350 Sparks Street, Ottawa

Hotel and Residential Development

Transportation Study

Prepared For: Morguard Real Estate Investment Trust

June 24, 2015

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Brian Athey
Vice President
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55 City Centre Drive, Suite 1000
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RE: 350 Sparks Street, Ottawa
Hotel and Residential Development
Transportation Study

Dear Mr. Athey:

We are pleased to provide this Transportation Study report for 350 Sparks Street, which covers our review of various transportation elements for the redevelopment of this site. This report has been prepared in support of the Site Plan Application for the subject lands.

If you have any questions regarding this study, please do not hesitate to contact the undersigned.

Sincerely,
BA Consulting Group Ltd.

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TRANSPORTATION BRIEF CHECKLIST

This transportation brief check list has been prepared for the submission of the 350 Sparks Street Hotel and Residential Development Transportation Study (June 2015). Provided below is a list key items covered in the City of Ottawa's TIA guidelines. Where an item has not been explicitly covered in this report, the reasons behind this omission are provided.

Report Context

1. Municipal address:
2. Location relative to major elements of the existing transportation system:
3. Existing land uses or permitted use provisions in the Official Plan, Zoning By-law, etc:
4. Proposed land uses and relevant planning regulations to be used in the analysis:
5. Proposed development size and location on site:
6. Estimated date of occupancy:
7. Planned phasing of development:
8. Proposed number of parking spaces:
9. Proposed access points and type of access:
10. Study area:
11. Time periods and phasing:
12. Horizon years (include reference to phased development): *Forecast traffic volumes were the addition of site traffic to traffic as discussed with City staff.*

Existing Conditions

1. Existing roads and ramps in the study area, including jurisdiction, classification, number of lanes, and posted speed limit;
2. Existing intersections, indicating type of control, lane configurations, turning restrictions, and any other relevant data (e.g., extraordinary lane widths, grades, etc.);
3. Existing access points to adjacent developments (both sides of all roads bordering the site);
4. Existing transit system, including stations and stops;
5. Existing on- and off-road bicycle facilities and pedestrian sidewalks and pathway networks;
6. Existing system operations (V/C, LOS)
7. Major trip generators/ attractors within the Study Area should be indicated

Demand Forecasting

1. General background growth: *See Report Context Item 12*
2. Other study area developments: *See Report Context Item 12*
3. Changes to the study area road network:
4. Future background system operations (V/C, LOS, queue lengths): *See Report Context Item 12*
5. include figures documenting future background travel demands by mode for each horizon year
6. Trip generation rates:
7. Trip distribution and assignment:

Impact Analysis

1. Total future system operations (V/C, LOS, queue lengths);
2. Signal and auxiliary lane (device) warrants:
3. Operational/ safety assessment (e.g., sight line assessment where grades are an issue):
4. Storage analysis for closely spaced intersections:
5. Pedestrian and bicycle network connections and continuity:
6. On-site circulation and design:
7. Potential for neighbourhood impacts and TDM:

CTS Impact Analysis

1. Network Capacity Analysis:
2. Non-auto network connections and continuity:
3. Potential for community impacts, and TDM:
4. Synchro Files: *Will be sent on request via email*
5. Screenline Analysis: *The scale of the project is not anticipated to have substantial overall network impacts*

TABLE OF CONTENTS

LIST OF TABLES

TABLE OF APPENDICES

1.0 INTRODUCTION

BA Group has been retained by Morguard Real Estate Investment Trust to provide transportation advisory services in support of the redevelopment of 350 Sparks Street in the City of Ottawa. The site is a City block bounded by Sparks Street to the north, Queen Street to the south, Bay Street to the west and Lyon Street North to the east. The site location is shown in Figure A1.

The site currently contains a 12-storey office building, a 311 suite hotel and a small residential building. The hotel and residential building are vacant at this time. The site has a supporting 270 space underground paid parking garage, with access onto Queen Street, which is also available to the general public.

The development plan would seek to demolish the existing hotel and small residential buildings and replace them with a new hotel and apartment building. The new hotel would contain a total of 303 suites, and the apartment building would contain 250 units. The existing office tower would remain as-is, with exception to some improvements to the façade on the ground floor. The underground garage would be expanded to provide a total of 348 parking stalls. As part of the development program, access to the parking garage would be relocated from Queen Street to Sparks Street.

The site is well situated from a transportation context point of view and is within walking distance to a variety of employment and entertainment destinations. It is also in close proximity to existing and planned transit infrastructure. The future Confederation Line LRT will further improve transit operations in the area and a station is being constructed adjacent to the site at the southwest corner of the Queen Street / Lyon Street North intersection.

BA Group has undertaken a transportation study to document and analyze various aspects of the redevelopment of the site. This includes a review of the following:

- The existing site
- The area transportation context
- Existing area road network traffic volumes and operations
- The development program
- Forecast travel demands
- Future area road network traffic operations and
- Key transportation elements of the Site Plan

This report provides a summary of our review.

2.0 EXISTING CONDITIONS

2.1 EXISTING SITE CONDITIONS

350 Sparks forms a City block bounded by Sparks Street to the north, Queen Street to the south, Bay Street to the west and Lyon Street North to the east. The site is zoned as a "MD – Mixed-Use Downtown" and currently contains a 12-storey sq.ft office building, a 311 suite hotel and a small residential building. The hotel and small residential building are vacant at this time. The site area context is further illustrated in Figure A2.

2.1.1 Site Access, Parking and Loading

The site features an underground paid parking garage, which serves the office and the formerly in operation hotel uses on site and is also available to the general public. Access to the garage is provided via a driveway onto Queen Street. Pick-up / drop-off operations occur via a lay-by and circular driveway onto Queen Street.

Site loading operations occur today through three main areas on Queen Street, Bay Street and Sparks Street, two of which are on street. On Queen Street a designated loading area is provided along the north side of the street, just east of the site parking garage driveway. Today, this area typically accommodates courier activity for the office building.

A second on-street loading area is provided on Sparks Street, west of Lyon Street North. This area also provides loading for both the office building and has a separate zone for 'Diplomat Loading.' Larger delivery vehicles are generally accommodated within this loading area.

The third loading area is within a loading dock internal to the hotel building and fronts onto Bay Street, just south of Sparks Street. This area accommodates a single truck, and was previously used by the hotel.

2.1.2 Parking Garage

The parking garage is generally located on the eastern portion of the lands underneath the office building. It contains a total of 270 parking spaces on two levels.

2.2 AREA TRANSPORTATION CONTEXT

2.3 ROAD NETWORK

An overview of the study area roads is provided below. A diagram illustrating the area traffic control and lane configuration is provided in Figure A3.

Bay Street is a one-way northbound local road that provides connectivity between Catherine Street to the South and Wellington Street to the north. In the vicinity of the site it has two vehicular travel lanes and a cycling lane. It is signalized at Queen Street at the southwest corner of the site, and a pedestrian crossing signal is provided at Sparks Street, which permits pedestrians to cross Bay Street under signal control.

Sparks Street is a local road that has vehicular travel lanes between Lyon Street North to the east and Bronson Road to west. Between Bay Street and Lyon Street North, along the north side of the site two-way travel is permitted. It is signalized at Lyon Street North, and traffic operates under STOP control at its intersection with Bay Street.

Lyon Street North is generally a one-way southbound arterial road that extends from Wellington Street in the north to Catherine Street in the south. Its south terminus is an onramp to Highway 417 westbound. A small section of Lyon Street North permits northbound travel between Sparks Street and Wellington Street. In this section northbound and southbound travel is separated by a median. It has four travel lanes in the immediate site area.

Queen Street is a two-way local road that runs between Elgin Street in the east and Bronson Road in the west. It is signalized at its intersections with Lyon Street North and Bay Street. At Lyon Street North it has a width to accommodate two westbound lanes and one eastbound lane.

All study area roads noted above have a speed limit of 50 km/h.

2.4 TRANSIT FACILITIES

The site is well served by the a number of existing bus routes and is within walking distance (1 to 2 city blocks) to the Transitway on Albert Street and Slater Street. The transitway has bus service that connects to City of Ottawa at large. Frequent service is provide seven days a week on OC Transpo routes 93, 94, 95, 96, 97, 98 and 99. Routes 95, 96 and 97 operate extended hours until the early morning. Bus routes 95 and 97 run 24 hours a day. Area transit routes and bus stops are illustrated in Figure A4.

2.5 CYCLING AND PEDESTRIAN FACILITIES

The site benefits from its proximity existing cycling infrastructure in the area, where there are bicycle lanes on Bay Street and Lyon Street North. These lanes allow for north-south travel within dedicated pavement area and connect to existing east-west cycling lanes on Wellington Road and Laurier Avenue.

Sidewalks are provided on all area roads bounding the site. Sparks Street, to the east of Lyon provides a pedestrian corridor through to Elgin Street, allowing for excellent east-west pedestrian connectivity through the downtown core to a variety of key attractions and north-south streets.

2.6 EXISTING TRAFFIC VOLUMES

Existing weekday morning and afternoon peak hour baseline traffic volumes are shown in Figure B1. These peak hours represent when the area is typically the busiest during the course of a week. These volumes were established through traffic data collected by the City of Ottawa and BA Group. Traffic count data is provided in **Appendix C**. Adjustments were made to balance traffic volumes between adjacent intersections.

The data indicates shows that traffic flows to/from the north are somewhat tidal in nature, relating to traffic entering the downtown core in the morning and leaving in the afternoon. Traffic volumes travelling to the south on Lyon Street North in the morning peak hour are substantially higher than during the afternoon peak hour. Conversely, traffic volumes to the north on Bay Street are much higher in the weekday afternoon than in the weekday morning peak hour.

2.7 EXISTING OPERATIONS

Traffic operations were reviewed at the following intersections:

- Bay Street / Sparks Street (pedestrian signal)
- Bay Street / Queen Street (signalized)
- Lyon Street North / Sparks Street (signalized)
- Lyon Street North / Queen Street (signalized)
- Parking garage driveway onto Queen Street (unsignalized)

2.7.1 Methodology

Traffic operations analyses have been undertaken in accordance with the methodologies outlined in the Highway Capacity Manual (HCM 2000) using the Synchro (Version 9) software package. The primary product of the signalized intersection capacity analysis evaluation is two sets of intersection performance indices.

The first is a volume-to-capacity (or v/c) ratio that provides an indication of the capacity utilization for movements at an intersection and at the intersection overall. A v/c ratio of 1.0 indicates that a turning movement or intersection may be operating at or near its theoretical capacity. The second measure is a level of service (LOS) indicator that provides a measure of the average level of delay that a motorist may experience while travelling through an intersection. The level of service indicator ranges from LOS A (little delay) to LOS F (extended delays). Level of Service criteria for signalized and unsignalized intersections is summarized in **Table 1**.

TABLE 1 HCM LEVEL OF SERVICE

Level of Service (LOS)	Signalized Intersections	Unsignalized Intersections
LOS A	≤ 10s	≤ 10s
LOS B	> 10s and ≤ 20s	> 10s and ≤ 15s
LOS C	> 20s and ≤ 35s	> 15s and ≤ 25s
LOS D	> 35s and ≤ 55s	> 25s and ≤ 35s
LOS E	> 55s and ≤ 80s	> 35s and ≤ 50s
LOS F	> 80s	> 50s

A summary of the capacity results are provided in the following. Detailed capacity analysis data sheets are provided in **Appendix D**.

2.7.2 Saturation Flow

The Synchro analysis has been prepared with a base saturation flow of 1,800 vehicles per hour per lane per City of Ottawa TIA Guidelines. Additionally, the Central Business District (CBD) adjustment factor in Synchro has been applied, which effectively further reduces saturation flow by an additional 10 percent to account for downtown conditions.

2.7.3 Signal Timing Plans

Signal timing plans obtained by the City of Ottawa were applied in the Synchro model. The Bay Street / Sparks Street intersection contains a pedestrian signal. In order to assess the pedestrian signal operations, this intersection was modelled as a signalized intersection, where the eastbound and westbound phases would only be activated by pedestrians pushing the crossing button (to stop northbound traffic) in order to cross Bay Street. Turns onto Bay Street from Sparks Street, would be under permissive control and can occur when gaps are present in the Bay Street traffic flow. Limitations to this approach are that any through movements across Bay Street on Sparks Street can only occur if the pedestrian signal is pressed, whereas under existing conditions a through movement can occur when a gap in Bay Street traffic is present. Therefore, due to the limitations of this approach, intersection v/c delays values may be modestly overstated for through movements on Sparks Street at the Bay Street intersection.

2.7.4 Analysis Results

Capacity analysis results for area intersections under existing conditions are summarized in Table 2. Capacity analysis results indicate that the study area intersections operate in a satisfactory manner. All intersections operate with overall v/c ratios of less than 0.70 during peak hours, which is indicative of available reserve capacity. All delays experienced by individual movements are in the LOS 'A' to 'D' range which is considered reasonable within an urban environment. The only movement which operates with higher end v/c ratios is the westbound through-left movement at the Lyon Street North / Queen Street intersection which has a v/c ratio of 0.85 during the weekday afternoon peak hour.

TABLE 2 CAPACITY ANALYSIS SUMMARY - EXISTING TRAFFIC OPERATIONS

Intersection	Weekday Morning Peak Hour			Weekday Afternoon Peak Hour		
	Overall	Key Moves	v/c, Delay, LOS	Overall	Key Moves	v/c, Delay, LOS
Signalized Intersections						
Bay Street / Sparks Street	0.22,6s,A	WBTR NBLTR	0.04,14s,B 0.32,6s,A	0.41,11s,B	WBTR NBLTR	0.05,14s,B 0.62,11s,B
Bay Street / Queen Street	0.48,13s,B	EBTL WBT WBR NBLTR	0.52,16s,B 0.31,7s,A 0.05,3s,A 0.45,13s,B	0.61,16s,B	EBTL WBT WBR NBTR	0.57,20s,C 0.64,20s,B 0.60,21s,C 0.58,12s,B
Lyon Street North / Sparks Street	0.68,4s,A	EBR SBTR	0.21,47s,D 0.70,4s,A	0.26,2s,A	EBR SBTR	0.02,25s,C 0.27,2s,A
Lyon Street North / Queen Street	0.64,20s,B	EBTR WBTL SBLTR	0.61,41s,D 0.48,38s,D 0.61,14s,B	0.60,18s,B	EBTR WBTL SBLTR	0.54,17s,B 0.88,31s,C 0.39,10s,A
Unsignalized Intersections						
Garage Driveway / Queen Street	-	SBLTR	0.01,14s,B	-	SBLTR	0.31,19s,C

Analysis results show that the existing garage driveway onto Queen Street operates with a Level of Service of 'B' during the weekday morning peak hour and a Level of Service 'C' during the weekday afternoon peak hour, which is indicative of acceptable intersection delays.

3.0 PLANNED TRANSPORTATION INFRASTRUCTURE

3.1 CONFEDERATION LINE

The Confederation Line LRT project will expand east-west service capacity in the City of Ottawa. It will extend between Blair Road at Highway 174 in the west through the downtown to Tunney's Pasture in the east. The line will contain a total of thirteen stations. A section of the LRT will be underground along the Queen Street corridor, with stops at Lyon Street North, O'Connor Street (i.e. Parliament Station) and the Rideau Centre. The Lyon Station will have access from the Place de Ville and Delta Hotel, immediately to the east of the site. Substantial completion of the LRT construction is planned for 2017.

3.2 QUEEN STREET RENEWAL PROJECT

The City of Ottawa has undertaken an Environmental Assessment and detailed design in support of changes to Queen Street between Bronson Street and Elgin Street. The project involves changes the streetscape, to respond to the new transit and pedestrian context of the Queen Street corridor. The detailed design for Queen Street identifies changes to Queen Street, Bay Street and Lyon Street North adjacent to the site. These include:

- Reducing the pavement width between Queen Street between Bay Street and Lyon Street North to provide additional boulevard.
- Providing 'sharrows' along Queen Street
- Provision of a bike box for travel from Bay Street northbound to Queen Street westbound
- The narrowing of the Lyon Street North pavement width north of Queen Street to provide additional boulevard. Lyon Street North would also have a bike lane.
- Narrowing Queen Street east of Lyon Street North to provide additional boulevard. The westbound approach to this intersection would be modified to have a left turn lane and a through lane.

A sensitivity analysis has been completed in this study to review future traffic conditions with these planned network changes in place.

3.3 BIKE SHARE PROGRAM

VeloGo, a bike share program, is planned to roll out in the Fall of 2015. This service, similar to Ottawa's past Bixi service, will allow members to use a shared pool of bikes through downtown Ottawa and Gatineau. Bikes could be picked-up, used, and dropped off at various locations. There is anticipated to be approximately 50 locations. Available documentation reviewed at the time of this study suggests a bike share location off-site is planned near the Queen Street / Lyon Street North intersection.

4.0 SITE PLAN

4.1 DEVELOPMENT PROGRAM

The development plan would seek to demolish the existing hotel and small residential buildings and replace them with a new hotel and apartment building. The new hotel would contain a total of 303 suites, and the apartment building would contain 250 units. The existing office tower would remain as-is, with exception to some improvements to the façade on the ground floor. The Site Plan is illustrated in Figure A5. The redevelopment of the site is anticipated to start in 2016.

4.2 SITE ACCESS, PARKING AND LOADING

4.2.1 Site Access, Parking and Pick-Up Drop-Off

Access to the parking garage would be relocated from its current location on Queen Street to Sparks Street, approximately 30 metres east of the westbound stop bar of the Bay Street / Sparks Street intersection (measured to the centreline of the driveway). The parking garage would contain a total 348 parking spaces, allocated as follows 142 office, 93 hotel and 113 apartment. Of the apartment spaces, 3 are proposed to facilitate car-share, and 15 are proposed for visitor use. The supply provided meets the zoning by-law requirements and will satisfy the needs of the site. The new Sparks Street driveway will contain a bike ramp, which provides access to the bike parking mezzanine level, which contains 125 bicycle parking spaces. 19 bicycle parking spaces will be provided at-grade. The bicycle parking supply meets the zoning by-law requirements for the new site uses.

Pick-up / Drop-off for this site would be on Queen Street, as under existing conditions, however the configuration of this facility would be modified. The Pick-Up / Drop-Off area would be an internal courtyard, which would have access via a single driveway onto Queen Street. The facility would accommodate all uses on site: office, hotel and apartment. Notably, all buildings have doors which front onto this courtyard. A vehicle manoeuvring diagram has been prepared to demonstrate that vehicles can enter and exit the facility in a suitable manner (**Appendix E**).

4.2.2 Loading Areas

Two on site loading area are provided to serve the three site uses, one on Bay Street the other on Sparks Street. The Bay Street loading area contains two loading spaces and is designated to accommodate hotel and office uses. The Sparks Street loading area would primarily function to serve resident move in.

5.0 DEMAND FORECASTING

Traffic forecasts were prepared for future conditions considering potential area growth and site related traffic.

5.1 BACKGROUND TRAFFIC GROWTH

It is anticipated that traffic volumes on the Queen Street corridor will either remain consistent with existing conditions or reduce with the completion of the Confederation Line, which will improve transit service in this area. For the purposes of this study, future traffic volumes without the redevelopment of the site have been assumed be consistent with existing conditions. This methodology is similar to vehicular traffic forecasting identified in the "Queen Street Renewal Transportation Assessment" report (Declan, May 2014) prepared in support of the Queen Street Renewal Environmental Assessment.

5.2 SITE TRIP GENERATION

Traffic volumes were generated for the site based on a review of traffic counts performed at the site and use of the ITE Trip Generation Manual. Modal split information from the 2011 Trans O-D Survey report for Ottawa Centre was also used to allocate trips by transportation mode for the apartment and hotel uses. Trip generation for the office is based on existing driveway counts.

Development of traffic volumes associated with the various development uses is summarized below. The resulting trip generation for the site is summarized in Table 3.

5.2.1 Office Trip Generation

The existing parking garage, which contains approximately 270 spaces, is predominately used by office workers for the site and is also available for general public use. Existing traffic counts show that this garage generates approximately 120 two-way trips during the weekday morning and 105 two-way trips during the weekday afternoon peak hour. Also on site today is the existing pick-up / drop-off facility, which is used by office workers and generates approximately 15 two-way trips during the weekday morning peak hour and 30 two-way trips during the weekday afternoon peak hour.

After redevelopment of the site, the parking spaces available for the office use will decrease from 270 spaces which exist today to approximately 142 spaces. Therefore, it is anticipated that traffic generated by the office use would also decrease. To maintain a conservative stance, it has been assumed for this study that office vehicular travel demands after redevelopment of the site would be similar in the future. This may modestly overstate the traffic impact of the redevelopment.

5.2.2 Apartment Trip Generation

Trips generation for the apartment building was performed based on a person trip generation basis. Information regarding person trip generation was adopted from the ITE Trip Generation Manual. Land Use Code ITE 232 – High Rise apartment was referred to[1]. The apartment is anticipated to generate approximately 80 two-way person trips during the weekday morning peak hour and 100 two-way person trips during the weekday afternoon peak hour.

Person trips were allocated as follows based on a review of mode split information in the 2011 Trans O-D survey[2]:

- Car-driver: 40%
- Car-passenger: 10%
- Non-Motorized: 25%
- Transit: 25%

The car-driver mode split of 40% was applied to calculate vehicular trips generated by the apartment use. In total, the apartment is estimated to generate approximately 35 two-way vehicular trips during the weekday morning peak hour and 40 two-way vehicular trips during the weekday afternoon peak hour.

5.2.3 Hotel Trip Generation

Trips generation for the hotel building was performed on a person trip generation basis, similar to the apartment building. Land Use Code ITE 310 – Hotel was used to estimate person trips[1]. Person trips were allocated as follows:

- Car-driver: 45%
- Car-passenger: 10%
- Non-Motorized: 10%
- Transit: 15%
- Taxi (as primary passenger): 15%
- Taxi (as additional passenger): 5%

These proportions are similar to the apartment mode splits, with adjustments made to reflect a greater usage of personal vehicles to travel to hotels, and taxis. Key vehicular trip generators, noting the above, are from passenger cars and taxis. A further breakdown of these vehicle types is provided below.

[1] Forecast vehicular trips generated through the application of ITE Trip generation rates were inflated by passenger occupancy rates presented in the ITE Trip Generation Handbook to forecast person trips as shown in Table 3.

[2] Please refer to Appendix F for additional information.

5.2.3.1 Passenger Car Trips

The car-driver mode split of 45% was applied to calculate passenger car trips generated by the hotel use. In total, the hotel is estimated to generate approximately 70 two-way vehicular trips during the weekday morning peak hour and 40 two-way vehicular trips during the weekday afternoon peak hour. For the purposes of trip assignment, these trips were broken down into two main categories: those who drive directly to/from the parking garage, and those who utilize the pick-up / drop-off area before/after travelling to/from the garage. This split was assumed to be 50/50.

5.2.3.2 Taxi Trips

The taxi primary passenger mode split of 15% was applied to calculate the number of taxi calls generated by the hotel use. The hotel is estimated that patrons would require 25 taxis to arrive and 15 taxis to leave the hotel during the weekday morning peak hour. Assuming that all arriving taxis after dropping off guests would be utilized to provide services to outbound guests, this would result in 50 two-way (i.e. 25 inbound; 25 outbound) trips during the weekday morning peak hour.

The hotel is estimated that patrons would require 20 taxis to arrive and 20 taxis to leave the hotel during the weekday afternoon peak hour. Assuming that all arriving taxis (after dropping off guests) would be utilized to provide services to outbound guests, this would result in 40 two-way trips (i.e. 20 inbound; 20 outbound) during the weekday afternoon peak hour.

5.2.3.3 Total Site Traffic and As of Right Comparison

The entire site upon build-out is anticipated to generate approximately 350 to 355 two-way trips. This is an increase beyond existing conditions, where only the office is in operation, of approximately 215 to 220 two-way trips.

A review was undertaken to estimate the traffic conditions on site prior to the closure of the existing hotel, which contained a total of 328 suites (larger than the current plan) (see **Appendix F**). Based on the rates presented in Table 3, the site at that time would generate approximately 315 to 320 two-way trips. A comparison of the proposed development plan traffic generation to the site prior to the hotel closure indicates the proposed development plan would generate approximately 35 additional two-way trips. The anticipated traffic of the proposed development plan is very similar to site prior to the hotel closure.

TABLE 3 SITE TRAFFIC GENERATION

Land Use	Information	Weekday Morning Peak Hour			Weekday Afternoon Peak Hour		
		In	Out	2-way	In	Out	2-way
Office - Existing							
Office – Garage Traffic	Ex. Counts	115	5	120	0	105	105
Office - Pick-Up / Drop-Off	Ex. Counts	5	10	15	15	15	30
Total Office Related Traffic		**120**	**15**	**135**	**15**	**120**	**135**
High Rise Apartment – 250 Units							
ITE Baseline Trip Rate	ITE 232	0.08	0.23	0.30	0.23	0.15	0.37
Person Trip Rate		0.09	0.26	0.35	0.26	0.17	0.43
Person Trips	100%	20	65	85	65	40	105
Car Driver	40%	8	26	34	26	16	42
Car Passenger	10%	2	7	9	7	4	11
Transit	25%	5	16	21	16	10	26
Non-Motorized	25%	5	16	21	16	10	26
Vehicular Trips (Rounded to Nearest 5)	40%	**10**	**25**	**35**	**25**	**15**	**40**
Hotel – 303 Suites							
ITE Baseline Trip Rate	ITE 310	0.40	0.29	0.68	0.34	0.36	0.70
Person Trip Rate		0.50	0.36	0.86	0.43	0.45	0.88
Person Trips	100%	150	110	260	130	135	265
Car Driver	45%	67	50	117	58	61	119
Car Passenger	10%	15	11	26	13	14	27
Non-Motorized	10%	15	11	26	13	14	27
Transit	15%	22	16	38	20	20	40
Taxi - primary passenger	15%	23	16	39	20	20	40
Taxi - as an additional passenger	5%	8	6	14	6	6	12
Passenger Car Trips							
Total Passenger Car Trips (Rounded to Nearest 5)		**70**	**50**	**120**	**60**	**60**	**120**
• *straight to garage*	*50%*	*35*	*25*	*60*	*30*	*30*	*60*
• *using PUDO / Valet, then Garage*[3]	*50%*	*35 (70)*	*25 (50)*	*60 (120)*	*30 (60)*	*30 (60)*	*60 (120)*
Taxi Trips							
Taxi Calls (Rounded to Nearest 5)		**25**	**15**	**40**	**20**	**20**	**40**
• **Taxi Trips (in and out of PUDO)**		**25**	**25**	**50**	**20**	**20**	**40**
TOTAL SITE TRIPS[3]		**200 (235)**	**90 (115)**	**290 (350)**	**100 (130)**	**195 (225)**	**295 (355)**
INCREASE BEYOND EXISTING CONDITIONS[3]		**80 (115)**	**75 (100)**	**155 (215)**	**85 (115)**	**75 (105)**	**160 (220)**
INCREASE BEYOND AS OF RIGHT CONDITIONS		**10 (10)**	**25 (25)**	**35 (35)**	**20 (20)**	**15 (15)**	**35 (35)**

Notes:

1. Person Trip rate = ITE Baseline Rate x Car Occupancy x Transit Adjustment (to adjust for inherent non-auto use in baseline ITE data)
   For Apartment: ITE Baseline Rate x 1.09 passengers per car (per ITE handbook) x 1.05
   For Hotel: ITE Baseline Rate x 1.26 passengers per car x 1.05
2. Mode split information based on review of AM Peak Period travel information in 2011 TRANS O-D survey. Refer to Appendix E.
3. ( ) Bracketed values reflect the entry / exit at the PUDO and the parking garage which effective dou8bles the in and out volumes at the site driveways.

5.3 TRIP DISTRIBUTION AND ASSIGNMENT

The trip distribution pattern was determined for the site uses based on a review of travel patterns recorded in 2011 Trans O-D Survey report and the surrounding road network connectivity. Detailed information regarding the distribution is provided in **Appendix F**. Office and Hotel distribution patterns were assumed to be the same for the purposes of this analysis. The resulting distribution pattern is shown in Table 4.

TABLE 4 OVERALL TRIP DISTRIBUTION PATTERN

Orientation	Office	Residential	Hotel
Outbound			
Queen Street - East	15.0%	10.0%	15.0%
Lyon Street North - South	30.0%	35.0%	30.0%
Bay Street - North	25.0%	20.0%	25.0%
Queen Street - West	25.0%	30.0%	25.0%
Sparks Street - West	5.0%	5.0%	5.0%
Total	**100%**	**100%**	**100%**
Inbound			
Queen Street - East	15.0%	10.0%	15.0%
Lyon Street North - North	25.0%	20.0%	25.0%
Bay Street - South	30.0%	35.0%	30.0%
Queen Street - West	25.0%	30.0%	25.0%
Sparks Street - West	5.0%	5.0%	5.0%
Queen Street - East	15.0%	10.0%	15.0%
Total	**100%**	**100%**	**100%**

Trips were assigned to the road network as shown in Figures B2 through Figure B5. The resulting Future total traffic volumes, which represent the addition of site traffic volumes to existing traffic volumes are shown in Figure B6.

6.0 FUTURE TRAFFIC OPERATIONS

6.1 CAPACITY ANALYSIS

Capacity analysis results under future traffic conditions are summarized in Table 5. Detailed capacity analysis sheets are provided in Appendix G. The results indicate that the study area intersections will continue to operate in a satisfactory manner. All intersections operate with overall v/c ratios of less than 0.80 during peak hours, which is indicative of available reserve capacity. All delays experienced by individual movements are in the LOS 'A' to 'D' range which is considered reasonable within an urban environment. The westbound through-left movement at the Lyon Street North / Queen Street intersection operates with a higher end, but still acceptable v/c ratios during the weekday afternoon peak hour of 0.86.

The Queen Street / Lyon Street North intersection was further assessed with the planned changes demonstrated in the Queen Street Renewal project. Under this configuration the intersection will have overall v/c ratios higher than those experienced under the current configuration; however, intersection operations will still be satisfactory.

The Queen Street Pick-Up / Drop off is forecast to operate well during peak hours and the key southbound STOP controlled approach is forecast to operate with a Level of Service 'C' during the weekday morning and afternoon peak hours.

The Sparks Street Garage Driveway is also forecast to operate well, and the key northbound STOP controlled approach will operate with Levels of Service in the 'A' to 'B' range.

The results indicate that site traffic can be suitably accommodated by the area road network.

TABLE 5 CAPACITY ANALYSIS SUMMARY – FUTURE TRAFFIC OPERATIONS (AREA ROAD NETWORK AS-IS)

Intersection	Weekday Morning Peak Hour			Weekday Afternoon Peak Hour		
	Overall	Key Moves	v/c, Delay, LOS	Overall	Key Moves	v/c, Delay, LOS
Signalized Intersections						
Bay Street / Sparks Street	0.28,7s,A	EBTL WBTR NBLTR	0.01,14s,B 0.04,14s,B 0.42,7s,A	0.48,12s,B	EBTL WBTR NBLTR	- ,- , A 0.14,15s,B 0.67,12s,B
Bay Street / Queen Street	0.57,14s,B	EBTL WBT WBR NBLTR	0.65,20s,C 0.38,7s,A 0.13,4s,A 0.50,14s,B	0.67,18s,B	EBTL WBT WBR NBTR	0.75,30s,C 0.70,21s,B 0.68,21s,C 0.61,12s,B
Lyon Street North / Sparks Street	0.77,11s,B	EBR SBTR	0.65,51s,D 0.78,9s,A	0.54,8s,A	EBR SBTR	0.55,21s,C 0.52,6s,A
Lyon Street North / Queen Street	0.67,21s,C	EBTR WBTL SBLTR	0.70,45s,D 0.52,39s,D 0.62,14s,B	0.65,17s,B	EBTR WBTL SBLTR	0.44,16s,B 0.86,28s,C 0.48,11s,B
Lyon Street North / Queen Street - After Queen Street Renewal	*0.79,25s,C*	*EBTR WBL WBT SBLTR*	*0.70,45s,D 0.59,53s,D 0.43,37s,D 0.78,18s,B*	*0.71,19s,B*	*EBTR WBL WBT SBLTR*	*0.44,16s,B 0.84,41s,D 0.73,24s,C 0.61,12s,B*
Unsignalized Intersections						
Pick-Up / Drop-Off Driveway onto Queen Street	-	EBTL WBTR SBLR	0.04,1s,A 0.20,0s,A 0.28,20s,C	-	EBTL WBTR SBLR	0.03,1s,A 0.38,0s,A 0.22,17s,C
Garage Driveway / Sparks Street	-	EBTR WBTL NBLR	0.11,0s,A 0.03,4s,A 0.11,10s,A	-	EBTR WBTL NBLR	0.06,0s,A 0.01,3s,A 0.23,11s,B

Notes:
1. Nominal traffic volumes associated with this movement. No delays, or v/c reported.

