | 15.7 | 31.4 | | | | | | |
| Lane LOS | A | | A | | C | D | | | | | | |
| Approach Delay (s) | 0.1 | | 1.7 | | 15.7 | 31.4 | | | | | | |
| Approach LOS | | | | | C | D | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Average Delay | | | 3.3 | | | | | | | | | |
| Intersection Capacity Utilization | | | 57.9% | | ICU Level of Service | | B | | | | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

Appendix C: Traffic Signal Warrant Analysis Spreadsheets



**For Warrant Calculation
Results, please hit 'Page
Down'**

| | | |
|----------------------------------|-------|---------|
| Demographics | | |
| Elem. School/Mobility Challenged | (y/n) | y |
| Senior's Complex | (y/n) | n |
| Pathway to School | (y/n) | y |
| Metro Area Population | (#) | 700,000 |
| Central Business District | (y/n) | n |

Average 6-hour Peak Turning Movements



| | | | | | |
|--|-------------|----------------------|---------|--------------------|------------------|
| Main Street (name) | Grant Ave | Direction (EW or NS) | EW | Road Authority: | City of Winnipeg |
| Side Street (name) | Brock St | Direction (EW or NS) | NS | City: | Winnipeg |
| Quadrant / Int # | | Comments | 2024 PD | Analysis Date: | |
| or Warrant Calculation results, please hit 'Page Down' | CHECK SHEET | | | Count Date: | |
| | | | | Date Entry Format: | (yyyy-mm-dd) |
| | | | | | |

| Lane Configuration | | | Exel LT | Th & LT | Through | Th+RT+LT | Th & RT | Exel RT | RT | Channelization (y/n) | UpStream Signal (m) | # of Thru Lanes | LT Phase Type | RTOR Allowed (y/n) | Actuated Thru Phase |
|--------------------|-----------|----|---------|---------|---------|----------|---------|---------|----|----------------------|---------------------|-----------------|---------------|--------------------|---------------------|
| 0 | | | | | | | | | | | | | | | |
| 1 | Grant Ave | WB | | 1 | | | 1 | | | | 700 | 2 | | | |
| 2 | Grant Ave | EB | | 1 | | | 1 | | | | 1100 | 2 | | | |
| 3 | Brook St | NB | | | | 1 | | | | | 10000 | 1 | | | |
| 4 | Brook St | SR | | | | 1 | | | | | 10000 | 1 | | | |

| Saturation Flow Rates (if not default) (vphpl) | | Default Saturation Flow Rates (vphpl) |
|---|--|---|
| Left Turn | | 1,650 |
| Through | | 1,800 |
| Right Turn | | 1,500 |

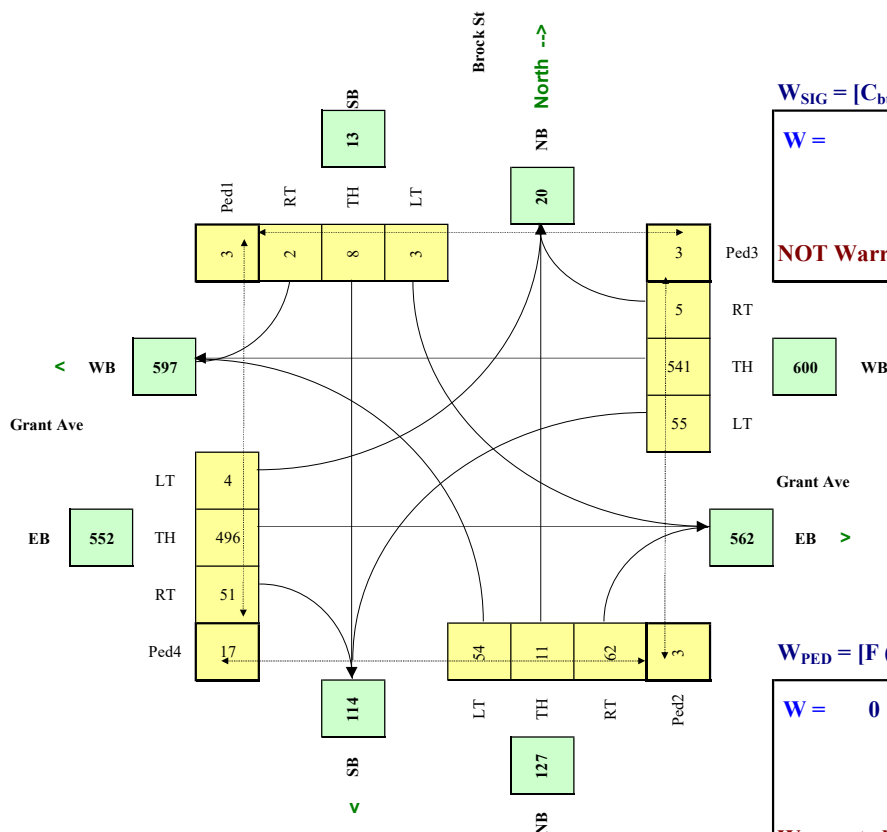
| | | |
|---|--|---|
| 5 | Are the Brock St NB right turns significantly impeded by through movements? (y/n) | n |
| 6 | Are the Brock St SB right turns significantly impeded by through movements? (y/n) | n |
| 7 | Are the Grant Ave WB right turns significantly impeded by through movements? (y/n) | n |
| 8 | Are the Grant Ave EB right turns significantly impeded by through movements? (y/n) | n |