6.1.1 Queuing Review – Sparks Street

A queuing review was conducted to determine the extent of westbound queuing at the Bay Street / Sparks Street intersection to confirm the appropriateness of the driveway spacing. The Synchro based queuing results are provided in Table 6. The results indicate that 95th percentile queues will not spill back to the parking garage driveway location which is 30 metres east of Bay Street (measured from the Bay Street STOP bar to the centre of the driveway). Therefore, the location is an appropriate distance from Bay Street.

TABLE 6 QUEUING REVIEW – SPARKS STREET

Queues	Weekday Morning		Weekday Afternoon Peak Hour		Driveway Location
	50th percentile (m)	95th percentile (m)	50th percentile (m)	95th percentile (m)	
WBLTR	7m	7m	7m	7m	30m east of Bay Street

Notes:
1. Vehicle queues rounded up to the nearest 7 metres to reflect the length of a passenger vehicle + buffer distance to the next vehicle. All reported queues through Synchro are less than 7 metres.

7.0 FINDINGS AND RECOMMENDATIONS

BA Group has undertaken a transportation impact assessment to review the proposed development plan for 350 Sparks Street. The site is a City block bounded by Sparks Street to the north, Queen Street to the south, Bay Street to the west and Lyon Street North to the east.

Key findings from our review are documented below:

Transportation Context

- The site is well situated from a transportation context point of view and is within walking distance to a variety of employment and entertainment destinations. Sidewalks are provided on all area roads bounding the site. Sparks Street, to the east of Lyon provides a pedestrian corridor through to Elgin Street, providing excellent east-west pedestrian connectivity through the downtown core to a variety of key attractions.

- The site benefits from its proximity to existing and planned transit infrastructure. The future Confederation Line LRT will further improve transit operations in the area and a station is being constructed immediately adjacent to the site at the southwest corner of the Queen Street / Lyon Street North intersection.

- The site is well situated from a cycling perspective, given its proximity existing cycling infrastructure in the area, where there are cycling lanes on Bay Street and Lyon Street North. These lanes allow for north-south travel within dedicated pavement area and connect to existing east-west cycling lanes on Wellington Road and Laurier Avenue.

- The City of Ottawa has undertaken an Environmental Assessment and detailed design in support of changes to Queen Street between Bronson Street and Elgin Street. The project involves changes the streetscape, to respond to the new transit and pedestrian context of the Queen Street corridor. The site will operate in a reasonable manner with and without the planned changes.

Site Traffic

- The entire site upon build-out is anticipated to generate approximately 350 to 355 two-way trips. This is an increase beyond existing conditions, where only the office is in operation, and the site generates approximately 215 to 220 two-way trips.

- A review was undertaken to estimate the traffic conditions on site prior to the closure of the existing hotel, which contained a total of 328 suites. Under prior conditions the site would generate approximately 315 to 320 two-way trips. The proposed development generates approximately 30 more two-way trips and is therefore similar, to the prior site in terms of trip generation potential.

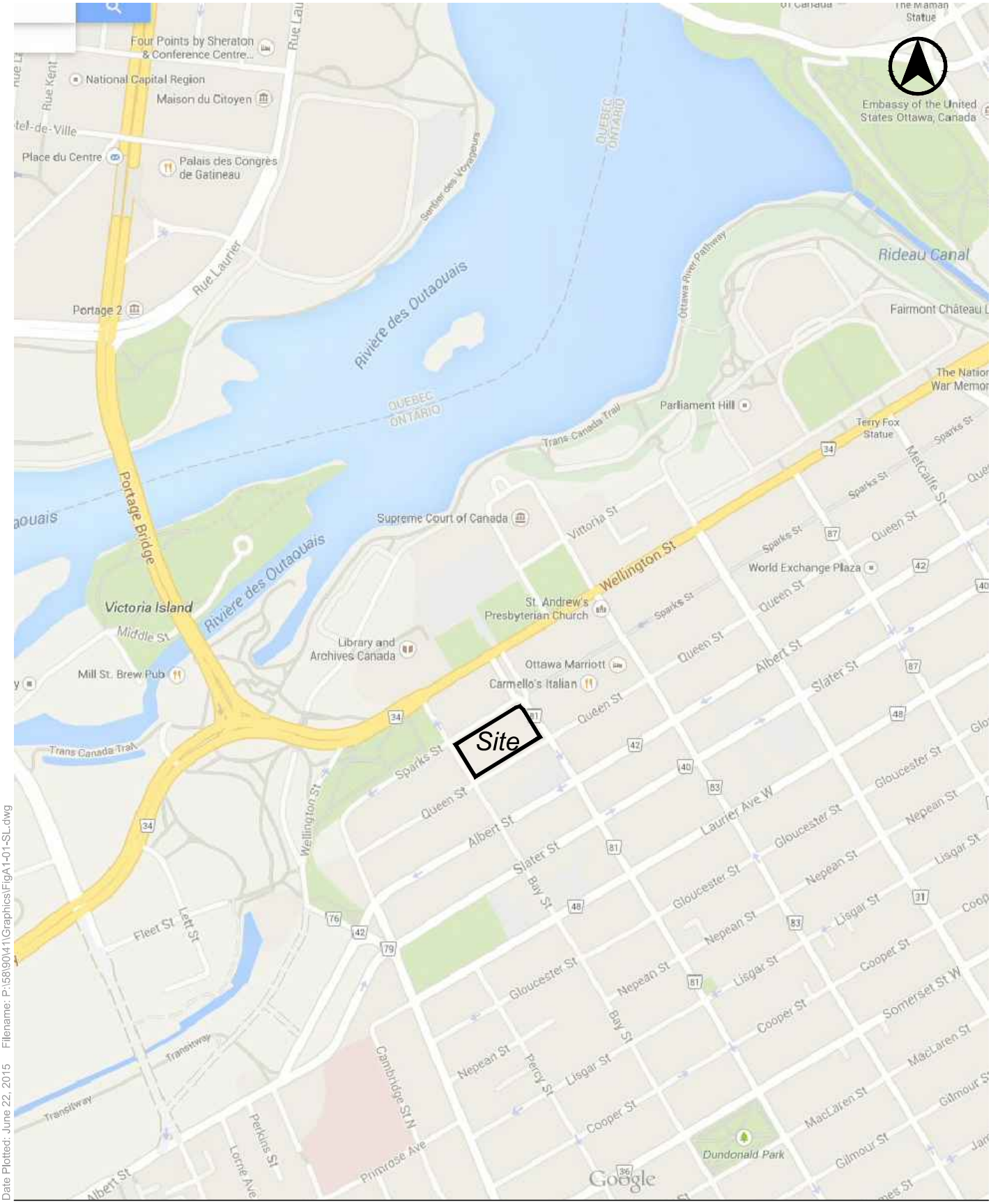
Traffic Operations

- Capacity analysis results indicate that the study area intersections operate in a satisfactory manner under Existing conditions. This is forecast to continue under future conditions upon build-out of the site. All study intersections are forecast operate with overall v/c ratios of less than 0.80 during peak hours, which is indicative of available reserve capacity. All delays experienced by individual movements are in the Level of Service 'A' to 'D' range which is considered reasonable within an urban environment.

- The Queen Street / Lyon Street North intersection was further assessed with the planned changes illustrated in the Queen Street Renewal project. Under this configuration the intersection will have overall v/c ratios higher than those experienced under the current configuration; however, forecast intersection operations will continue to be satisfactory.

Based upon our review, the study area road network can reasonably accommodate forecast traffic demands and study area intersections and site driveways will operate in a suitable manner.

APPENDIX A:
Context Figures



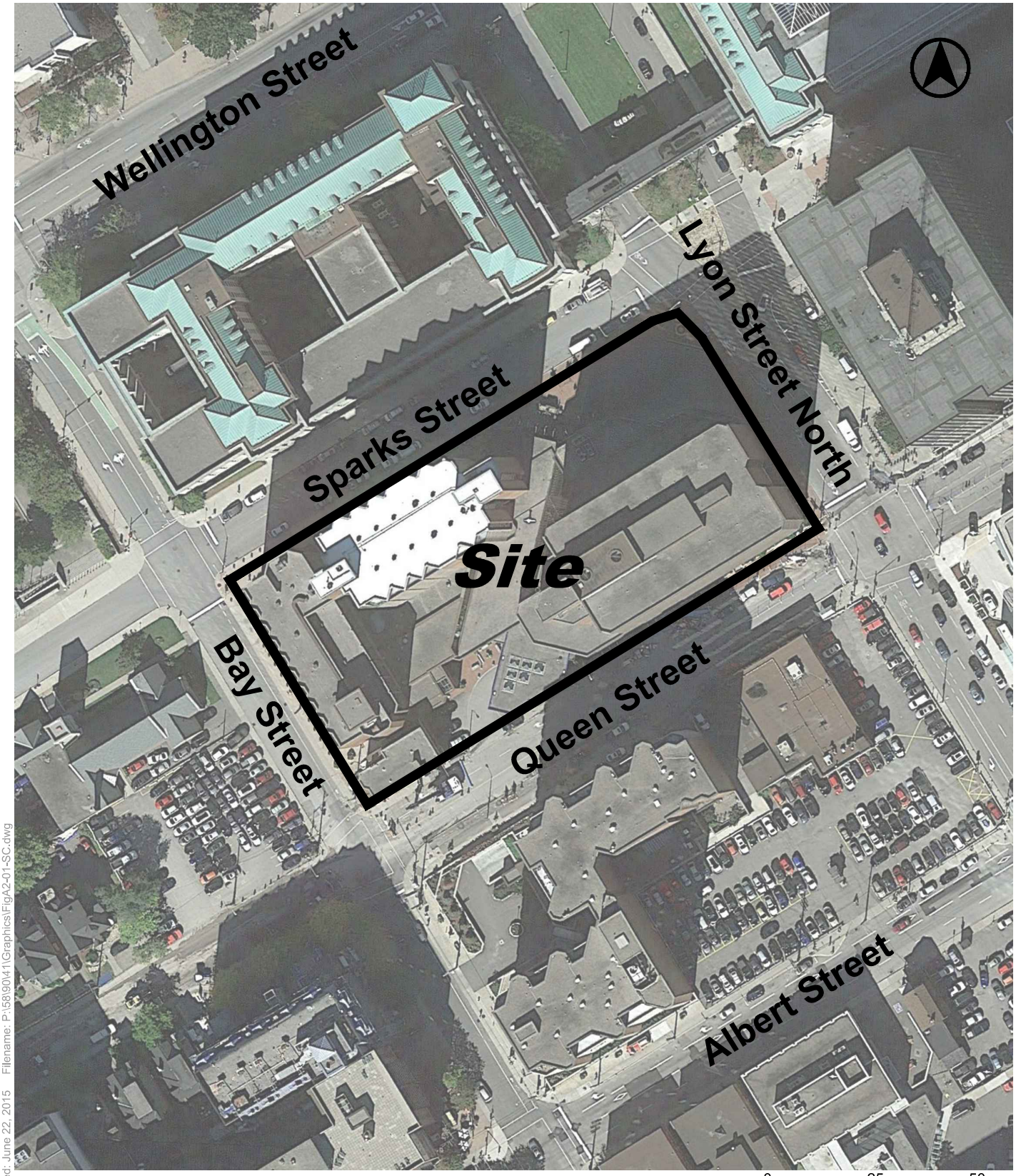
Date Plotted: June 22, 2015 Filename: P:\5890\41\Graphics\FigA1-01-SL.dwg

SITE LOCATION

BA Group

350 Sparks Street Transportation Study
5890-41 June 2015

Figure A1



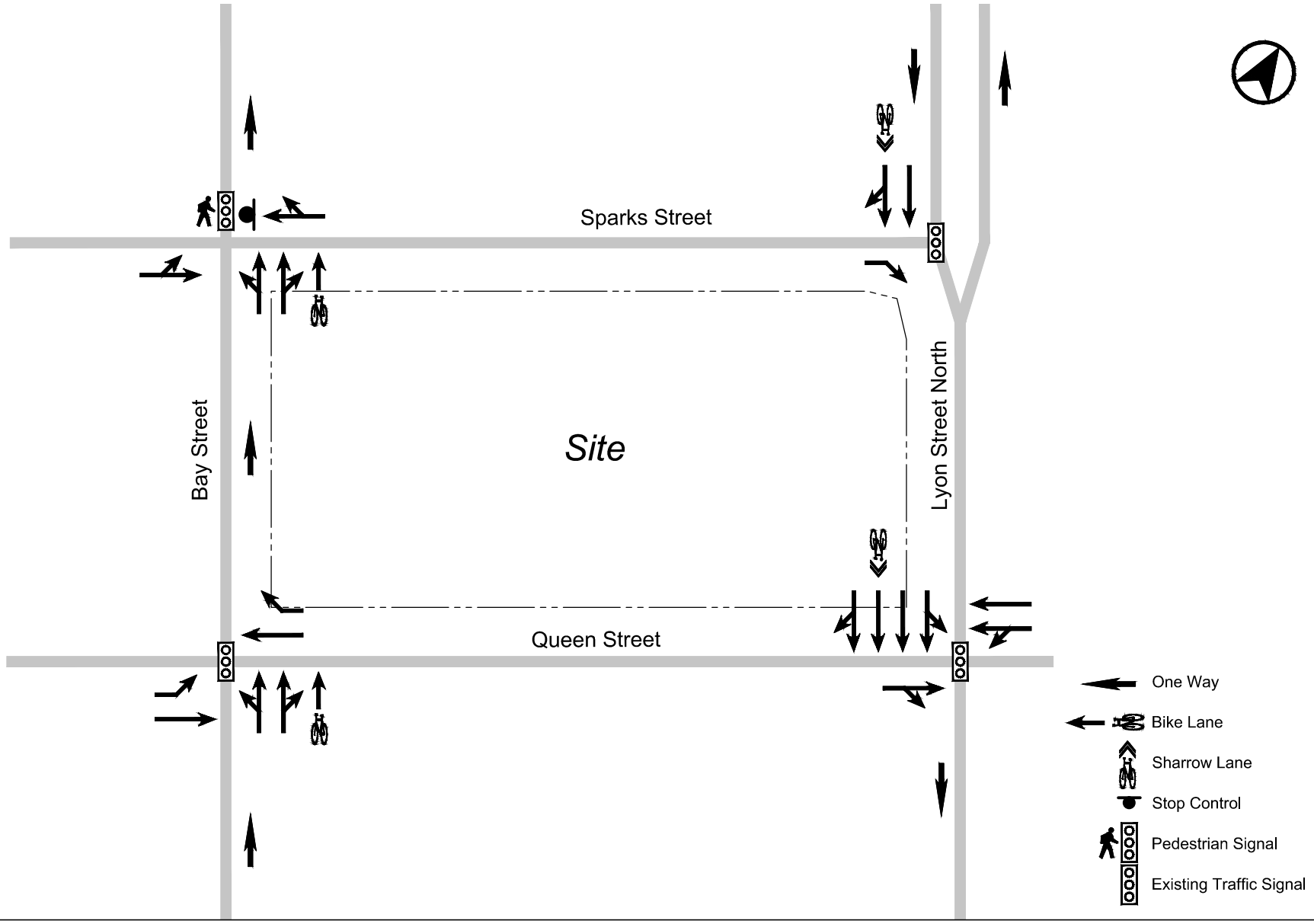
Date Plotted: June 22, 2015 Filename: P:\5890\41\Graphics\FigA2-01-SC.dwg

AREA CONTEXT

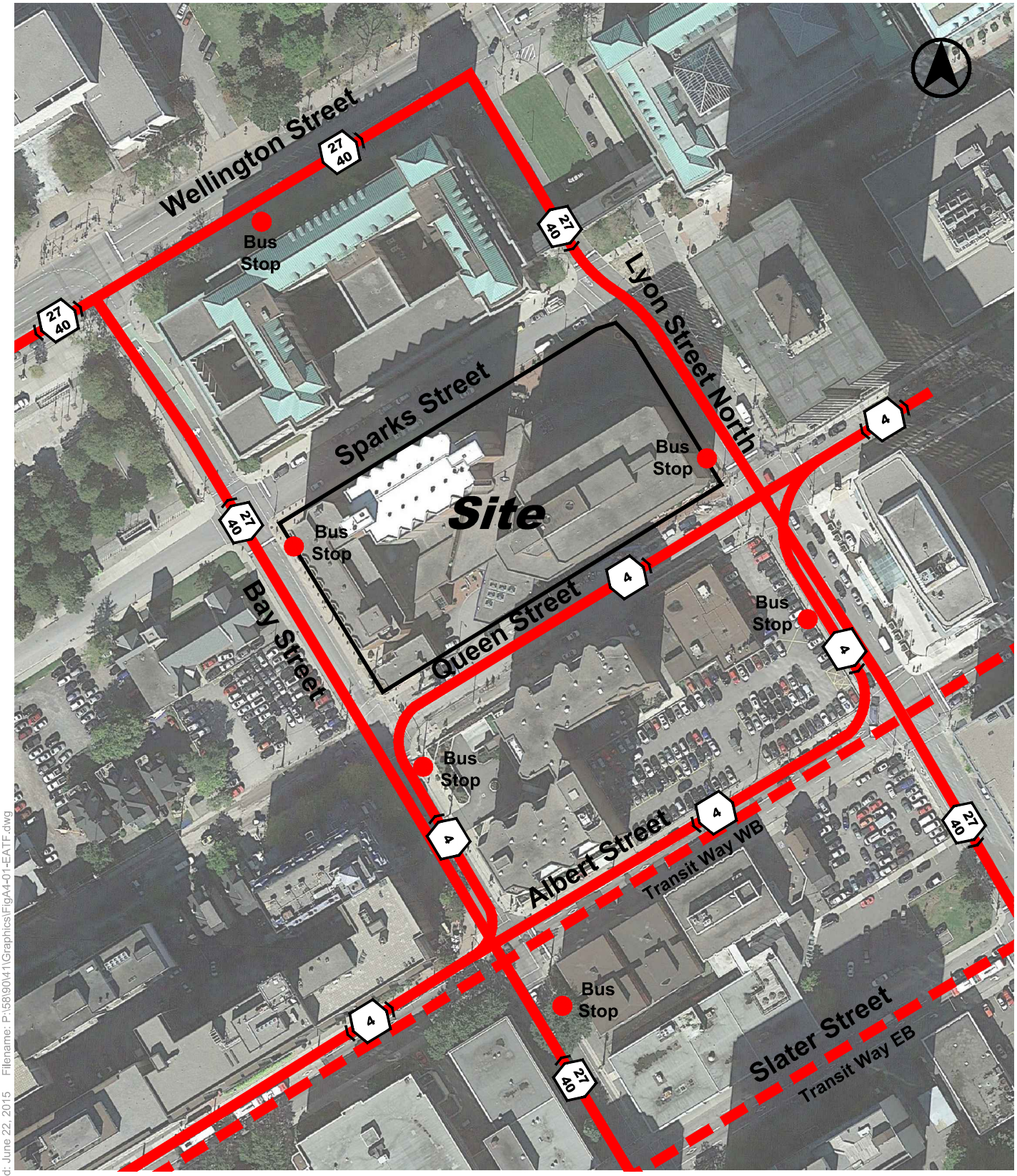
BA Group

350 Sparks Street Transportation Study
5890-41 June 2015

Figure A2



EXISTING AREA TRAFFIC CONTROL AND LANE CONFIGURATION



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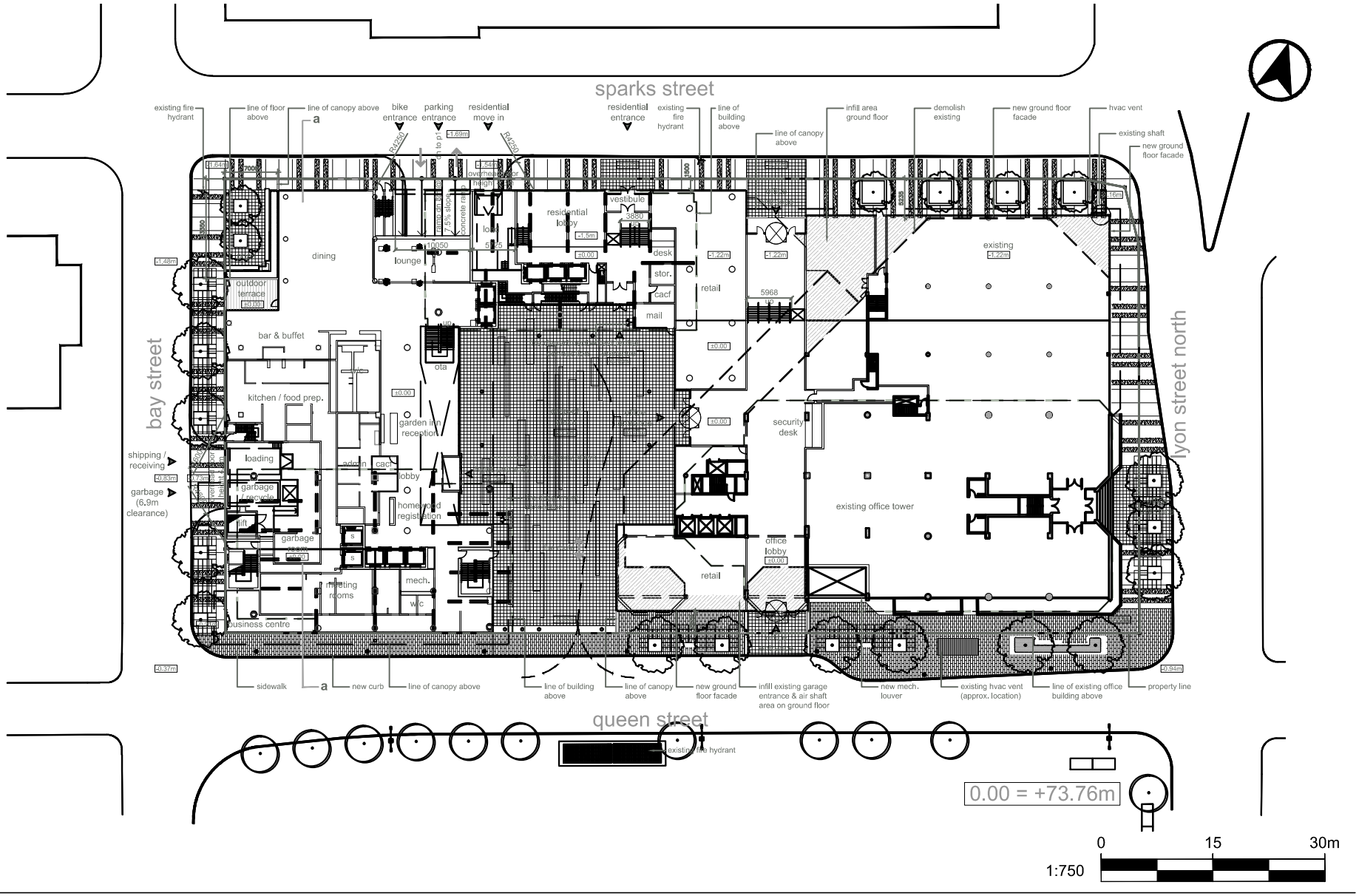
AREA TRANSIT FACILITIES

(Existing)

BA Group

350 Sparks Street Transportation Study
5890-41 June 2015

Figure A4



Date Plotted: June 24, 2015 Filename: P:\5890\41\Graphics\FigA5-01-SP.dwg

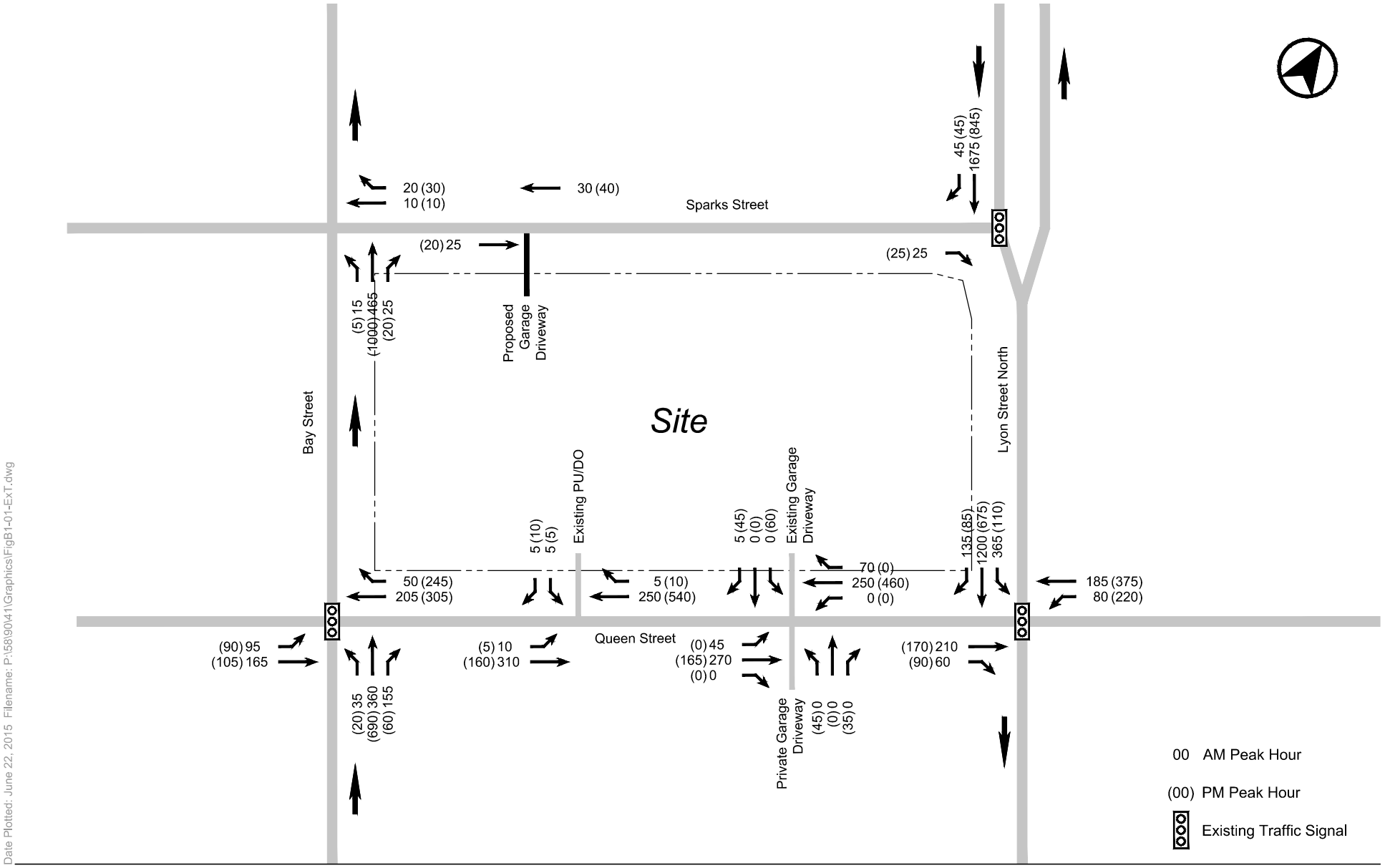
SITE PLAN

BA Group

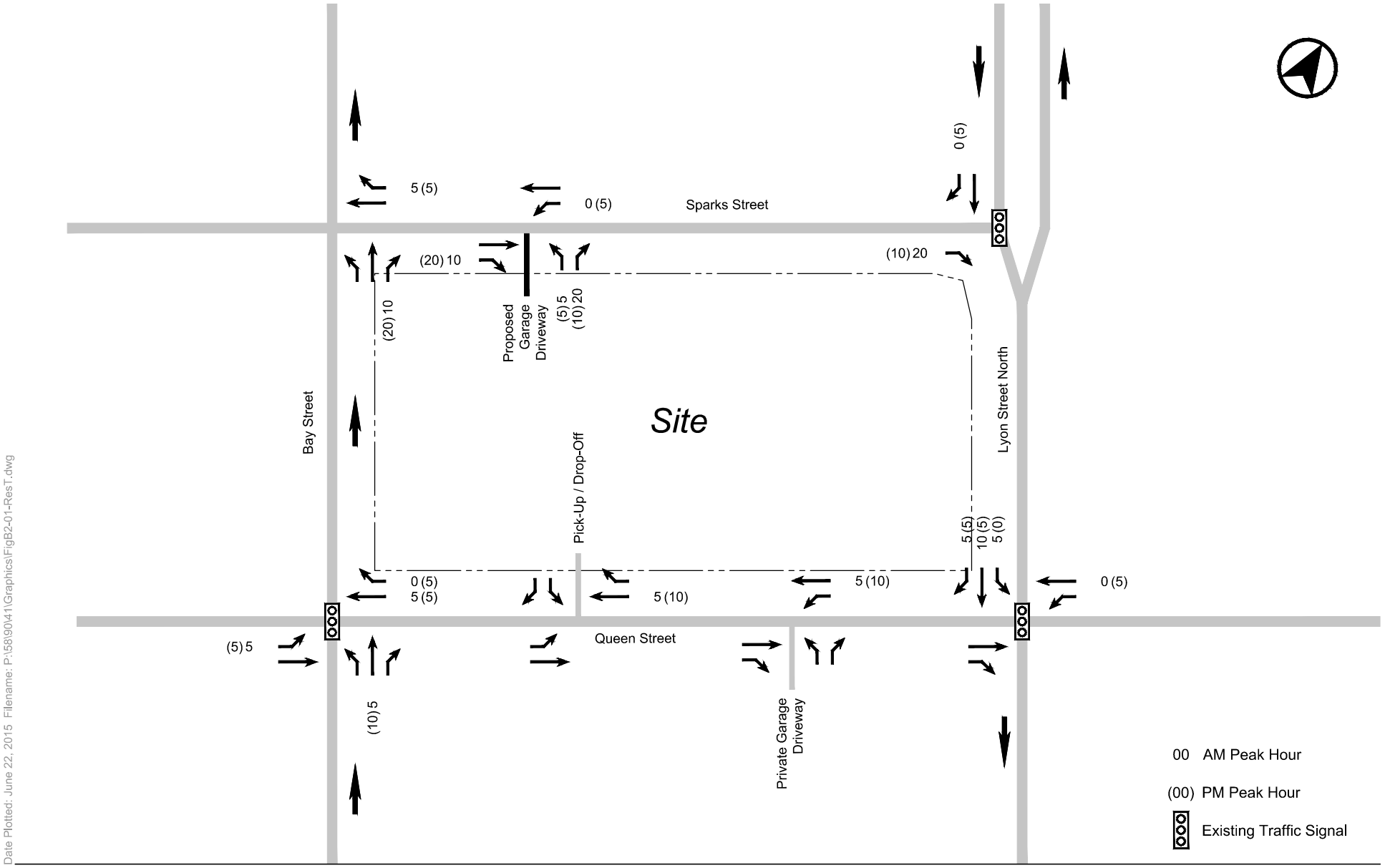
350 Sparks Street Transportation Study
5890-41 June 2015

Figure A5

APPENDIX B:
Traffic Volume Figures

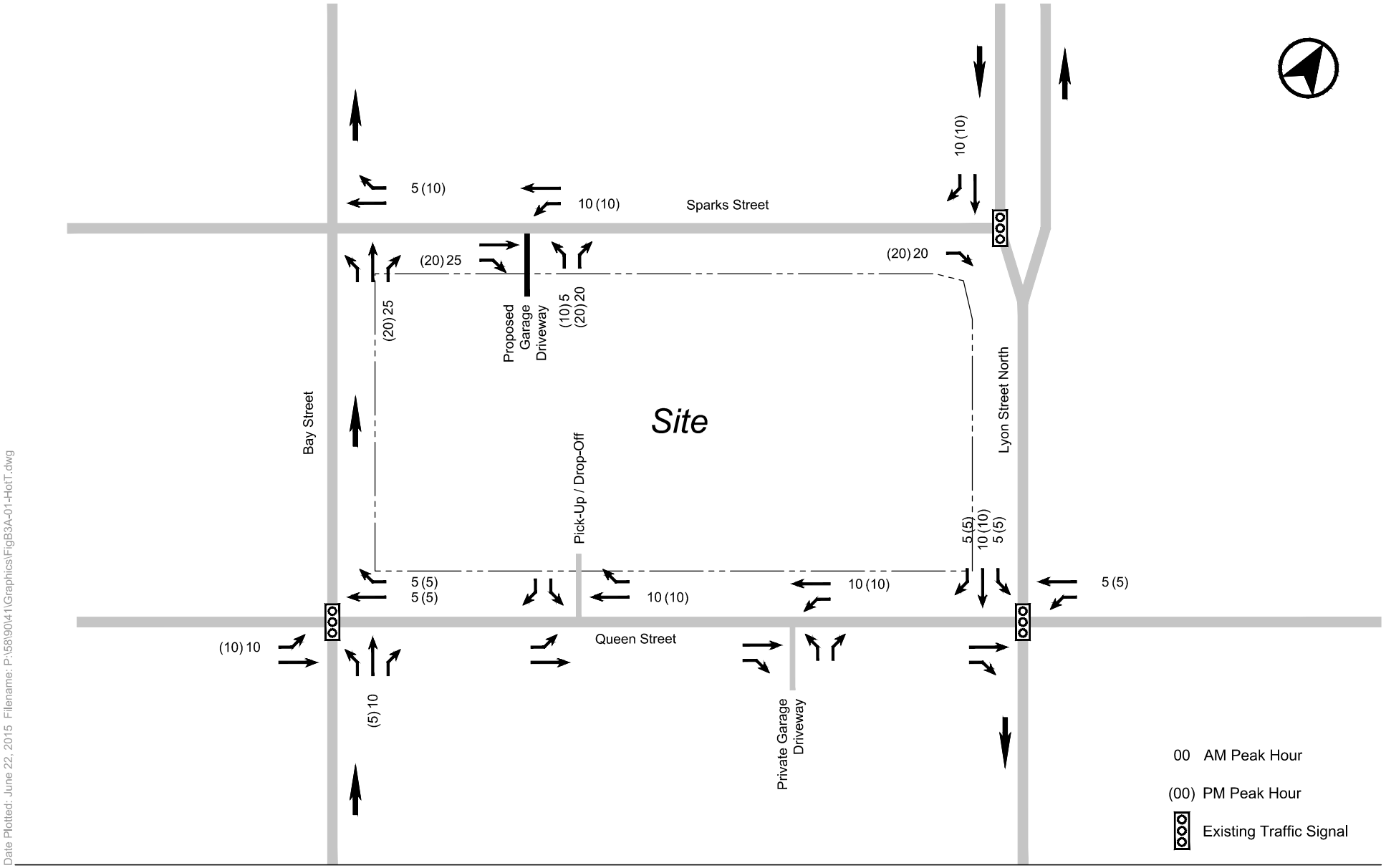


EXISTING TRAFFIC VOLUMES



Date Plotted: June 22, 2015 Filename: P:\5890\41\Graphics\FigB2-01-ResT.dwg

RESIDENTIAL TRAFFIC VOLUMES



Date Plotted: June 22, 2015 Filename: P:\5890\41\Graphics\FigB3A-01-HotT.dwg

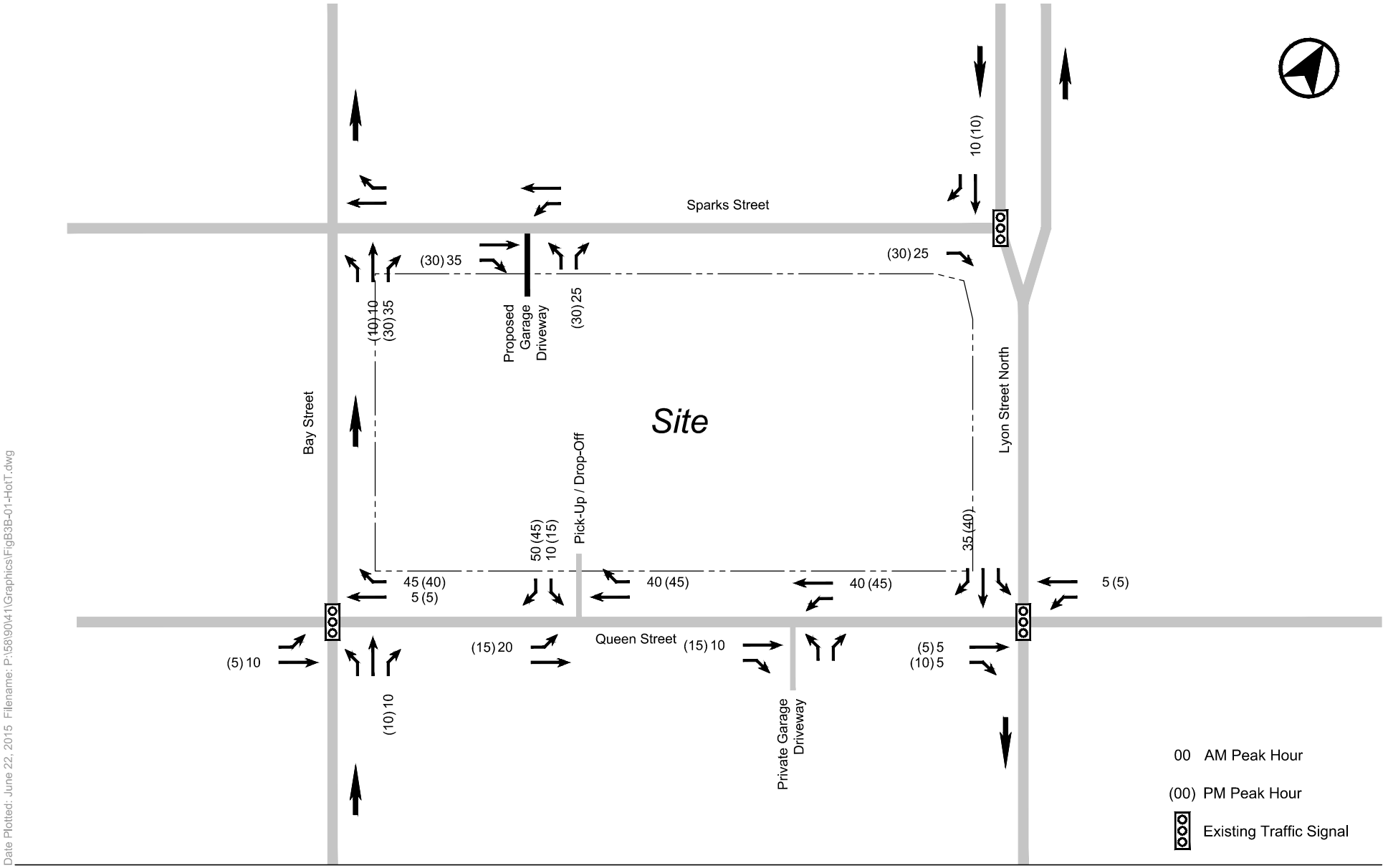
HOTEL TRAFFIC VOLUMES

Guests Travelling Directly to / from Garage

BA Group

350 Sparks Street Transportation Study
5890-41 June 2015

Figure B3a



Date Plotted: June 22, 2015 Filename: P:\5890\41\Graphics\FigB3B-01-HotT.dwg

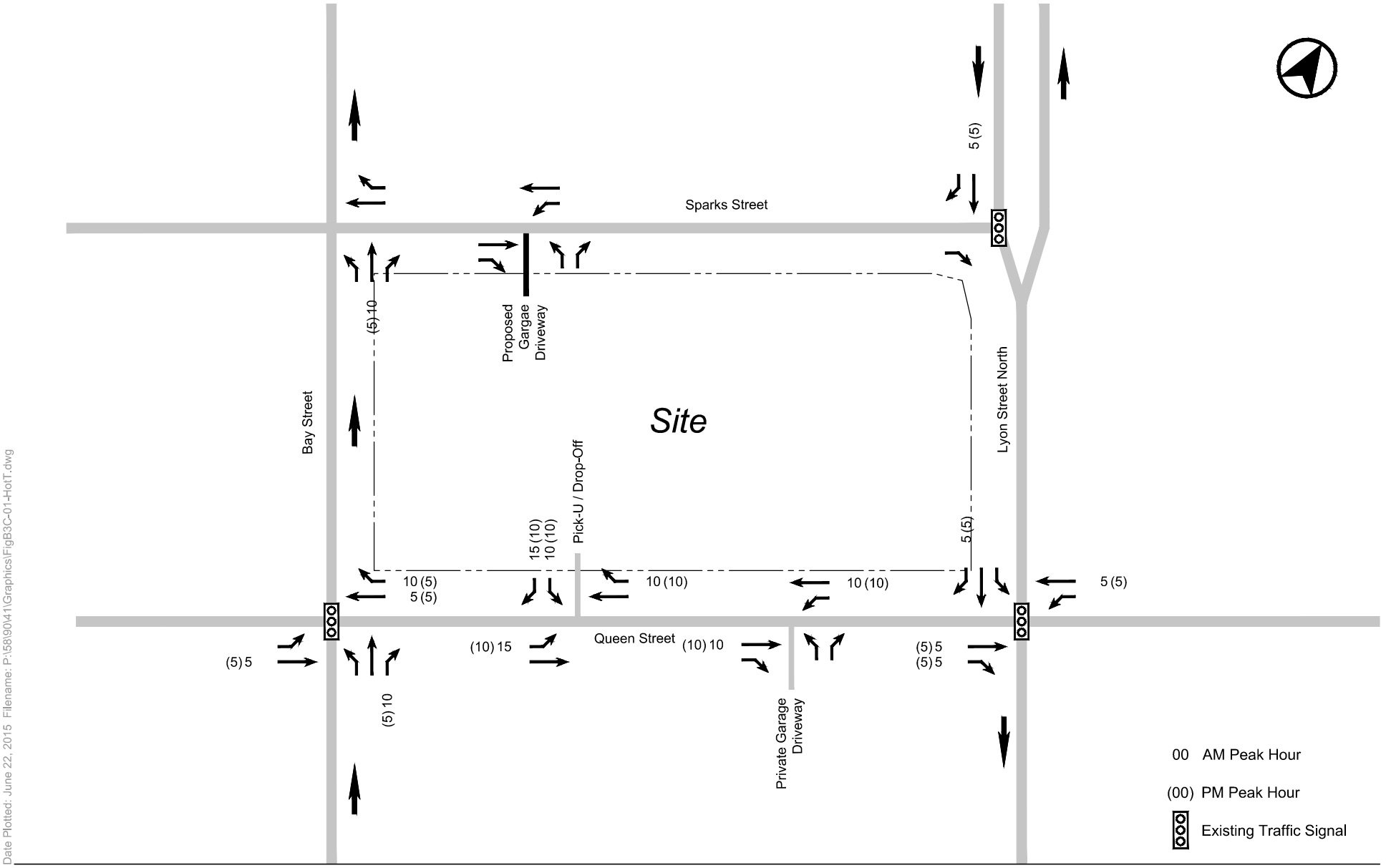
HOTEL TRAFFIC VOLUMES

Guests Using Pick-Up / Drop-Off or Valet Services

BA Group

350 Sparks Street Transportation Study
5890-41 June 2015

Figure B3b



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HOTEL TRAFFIC VOLUMES

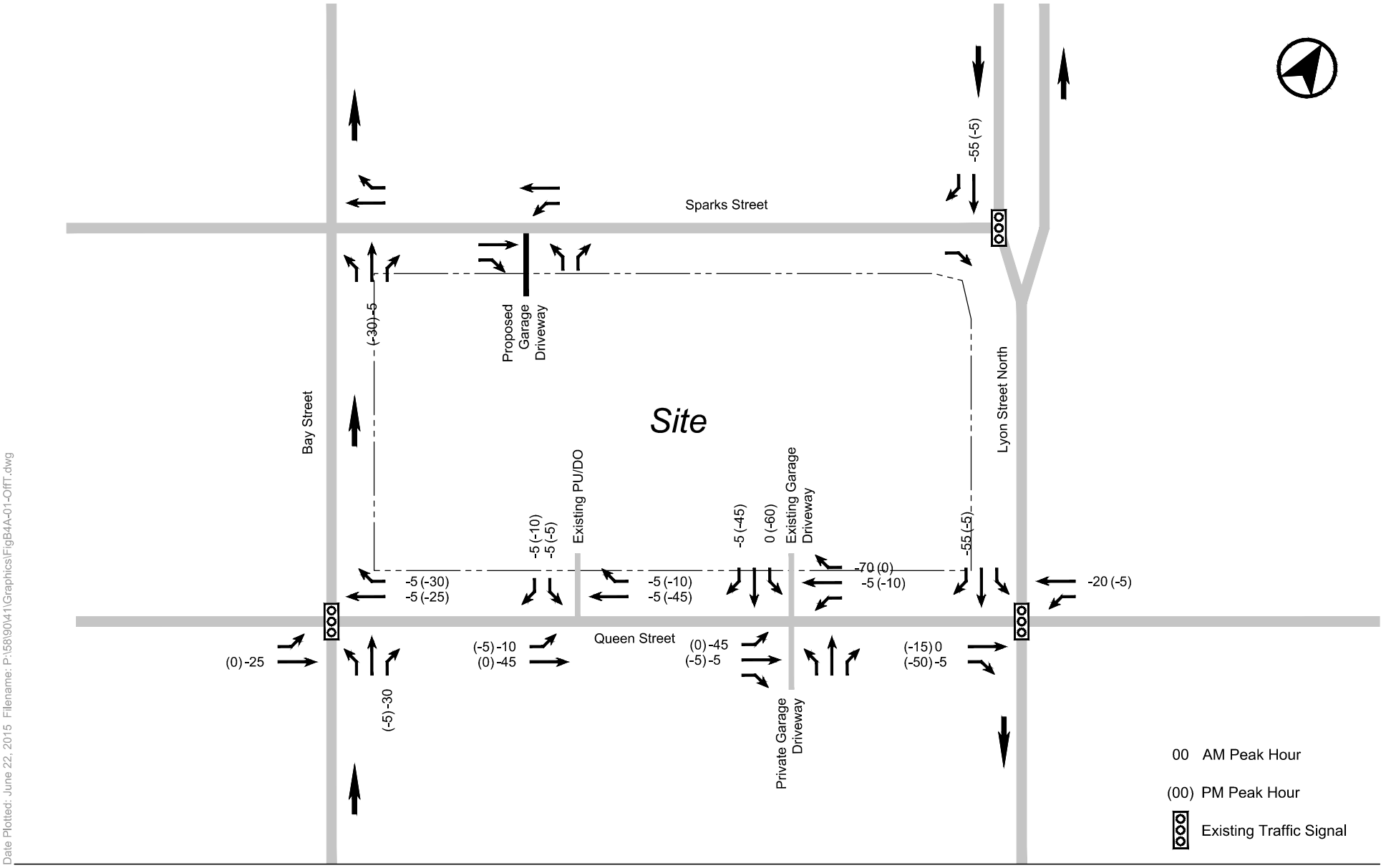
Taxis

BA Group

350 Sparks Street Transportation Study

5890-41 June 2015

Figure B3c



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OFFICE TRAFFIC VOLUMES

Removal of Existing Garage Trips

BA Group

350 Sparks Street Transportation Study
5890-41 June 2015

Figure B4a

Date Plotted: June 22, 2015 Filename: P:\5890\41\Graphics\FigB4B-01-OffT.dwg

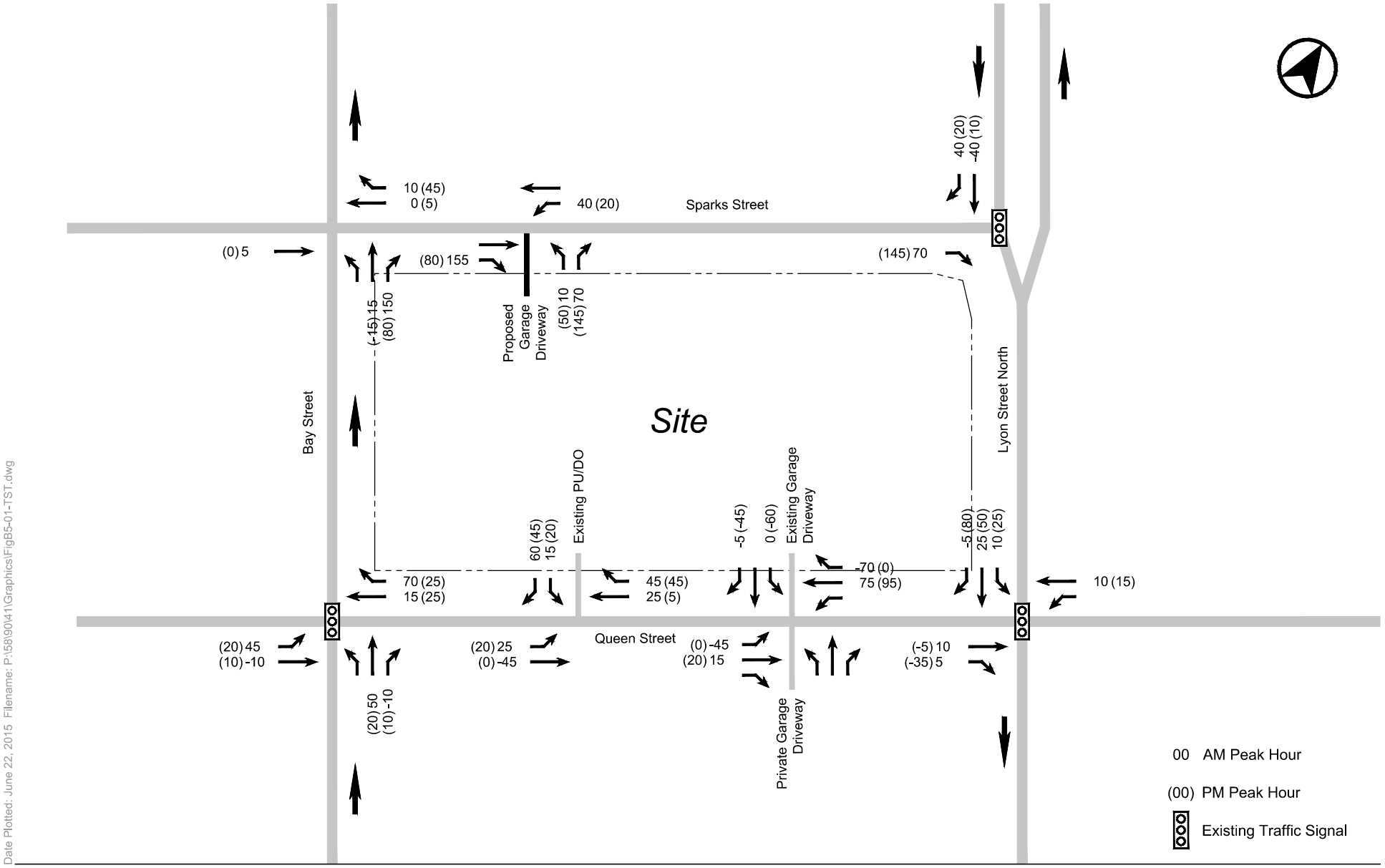
OFFICE TRAFFIC VOLUMES

Reassignment of Office Traffic to New Garage Driveway

BA Group

350 Sparks Street Transportation Study
5890-41 June 2015

Figure B4b



Date Plotted: June 22, 2015 Filename: P:\5890\41\Graphics\FigB5-01-TST.dwg

TOTAL SITE TRAFFIC VOLUMES

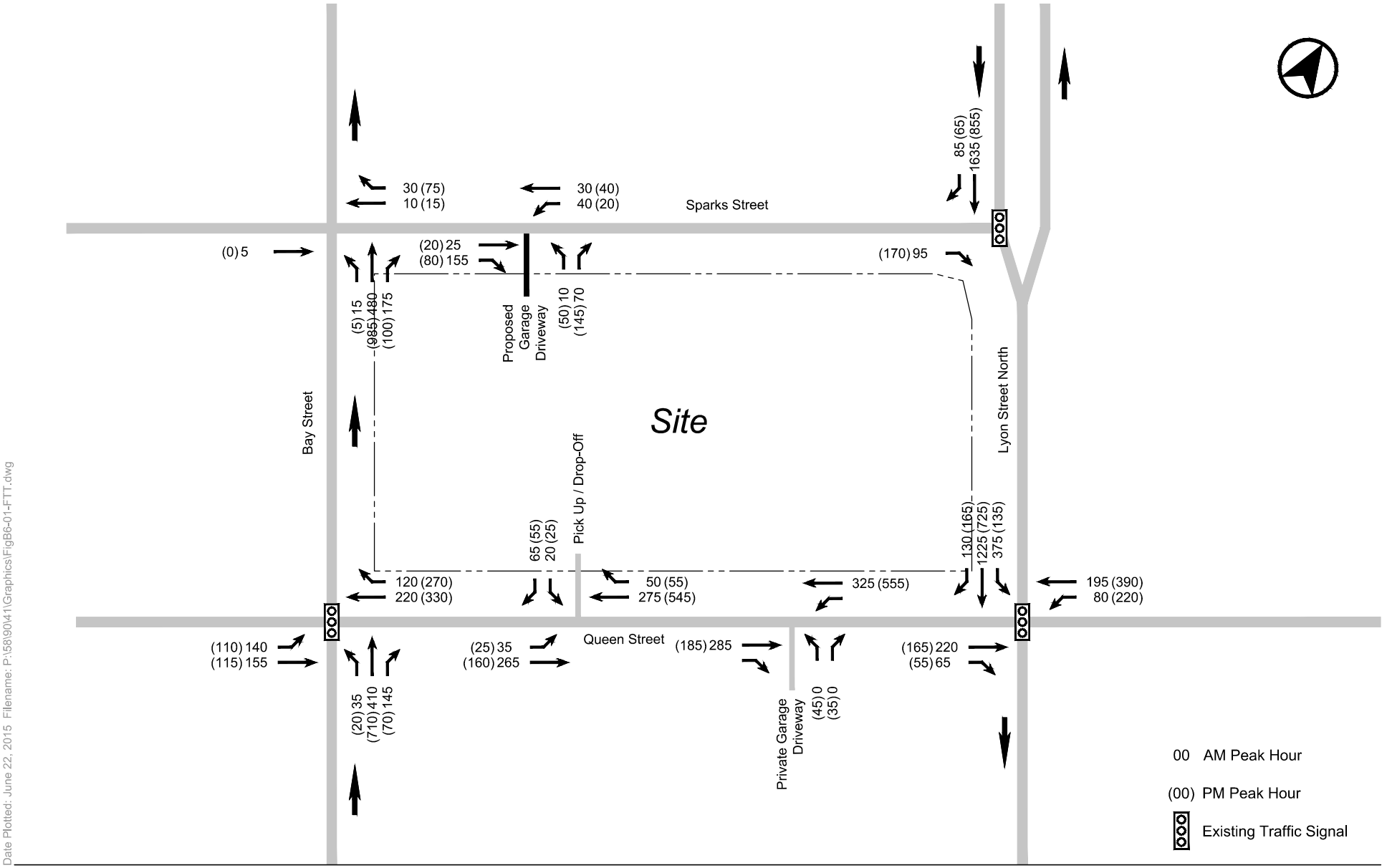
(Net Traffic Changes)

BA Group

350 Sparks Street Transportation Study

5890-41 June 2015

Figure B5



Date Plotted: June 22, 2015 Filename: P:\5890\41\Graphics\FigB6-01-FTT.dwg

FUTURE TOTAL TRAFFIC VOLUMES

(Existing + Net Traffic Change)

APPENDIX C:
Turning Movement Data

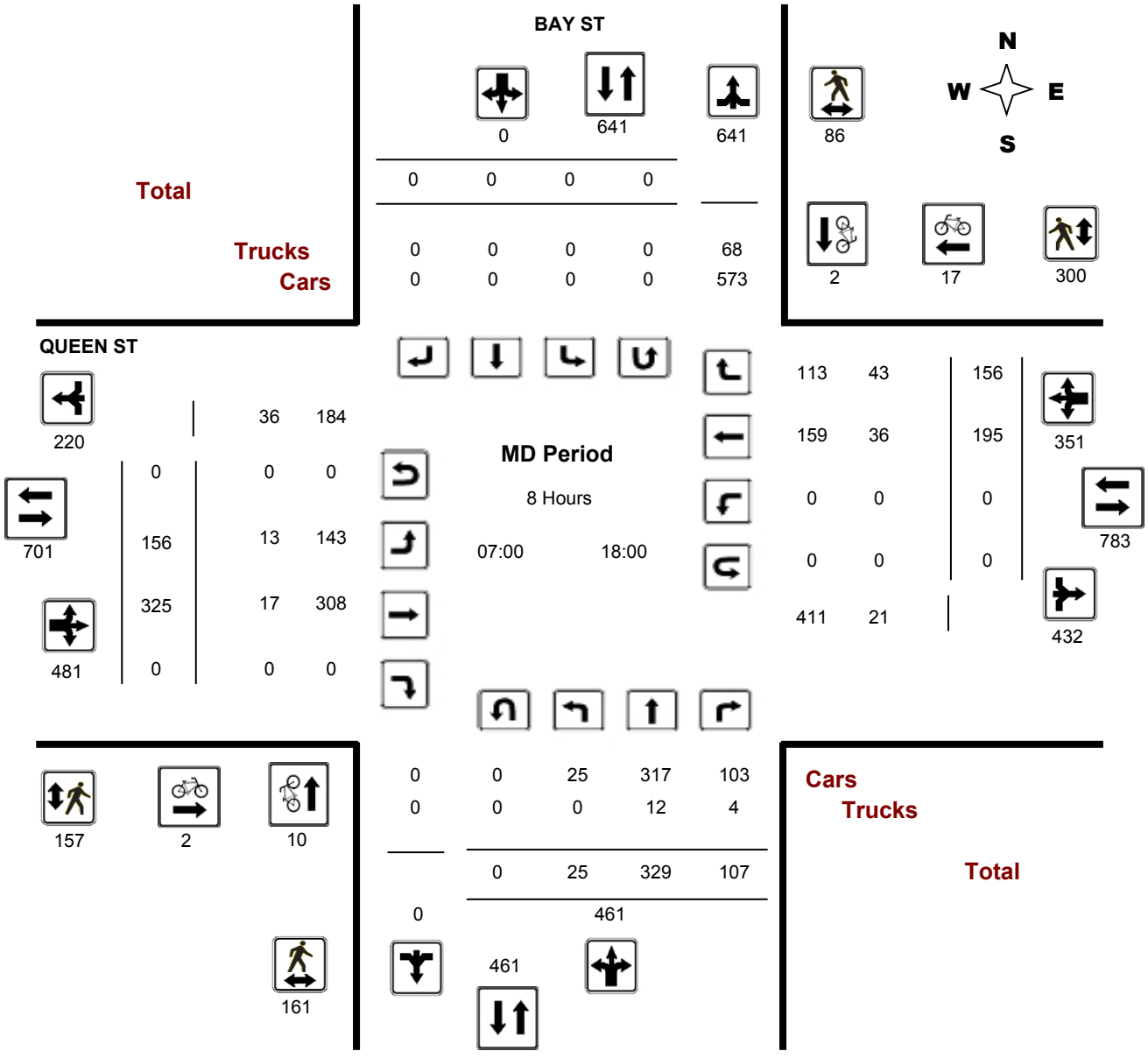
Public Works - Traffic Services

Turning Movements Count - Full Study Diagram

BAY ST @ QUEEN ST

Survey Date: Wednesday, May 01, 2013 **WO#:** 31186

Start Time: 07:00 **Device:**



Validation Note: Results generated Nov 26, 2014. All records still in violation were set to Edited.

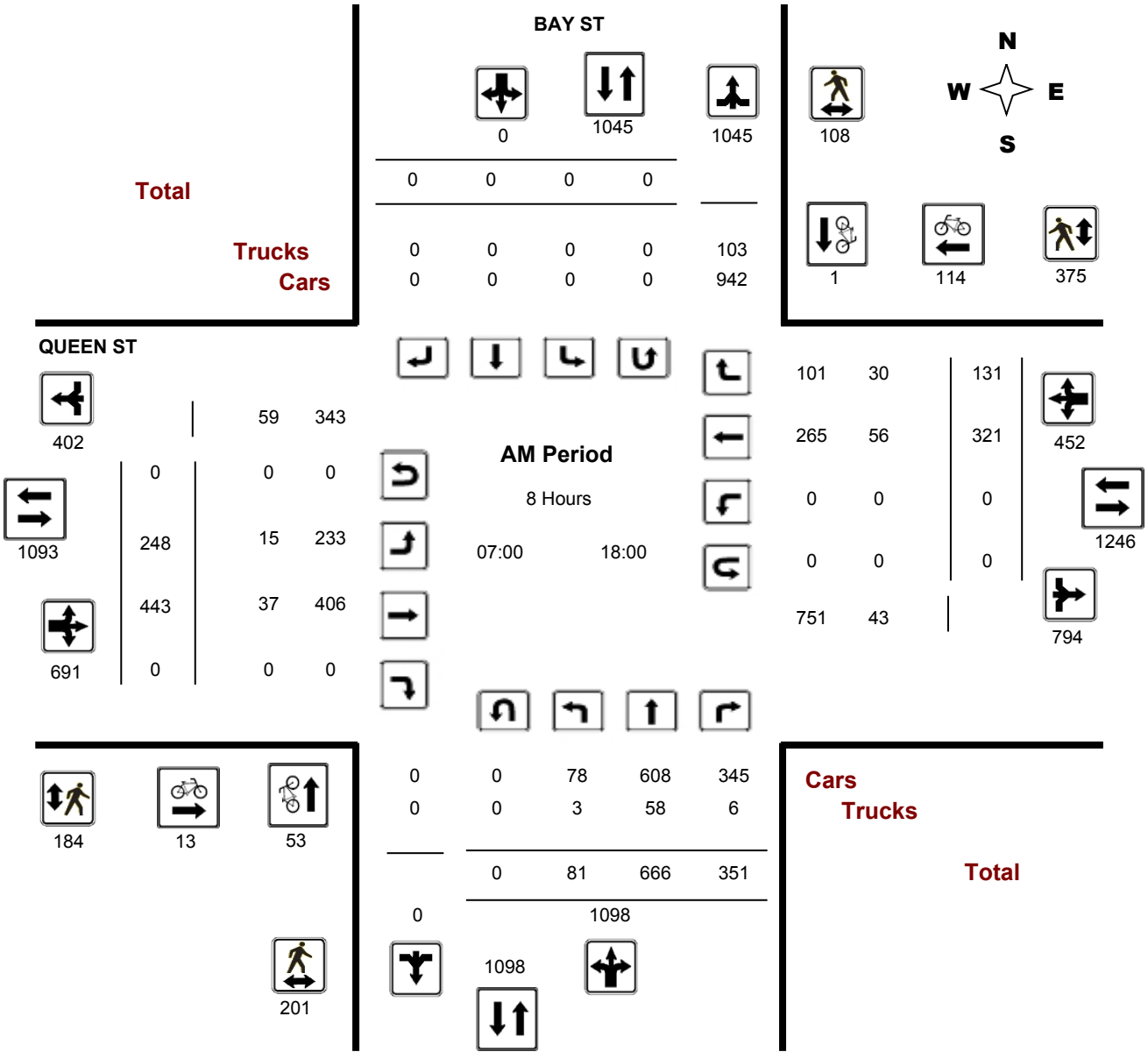
Public Works - Traffic Services

Turning Movements Count - Full Study Diagram

BAY ST @ QUEEN ST

Survey Date: Wednesday, May 01, 2013 **WO#:** 31186

Start Time: 07:00 **Device:**



Validation Note: Results generated Nov 26, 2014. All records still in violation were set to Edited.