| Demographics | | |
|----------------------------------|-------|---------|
| Elem. School/Mobility Challenged | (y/n) | y |
| Senior's Complex | (y/n) | n |
| Pathway to School | (y/n) | y |
| Metro Area Population | (#) | 700,000 |
| Central Business District | (y/n) | n |

| 0 | Other input | | Speed (Km/h) | Truck % | Bus Rt (y/n) | Median (m) |
|---|-------------|-----|-----------------|------------|-----------------|---------------|
| 1 | Grant Ave | EW | 50 | 3.0% | n | 5.0 |
| 2 | Brook St | N/S | 50 | 2.0% | n | 0.0 |

| | | | | | | | | | | | | | | | | | |
|----------|---|-----|----|------|----|-----|----|-----|-------|----|----|-------|-----|--------|--------|--------|--------|
| Brock St | | NS | SO | 2.0% | n | 0.0 | | | | | | | | | | | |
| 4 | Set Peak Hours | | | | | | | | | | | | | Ped1 | Ped2 | Ped3 | Ped4 |
| 5 | Traffic Input | NB | | | SB | | | WB | | | EB | | | NS | NS | EW | EW |
| 6 | | LT | Th | RT | LT | Th | RT | LT | Th | RT | LT | Th | RT | W Side | E Side | N Side | S Side |
| 7 | 7:00 - 8:00 | 325 | 65 | 373 | 18 | 45 | 13 | 328 | 3245 | 28 | 25 | 2978 | 308 | 20 | 20 | 20 | 100 |
| 8 | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | | | | | |
| 13 | Total (6-hour peak) | 325 | 65 | 373 | 18 | 45 | 13 | 328 | 3,245 | 28 | 25 | 2,978 | 308 | 20 | 20 | 20 | 100 |
| 14 | Average (6-hour peak) | 54 | 11 | 62 | 3 | 8 | 2 | 55 | 541 | 5 | 4 | 496 | 51 | 3 | 3 | 3 | 17 |
| 15 | Actual Pedestrian Crossing Distance (m) | | | | | | | | | | | | | | | | |

Average 6-hour Peak Turning Movements



$$W_{SIG} = [C_{bt}(X_{v-v}) / K_1 + (F(X_{v-p}) L) / K_2] \times C_i$$

| | | | |
|------------|-----------|------------|------------|
| W = | 67 | 62 | 5 |
| | | <i>Veh</i> | <i>Ped</i> |