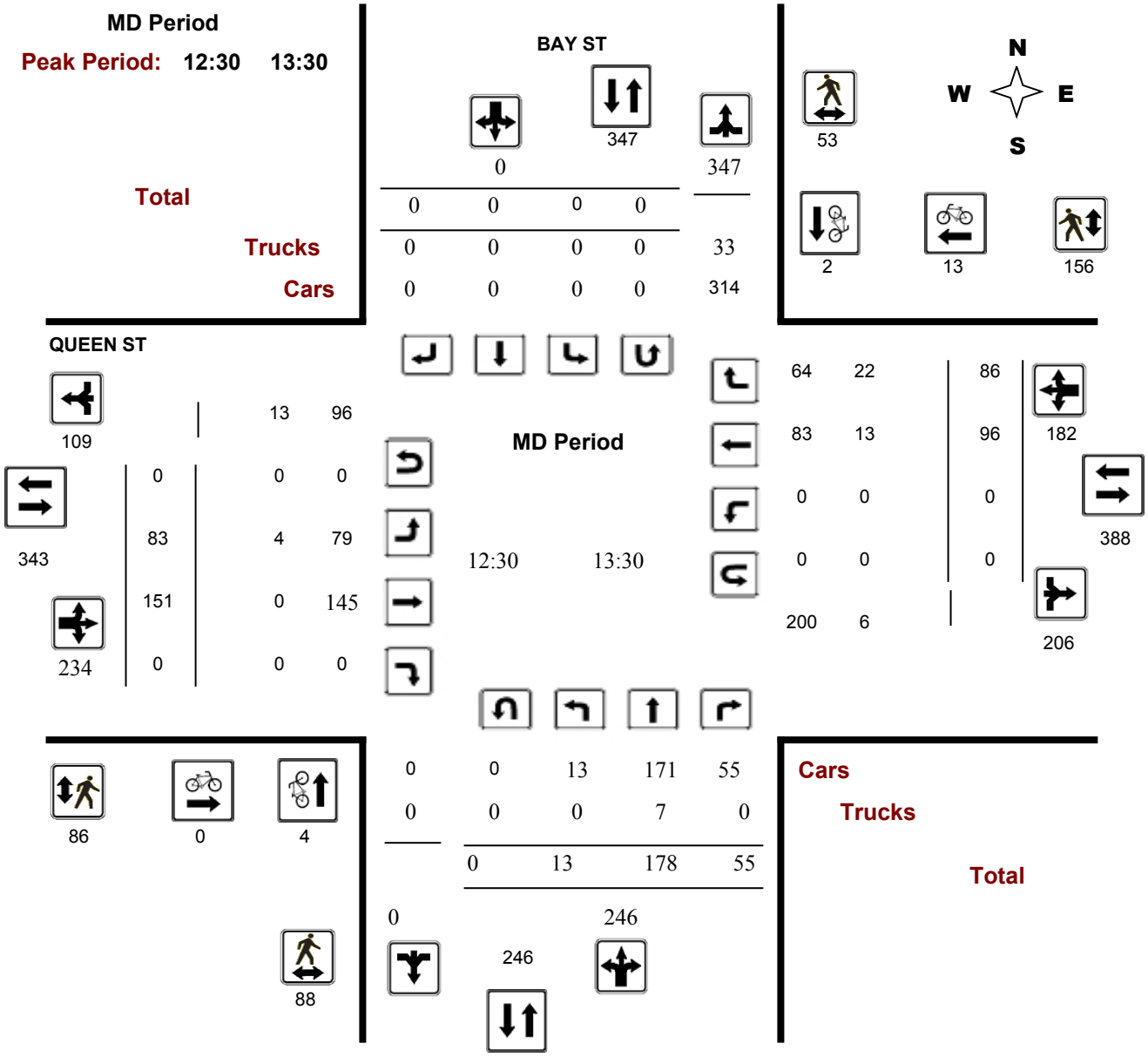
Public Works - Traffic Services

Turning Movements Count - Peak Period Diagram

BAY ST @ QUEEN ST

Survey Date: Wednesday, May 01, 2013 **WO No:** 31186

Start Time: 07:00 **Device:**



Validation Note: Results generated Nov 26, 2014. All records still in violation were set to Edited.

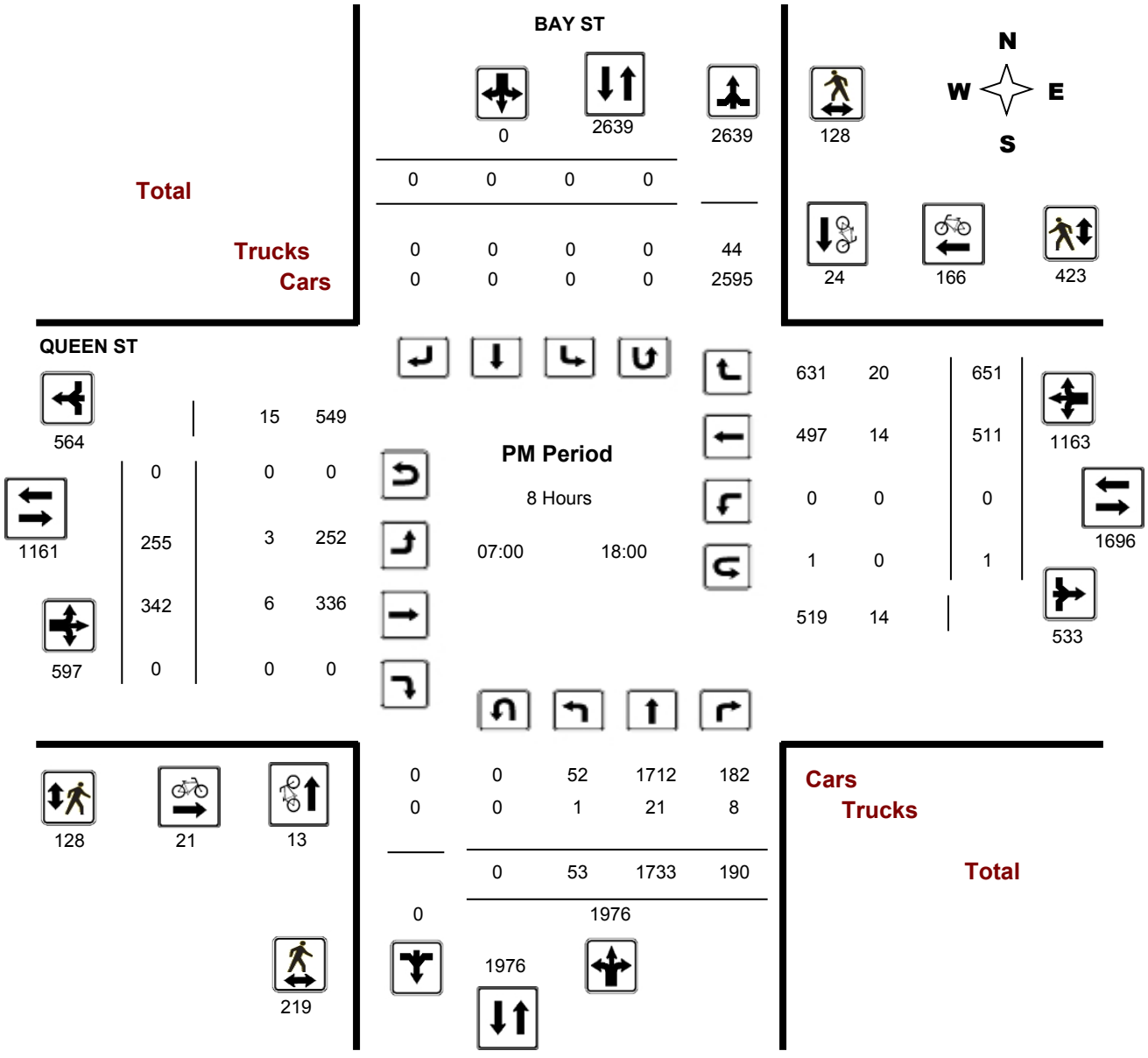
Public Works - Traffic Services

Turning Movements Count - Full Study Diagram

BAY ST @ QUEEN ST

Survey Date: Wednesday, May 01, 2013 **WO#:** 31186

Start Time: 07:00 **Device:**



Validation Note: Results generated Nov 26, 2014. All records still in violation were set to Edited.

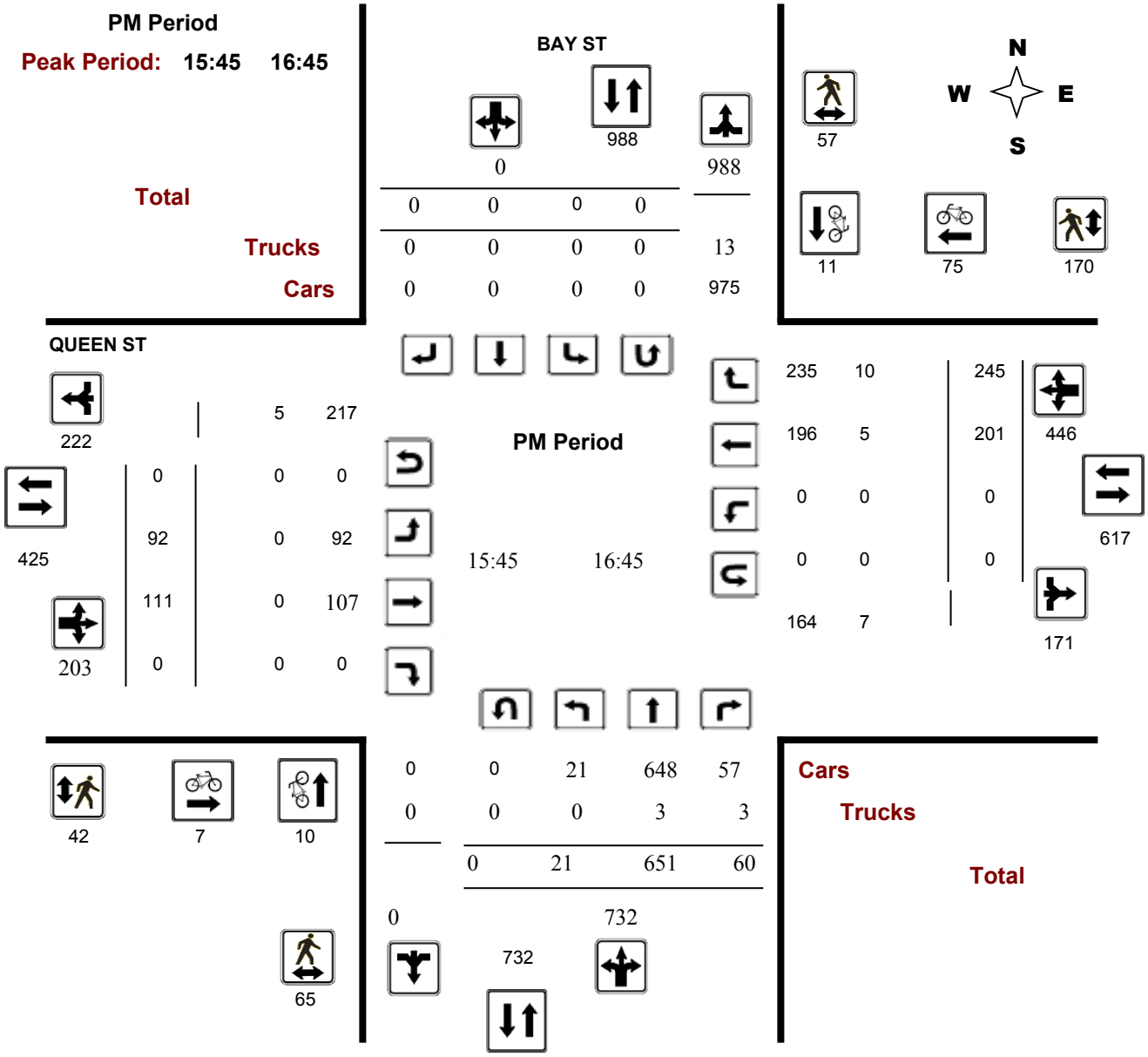
Public Works - Traffic Services

Turning Movements Count - Peak Period Diagram

BAY ST @ QUEEN ST

Survey Date: Wednesday, May 01, 2013 **WO No:** 31186

Start Time: 07:00 **Device:**



Validation Note: Results generated Nov 26, 2014. All records still in violation were set to Edited.

Public Works - Traffic Services

W.O. 31186

Turning Movement Count - 15 Minute Summary Report

BAY ST @ QUEEN ST

Survey Date: Wednesday, May 01, 2013

Total Observed U-Turns

Northbound: 0 Southbound: 0

Eastbound: 0 Westbound: 1

		BAY ST									QUEEN ST									
		Northbound				Southbound					Eastbound				Westbound					
Time Period		LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	Grand Total
07:00	07:15	5	29	21	**55**	0	0	0	**0**	**55**	10	25	0	**35**	0	17	9	**26**	**61**	**116**
07:15	07:30	7	39	22	**68**	0	0	0	**0**	**68**	15	29	0	**44**	0	22	7	**29**	**73**	**141**
07:30	07:45	7	61	18	**86**	0	0	0	**0**	**86**	18	32	0	**50**	0	27	11	**38**	**88**	**174**
07:45	08:00	12	66	25	**103**	0	0	0	**0**	**103**	22	35	0	**57**	0	37	8	**45**	**102**	**205**
08:00	08:15	6	52	36	**94**	0	0	0	**0**	**94**	24	34	0	**58**	0	45	9	**54**	**112**	**206**
08:15	08:30	10	58	30	**98**	0	0	0	**0**	**98**	26	38	0	**64**	0	37	18	**55**	**119**	**217**
08:30	08:45	11	77	46	**134**	0	0	0	**0**	**134**	22	39	0	**61**	0	30	10	**40**	**101**	**235**
08:45	09:00	9	80	43	**132**	0	0	0	**0**	**132**	24	42	0	**66**	0	25	10	**35**	**101**	**233**
09:00	09:15	5	56	35	**96**	0	0	0	**0**	**96**	23	45	0	**68**	0	36	11	**47**	**115**	**211**
09:15	09:30	2	69	28	**99**	0	0	0	**0**	**99**	24	42	0	**66**	0	15	16	**31**	**97**	**196**
09:30	09:45	5	46	25	**76**	0	0	0	**0**	**76**	22	44	0	**66**	0	13	9	**22**	**88**	**164**
09:45	10:00	2	33	22	**57**	0	0	0	**0**	**57**	18	38	0	**56**	0	17	13	**30**	**86**	**143**
11:30	11:45	5	33	10	**48**	0	0	0	**0**	**48**	19	42	0	**61**	0	28	21	**49**	**110**	**158**
11:45	12:00	3	52	9	**64**	0	0	0	**0**	**64**	17	48	0	**65**	0	32	16	**48**	**113**	**177**
12:00	12:15	2	32	22	**56**	0	0	0	**0**	**56**	15	35	0	**50**	0	25	20	**45**	**95**	**151**
12:15	12:30	2	34	11	**47**	0	0	0	**0**	**47**	22	49	0	**71**	0	14	13	**27**	**98**	**145**
12:30	12:45	5	35	9	**49**	0	0	0	**0**	**49**	18	32	0	**50**	0	25	19	**44**	**94**	**143**
12:45	13:00	6	40	12	**58**	0	0	0	**0**	**58**	19	50	0	**69**	0	21	21	**42**	**111**	**169**
13:00	13:15	0	53	12	**65**	0	0	0	**0**	**65**	22	35	0	**57**	0	25	27	**52**	**109**	**174**
13:15	13:30	2	50	22	**74**	0	0	0	**0**	**74**	24	34	0	**58**	0	25	19	**44**	**102**	**176**
15:00	15:15	4	131	21	**156**	0	0	0	**0**	**156**	23	29	0	**52**	0	23	41	**64**	**116**	**272**
15:15	15:30	2	163	16	**181**	0	0	0	**0**	**181**	24	32	0	**56**	0	30	54	**84**	**140**	**321**
15:30	15:45	8	177	7	**192**	0	0	0	**0**	**192**	28	34	0	**62**	0	38	56	**94**	**156**	**348**
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16:30	16:45	8	167	21	**196**	0	0	0	**0**	**196**	23	23	0	**46**	0	63	61	**124**	**170**	**366**
16:45	17:00	3	155	13	**171**	0	0	0	**0**	**171**	22	29	0	**51**	0	48	57	**105**	**156**	**327**
17:00	17:15	4	142	16	**162**	0	0	0	**0**	**162**	18	32	0	**50**	0	52	55	**108**	**158**	**320**
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17:30	17:45	3	89	19	**111**	0	0	0	**0**	**111**	21	29	0	**50**	0	40	43	**83**	**133**	**244**
17:45	18:00	4	102	21	**127**	0	0	0	**0**	**127**	12	22	0	**34**	0	29	39	**68**	**102**	**229**
Total		159	2728	648	**3535**	0	0	0	**0**	**3535**	659	1110	0	**1769**	0	1027	938	**1966**	**3735**	**7270**

Note: U-Turns are included in Totals.

Validation Note: **Results generated Nov 26, 2014. All records still in violation were set to Edited.**

Public Works - Traffic Services

Turning Movement Count - Cyclist Volume Report

Work Order
31186

BAY ST @ QUEEN ST

Count Date: Wednesday, May 01, 2013 **Start Time:** 07:00

	BAY ST			QUEEN ST			
Time Period	Northbound	Southbound	**Street Total**	Eastbound	Westbound	**Street Total**	**Grand Total**
07:00 08:00	20	0	**20**	3	36	**39**	**59**
08:00 09:00	19	0	**19**	7	65	**72**	**91**
09:00 10:00	14	1	**15**	3	13	**16**	**31**
11:30 12:30	6	0	**6**	2	4	**6**	**12**
12:30 13:30	4	2	**6**	0	13	**13**	**19**
15:00 16:00	2	1	**3**	3	30	**33**	**36**
16:00 17:00	10	15	**25**	9	78	**87**	**112**
17:00 18:00	1	8	**9**	9	58	**67**	**76**
Total	76	27	**103**	36	297	**333**	**436**

Validation Note: Results generated Nov 26, 2014. All records still in violation were set to Edited.

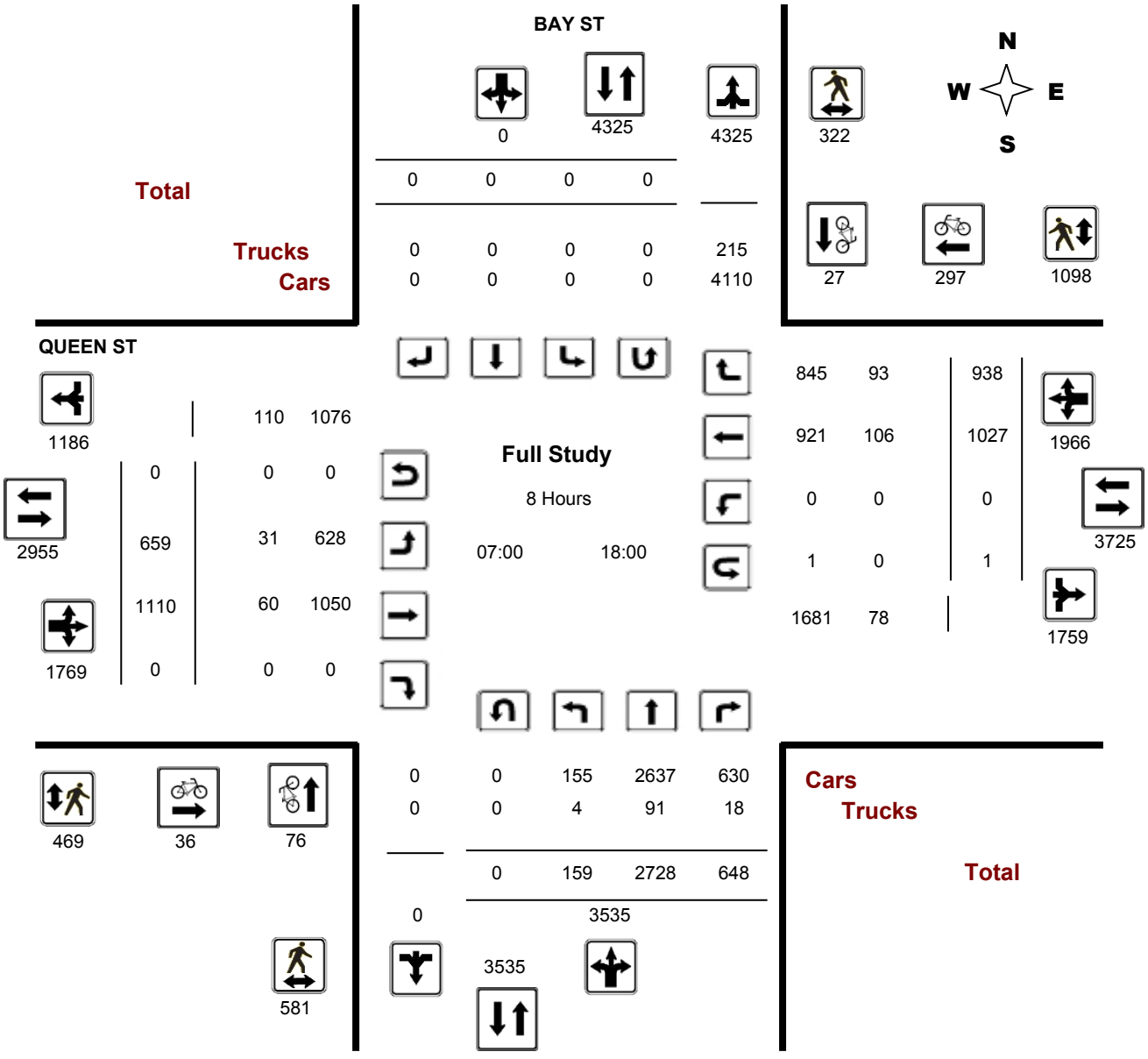
Public Works - Traffic Services

Turning Movements Count - Full Study Diagram

BAY ST @ QUEEN ST

Survey Date: Wednesday, May 01, 2013 **WO#:** 31186

Start Time: 07:00 **Device:**



Validation Note: Results generated Nov 26, 2014. All records still in violation were set to Edited.

Public Works - Traffic Services

W.O. 31186

Turning Movement Count - Heavy Vehicle Report

BAY ST @ QUEEN ST

Survey Date: Wednesday, May 01, 2013

		BAY ST									QUEEN ST									
		Northbound				Southbound					Eastbound				Westbound					
Time Period		LT	ST	RT	**N TOT**	LT	ST	RT	**S TOT**	**STR TOT**	LT	ST	RT	**E TOT**	LT	ST	RT	**W TOT**	**STR TOT**	**Grand Total**
07:00	08:00	2	30	2	**34**	0	0	0	**0**	**34**	0	4	0	**4**	0	11	5	**16**	**20**	**54**
08:00	09:00	1	15	2	**18**	0	0	0	**0**	**18**	6	10	0	**16**	0	19	6	**25**	**41**	**59**
09:00	10:00	0	13	2	**15**	0	0	0	**0**	**15**	9	23	0	**32**	0	26	19	**45**	**77**	**92**
11:30	12:30	0	5	4	**9**	0	0	0	**0**	**9**	9	11	0	**20**	0	23	21	**44**	**64**	**73**
12:30	13:30	0	7	0	**7**	0	0	0	**0**	**7**	4	6	0	**10**	0	13	22	**35**	**45**	**52**
15:00	16:00	1	9	5	**15**	0	0	0	**0**	**15**	3	1	0	**4**	0	7	14	**21**	**25**	**40**
16:00	17:00	0	5	2	**7**	0	0	0	**0**	**7**	0	4	0	**4**	0	4	3	**7**	**11**	**18**
17:00	18:00	0	7	1	**8**	0	0	0	**0**	**8**	0	1	0	**1**	0	3	3	**6**	**7**	**15**
Total :		4	91	18	**113**	0	0	0	**0**	**113**	31	60	0	**91**	0	106	93	**199**	**290**	**403**

Heavy Vehicles are vehicles having one rear axle with four or more wheels, or having two or more rear axles. These vehicles include most O.C. Transpo, school and inter-city buses. Further, they ARE included in the Turning Movement Count Summary.

CITY OPERATIONS - PUBLIC WORKS

Turning Movement Count - Pedestrian Volume Report

Work Order 31186

BAY ST @ QUEEN ST

Count Date: Wednesday, May 01, 2013 **Start Time:** 07:00

		BAY ST			QUEEN ST			
Time Period		Northbound	Southbound	**Street Total**	Eastbound	Westbound	**Street Total**	**Grand Total**
07:00	07:15	18	4	**22**	3	25	**28**	**50**
07:15	07:30	17	14	**31**	8	39	**47**	**78**
07:30	07:45	12	17	**29**	15	38	**53**	**82**
07:45	08:00	22	11	**33**	19	48	**67**	**100**
07:00	08:00	69	46	**115**	45	150	**195**	**310**
08:00	08:15	15	9	**24**	44	41	**85**	**109**
08:15	08:30	22	17	**39**	33	38	**71**	**110**
08:30	08:45	27	13	**40**	15	52	**67**	**107**
08:45	09:00	14	6	**20**	13	37	**50**	**70**
08:00	09:00	78	45	**123**	105	168	**273**	**396**
09:00	09:15	20	7	**27**	6	20	**26**	**53**
09:15	09:30	16	5	**21**	10	18	**28**	**49**
09:30	09:45	14	2	**16**	12	6	**18**	**34**
09:45	10:00	4	3	**7**	6	13	**19**	**26**
09:00	10:00	54	17	**71**	34	57	**91**	**162**
11:30	11:45	16	11	**27**	12	24	**36**	**63**
11:45	12:00	8	6	**14**	17	26	**43**	**57**
12:00	12:15	25	7	**32**	19	54	**73**	**105**
12:15	12:30	24	9	**33**	23	40	**63**	**96**
11:30	12:30	73	33	**106**	71	144	**215**	**321**
12:30	12:45	15	15	**30**	24	54	**78**	**108**
12:45	13:00	13	12	**25**	24	43	**67**	**92**
13:00	13:15	36	8	**44**	17	24	**41**	**85**
13:15	13:30	24	18	**42**	21	35	**56**	**98**
12:30	13:30	88	53	**141**	86	156	**242**	**383**
15:00	15:15	12	5	**17**	11	16	**27**	**44**
15:15	15:30	19	11	**30**	4	26	**30**	**60**
15:30	15:45	25	9	**34**	10	26	**36**	**70**
15:45	16:00	9	13	**22**	9	35	**44**	**66**
15:00	16:00	65	38	**103**	34	103	**137**	**240**
16:00	16:15	17	17	**34**	10	45	**55**	**89**
16:15	16:30	25	9	**34**	11	46	**57**	**91**
16:30	16:45	14	18	**32**	12	44	**56**	**88**
16:45	17:00	18	7	**25**	17	42	**59**	**84**
16:00	17:00	74	51	**125**	50	177	**227**	**352**
17:00	17:15	21	10	**31**	9	35	**44**	**75**
17:15	17:30	25	15	**40**	9	46	**55**	**95**
17:30	17:45	9	2	**11**	15	37	**52**	**63**
17:45	18:00	25	12	**37**	11	25	**36**	**73**
17:00	18:00	80	39	**119**	44	143	**187**	**306**
Total	.....	581	322	**903**	469	1098	**1567**	**2470**

Validation Note: Results generated Nov 26, 2014. All records still in violation were set to Edited.

Public Works - Traffic Services

Turning Movement Count - Summary Report

Work Order
31186

BAY ST @ QUEEN ST

Survey Date: Wednesday, May 01, 2013

Total Observed U-Turns

Northbound: 0 Southbound: 0

Eastbound: 0 Westbound: 1

AADT Factor

.90

Full Study

	BAY ST									QUEEN ST									
	Northbound				Southbound					Eastbound				Westbound					
Period	LT	ST	RT	**NB TOT**	LT	ST	RT	**SB TOT**	**STR TOT**	LT	ST	RT	**EB TOT**	LT	ST	RT	**WB TOT**	**STR TOT**	**Grand Total**
07:00 08:00	31	195	86	**312**	0	0	0	**0**	**312**	65	121	0	**186**	0	103	35	**138**	**324**	**636**
08:00 09:00	36	267	155	**458**	0	0	0	**0**	**458**	96	153	0	**249**	0	137	47	**184**	**433**	**891**
09:00 10:00	14	204	110	**328**	0	0	0	**0**	**328**	87	169	0	**256**	0	81	49	**130**	**386**	**714**
11:30 12:30	12	151	52	**215**	0	0	0	**0**	**215**	73	174	0	**247**	0	99	70	**169**	**416**	**631**
12:30 13:30	13	178	55	**246**	0	0	0	**0**	**246**	83	151	0	**234**	0	96	86	**182**	**416**	**662**
15:00 16:00	20	640	56	**716**	0	0	0	**0**	**716**	97	124	0	**221**	0	130	219	**349**	**570**	**1286**
16:00 17:00	18	637	61	**716**	0	0	0	**0**	**716**	92	111	0	**203**	0	210	234	**444**	**647**	**1363**
17:00 18:00	15	456	73	**544**	0	0	0	**0**	**544**	66	107	0	**173**	0	171	198	**369**	**542**	**1086**
Total	159	2728	648	**3535**	0	0	0	**0**	**3535**	659	1110	0	**1769**	0	1027	938	**1965**	**3734**	**7269**
Equ 12Hr	221	3791	900	**4912**	0	0	0	**0**	**4912**	916	1542	0	**2458**	0	1427	1303	**2730**	**5188**	**10100**

Note: These values are calculated by multiplying the totals by the appropriate expansion factor. **1.39**

Avg 12Hr	198	3412	810	**4420**	0	0	0	**0**	**4420**	824	1387	0	**2212**	0	1284	1172	**2457**	**4669**	**9090**

Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor. **.90**

Avg 24Hr	259	4469	1061	**5790**	0	0	0	**0**	**5790**	1079	1816	0	**2897**	0	1682	1535	**3218**	**6116**	**11907**

Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor. **1.31**

Validation Note: Results generated Nov 26, 2014. All records still in violation were set to Edited.

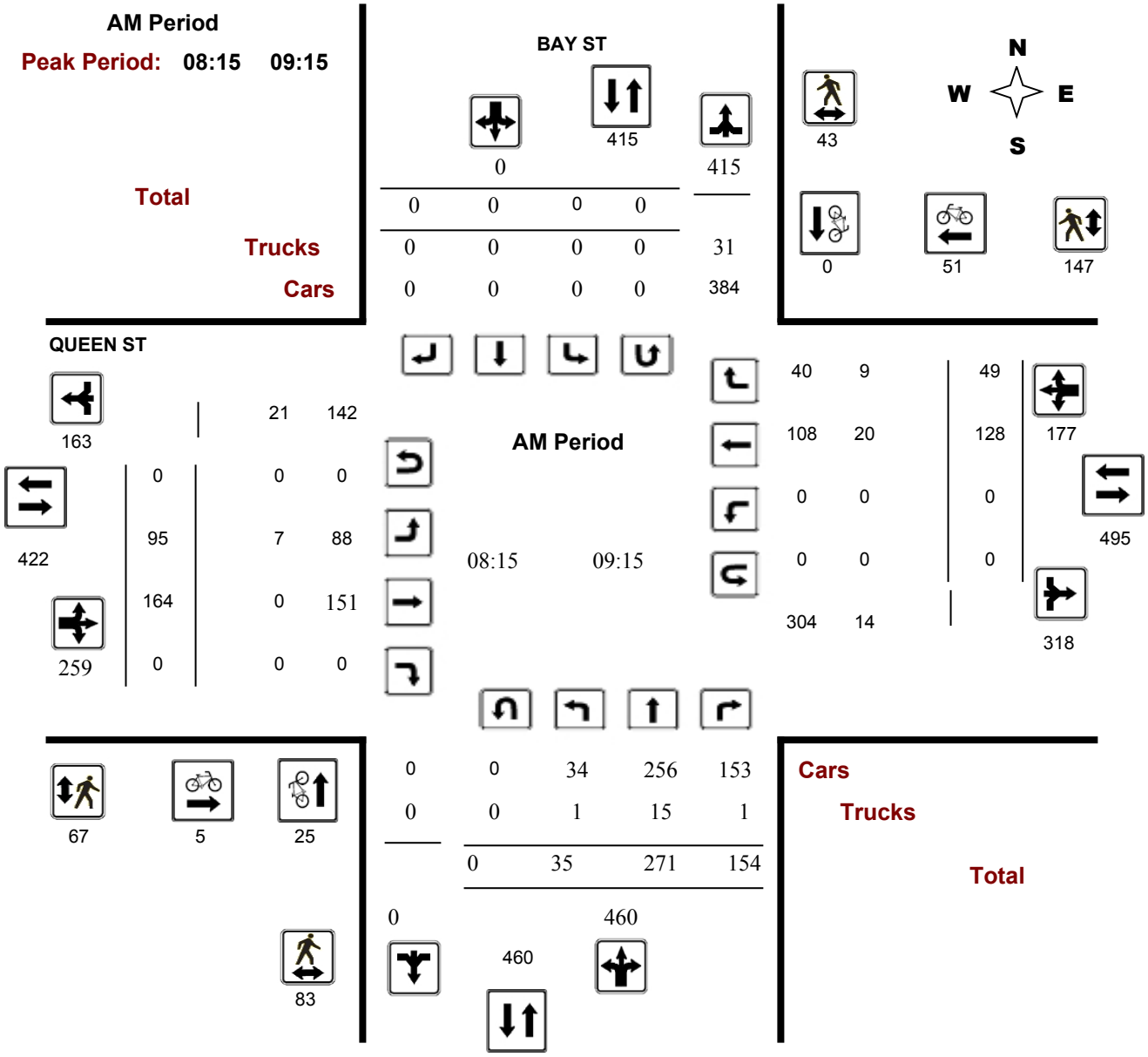
Public Works - Traffic Services

Turning Movements Count - Peak Period Diagram

BAY ST @ QUEEN ST

Survey Date: Wednesday, May 01, 2013 **WO No:** 31186

Start Time: 07:00 **Device:**



Validation Note: Results generated Nov 26, 2014. All records still in violation were set to Edited.

Public Works - Traffic Services

W.O. 34544

Turning Movement Count - 15 Minute Summary Report

BAY ST @ SPARKS ST

Survey Date: Thursday, April 23, 2015

Total Observed U-Turns

Northbound: 0 Southbound: 0

Eastbound: 0 Westbound: 1

		BAY ST									SPARKS ST									
		Northbound				Southbound					Eastbound				Westbound					
Time Period		LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	Grand Total
07:00	07:15	2	79	2	**83**	0	0	0	**0**	**83**	0	0	0	**0**	0	1	6	**7**	**7**	**90**
07:15	07:30	3	82	4	**89**	0	0	0	**0**	**89**	0	0	0	**0**	0	5	3	**8**	**8**	**97**
07:30	07:45	2	103	3	**108**	0	0	0	**0**	**108**	0	0	0	**0**	0	6	4	**10**	**10**	**118**
07:45	08:00	6	122	4	**132**	0	0	0	**0**	**132**	0	0	0	**0**	0	3	4	**7**	**7**	**139**
08:00	08:15	4	98	10	**112**	0	0	0	**0**	**112**	0	0	0	**0**	0	3	8	**11**	**11**	**123**
08:15	08:30	2	121	5	**128**	0	0	0	**0**	**128**	0	0	0	**0**	0	3	5	**8**	**8**	**136**
08:30	08:45	1	123	4	**128**	0	0	0	**0**	**128**	0	0	0	**0**	0	3	5	**9**	**9**	**137**
08:45	09:00	2	100	9	**111**	0	0	0	**0**	**111**	0	0	0	**0**	0	3	1	**4**	**4**	**115**
09:00	09:15	0	109	6	**115**	0	0	0	**0**	**115**	0	0	0	**0**	0	7	6	**13**	**13**	**128**
09:15	09:30	4	90	3	**97**	0	0	0	**0**	**97**	1	0	0	**1**	0	5	3	**8**	**9**	**106**
09:30	09:45	5	70	7	**82**	0	0	0	**0**	**82**	0	0	0	**0**	0	5	1	**6**	**6**	**88**
09:45	10:00	1	64	9	**74**	0	0	0	**0**	**74**	0	0	0	**0**	0	3	3	**6**	**6**	**80**
11:30	11:45	8	83	3	**94**	0	0	0	**0**	**94**	0	0	0	**0**	0	2	3	**5**	**5**	**99**
11:45	12:00	4	98	3	**105**	0	0	0	**0**	**105**	1	0	0	**1**	0	6	0	**6**	**7**	**112**
12:00	12:15	1	81	8	**90**	0	0	0	**0**	**90**	0	1	0	**1**	0	2	4	**6**	**7**	**97**
12:15	12:30	2	92	2	**96**	0	0	0	**0**	**96**	1	0	0	**1**	0	2	1	**3**	**4**	**100**
12:30	12:45	1	102	1	**104**	0	0	0	**0**	**104**	0	0	0	**0**	0	5	1	**6**	**6**	**110**
12:45	13:00	1	76	6	**83**	0	0	0	**0**	**83**	0	0	0	**0**	0	0	4	**4**	**4**	**87**
13:00	13:15	4	111	4	**119**	0	0	0	**0**	**119**	0	0	0	**0**	0	2	4	**6**	**6**	**125**
13:15	13:30	5	87	7	**99**	0	0	0	**0**	**99**	0	0	0	**0**	0	1	2	**3**	**3**	**102**
15:00	15:15	0	213	0	**213**	0	0	0	**0**	**213**	0	0	0	**0**	0	5	6	**11**	**11**	**224**
15:15	15:30	2	256	5	**263**	0	0	0	**0**	**263**	1	1	0	**2**	0	5	5	**10**	**12**	**275**
15:30	15:45	2	254	3	**259**	0	0	0	**0**	**259**	2	0	0	**2**	0	0	4	**4**	**6**	**265**
15:45	16:00	1	255	5	**261**	0	0	0	**0**	**261**	1	1	0	**2**	0	3	3	**6**	**8**	**269**
16:00	16:15	2	240	5	**247**	0	0	0	**0**	**247**	2	0	0	**2**	0	3	11	**14**	**16**	**263**
16:15	16:30	1	260	5	**266**	0	0	0	**0**	**266**	1	1	0	**2**	0	1	6	**7**	**9**	**275**
16:30	16:45	2	250	5	**257**	0	0	0	**0**	**257**	0	1	0	**1**	0	2	9	**11**	**12**	**269**
16:45	17:00	1	241	2	**244**	0	0	0	**0**	**244**	1	0	0	**1**	0	3	7	**10**	**11**	**255**
17:00	17:15	3	236	5	**244**	0	0	0	**0**	**244**	2	0	0	**2**	0	3	7	**10**	**12**	**256**
17:15	17:30	3	236	2	**241**	0	0	0	**0**	**241**	2	0	0	**2**	0	3	7	**10**	**12**	**253**
17:30	17:45	2	173	4	**179**	0	0	0	**0**	**179**	1	0	0	**1**	0	4	2	**6**	**7**	**186**
17:45	18:00	4	161	4	**169**	0	0	0	**0**	**169**	1	2	0	**3**	1	3	1	**5**	**8**	**177**
TOTAL:		81	4666	145	**4892**	0	0	0	**0**	**4892**	17	7	0	**24**	1	102	136	**240**	**264**	**5156**

Note: U-Turns are included in Totals.

Comment:

Public Works - Traffic Services

Turning Movement Count - Cyclist Volume Report

Work Order
34544

BAY ST @ SPARKS ST

Count Date: Thursday, April 23, 2015 **Start Time:** 07:00

	BAY ST			SPARKS ST			
Time Period	Northbound	Southbound	**Street Total**	Eastbound	Westbound	**Street Total**	**Grand Total**
07:00 08:00	24	5	**29**	2	0	**2**	**31**
08:00 09:00	52	0	**52**	0	0	**0**	**52**
09:00 10:00	34	1	**35**	1	0	**1**	**36**
11:30 12:30	9	0	**9**	0	0	**0**	**9**
12:30 13:30	6	0	**6**	0	2	**2**	**8**
15:00 16:00	28	0	**28**	0	3	**3**	**31**
16:00 17:00	59	0	**59**	0	16	**16**	**75**
17:00 18:00	48	1	**49**	2	4	**6**	**55**
Total	260	7	**267**	5	25	**30**	**297**

Comment:

Note: These volumes consists of bicycles only (no mopeds or motorcycles) and ARE NOT included in the Turning Movement Count Summary.

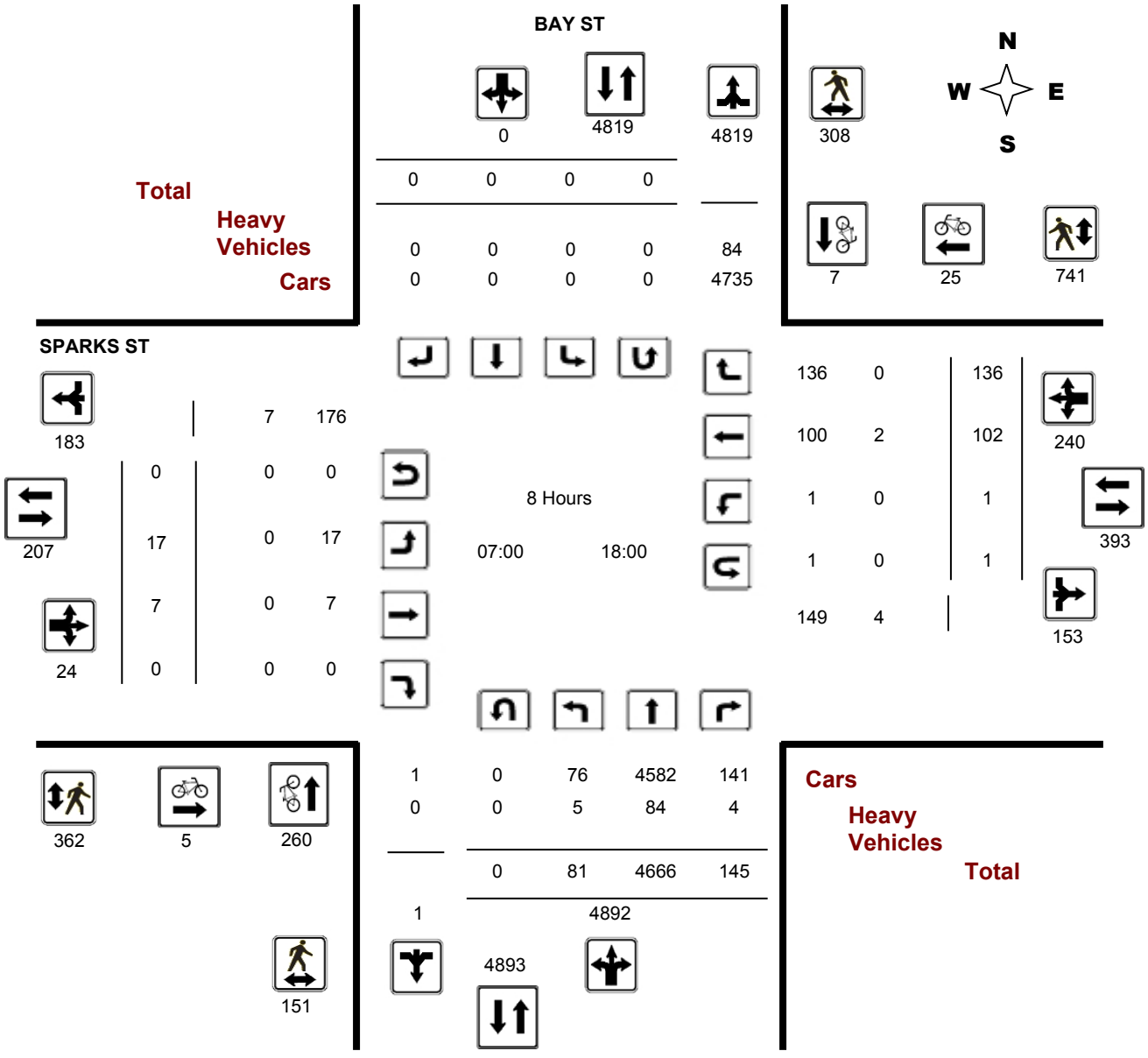
Public Works - Traffic Services

Turning Movement Count - Full Study Diagram

BAY ST @ SPARKS ST

Survey Date: Thursday, April 23, 2015
Start Time: 07:00

WO#: 34544
Device: Miovision



Comments

Public Works - Traffic Services

W.O. 34544

Turning Movement Count - Heavy Vehicle Report

BAY ST @ SPARKS ST

Survey Date: Thursday, April 23, 2015

		BAY ST									SPARKS ST									
		Northbound				Southbound					Eastbound				Westbound					
Time Period		LT	ST	RT	**N TOT**	LT	ST	RT	**S TOT**	**STR TOT**	LT	ST	RT	**E TOT**	LT	ST	RT	**W TOT**	**STR TOT**	**Grand Total**
07:00	08:00	0	23	0	**23**	0	0	0	**0**	**23**	0	0	0	**0**	0	0	0	**0**	**0**	**23**
08:00	09:00	0	20	1	**21**	0	0	0	**0**	**21**	0	0	0	**0**	0	0	0	**0**	**0**	**21**
09:00	10:00	1	10	0	**11**	0	0	0	**0**	**11**	0	0	0	**0**	0	1	0	**1**	**1**	**12**
11:30	12:30	2	9	2	**13**	0	0	0	**0**	**13**	0	0	0	**0**	0	1	0	**1**	**1**	**14**
12:30	13:30	2	7	0	**9**	0	0	0	**0**	**9**	0	0	0	**0**	0	0	0	**0**	**0**	**9**
15:00	16:00	0	9	0	**9**	0	0	0	**0**	**9**	0	0	0	**0**	0	0	0	**0**	**0**	**9**
16:00	17:00	0	5	0	**5**	0	0	0	**0**	**5**	0	0	0	**0**	0	0	0	**0**	**0**	**5**
17:00	18:00	0	1	1	**2**	0	0	0	**0**	**2**	0	0	0	**0**	0	0	0	**0**	**0**	**2**
Total :		5	84	4	**93**	0	0	0	**0**	**93**	0	0	0	**0**	0	2	0	**2**	**2**	**95**

Heavy Vehicles are vehicles having one rear axle with four or more wheels, or having two or more rear axles. These vehicles include most O.C. Transpo, school and inter-city buses. Further, they ARE included in the Turning Movement Count Summary.

Public Works - Traffic Services

Work Order
34544

Turning Movement Count - Pedestrian Volume Report

BAY ST @ SPARKS ST

Count Date: Thursday, April 23, 2015 **Start Time:** 07:00

Time Period	NB Approach (E or W Crossing)	SB Approach (E or W Crossing)	Total	EB Approach (N or S Crossing)	WB Approach (N or S Crossing)	Total	Grand Total
07:00 07:15	2	5	**7**	4	15	**19**	**26**
07:15 07:30	0	6	**6**	3	18	**21**	**27**
07:30 07:45	4	5	**9**	11	28	**39**	**48**
07:45 08:00	5	5	**10**	20	35	**55**	**65**
07:00 08:00	11	21	**32**	38	96	**134**	**166**
08:00 08:15	10	9	**19**	19	23	**42**	**61**
08:15 08:30	5	6	**11**	17	18	**35**	**46**
08:30 08:45	3	3	**6**	16	23	**39**	**45**
08:45 09:00	5	11	**16**	14	19	**33**	**49**
08:00 09:00	23	29	**52**	66	83	**149**	**201**
09:00 09:15	3	9	**12**	5	10	**15**	**27**
09:15 09:30	5	2	**7**	12	28	**40**	**47**
09:30 09:45	7	1	**8**	2	9	**11**	**19**
09:45 10:00	1	31	**32**	35	5	**40**	**72**
09:00 10:00	16	43	**59**	54	52	**106**	**165**
11:30 11:45	2	9	**11**	3	12	**15**	**26**
11:45 12:00	5	11	**16**	5	11	**16**	**32**
12:00 12:15	11	10	**21**	14	19	**33**	**54**
12:15 12:30	8	16	**24**	11	19	**30**	**54**
11:30 12:30	26	46	**72**	33	61	**94**	**166**
12:30 12:45	11	24	**35**	14	16	**30**	**65**
12:45 13:00	5	18	**23**	7	9	**16**	**39**
13:00 13:15	6	11	**17**	8	17	**25**	**42**
13:15 13:30	12	11	**23**	3	12	**15**	**38**
12:30 13:30	34	64	**98**	32	54	**86**	**184**
15:00 15:15	0	2	**2**	5	11	**16**	**18**
15:15 15:30	2	3	**5**	6	20	**26**	**31**
15:30 15:45	3	7	**10**	5	33	**38**	**48**
15:45 16:00	3	8	**11**	14	26	**40**	**51**
15:00 16:00	8	20	**28**	30	90	**120**	**148**
16:00 16:15	1	18	**19**	23	29	**52**	**71**
16:15 16:30	5	15	**20**	12	26	**38**	**58**
16:30 16:45	1	9	**10**	13	72	**85**	**95**
16:45 17:00	9	8	**17**	10	27	**37**	**54**
16:00 17:00	16	50	**66**	58	154	**212**	**278**
17:00 17:15	5	13	**18**	10	95	**105**	**123**
17:15 17:30	3	9	**12**	16	18	**34**	**46**
17:30 17:45	3	6	**9**	9	18	**27**	**36**
17:45 18:00	6	7	**13**	16	20	**36**	**49**
17:00 18:00	17	35	**52**	51	151	**202**	**254**
Total	151	308	**459**	362	741	**1103**	**1562**

Comment:

Public Works - Traffic Services

Work Order
34544

Turning Movement Count - Full Study Summary Report

BAY ST @ SPARKS ST

Survey Date: Thursday, April 23, 2015

Total Observed U-Turns

Northbound: 0 Southbound: 0

Eastbound: 0 Westbound: 1

AADT Factor

.90

Full Study

	BAY ST									SPARKS ST									
	Northbound				Southbound					Eastbound				Westbound					
Period	LT	ST	RT	**NB TOT**	LT	ST	RT	**SB TOT**	**STR TOT**	LT	ST	RT	**EB TOT**	LT	ST	RT	**WB TOT**	**STR TOT**	**Grand Total**
07:00 08:00	13	386	13	**412**	0	0	0	**0**	**412**	0	0	0	**0**	0	15	17	**32**	**32**	**444**
08:00 09:00	9	442	28	**479**	0	0	0	**0**	**479**	0	0	0	**0**	0	12	19	**31**	**31**	**510**
09:00 10:00	10	333	25	**368**	0	0	0	**0**	**368**	1	0	0	**1**	0	20	13	**33**	**34**	**402**
11:30 12:30	15	354	16	**385**	0	0	0	**0**	**385**	2	1	0	**3**	0	12	8	**20**	**23**	**408**
12:30 13:30	11	376	18	**405**	0	0	0	**0**	**405**	0	0	0	**0**	0	8	11	**19**	**19**	**424**
15:00 16:00	5	978	13	**996**	0	0	0	**0**	**996**	4	2	0	**6**	0	13	18	**31**	**37**	**1033**
16:00 17:00	6	991	17	**1014**	0	0	0	**0**	**1014**	4	2	0	**6**	0	9	33	**42**	**48**	**1062**
17:00 18:00	12	806	15	**833**	0	0	0	**0**	**833**	6	2	0	**8**	1	13	17	**31**	**39**	**872**
Total	81	4666	145	**4892**	0	0	0	**0**	**4892**	17	7	0	**24**	1	102	136	**239**	**263**	**5155**
Equ 12Hr	112	6485	201	**6798**	0	0	0	**0**	**6798**	23	9	0	**32**	1	141	189	**331**	**363**	**7161**

Note: These values are calculated by multiplying the totals by the appropriate expansion factor. **1.39**

Avg 12Hr	101	5837	181	**6119**	0	0	0	**0**	**6119**	20	8	0	**28**	0	126	170	**297**	**326**	**6444**

Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor. **.90**

Avg 24Hr	132	7646	237	**8015**	0	0	0	**0**	**8015**	26	10	0	**36**	0	165	222	**389**	**427**	**8441**

Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor. **1.31**

Comments:

Note: U-Turns are included in Totals.

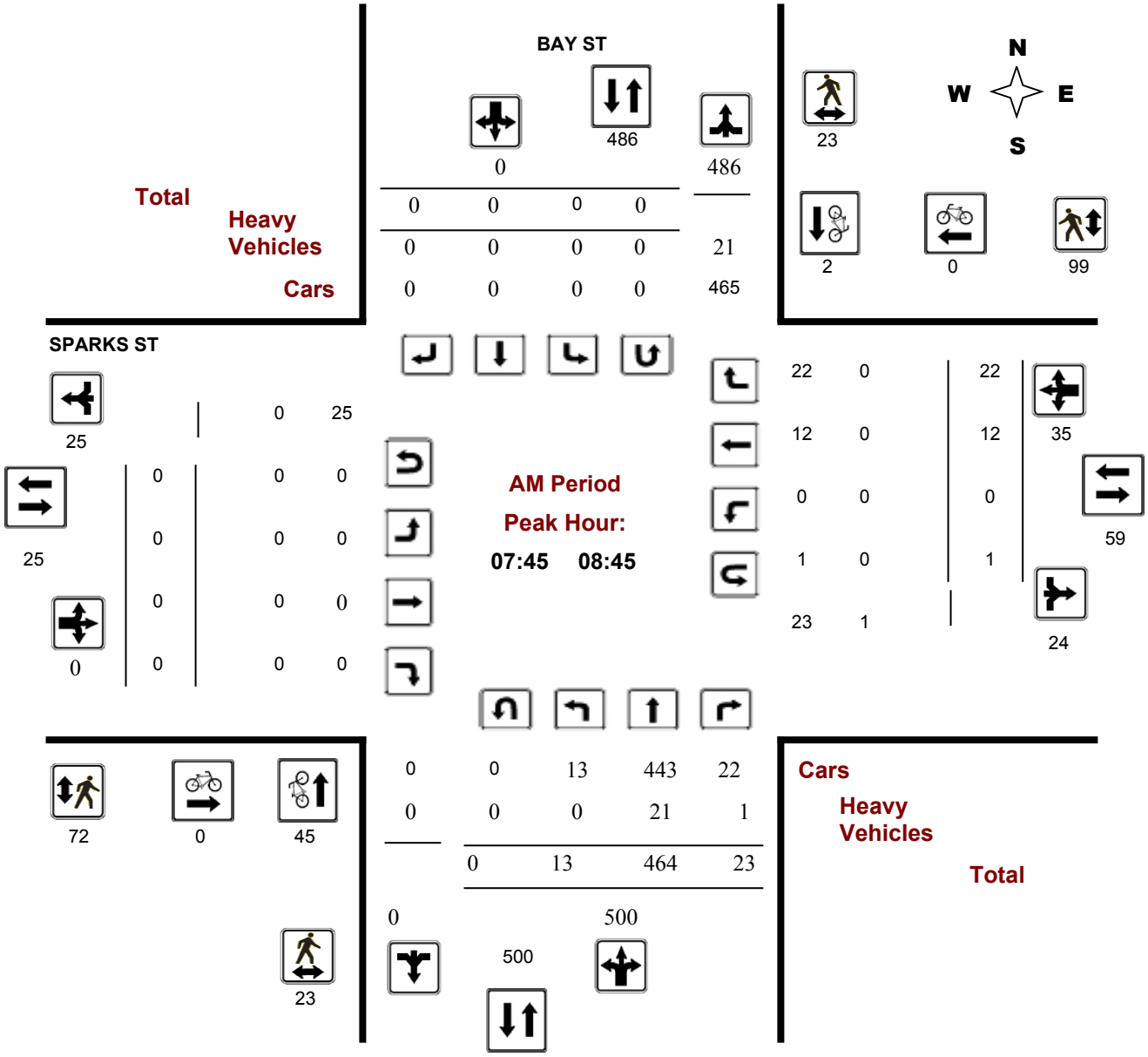
Public Works - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

BAY ST @ SPARKS ST

Survey Date: Thursday, April 23, 2015
Start Time: 07:00

WO No: 34544
Device: Miovision



Comments

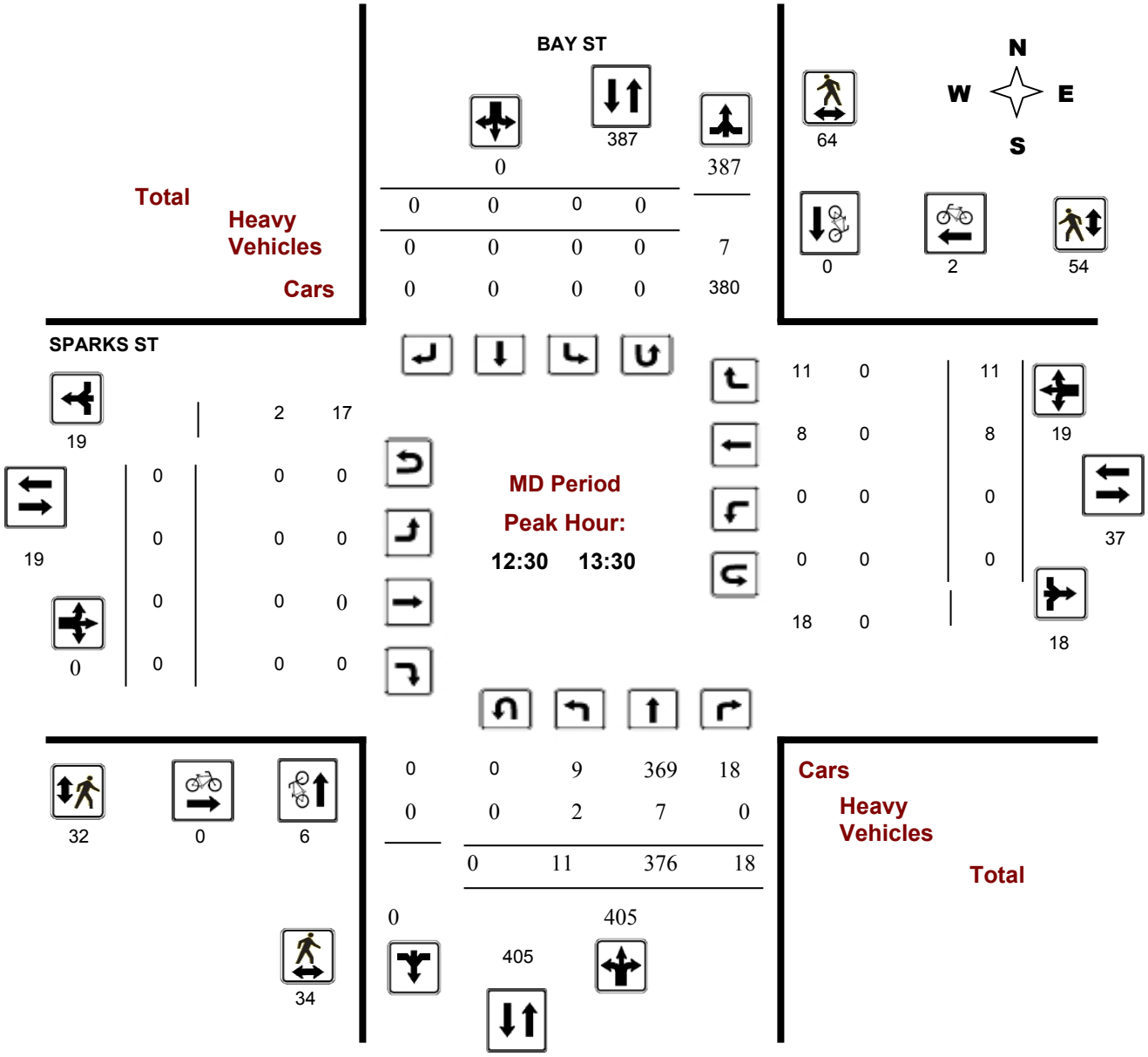
Public Works - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

BAY ST @ SPARKS ST

Survey Date: Thursday, April 23, 2015
Start Time: 07:00

WO No: 34544
Device: Miovision



Comments

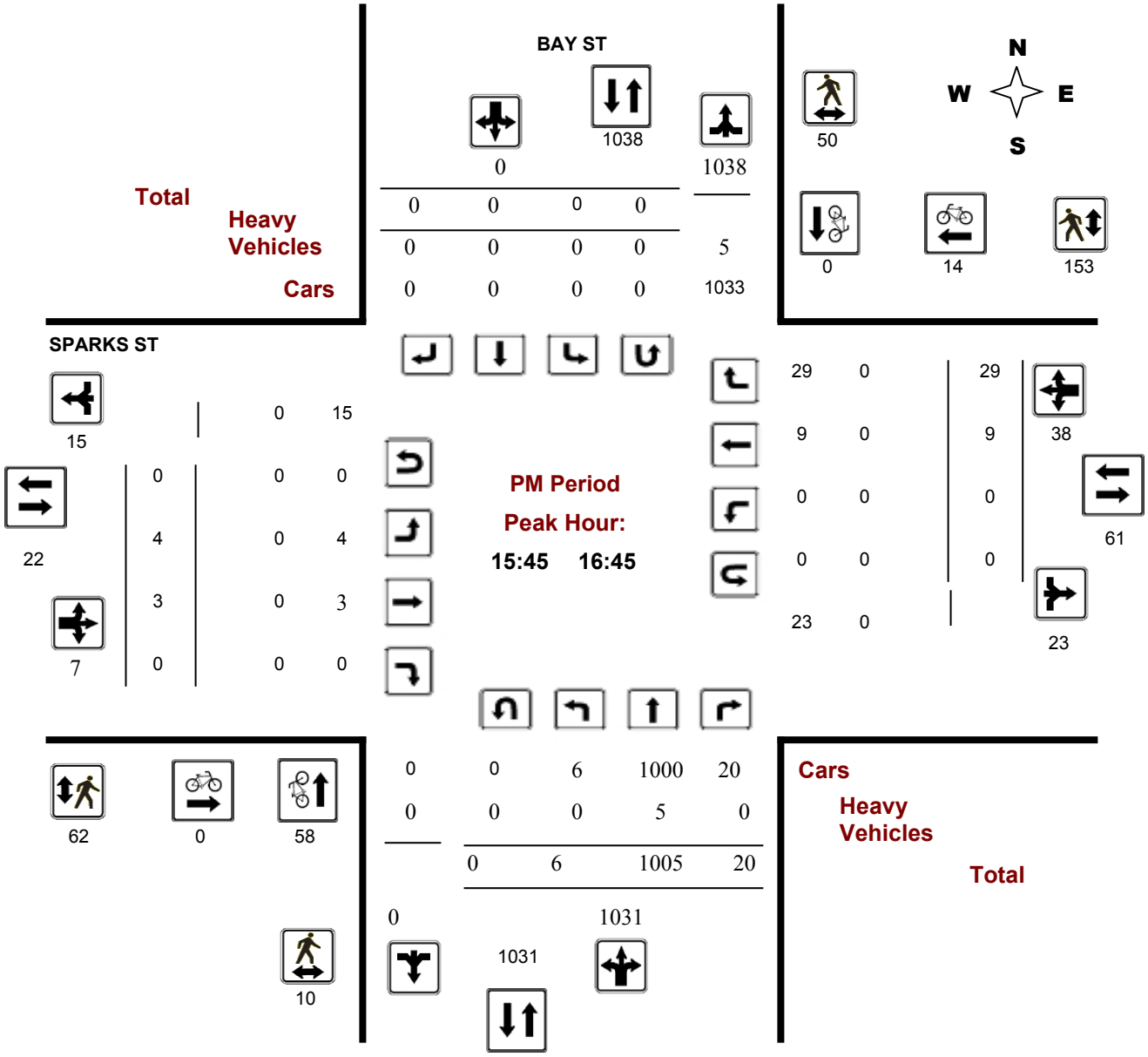
Public Works - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

BAY ST @ SPARKS ST

Survey Date: Thursday, April 23, 2015 **WO No:** 34544

Start Time: 07:00 **Device:** Miovision



Comments

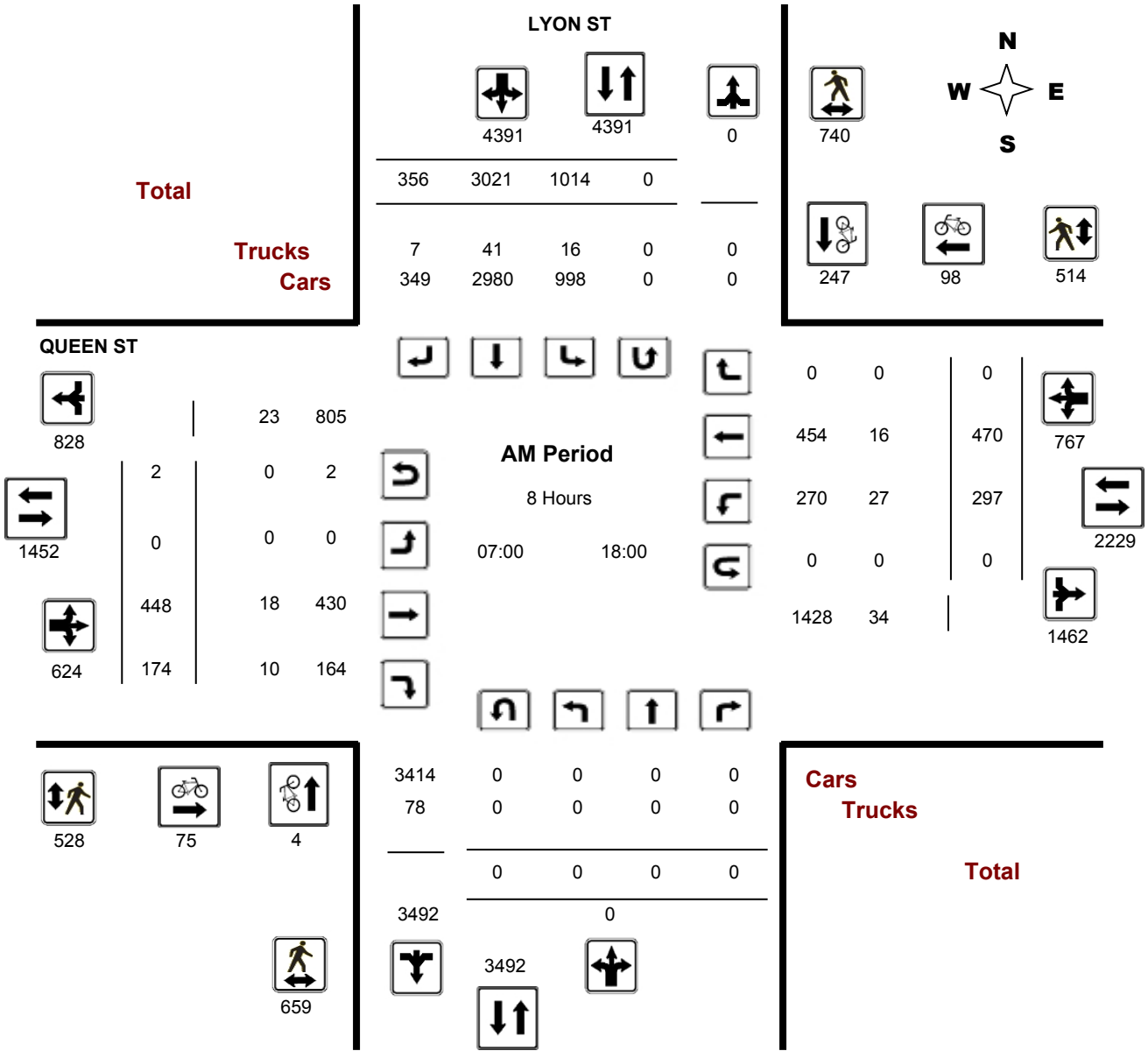
Public Works - Traffic Services

Turning Movements Count - Full Study Diagram

QUEEN ST @ LYON ST

Survey Date: Thursday, May 02, 2013 **WO#:** 31189

Start Time: 07:00 **Device:**



Validation Note: Results generated Nov 26, 2014. All records still in violation were set to Edited.