NOT Warranted

RESET SHEET

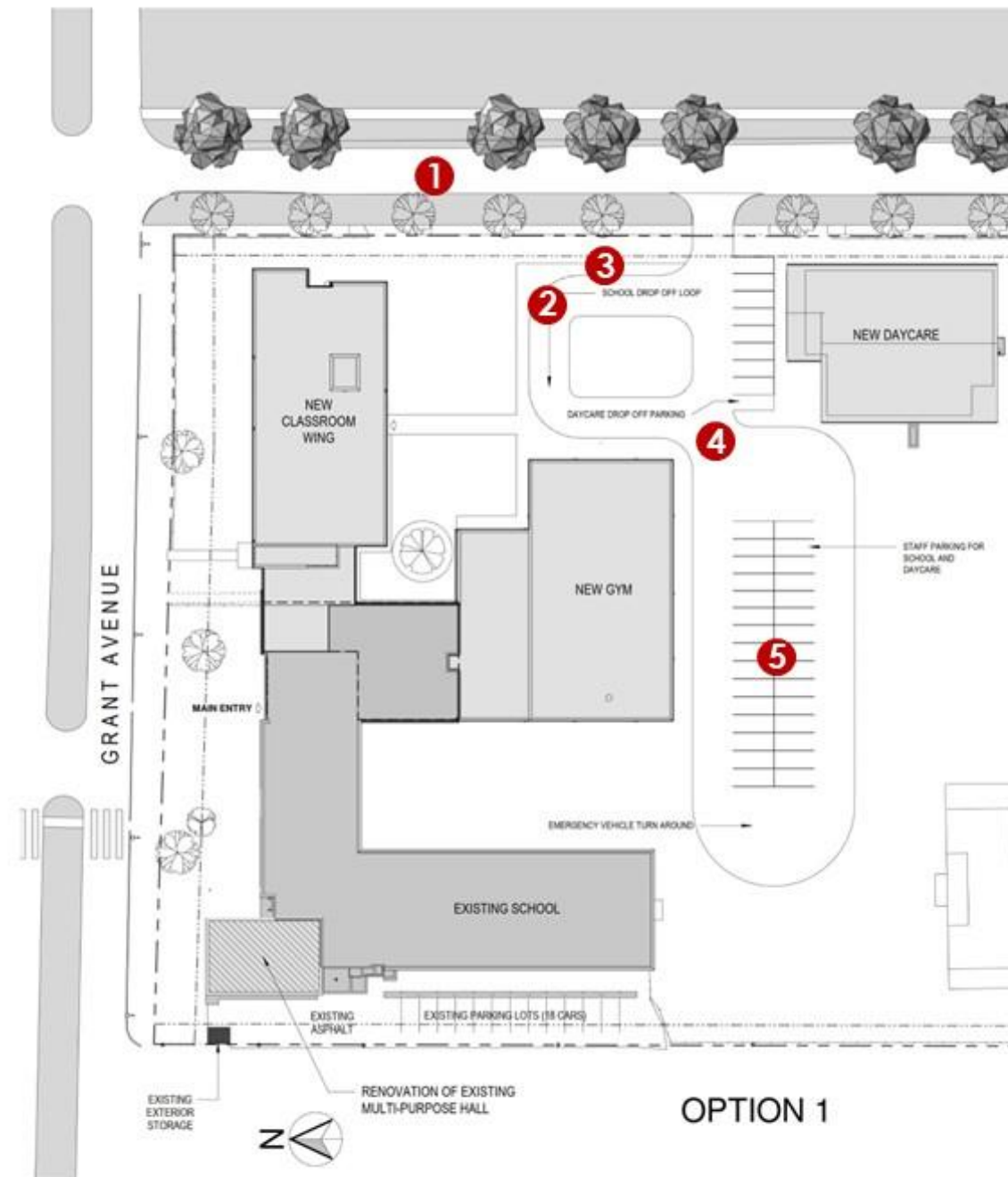
$$\mathbf{W}_{\text{PED}} = [\mathbf{F} ((\mathbf{X}_{\text{ped}_m})\mathbf{d}_m/\mathbf{K}_2) + (\mathbf{X}_{\text{ped}_s})\mathbf{d}_s/\mathbf{K}_3]$$