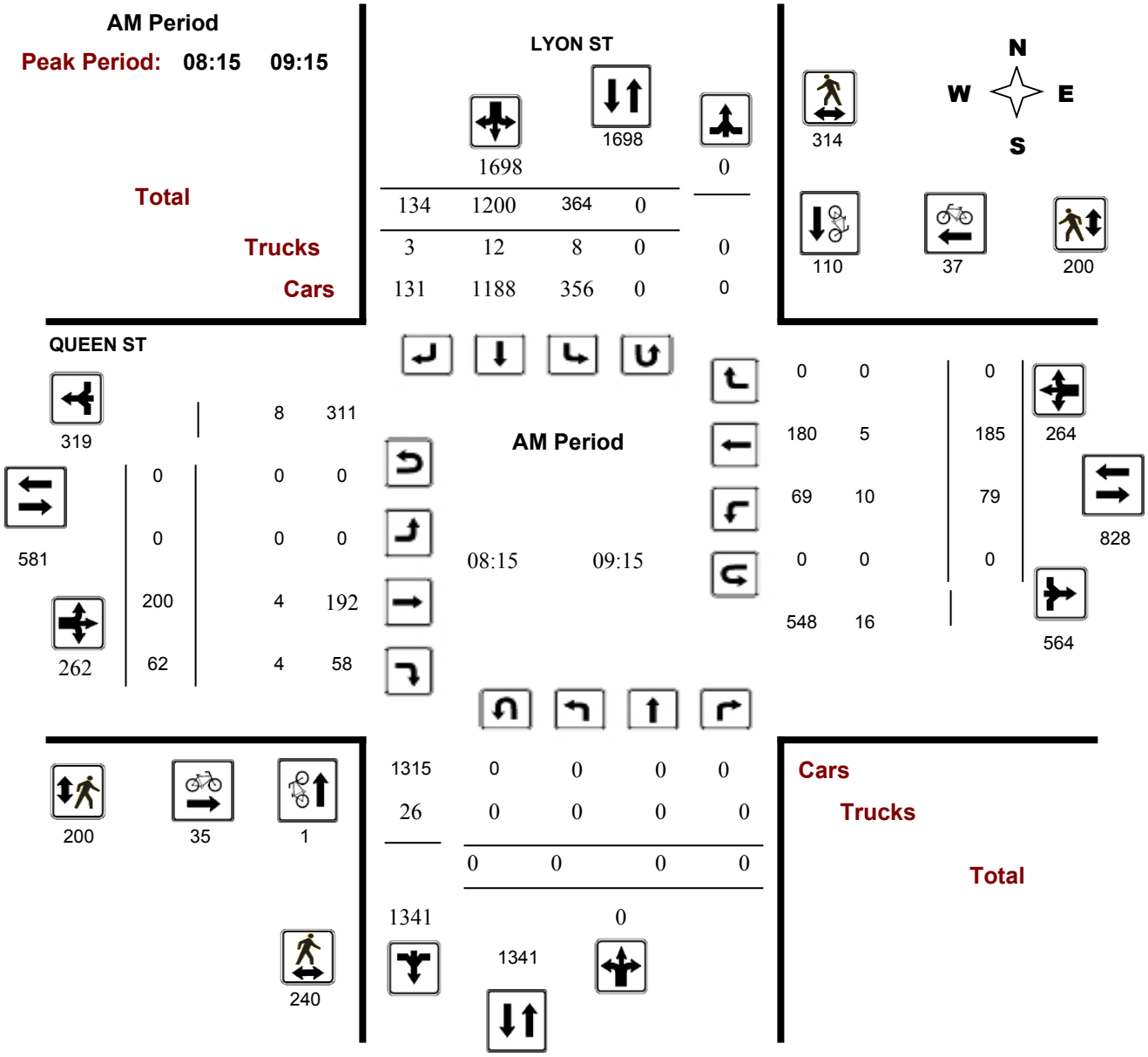
Public Works - Traffic Services

Turning Movements Count - Peak Period Diagram

QUEEN ST @ LYON ST

Survey Date: Thursday, May 02, 2013 **WO No:** 31189

Start Time: 07:00 **Device:**



Validation Note: Results generated Nov 26, 2014. All records still in violation were set to Edited.

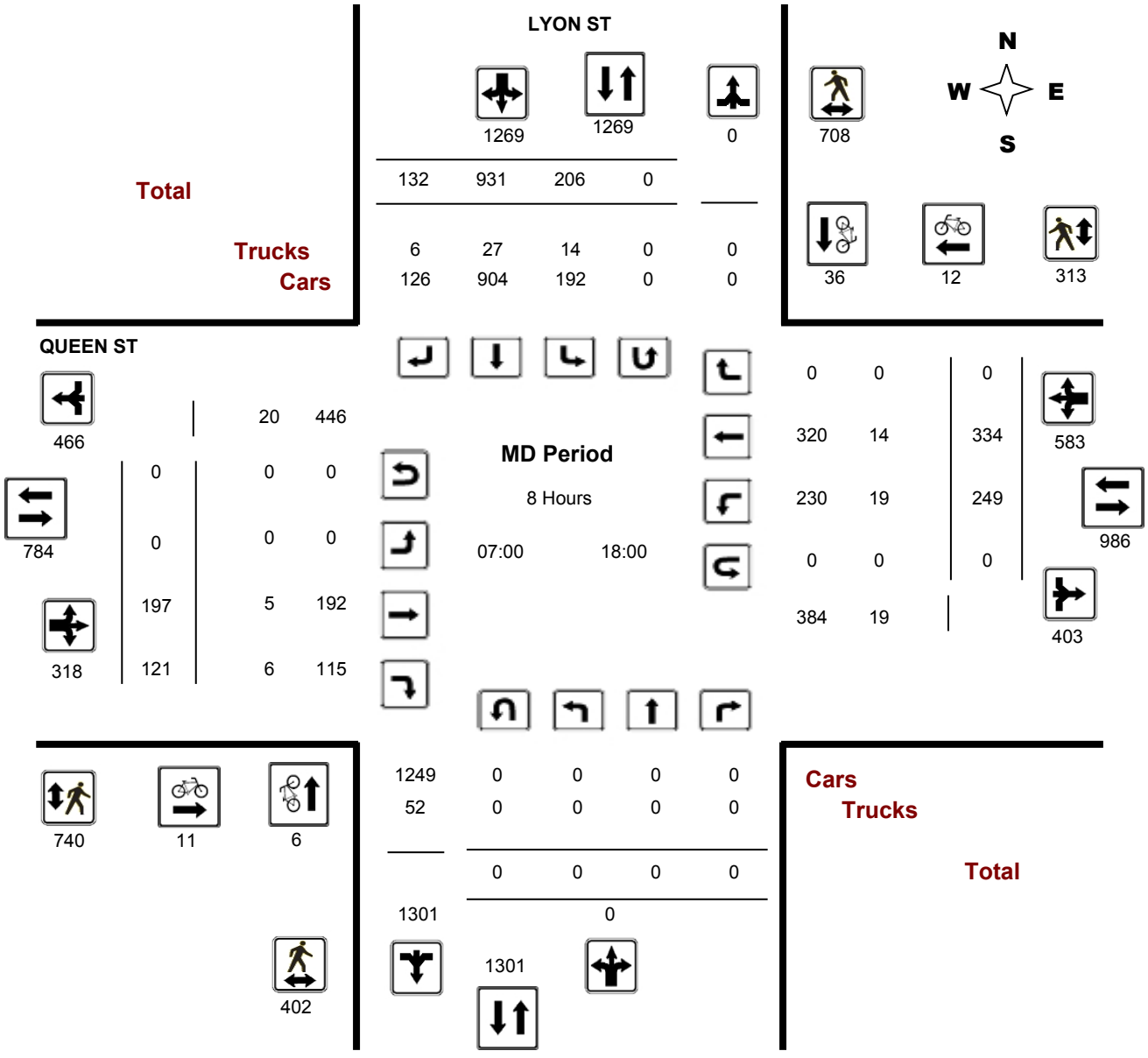
Public Works - Traffic Services

Turning Movements Count - Full Study Diagram

QUEEN ST @ LYON ST

Survey Date: Thursday, May 02, 2013 **WO#:** 31189

Start Time: 07:00 **Device:**



Validation Note: Results generated Nov 26, 2014. All records still in violation were set to Edited.

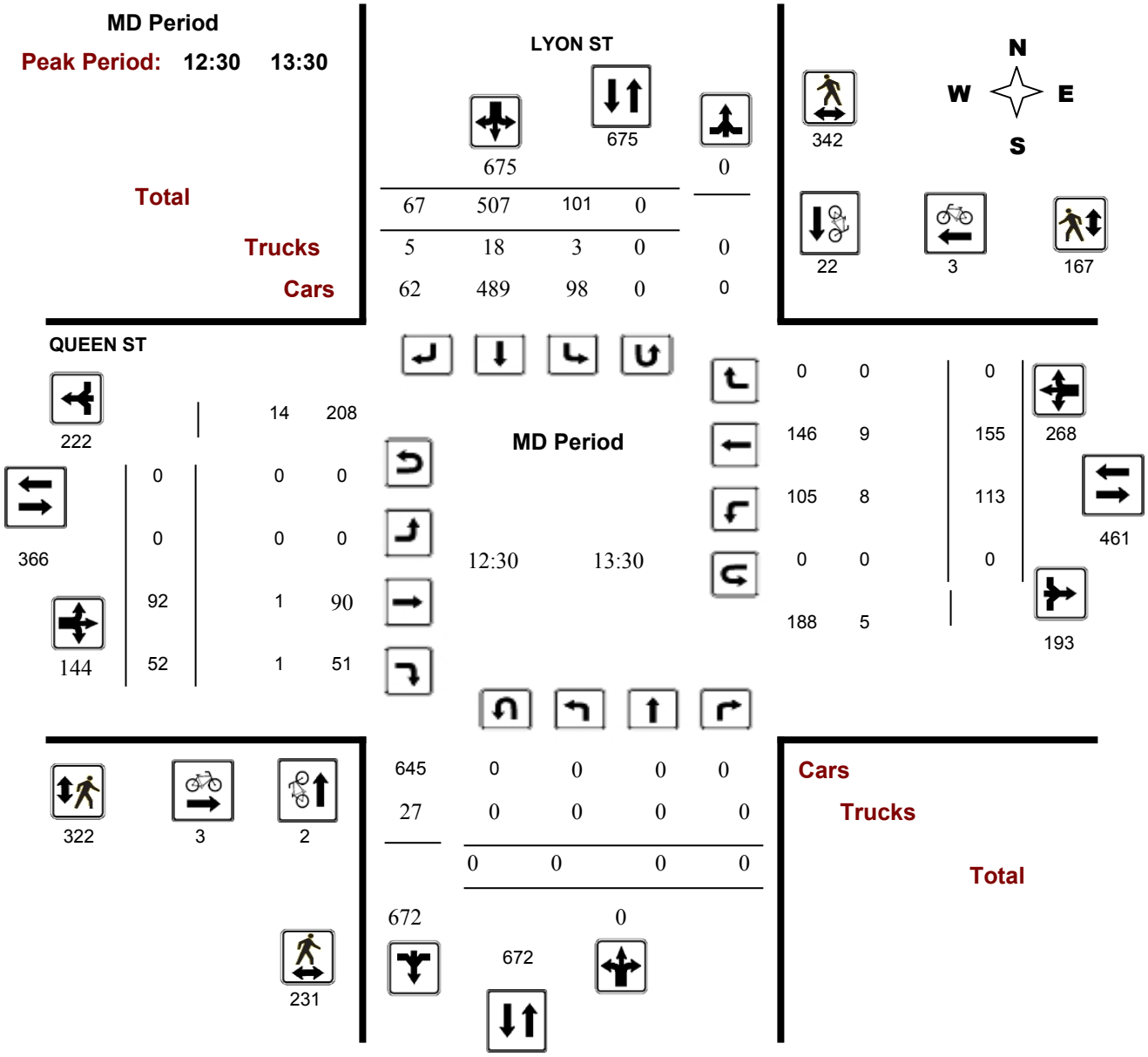
Public Works - Traffic Services

Turning Movements Count - Peak Period Diagram

QUEEN ST @ LYON ST

Survey Date: Thursday, May 02, 2013 **WO No:** 31189

Start Time: 07:00 **Device:**



Validation Note: Results generated Nov 26, 2014. All records still in violation were set to Edited.

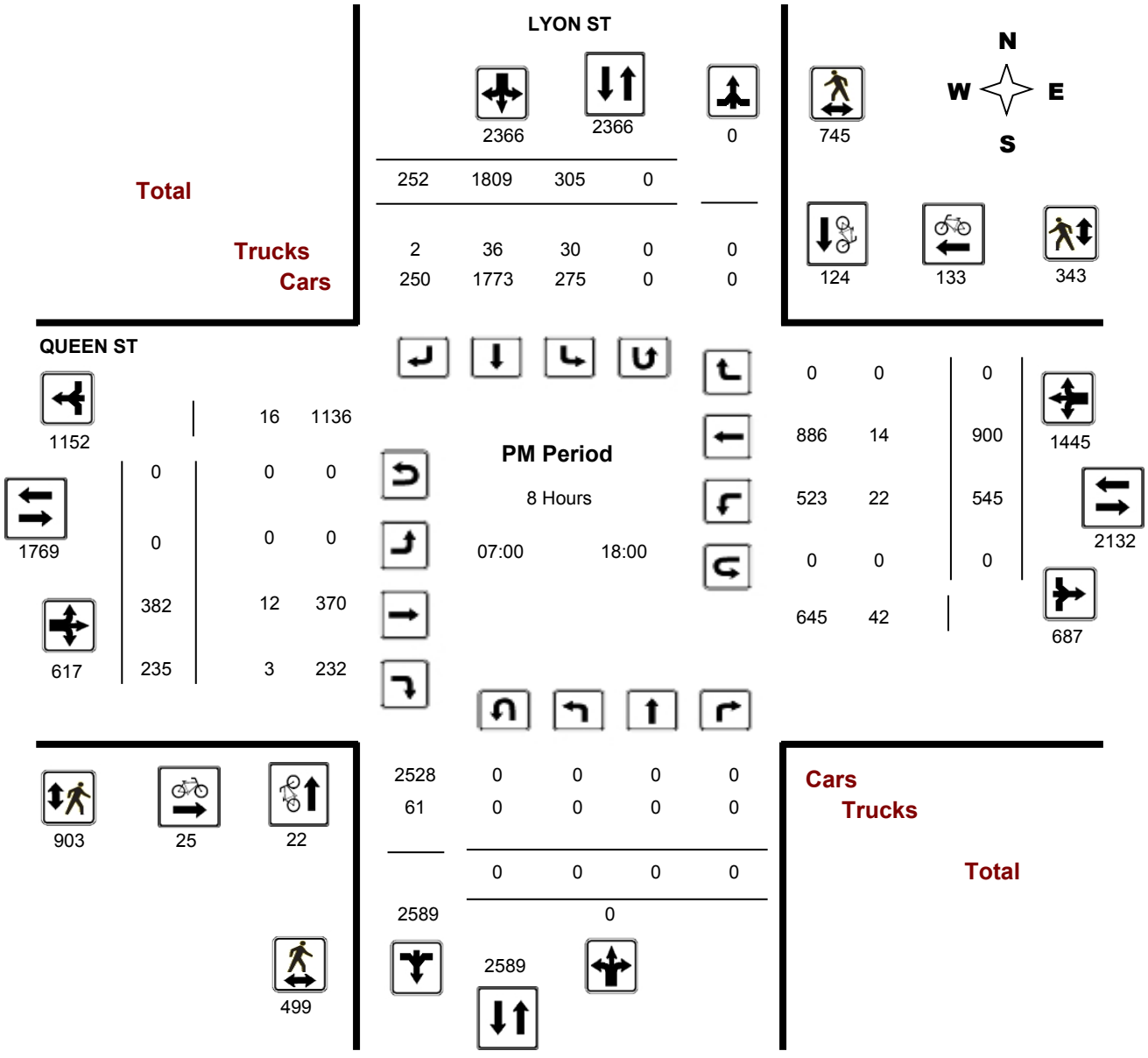
Public Works - Traffic Services

Turning Movements Count - Full Study Diagram

QUEEN ST @ LYON ST

Survey Date: Thursday, May 02, 2013 **WO#:** 31189

Start Time: 07:00 **Device:**



Validation Note: Results generated Nov 26, 2014. All records still in violation were set to Edited.

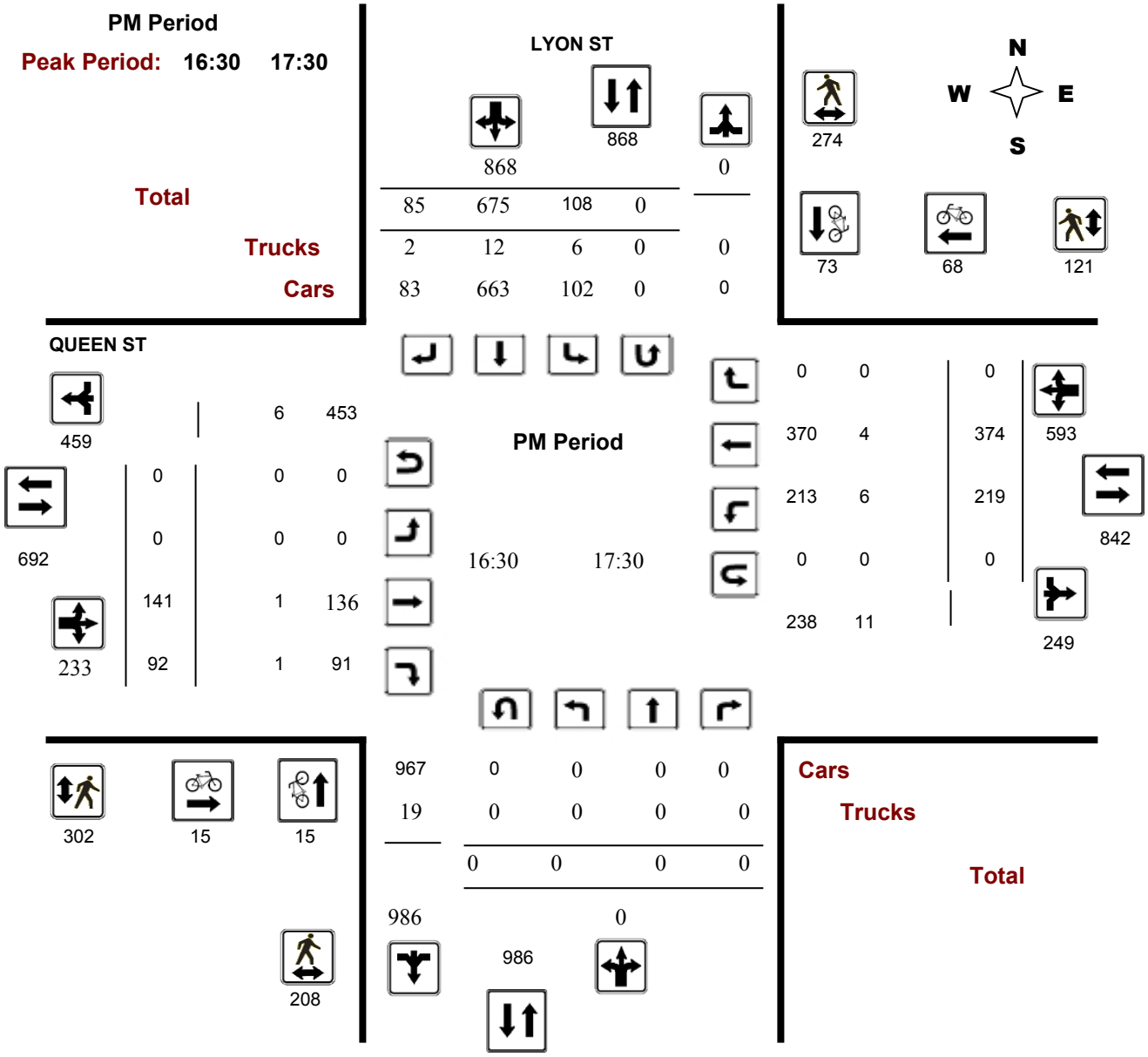
Public Works - Traffic Services

Turning Movements Count - Peak Period Diagram

QUEEN ST @ LYON ST

Survey Date: Thursday, May 02, 2013 **WO No:** 31189

Start Time: 07:00 **Device:**



Validation Note: Results generated Nov 26, 2014. All records still in violation were set to Edited.

Public Works - Traffic Services

W.O. 31189

Turning Movement Count - 15 Minute Summary Report

QUEEN ST @ LYON ST

Survey Date: Thursday, May 02, 2013

Total Observed U-Turns

Northbound: 0 Southbound: 0

Eastbound: 2 Westbound: 0

		LYON ST									QUEEN ST									
		Northbound				Southbound					Eastbound				Westbound					
Time Period		LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	Grand Total
07:00	07:15	0	0	0	**0**	99	241	22	**362**	**362**	0	21	15	**36**	25	25	0	**50**	**86**	**448**
07:15	07:30	0	0	0	**0**	109	249	32	**390**	**390**	0	31	8	**41**	23	41	0	**64**	**105**	**495**
07:30	07:45	0	0	0	**0**	99	284	29	**412**	**412**	0	34	7	**41**	24	29	0	**53**	**94**	**506**
07:45	08:00	0	0	0	**0**	106	253	37	**396**	**396**	0	45	16	**61**	19	31	0	**50**	**111**	**507**
08:00	08:15	0	0	0	**0**	100	286	40	**426**	**426**	0	32	18	**50**	19	35	0	**54**	**104**	**530**
08:15	08:30	0	0	0	**0**	93	277	25	**395**	**395**	0	57	16	**73**	23	46	0	**69**	**142**	**537**
08:30	08:45	0	0	0	**0**	93	287	42	**422**	**422**	0	42	18	**60**	23	50	0	**73**	**133**	**555**
08:45	09:00	0	0	0	**0**	96	301	29	**426**	**426**	0	60	19	**79**	17	49	0	**66**	**145**	**571**
09:00	09:15	0	0	0	**0**	82	335	38	**455**	**455**	0	41	9	**50**	16	40	0	**56**	**106**	**561**
09:15	09:30	0	0	0	**0**	55	186	28	**269**	**269**	0	26	22	**48**	50	52	0	**102**	**150**	**419**
09:30	09:45	0	0	0	**0**	50	173	15	**238**	**238**	0	32	14	**46**	34	34	0	**68**	**114**	**352**
09:45	10:00	0	0	0	**0**	32	149	19	**200**	**200**	0	27	12	**39**	24	38	0	**62**	**101**	**301**
11:30	11:45	0	0	0	**0**	30	112	18	**160**	**160**	0	22	14	**36**	39	49	0	**88**	**124**	**284**
11:45	12:00	0	0	0	**0**	36	119	15	**170**	**170**	0	32	18	**50**	34	54	0	**88**	**138**	**308**
12:00	12:15	0	0	0	**0**	19	98	18	**135**	**135**	0	25	20	**45**	33	37	0	**70**	**115**	**250**
12:15	12:30	0	0	0	**0**	20	95	14	**129**	**129**	0	26	17	**43**	30	39	0	**69**	**112**	**241**
12:30	12:45	0	0	0	**0**	29	126	27	**182**	**182**	0	21	12	**33**	38	35	0	**73**	**106**	**288**
12:45	13:00	0	0	0	**0**	23	142	16	**181**	**181**	0	17	8	**25**	27	33	0	**60**	**85**	**266**
13:00	13:15	0	0	0	**0**	25	114	11	**150**	**150**	0	26	13	**39**	27	44	0	**71**	**110**	**260**
13:15	13:30	0	0	0	**0**	24	125	13	**162**	**162**	0	28	19	**47**	21	43	0	**64**	**111**	**273**
15:00	15:15	0	0	0	**0**	18	141	20	**179**	**179**	0	26	10	**36**	38	60	0	**98**	**134**	**313**
15:15	15:30	0	0	0	**0**	29	140	22	**191**	**191**	0	18	22	**40**	38	68	0	**106**	**146**	**337**
15:30	15:45	0	0	0	**0**	15	66	13	**94**	**94**	0	15	11	**26**	32	42	0	**74**	**100**	**194**
15:45	16:00	0	0	0	**0**	26	153	23	**202**	**202**	0	32	9	**41**	39	72	0	**111**	**152**	**354**
16:00	16:15	0	0	0	**0**	30	141	25	**196**	**196**	0	36	26	**62**	43	70	0	**113**	**175**	**371**
16:15	16:30	0	0	0	**0**	37	171	22	**230**	**230**	0	33	17	**50**	50	91	0	**141**	**191**	**421**
16:30	16:45	0	0	0	**0**	17	161	27	**205**	**205**	0	40	20	**60**	54	82	0	**136**	**196**	**401**
16:45	17:00	0	0	0	**0**	28	150	20	**198**	**198**	0	38	27	**65**	49	95	0	**144**	**209**	**407**
17:00	17:15	0	0	0	**0**	36	178	18	**232**	**232**	0	33	16	**49**	53	99	0	**152**	**201**	**433**
17:15	17:30	0	0	0	**0**	27	186	20	**233**	**233**	0	30	29	**59**	63	98	0	**161**	**220**	**453**
17:30	17:45	0	0	0	**0**	26	171	26	**223**	**223**	0	41	21	**62**	33	75	0	**108**	**170**	**393**
17:45	18:00	0	0	0	**0**	16	151	16	**183**	**183**	0	40	27	**67**	53	48	0	**101**	**168**	**351**
Total		0	0	0	**0**	1525	5761	740	**8026**	**8026**	0	1027	530	**1559**	1091	1704	0	**2795**	**4354**	**12380**

Note: U-Turns are included in Totals.

Validation Note: **Results generated Nov 26, 2014. All records still in violation were set to Edited.**

Public Works - Traffic Services

Turning Movement Count - Cyclist Volume Report

Work Order
31189

QUEEN ST @ LYON ST

Count Date: Thursday, May 02, 2013 **Start Time:** 07:00

	LYON ST			QUEEN ST			
Time Period	Northbound	Southbound	**Street Total**	Eastbound	Westbound	**Street Total**	**Grand Total**
07:00 08:00	1	86	**87**	21	38	**59**	**146**
08:00 09:00	2	115	**117**	33	42	**75**	**192**
09:00 10:00	1	46	**47**	21	18	**39**	**86**
11:30 12:30	4	14	**18**	8	9	**17**	**35**
12:30 13:30	2	22	**24**	3	3	**6**	**30**
15:00 16:00	3	12	**15**	4	16	**20**	**35**
16:00 17:00	9	58	**67**	9	55	**64**	**131**
17:00 18:00	10	54	**64**	12	62	**74**	**138**
Total	32	407	**439**	111	243	**354**	**793**

Validation Note: Results generated Nov 26, 2014. All records still in violation were set to Edited.

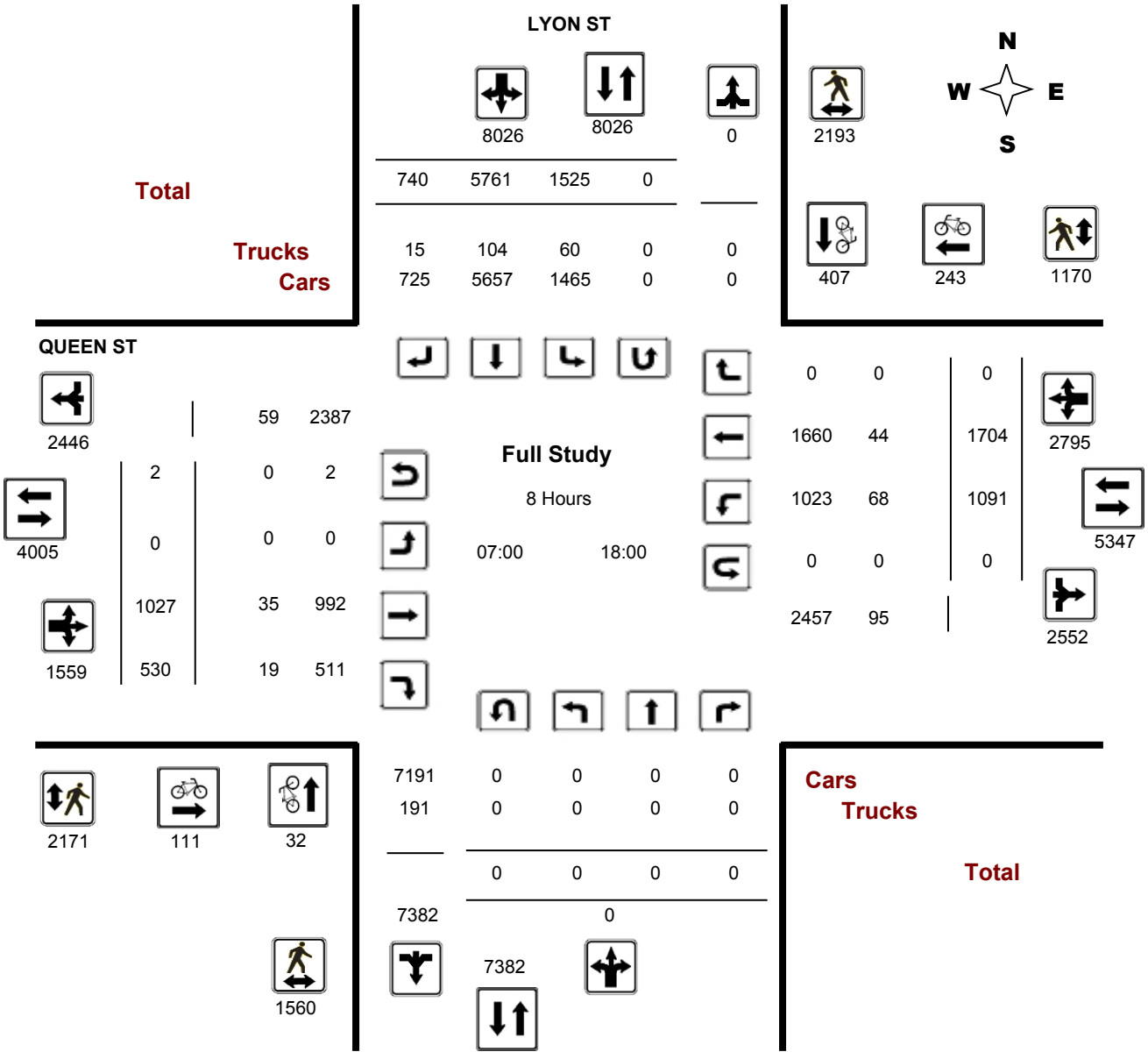
Public Works - Traffic Services

Turning Movements Count - Full Study Diagram

QUEEN ST @ LYON ST

Survey Date: Thursday, May 02, 2013 **WO#:** 31189

Start Time: 07:00 **Device:**



Validation Note: Results generated Nov 26, 2014. All records still in violation were set to Edited.

Public Works - Traffic Services

W.O. 31189

Turning Movement Count - Heavy Vehicle Report

QUEEN ST @ LYON ST

Survey Date: Thursday, May 02, 2013

Time Period		LYON ST Northbound LT	ST	RT	N TOT	LYON ST Southbound LT	ST	RT	S TOT	STR TOT	QUEEN ST Eastbound LT	ST	RT	E TOT	QUEEN ST Westbound LT	ST	RT	W TOT	STR TOT	Grand Total
07:00	08:00	0	0	0	**0**	2	13	1	**16**	**16**	0	4	2	**6**	7	5	0	**12**	**18**	**34**
08:00	09:00	0	0	0	**0**	8	13	1	**22**	**22**	0	9	4	**13**	8	6	0	**14**	**27**	**49**
09:00	10:00	0	0	0	**0**	6	15	5	**26**	**26**	0	5	4	**9**	12	5	0	**17**	**26**	**52**
11:30	12:30	0	0	0	**0**	11	9	1	**21**	**21**	0	3	5	**8**	11	5	0	**16**	**24**	**45**
12:30	13:30	0	0	0	**0**	3	18	5	**26**	**26**	0	2	1	**3**	8	9	0	**17**	**20**	**46**
15:00	16:00	0	0	0	**0**	9	15	0	**24**	**24**	0	4	2	**6**	6	4	0	**10**	**16**	**40**
16:00	17:00	0	0	0	**0**	16	11	2	**29**	**29**	0	8	1	**9**	12	6	0	**18**	**27**	**56**
17:00	18:00	0	0	0	**0**	5	10	0	**15**	**15**	0	0	0	**0**	4	4	0	**8**	**8**	**23**
Total :		0	0	0	**0**	60	104	15	**179**	**179**	0	35	19	**54**	68	44	0	**112**	**166**	**345**

Heavy Vehicles are vehicles having one rear axle with four or more wheels, or having two or more rear axles. These vehicles include most O.C. Transpo, school and inter-city buses. Further, they ARE included in the Turning Movement Count Summary.

CITY OPERATIONS - PUBLIC WORKS

Turning Movement Count - Pedestrian Volume Report

Work Order 31189

QUEEN ST @ LYON ST

Count Date: Thursday, May 02, 2013 **Start Time:** 07:00

Time Period		LYON ST			QUEEN ST			
		Northbound	Southbound	**Street Total**	Eastbound	Westbound	**Street Total**	**Grand Total**
07:00	07:15	47	44	**91**	40	42	**82**	**173**
07:15	07:30	60	44	**104**	43	45	**88**	**192**
07:30	07:45	66	61	**127**	51	60	**111**	**238**
07:45	08:00	68	98	**166**	77	62	**139**	**305**
07:00	08:00	241	247	**488**	211	209	**420**	**908**
08:00	08:15	69	75	**144**	55	35	**90**	**234**
08:15	08:30	76	94	**170**	63	75	**138**	**308**
08:30	08:45	46	86	**132**	49	35	**84**	**216**
08:45	09:00	72	66	**138**	41	40	**81**	**219**
08:00	09:00	263	321	**584**	208	185	**393**	**977**
09:00	09:15	46	68	**114**	47	50	**97**	**211**
09:15	09:30	37	52	**89**	30	30	**60**	**149**
09:30	09:45	34	24	**58**	22	25	**47**	**105**
09:45	10:00	38	28	**66**	10	15	**25**	**91**
09:00	10:00	155	172	**327**	109	120	**229**	**556**
11:30	11:45	41	55	**96**	66	34	**100**	**196**
11:45	12:00	30	116	**146**	108	50	**158**	**304**
12:00	12:15	37	114	**151**	134	10	**144**	**295**
12:15	12:30	63	81	**144**	110	52	**162**	**306**
11:30	12:30	171	366	**537**	418	146	**564**	**1101**
12:30	12:45	53	98	**151**	93	35	**128**	**279**
12:45	13:00	71	100	**171**	81	52	**133**	**304**
13:00	13:15	48	72	**120**	90	45	**135**	**255**
13:15	13:30	59	72	**131**	58	35	**93**	**224**
12:30	13:30	231	342	**573**	322	167	**489**	**1062**
15:00	15:15	33	45	**78**	52	37	**89**	**167**
15:15	15:30	57	53	**110**	67	30	**97**	**207**
15:30	15:45	21	42	**63**	51	21	**72**	**135**
15:45	16:00	33	52	**85**	90	23	**113**	**198**
15:00	16:00	144	192	**336**	260	111	**371**	**707**
16:00	16:15	46	134	**180**	141	51	**192**	**372**
16:15	16:30	26	40	**66**	108	22	**130**	**196**
16:30	16:45	42	38	**80**	65	22	**87**	**167**
16:45	17:00	75	89	**164**	88	22	**110**	**274**
16:00	17:00	189	301	**490**	402	117	**519**	**1009**
17:00	17:15	54	69	**123**	88	25	**113**	**236**
17:15	17:30	37	78	**115**	61	52	**113**	**228**
17:30	17:45	37	71	**108**	50	22	**72**	**180**
17:45	18:00	38	34	**72**	42	16	**58**	**130**
17:00	18:00	166	252	**418**	241	115	**356**	**774**
Total	.....	1560	2193	**3753**	2171	1170	**3341**	**7094**

Validation Note: Results generated Nov 26, 2014. All records still in violation were set to Edited.

Public Works - Traffic Services

Turning Movement Count - Summary Report

Work Order
31189

QUEEN ST @ LYON ST

Survey Date: Thursday, May 02, 2013

Total Observed U-Turns

Northbound: 0 Southbound: 0

Eastbound: 2 Westbound: 0

AADT Factor

.90

Full Study

	LYON ST									QUEEN ST									
	Northbound				Southbound					Eastbound				Westbound					
Period	LT	ST	RT	**NB TOT**	LT	ST	RT	**SB TOT**	**STR TOT**	LT	ST	RT	**EB TOT**	LT	ST	RT	**WB TOT**	**STR TOT**	**Grand Total**
07:00 08:00	0	0	0	**0**	413	1027	120	**1560**	**1560**	0	131	46	**177**	91	126	0	**217**	**394**	**1954**
08:00 09:00	0	0	0	**0**	382	1151	136	**1669**	**1669**	0	191	71	**262**	82	180	0	**262**	**524**	**2193**
09:00 10:00	0	0	0	**0**	219	843	100	**1162**	**1162**	0	126	57	**183**	124	164	0	**288**	**471**	**1633**
11:30 12:30	0	0	0	**0**	105	424	65	**594**	**594**	0	105	69	**174**	136	179	0	**315**	**489**	**1083**
12:30 13:30	0	0	0	**0**	101	507	67	**675**	**675**	0	92	52	**144**	113	155	0	**268**	**412**	**1087**
15:00 16:00	0	0	0	**0**	88	500	78	**666**	**666**	0	91	52	**143**	147	242	0	**389**	**532**	**1198**
16:00 17:00	0	0	0	**0**	112	623	94	**829**	**829**	0	147	90	**237**	196	338	0	**534**	**771**	**1600**
17:00 18:00	0	0	0	**0**	105	686	80	**871**	**871**	0	144	93	**237**	202	320	0	**522**	**759**	**1630**
Total	0	0	0	**0**	1525	5761	740	**8026**	**8026**	0	1027	530	**1557**	1091	1704	0	**2795**	**4352**	**12378**
Equ 12Hr	0	0	0	**0**	2119	8007	1028	**11154**	**11154**	0	1427	736	**2163**	1516	2368	0	**3884**	**6047**	**17201**

Note: These values are calculated by multiplying the totals by the appropriate expansion factor. **1.39**

Avg 12Hr	0	0	0	**0**	1907	7206	925	**10038**	**10039**	0	1284	662	**1946**	1364	2131	0	**3495**	**5442**	**15480**

Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor. **.90**

Avg 24Hr	0	0	0	**0**	2498	9439	1211	**13149**	**13151**	0	1682	867	**2549**	1786	2791	0	**4578**	**7129**	**20278**

Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor. **1.31**

Validation Note: Results generated Nov 26, 2014. All records still in violation were set to Edited.

Public Works - Traffic Services

W.O. 34545

Turning Movement Count - 15 Minute Summary Report

LYON ST @ SPARKS ST

Survey Date: Thursday, April 23, 2015

Total Observed U-Turns

Northbound: 0 Southbound: 0

Eastbound: 1 Westbound: 0

		LYON ST									SPARKS ST									
		Northbound				Southbound					Eastbound				Westbound					
Time Period		LT	ST	RT	**N TOT**	LT	ST	RT	**S TOT**	**STR TOT**	LT	ST	RT	**E TOT**	LT	ST	RT	**W TOT**	**STR TOT**	**Grand Total**
07:00	07:15	0	0	0	**0**	0	335	12	**347**	**347**	0	0	4	**4**	3	0	0	**3**	**7**	**354**
07:15	07:30	0	0	0	**0**	0	364	7	**371**	**371**	0	0	5	**5**	2	0	1	**3**	**8**	**379**
07:30	07:45	0	0	0	**0**	0	421	12	**433**	**433**	0	0	4	**4**	2	0	0	**2**	**6**	**439**
07:45	08:00	0	0	0	**0**	0	408	10	**418**	**418**	0	0	6	**6**	0	0	0	**0**	**6**	**424**
08:00	08:15	0	1	0	**1**	0	361	11	**372**	**373**	0	0	11	**11**	1	0	1	**2**	**13**	**386**
08:15	08:30	0	0	0	**0**	0	376	12	**388**	**388**	0	0	5	**5**	4	0	0	**4**	**9**	**397**
08:30	08:45	0	0	0	**0**	0	414	6	**420**	**420**	0	0	5	**5**	0	0	0	**0**	**5**	**425**
08:45	09:00	0	0	0	**0**	0	398	13	**411**	**411**	0	0	10	**10**	0	0	0	**0**	**10**	**421**
09:00	09:15	0	0	0	**0**	0	373	10	**383**	**383**	0	0	2	**2**	1	0	2	**3**	**5**	**388**
09:15	09:30	0	0	0	**0**	0	238	9	**247**	**247**	0	0	4	**4**	0	0	0	**0**	**4**	**251**
09:30	09:45	0	0	0	**0**	0	192	8	**200**	**200**	0	0	7	**7**	0	0	1	**1**	**8**	**208**
09:45	10:00	0	0	0	**0**	0	162	5	**167**	**167**	0	0	3	**3**	0	0	0	**0**	**3**	**170**
15:00	15:15	0	5	0	**5**	0	165	14	**179**	**184**	0	0	4	**4**	0	0	0	**0**	**4**	**188**
15:15	15:30	0	2	0	**2**	0	167	10	**177**	**179**	0	0	4	**4**	0	0	0	**0**	**4**	**183**
15:30	15:45	0	5	0	**5**	0	192	8	**200**	**205**	0	0	9	**10**	0	0	1	**1**	**11**	**216**
15:45	16:00	0	5	0	**5**	0	180	8	**188**	**193**	0	0	4	**4**	0	0	0	**0**	**4**	**197**
16:00	16:15	0	12	1	**13**	0	170	13	**183**	**196**	0	0	5	**5**	1	0	1	**2**	**7**	**203**
16:15	16:30	0	4	0	**4**	0	182	4	**186**	**190**	0	0	6	**6**	0	0	0	**0**	**6**	**196**
16:30	16:45	0	8	0	**8**	0	188	11	**199**	**207**	0	0	9	**9**	0	0	0	**0**	**9**	**216**
16:45	17:00	0	1	0	**1**	0	183	15	**198**	**199**	0	0	5	**5**	0	0	0	**0**	**5**	**204**
17:00	17:15	0	2	1	**3**	0	164	11	**175**	**178**	0	0	3	**3**	0	0	0	**0**	**3**	**181**
17:15	17:30	0	2	0	**2**	0	170	8	**178**	**180**	0	0	2	**2**	0	0	0	**0**	**2**	**182**
17:30	17:45	0	4	0	**4**	0	161	8	**169**	**173**	0	0	8	**8**	0	0	0	**0**	**8**	**181**
17:45	18:00	0	2	0	**2**	0	157	9	**166**	**168**	0	0	7	**7**	1	0	1	**2**	**9**	**177**
TOTAL:		0	53	2	**55**	0	6121	234	**6355**	**6410**	0	0	132	**133**	15	0	8	**23**	**156**	**6566**

Note: U-Turns are included in Totals.

Comment:

Public Works - Traffic Services

Turning Movement Count - Cyclist Volume Report

Work Order
34545

LYON ST @ SPARKS ST

Count Date: Thursday, April 23, 2015 **Start Time:** 07:00

	LYON ST			SPARKS ST			
Time Period	Northbound	Southbound	**Street Total**	Eastbound	Westbound	**Street Total**	**Grand Total**
07:00 08:00	0	40	**40**	10	0	**10**	**50**
08:00 09:00	0	72	**72**	4	0	**4**	**76**
09:00 10:00	0	22	**22**	3	0	**3**	**25**
15:00 16:00	1	8	**9**	0	6	**6**	**15**
16:00 17:00	5	30	**35**	1	5	**6**	**41**
17:00 18:00	0	34	**34**	1	4	**5**	**39**
Total	6	206	**212**	19	15	**34**	**246**

Comment:

Note: These volumes consists of bicycles only (no mopeds or motorcycles) and ARE NOT included in the Turning Movement Count Summary.

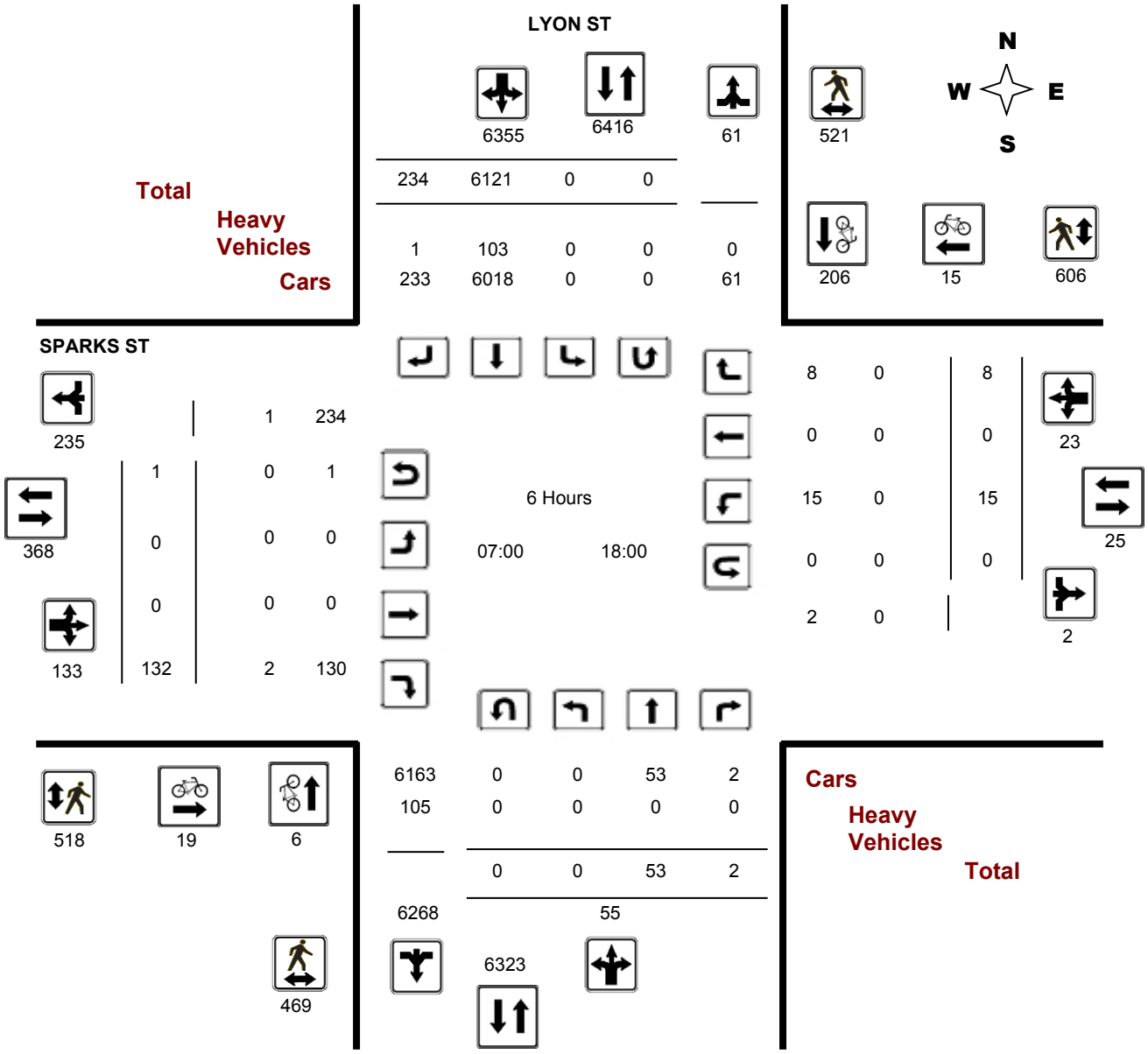
Public Works - Traffic Services

Turning Movement Count - Full Study Diagram

LYON ST @ SPARKS ST

Survey Date: Thursday, April 23, 2015
Start Time: 07:00

WO#: 34545
Device: Miovision



Comments

Public Works - Traffic Services

W.O. 34545

Turning Movement Count - Heavy Vehicle Report

LYON ST @ SPARKS ST

Survey Date: Thursday, April 23, 2015

		LYON ST									SPARKS ST									
		Northbound				Southbound					Eastbound				Westbound					
Time Period		LT	ST	RT	**N TOT**	LT	ST	RT	**S TOT**	**STR TOT**	LT	ST	RT	**E TOT**	LT	ST	RT	**W TOT**	**STR TOT**	**Grand Total**
07:00	08:00	0	0	0	**0**	0	9	0	**9**	**9**	0	0	0	**0**	0	0	0	**0**	**0**	**9**
08:00	09:00	0	0	0	**0**	0	14	1	**15**	**15**	0	0	1	**1**	0	0	0	**0**	**1**	**16**
09:00	10:00	0	0	0	**0**	0	17	0	**17**	**17**	0	0	0	**0**	0	0	0	**0**	**0**	**17**
15:00	16:00	0	0	0	**0**	0	30	0	**30**	**30**	0	0	0	**0**	0	0	0	**0**	**0**	**30**
16:00	17:00	0	0	0	**0**	0	22	0	**22**	**22**	0	0	0	**0**	0	0	0	**0**	**0**	**22**
17:00	18:00	0	0	0	**0**	0	11	0	**11**	**11**	0	0	1	**1**	0	0	0	**0**	**1**	**12**
Total :		0	0	0	**0**	0	103	1	**104**	**104**	0	0	2	**2**	0	0	0	**0**	**2**	**106**

Heavy Vehicles are vehicles having one rear axle with four or more wheels, or having two or more rear axles. These vehicles include most O.C. Transpo, school and inter-city buses. Further, they ARE included in the Turning Movement Count Summary.

Public Works - Traffic Services

Work Order
34545

Turning Movement Count - Pedestrian Volume Report

LYON ST @ SPARKS ST

Count Date: Thursday, April 23, 2015 **Start Time:** 07:00

Time Period	NB Approach (E or W Crossing)	SB Approach (E or W Crossing)	Total	EB Approach (N or S Crossing)	WB Approach (N or S Crossing)	Total	Grand Total
07:00 07:15	12	12	**24**	6	52	**58**	**82**
07:15 07:30	6	9	**15**	8	45	**53**	**68**
07:30 07:45	14	12	**26**	9	55	**64**	**90**
07:45 08:00	12	17	**29**	18	66	**84**	**113**
07:00 08:00	44	50	**94**	41	218	**259**	**353**
08:00 08:15	18	19	**37**	21	48	**69**	**106**
08:15 08:30	24	19	**43**	22	43	**65**	**108**
08:30 08:45	15	14	**29**	14	34	**48**	**77**
08:45 09:00	22	16	**38**	11	34	**45**	**83**
08:00 09:00	79	68	**147**	68	159	**227**	**374**
09:00 09:15	18	20	**38**	5	8	**13**	**51**
09:15 09:30	25	6	**31**	12	10	**22**	**53**
09:30 09:45	14	5	**19**	3	5	**8**	**27**
09:45 10:00	14	37	**51**	5	6	**11**	**62**
09:00 10:00	71	68	**139**	25	29	**54**	**193**
15:00 15:15	31	26	**57**	25	12	**37**	**94**
15:15 15:30	52	23	**75**	21	13	**34**	**109**
15:30 15:45	18	29	**47**	34	14	**48**	**95**
15:45 16:00	17	34	**51**	38	14	**52**	**103**
15:00 16:00	118	112	**230**	118	53	**171**	**401**
16:00 16:15	23	40	**63**	59	21	**80**	**143**
16:15 16:30	30	38	**68**	30	13	**43**	**111**
16:30 16:45	29	36	**65**	45	30	**75**	**140**
16:45 17:00	21	29	**50**	28	22	**50**	**100**
16:00 17:00	103	143	**246**	162	86	**248**	**494**
17:00 17:15	16	33	**49**	52	17	**69**	**118**
17:15 17:30	15	23	**38**	26	12	**38**	**76**
17:30 17:45	10	13	**23**	19	15	**34**	**57**
17:45 18:00	13	11	**24**	7	17	**24**	**48**
17:00 18:00	54	80	**134**	104	61	**165**	**299**
Total	469	521	**990**	518	606	**1124**	**2114**

Comment:

Public Works - Traffic Services

Work Order
34545

Turning Movement Count - Full Study Summary Report

LYON ST @ SPARKS ST

Survey Date: Thursday, April 23, 2015

Total Observed U-Turns

Northbound: 0 Southbound: 0

Eastbound: 1 Westbound: 0

AADT Factor

.49

Full Study

	LYON ST									SPARKS ST									
	Northbound				Southbound					Eastbound				Westbound					
Period	LT	ST	RT	**NB TOT**	LT	ST	RT	**SB TOT**	**STR TOT**	LT	ST	RT	**EB TOT**	LT	ST	RT	**WB TOT**	**STR TOT**	**Grand Total**
07:00 08:00	0	0	0	**0**	0	1528	41	**1569**	**1569**	0	0	19	**19**	7	0	1	**8**	**27**	**1596**
08:00 09:00	0	1	0	**1**	0	1549	42	**1591**	**1592**	0	0	31	**31**	5	0	1	**6**	**37**	**1629**
09:00 10:00	0	0	0	**0**	0	965	32	**997**	**997**	0	0	16	**16**	1	0	3	**4**	**20**	**1017**
15:00 16:00	0	17	0	**17**	0	704	40	**744**	**761**	0	0	21	**21**	0	0	1	**1**	**22**	**783**
16:00 17:00	0	25	1	**26**	0	723	43	**766**	**792**	0	0	25	**25**	1	0	1	**2**	**27**	**819**
17:00 18:00	0	10	1	**11**	0	652	36	**688**	**699**	0	0	20	**20**	1	0	1	**2**	**22**	**721**
Total	0	53	2	**55**	0	6121	234	**6355**	**6410**	0	0	132	**132**	15	0	8	**23**	**155**	**6565**
Equ 12Hr	0	73	2	**75**	0	8508	325	**8833**	**8908**	0	0	183	**183**	20	0	11	**31**	**214**	**9122**

Note: These values are calculated by multiplying the totals by the appropriate expansion factor. **1.39**

Avg 12Hr	0	35	1	**36**	0	4139	158	**4297**	**4333**	0	0	89	**89**	9	0	5	**15**	**104**	**4437**

Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor. **.49**

Avg 24Hr	0	45	1	**47**	0	5422	206	**5629**	**5676**	0	0	116	**116**	11	0	6	**19**	**136**	**5812**

Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor. **1.31**

Comments:

Note: U-Turns are included in Totals.

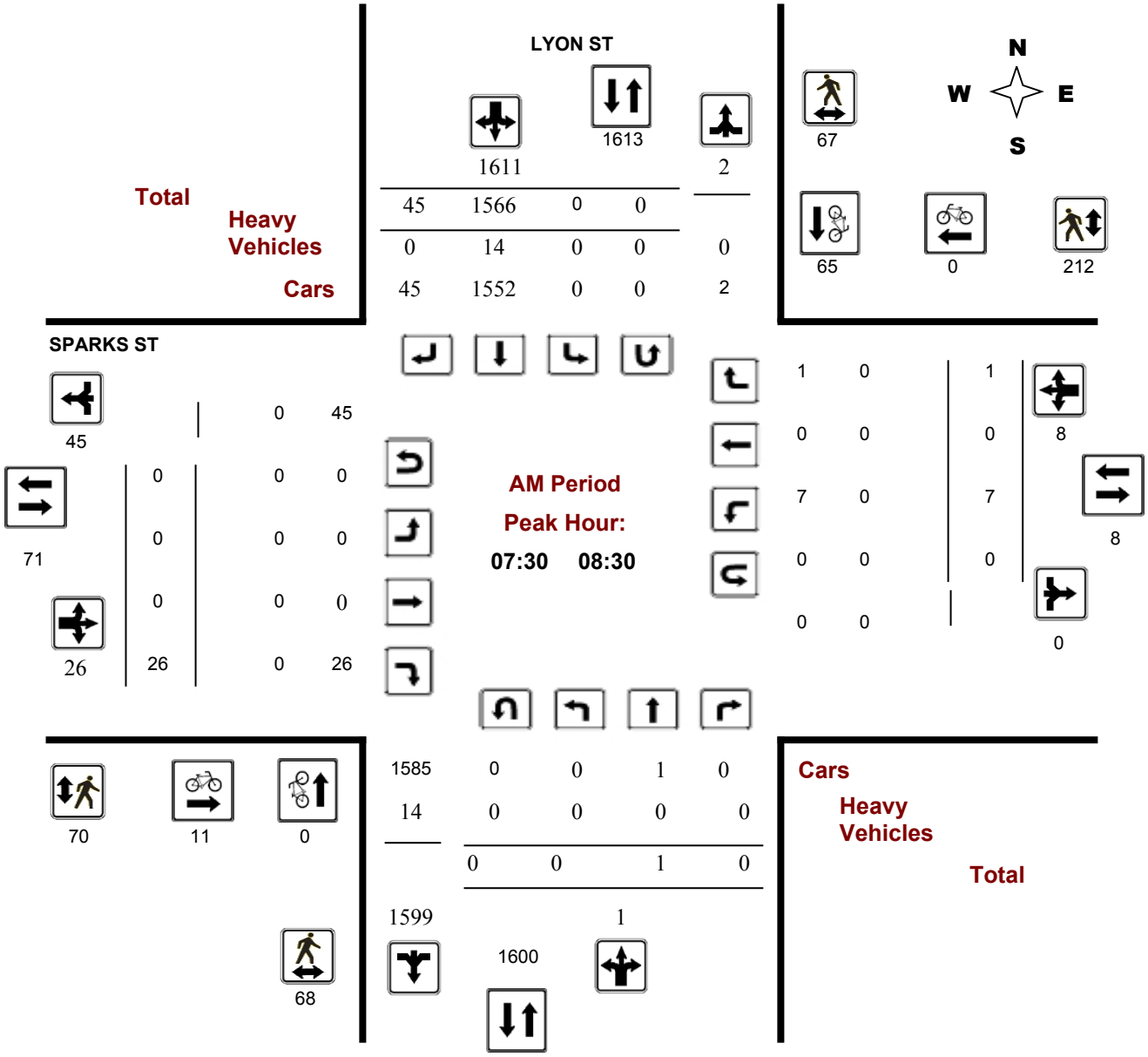
Public Works - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