$$\mathbf{W} = \mathbf{0}$$

Warranted - Complex Intersection

Appendix D: Site Plan Options





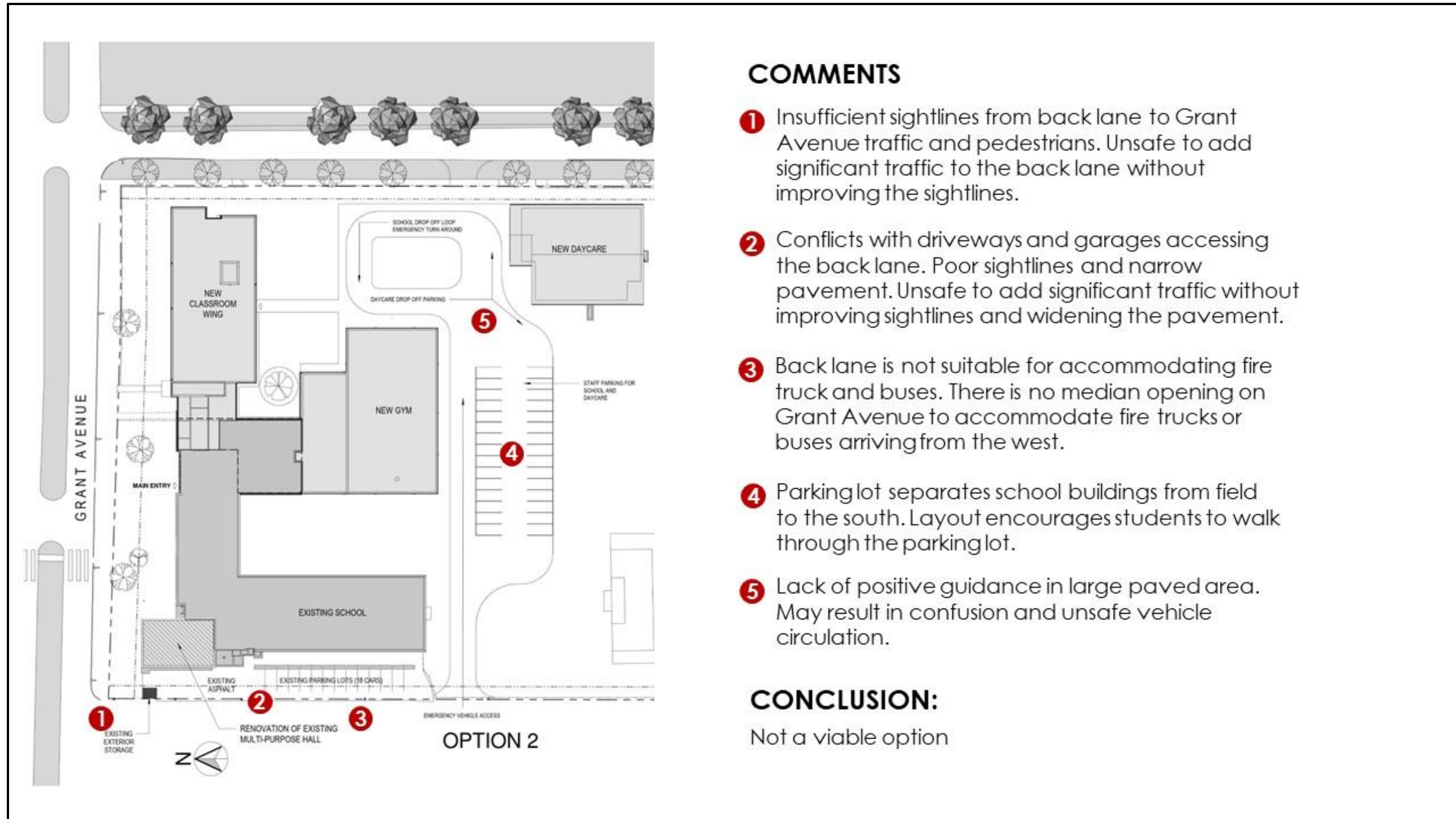
OPTION 1

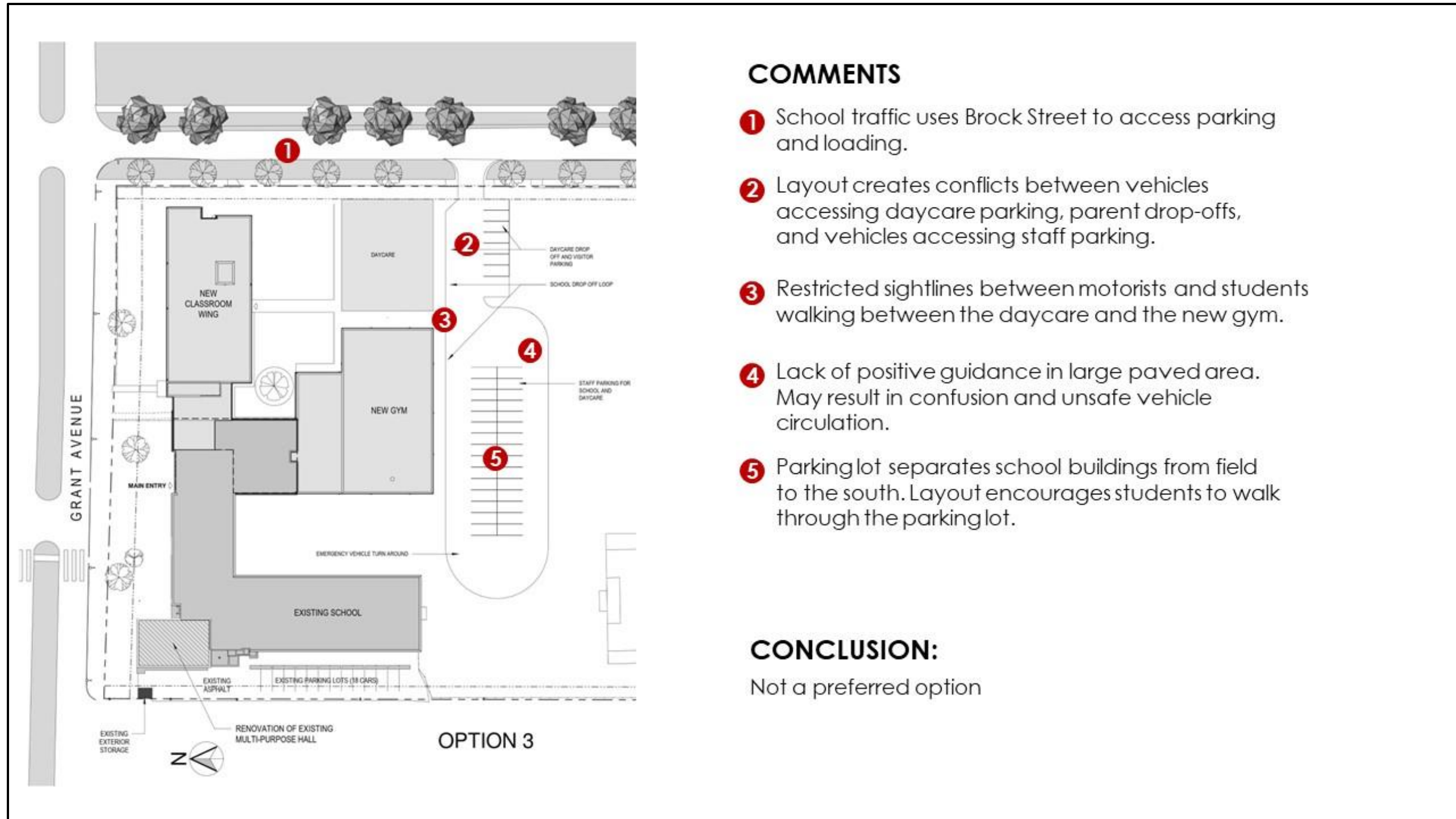
COMMENTS

- 1** School traffic uses Brock Street to access parking and loading.
- 2** Drop off loop geometry is insufficient for fire trucks and school buses.
- 3** Drop off loop geometry is insufficient for expected parent demand. High likelihood of queue spillback onto Brock Street.
- 4** Awkward conflicts between school drop-off vehicles exiting, staff vehicles entering and exiting, and daycare drop-off parking.
- 5** Parking lot separates school buildings from field to the south. Layout encourages students to walk through the parking lot.

CONCLUSION:

Not a viable option





COMMENTS

- 1 School traffic uses Brock Street to access parking and loading.
- 2 Layout creates conflicts between vehicles accessing daycare parking, parent drop-offs, and vehicles accessing staff parking.
- 3 Restricted sightlines between motorists and students walking between the daycare and the new gym.
- 4 Lack of positive guidance in large paved area. May result in confusion and unsafe vehicle circulation.
- 5 Parking lot separates school buildings from field to the south. Layout encourages students to walk through the parking lot.

CONCLUSION:

Not a preferred option