LYON ST @ SPARKS ST

Survey Date: Thursday, April 23, 2015 **WO No:** 34545

Start Time: 07:00 **Device:** Miovision



Comments

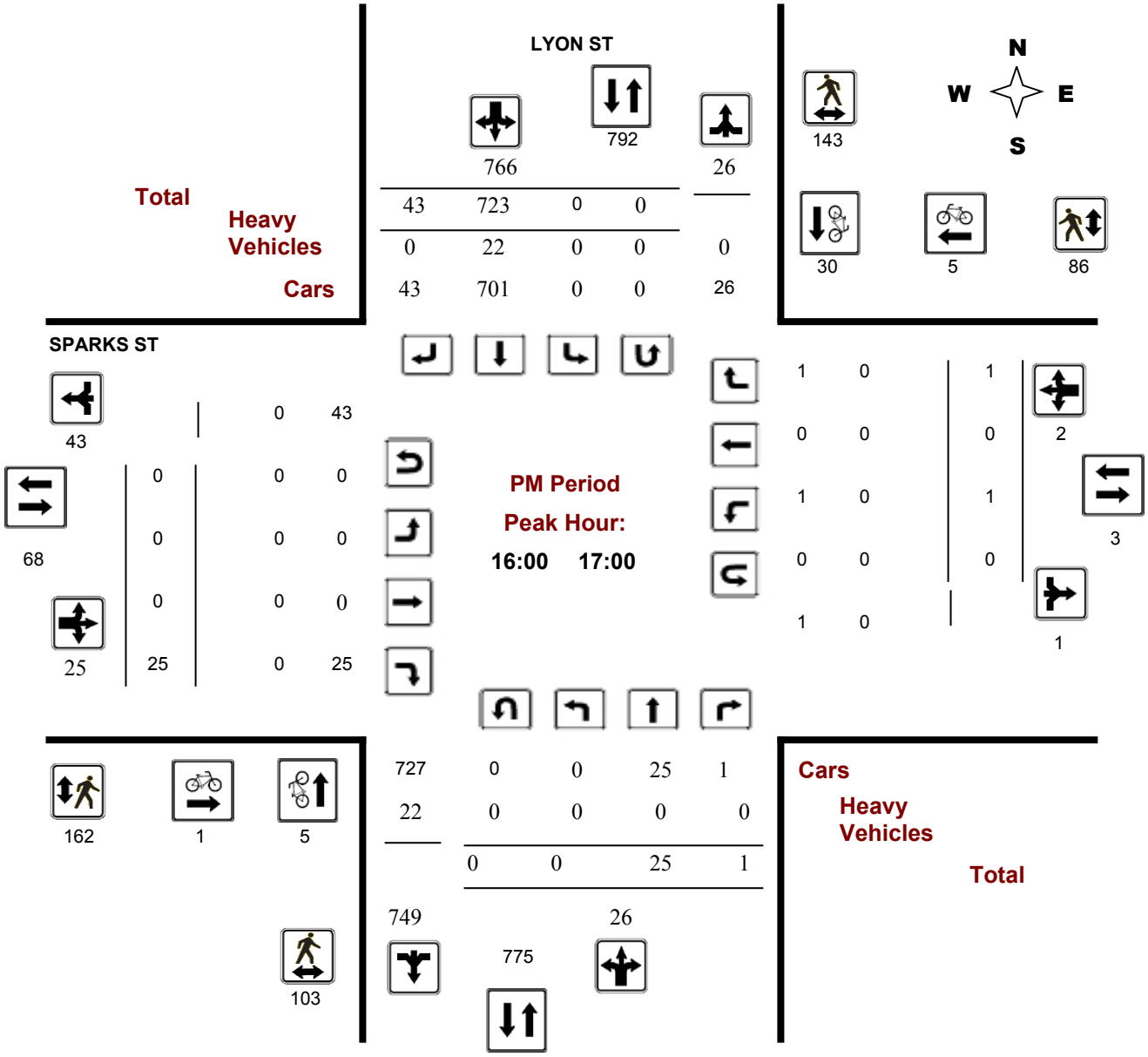
Public Works - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

LYON ST @ SPARKS ST

Survey Date: Thursday, April 23, 2015
Start Time: 07:00

WO No: 34545
Device: Miovision



Comments

Project No: 5890.41
Project Name: 350 Sparks St
Study Location: Queen St
Municipality: Ottawa
Study Date: Wed April 29, 2015
Study Time: 7:00-10:00 & 15:00-16:00
Study Type: Traffic Counts

Driveway:	361 Queen St, Layby (PUDO)							
End	Inbound			Outbound			Two Way	
Time	Right	Left	Total	Right	Left	Total	Total	Hourly
7:15	0	0	0	0	0	0	0	
7:30	0	0	0	0	0	0	0	
7:45	2	2	4	1	3	4	8	
8:00	0	1	1	0	0	0	1	9
8:15	1	0	1	0	1	1	2	11
8:30	4	2	6	0	2	2	8	19
8:45	0	3	3	3	2	5	8	19
9:00	1	2	3	3	1	4	7	25
9:15	1	2	3	1	2	3	6	29
9:30	1	2	3	2	0	2	5	26
9:45	0	0	0	0	0	0	0	18
10:00	1	1	2	0	1	1	3	14
Total	11	15	26	10	12	22	48	
Peak Hour								
8:15-9:15	6	9	15	7	7	14	29	

Driveway:	361 Queen St, Layby (PUDO)							
End	Inbound			Outbound			Two Way	
Time	Right	Left	Total	Right	Left	Total	Total	Hourly
15:15	1	1	2	1	1	2	4	
15:30	2	1	3	0	1	1	4	
15:45	3	1	4	3	3	6	10	
16:00	2	2	4	2	2	4	8	26
16:15	3	1	4	3	1	4	8	30
16:30	1	3	4	1	1	2	6	32
16:45	0	0	0	0	1	1	1	23
17:00	0	0	0	1	0	1	1	16
17:15	2	2	4	4	0	4	8	16
17:30	1	1	2	1	0	1	3	13
17:45	2	0	2	1	1	2	4	16
18:00	0	0	0	0	1	1	1	16
Total	17	12	29	17	12	29	58	
Peak Hour								
15:30-16:30	9	7	16	9	7	16	32	

Project No: 5890.41
Project Name: 350 Sparks St
Study Location: Queen St
Municipality: Ottawa
Study Date: Wed April 29, 2015
Study Time: 7:00-10:00 & 15:00-16:00
Study Type: Traffic Counts

Driveway:	Hotel & Public Parking Lot							
End	Inbound			Outbound			Two Way	
Time	Right	Left	Total	Right	Left	Total	Total	Hourly
7:15	0	0	0	0	0	0	0	
7:30	8	7	15	0	0	0	15	
7:45	6	5	11	0	0	0	11	
8:00	8	12	20	0	0	0	20	46
8:15	12	12	24	0	1	1	25	71
8:30	15	10	25	1	0	1	26	82
8:45	27	8	35	2	0	2	37	108
9:00	16	17	33	0	1	1	34	122
9:15	9	14	23	0	0	0	23	120
9:30	12	9	21	1	2	3	24	118
9:45	6	0	6	1	2	3	9	90
10:00	5	1	6	0	0	0	6	62
Total	124	95	219	5	6	11	230	
Peak Hour 8:00-9:00	70	47	117	3	2	5	122	

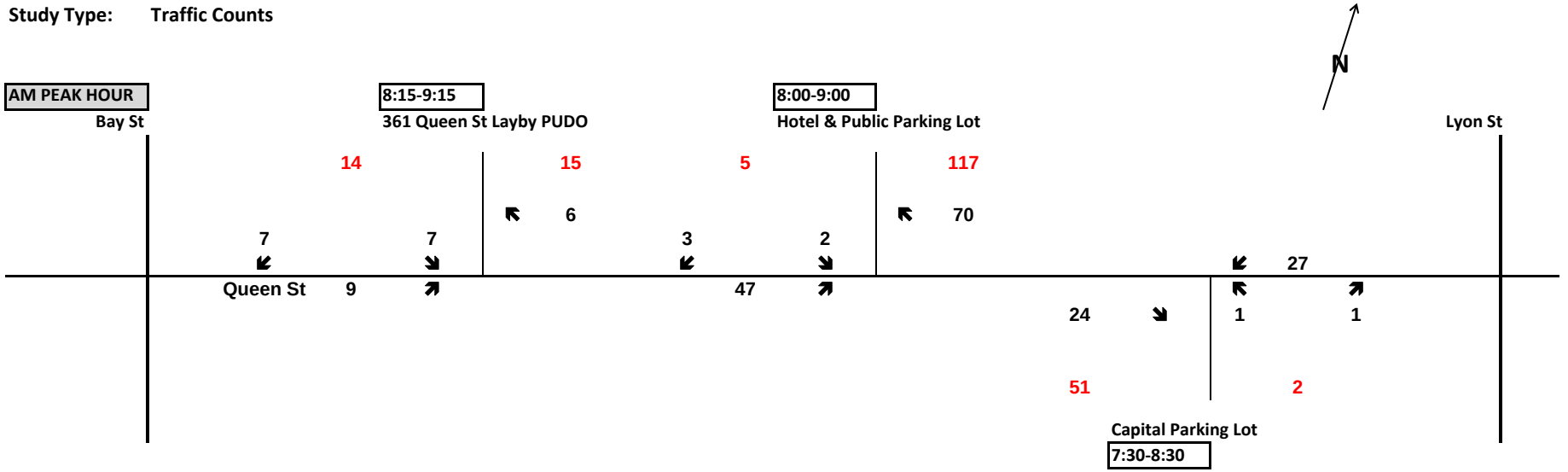
Driveway:	Hotel & Public Parking Lot							
End	Inbound			Outbound			Two Way	
Time	Right	Left	Total	Right	Left	Total	Total	Hourly
15:15	2	3	5	5	7	12	17	
15:30	0	0	0	9	7	16	16	
15:45	1	1	2	8	8	16	18	
16:00	2	1	3	10	6	16	19	70
16:15	2	0	2	17	11	28	30	83
16:30	0	1	1	7	14	21	22	89
16:45	0	0	0	11	23	34	34	105
17:00	0	0	0	10	10	20	20	106
17:15	0	0	0	16	11	27	27	103
17:30	0	0	0	6	9	15	15	96
17:45	0	0	0	11	3	14	14	76
18:00	0	0	0	6	3	9	9	65
Total	7	6	13	116	112	228	241	
Peak Hour 16:00-17:00	2	1	3	45	58	103	106	

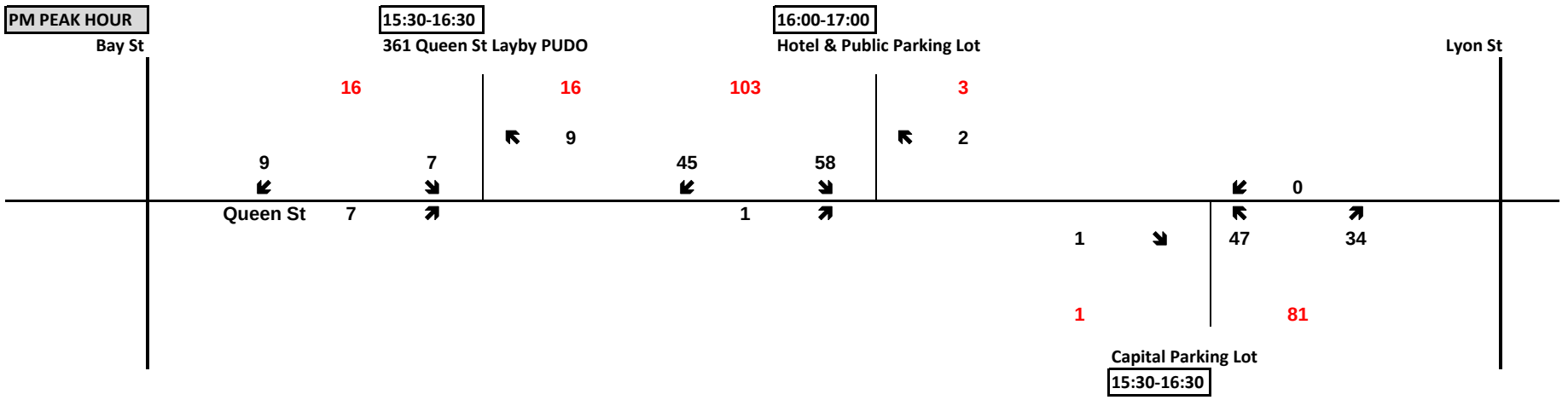
Project No: 5890.41
Project Name: 350 Sparks St
Study Location: Queen St
Municipality: Ottawa
Study Date: Wed April 29, 2015
Study Time: 7:00-10:00 & 15:00-16:00
Study Type: Traffic Counts

Driveway:	Capital Parking Lot							
End	Inbound			Outbound			Two Way	
Time	Right	Left	Total	Right	Left	Total	Total	Hourly
7:15	0	1	1	1	0	1	2	
7:30	3	3	6	0	0	0	6	
7:45	3	9	12	0	0	0	12	
8:00	7	10	17	1	1	2	19	39
8:15	4	1	5	0	0	0	5	42
8:30	10	7	17	0	0	0	17	53
8:45	5	7	12	0	0	0	12	53
9:00	1	4	5	0	0	0	5	39
9:15	5	9	14	0	1	1	15	49
9:30	6	6	12	0	0	0	12	44
9:45	4	6	10	0	0	0	10	42
10:00	1	1	2	0	0	0	2	39
Total	49	64	113	2	2	4	117	
Peak Hour								
7:30-8:30	24	27	51	1	1	2	53	

Driveway:	Capital Parking Lot							
End	Inbound			Outbound			Two Way	
Time	Right	Left	Total	Right	Left	Total	Total	Hourly
15:15	1	2	3	4	9	13	16	
15:30	0	0	0	5	8	13	13	
15:45	1	0	1	8	18	26	27	
16:00	0	0	0	6	7	13	13	69
16:15	0	0	0	14	13	27	27	80
16:30	0	0	0	6	9	15	15	82
16:45	1	0	1	9	6	15	16	71
17:00	0	0	0	3	9	12	12	70
17:15	0	0	0	7	7	14	14	57
17:30	0	0	0	1	5	6	6	48
17:45	0	0	0	2	4	6	6	38
18:00	0	1	1	1	3	4	5	31
Total	3	3	6	66	98	164	170	
Peak Hour								
15:30-16:30	1	0	1	34	47	81	82	

Project No: 5890
Project Name: 350 Sparks St
Study Location: Queen St
Municipality: Ottawa
Study Date: Wed April 29, 2015
Study Time: 7:00-10:00 & 15:00-16:00
Study Type: Traffic Counts





APPENDIX D:
Existing Traffic Operations – Capacity Analysis Sheets

Queues
3: Bay & Queen

24/06/2015

Lane Group	EBT	WBT	WBR	NBT
Lane Group Flow (vph)	274	189	53	579
v/c Ratio	0.52	0.31	0.11	0.48
Control Delay	16.8	7.4	1.2	11.1
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	16.8	7.4	1.2	11.1
Queue Length 50th (m)	19.3	7.9	0.1	15.9
Queue Length 95th (m)	37.1	15.0	m1.1	26.8
Internal Link Dist (m)	50.7	33.5		61.4
Turn Bay Length (m)			20.0	
Base Capacity (vph)	530	603	493	1202
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.52	0.31	0.11	0.48

Intersection Summary
m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis
3: Bay & Queen

24/06/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	95	165	0	0	180	50	35	360	155	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.1			4.1	4.1		4.1				
Lane Util. Factor		1.00			1.00	1.00		0.95				
Frpb, ped/bikes		1.00			1.00	0.92		0.94				
Flpb, ped/bikes		0.99			1.00	1.00		0.99				
Frt		1.00			1.00	0.85		0.96				
Flt Protected		0.98			1.00	1.00		1.00				
Satd. Flow (prot)		1459			1397	1074		2625				
Flt Permitted		0.83			1.00	1.00		1.00				
Satd. Flow (perm)		1231			1397	1074		2625				
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	100	174	0	0	189	53	37	379	163	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	30	0	69	0	0	0	0
Lane Group Flow (vph)	0	274	0	0	189	23	0	510	0	0	0	0
Confl. Peds. (#/hr)	40		80	80		40	70		150	150		70
Confl. Bikes (#/hr)			5			50			25			
Heavy Vehicles (%)	7%	8%	1%	1%	16%	18%	3%	6%	1%	1%	1%	1%
Turn Type	Perm	NA			NA	Perm	Perm	NA				
Protected Phases		4			8			2				
Permitted Phases	4					8	2					
Actuated Green, G (s)		24.9			24.9	24.9		24.9				
Effective Green, g (s)		25.9			25.9	25.9		25.9				
Actuated g/C Ratio		0.43			0.43	0.43		0.43				
Clearance Time (s)		5.1			5.1	5.1		5.1				
Vehicle Extension (s)		3.0			3.0	3.0		3.0				
Lane Grp Cap (vph)		531			603	463		1133				
v/s Ratio Prot					0.14							
v/s Ratio Perm		c0.22				0.02		0.19				
v/c Ratio		0.52			0.31	0.05		0.45				
Uniform Delay, d1		12.5			11.2	9.9		12.0				
Progression Factor		1.00			0.54	0.29		1.00				
Incremental Delay, d2		3.6			1.2	0.2		1.3				
Delay (s)		16.0			7.2	3.1		13.3				
Level of Service		B			A	A		B				
Approach Delay (s)		16.0			6.3			13.3			0.0	
Approach LOS		B			A			B			A	

Intersection Summary					
HCM 2000 Control Delay	12.5	HCM 2000 Level of Service		B	
HCM 2000 Volume to Capacity ratio	0.48				
Actuated Cycle Length (s)	60.0	Sum of lost time (s)		8.2	
Intersection Capacity Utilization	63.9%	ICU Level of Service		B	
Analysis Period (min)	15				

c Critical Lane Group

Queues
6: Lyon & Queen

24/06/2015

Lane Group	EBT	WBT	SBT
Lane Group Flow (vph)	258	273	1752
v/c Ratio	0.62	0.48	0.61
Control Delay	39.6	38.2	14.2
Queue Delay	0.0	0.0	45.2
Total Delay	39.6	38.2	59.4
Queue Length 50th (m)	42.7	25.5	60.8
Queue Length 95th (m)	66.3	38.1	70.8
Internal Link Dist (m)	43.2	41.1	46.0
Turn Bay Length (m)			
Base Capacity (vph)	415	563	2878
Starvation Cap Reductn	0	0	1275
Spillback Cap Reductn	0	0	0
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.62	0.48	1.09

Intersection Summary

HCM Signalized Intersection Capacity Analysis
6: Lyon & Queen

24/06/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	190	60	80	185	0	0	0	0	365	1200	135
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.5			4.4						4.4	
Lane Util. Factor		1.00			0.95						0.86	
Frpb, ped/bikes		0.91			1.00						0.96	
Flpb, ped/bikes		1.00			0.95						0.89	
Frt		0.97			1.00						0.99	
Flt Protected		1.00			0.99						0.99	
Satd. Flow (prot)		1372			2713						4556	
Flt Permitted		1.00			0.69						0.99	
Satd. Flow (perm)		1372			1901						4556	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	196	62	82	191	0	0	0	0	376	1237	139
RTOR Reduction (vph)	0	9	0	0	0	0	0	0	0	0	9	0
Lane Group Flow (vph)	0	249	0	0	273	0	0	0	0	0	1743	0
Confl. Peds. (#/hr)	310		240	240		310				200		200
Confl. Bikes (#/hr)			40			40						110
Heavy Vehicles (%)	1%	4%	6%	13%	3%	1%	1%	1%	1%	2%	1%	2%
Turn Type		NA		Perm	NA					Perm	NA	
Protected Phases		4			8						1 2	
Permitted Phases				8						1 2		
Actuated Green, G (s)		34.5			34.6						74.0	
Effective Green, g (s)		35.5			35.6						75.0	
Actuated g/C Ratio		0.30			0.30						0.62	
Clearance Time (s)		5.5			5.4							
Vehicle Extension (s)		3.0			3.0							
Lane Grp Cap (vph)		405			563						2847	
v/s Ratio Prot		c0.18										
v/s Ratio Perm					0.14						0.38	
v/c Ratio		0.61			0.48						0.61	
Uniform Delay, d1		36.4			34.7						13.7	
Progression Factor		0.95			1.00						1.00	
Incremental Delay, d2		6.1			3.0						0.4	
Delay (s)		40.6			37.6						14.1	
Level of Service		D			D						B	
Approach Delay (s)		40.6			37.6			0.0			14.1	
Approach LOS		D			D			A			B	

Intersection Summary					
HCM 2000 Control Delay	19.9	HCM 2000 Level of Service		B	
HCM 2000 Volume to Capacity ratio	0.64				
Actuated Cycle Length (s)	120.0	Sum of lost time (s)		13.9	
Intersection Capacity Utilization	74.2%	ICU Level of Service		D	
Analysis Period (min)	15				

c Critical Lane Group

Queues
9: Bay & Sparks

24/06/2015

Lane Group	WBT	NBT
Lane Group Flow (vph)	31	526
v/c Ratio	0.07	0.32
Control Delay	9.0	5.6
Queue Delay	0.0	0.2
Total Delay	9.0	5.8
Queue Length 50th (m)	0.7	10.4
Queue Length 95th (m)	5.1	11.7
Internal Link Dist (m)	123.2	51.2
Turn Bay Length (m)		
Base Capacity (vph)	466	1621
Starvation Cap Reductn	0	391
Spillback Cap Reductn	0	0
Storage Cap Reductn	0	0
Reduced v/c Ratio	0.07	0.43

Intersection Summary

HCM Signalized Intersection Capacity Analysis
9: Bay & Sparks

24/06/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	0	10	20	15	465	25	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)					3.0			4.4				
Lane Util. Factor					1.00			0.95				
Frpb, ped/bikes					0.98			0.99				
Flpb, ped/bikes					1.00			1.00				
Frt					0.91			0.99				
Flt Protected					1.00			1.00				
Satd. Flow (prot)					1426			2884				
Flt Permitted					1.00			1.00				
Satd. Flow (perm)					1426			2884				
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	0	0	10	21	16	484	26	0	0	0
RTOR Reduction (vph)	0	0	0	0	14	0	0	6	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	17	0	0	520	0	0	0	0
Confl. Peds. (#/hr)	20		20	20		20	70		100	100		70
Confl. Bikes (#/hr)									50			
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	5%	4%	1%	1%	1%
Turn Type					NA		Perm	NA				
Protected Phases		4			8			2				
Permitted Phases	4						2					
Actuated Green, G (s)					18.0			32.6				
Effective Green, g (s)					19.0			33.6				
Actuated g/C Ratio					0.32			0.56				
Clearance Time (s)					4.0			5.4				
Vehicle Extension (s)					3.0			3.0				
Lane Grp Cap (vph)					451			1615				
v/s Ratio Prot					c0.01							
v/s Ratio Perm								0.18				
v/c Ratio					0.04			0.32				
Uniform Delay, d1					14.2			7.1				
Progression Factor					1.00			0.74				
Incremental Delay, d2					0.0			0.5				
Delay (s)					14.2			5.7				
Level of Service					B			A				
Approach Delay (s)		0.0			14.2			5.7			0.0	
Approach LOS		A			B			A			A	

Intersection Summary					
HCM 2000 Control Delay	6.2	HCM 2000 Level of Service		A	
HCM 2000 Volume to Capacity ratio	0.22				
Actuated Cycle Length (s)	60.0	Sum of lost time (s)		7.4	
Intersection Capacity Utilization	49.2%	ICU Level of Service		A	
Analysis Period (min)	15				

c Critical Lane Group

Queues
11: Lyon & Sparks

24/06/2015

Lane Group	EBR	SBT
Lane Group Flow (vph)	27	1830
v/c Ratio	0.27	0.66
Control Delay	29.4	3.7
Queue Delay	0.0	0.0
Total Delay	29.4	3.7
Queue Length 50th (m)	1.2	0.0
Queue Length 95th (m)	8.7	85.8
Internal Link Dist (m)		25.7
Turn Bay Length (m)		
Base Capacity (vph)	233	2791
Starvation Cap Reductn	0	0
Spillback Cap Reductn	0	0
Storage Cap Reductn	0	0
Reduced v/c Ratio	0.12	0.66

Intersection Summary

HCM Signalized Intersection Capacity Analysis
11: Lyon & Sparks

24/06/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	0	25	0	0	1675	45
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Total Lost time (s)		3.8			4.3	
Lane Util. Factor		1.00			0.95	
Frpb, ped/bikes		0.77			0.99	
Flpb, ped/bikes		1.00			1.00	
Frt		0.86			1.00	
Flt Protected		1.00			1.00	
Satd. Flow (prot)		944			3009	
Flt Permitted		1.00			1.00	
Satd. Flow (perm)		944			3009	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	0	27	0	0	1782	48
RTOR Reduction (vph)	0	18	0	0	1	0
Lane Group Flow (vph)	0	9	0	0	1829	0
Confl. Peds. (#/hr)	70	100	100			160
Confl. Bikes (#/hr)		10				30
Heavy Vehicles (%)	1%	15%	1%	1%	1%	4%
Turn Type		Perm			NA	
Protected Phases					6	
Permitted Phases		4				
Actuated Green, G (s)		3.4			84.1	
Effective Green, g (s)		4.4			85.1	
Actuated g/C Ratio		0.05			0.87	
Clearance Time (s)		4.8			5.3	
Vehicle Extension (s)		3.0			3.0	
Lane Grp Cap (vph)		42			2623	
v/s Ratio Prot					c0.61	
v/s Ratio Perm		c0.01				
v/c Ratio		0.21			0.70	
Uniform Delay, d1		44.9			2.0	
Progression Factor		1.00			1.00	
Incremental Delay, d2		2.5			1.6	
Delay (s)		47.4			3.6	
Level of Service		D			A	
Approach Delay (s)	47.4			0.0	3.6	
Approach LOS	D			A	A	

Intersection Summary				
HCM 2000 Control Delay	4.2	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.68			
Actuated Cycle Length (s)	97.6	Sum of lost time (s)	9.1	
Intersection Capacity Utilization	76.2%	ICU Level of Service	D	
Analysis Period (min)	15			

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
12: Queen & Parking Dwy

24/06/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	45	245	25	25	225	70	0	0	5	0	0	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	47	258	26	26	237	74	0	0	5	0	0	5
Pedestrians		150			150			150			150	
Lane Width (m)		3.6			3.6			3.6			3.6	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		12			12			12			12	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)		80			67							
pX, platoon unblocked	0.92						0.92	0.92		0.92	0.92	0.92
vC, conflicting volume	461			434			997	1029	571	997	1005	574
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	375			434			956	990	571	956	965	498
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	95			97			100	100	99	100	100	99
cM capacity (veh/h)	957			985			129	161	398	128	167	405

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	332	337	5	5
Volume Left	47	26	0	0
Volume Right	26	74	5	5
cSH	957	985	398	405
Volume to Capacity	0.05	0.03	0.01	0.01
Queue Length 95th (m)	1.1	0.6	0.3	0.3
Control Delay (s)	1.7	0.9	14.2	14.0
Lane LOS	A	A	B	B
Approach Delay (s)	1.7	0.9	14.2	14.0
Approach LOS			B	B

Intersection Summary					
Average Delay			1.5		
Intersection Capacity Utilization			49.1%	ICU Level of Service	A
Analysis Period (min)			15		

Queues
3: Bay & Queen

24/06/2015

Lane Group	EBT	WBT	WBR	NBT
Lane Group Flow (vph)	208	324	261	819
v/c Ratio	0.57	0.64	0.64	0.59
Control Delay	21.4	20.7	19.2	11.9
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	21.4	20.7	19.2	11.9
Queue Length 50th (m)	14.8	19.2	11.5	25.2
Queue Length 95th (m)	31.6	m27.5	m18.5	38.5
Internal Link Dist (m)	50.7	55.4		61.4
Turn Bay Length (m)			20.0	
Base Capacity (vph)	367	505	408	1393
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.57	0.64	0.64	0.59

Intersection Summary
m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis
3: Bay & Queen

24/06/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	90	105	0	0	305	245	20	690	60	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.1			4.1	4.1		4.1				
Lane Util. Factor		1.00			1.00	1.00		0.95				
Frpb, ped/bikes		1.00			1.00	0.88		0.98				
Flpb, ped/bikes		0.98			1.00	1.00		1.00				
Frt		1.00			1.00	0.85		0.99				
Flt Protected		0.98			1.00	1.00		1.00				
Satd. Flow (prot)		1449			1397	1031		2827				
Flt Permitted		0.69			1.00	1.00		1.00				
Satd. Flow (perm)		1016			1397	1031		2827				
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	96	112	0	0	324	261	21	734	64	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	36	0	11	0	0	0	0
Lane Group Flow (vph)	0	208	0	0	324	225	0	808	0	0	0	0
Confl. Peds. (#/hr)	60		70	70		60	40		170	170		40
Confl. Bikes (#/hr)			10			80			10			10
Heavy Vehicles (%)	7%	8%	1%	1%	16%	18%	3%	6%	1%	1%	1%	1%
Turn Type	Perm	NA			NA	Perm	Perm	NA				
Protected Phases		4			8			2				
Permitted Phases	4					8	2					
Actuated Green, G (s)		18.9			18.9	18.9		25.9				
Effective Green, g (s)		19.9			19.9	19.9		26.9				
Actuated g/C Ratio		0.36			0.36	0.36		0.49				
Clearance Time (s)		5.1			5.1	5.1		5.1				
Vehicle Extension (s)		3.0			3.0	3.0		3.0				
Lane Grp Cap (vph)		367			505	373		1382				
v/s Ratio Prot					c0.23							
v/s Ratio Perm		0.20				0.22		0.29				
v/c Ratio		0.57			0.64	0.60		0.58				
Uniform Delay, d1		14.1			14.6	14.3		10.1				
Progression Factor		1.00			1.03	1.06		1.00				
Incremental Delay, d2		6.2			4.6	5.3		1.8				
Delay (s)		20.3			19.7	20.5		11.9				
Level of Service		C			B	C		B				
Approach Delay (s)		20.3			20.1			11.9			0.0	
Approach LOS		C			C			B			A	

Intersection Summary			
HCM 2000 Control Delay	15.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	55.0	Sum of lost time (s)	8.2
Intersection Capacity Utilization	71.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Queues
6: Lyon & Queen

24/06/2015

Lane Group	EBT	WBT	SBT
Lane Group Flow (vph)	280	640	935
v/c Ratio	0.55	0.88	0.40
Control Delay	16.7	33.1	9.7
Queue Delay	0.0	0.0	0.0
Total Delay	16.7	33.1	9.7
Queue Length 50th (m)	13.7	28.0	14.4
Queue Length 95th (m)	33.5	#53.6	20.2
Internal Link Dist (m)	43.2	41.1	46.0
Turn Bay Length (m)			
Base Capacity (vph)	508	730	2358
Starvation Cap Reductn	0	0	0
Spillback Cap Reductn	0	0	0
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.55	0.88	0.40

Intersection Summary
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis
6: Lyon & Queen

24/06/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	170	90	220	375	0	0	0	0	110	675	85
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.5			4.4						5.0	
Lane Util. Factor		1.00			0.95						0.86	
Frpb, ped/bikes		0.93			1.00						0.95	
Flpb, ped/bikes		1.00			0.95						0.98	
Frt		0.95			1.00						0.99	
Flt Protected		1.00			0.98						0.99	
Satd. Flow (prot)		1393			2835						4961	
Flt Permitted		1.00			0.71						0.99	
Satd. Flow (perm)		1393			2050						4961	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	183	97	237	403	0	0	0	0	118	726	91
RTOR Reduction (vph)	0	15	0	0	0	0	0	0	0	0	14	0
Lane Group Flow (vph)	0	265	0	0	640	0	0	0	0	0	921	0
Confl. Peds. (#/hr)	270		210	210		270	300		120	120		300
Confl. Bikes (#/hr)			10			80			10			10
Heavy Vehicles (%)	1%	4%	1%	3%	1%	1%	1%	1%	1%	6%	2%	2%
Turn Type		NA		Perm	NA					Perm	NA	
Protected Phases		4			8						6	
Permitted Phases				8						6		
Actuated Green, G (s)		18.5			18.6						25.0	
Effective Green, g (s)		19.5			19.6						26.0	
Actuated g/C Ratio		0.35			0.36						0.47	
Clearance Time (s)		5.5			5.4						6.0	
Vehicle Extension (s)		3.0			3.0						3.0	
Lane Grp Cap (vph)		493			730						2345	
v/s Ratio Prot		0.19										
v/s Ratio Perm					c0.31						0.19	
v/c Ratio		0.54			0.88						0.39	
Uniform Delay, d1		14.2			16.6						9.4	
Progression Factor		0.92			1.00						1.00	
Incremental Delay, d2		4.0			14.0						0.5	
Delay (s)		17.0			30.6						9.9	
Level of Service		B			C						A	
Approach Delay (s)		17.0			30.6			0.0			9.9	
Approach LOS		B			C			A			A	

Intersection Summary					
HCM 2000 Control Delay	18.1	HCM 2000 Level of Service		B	
HCM 2000 Volume to Capacity ratio	0.60				
Actuated Cycle Length (s)	55.0	Sum of lost time (s)		9.5	
Intersection Capacity Utilization	68.5%	ICU Level of Service		C	
Analysis Period (min)	15				

c Critical Lane Group

Queues
9: Bay & Sparks

24/06/2015

Lane Group	WBT	NBT
Lane Group Flow (vph)	41	1045
v/c Ratio	0.09	0.62
Control Delay	8.1	10.8
Queue Delay	0.0	3.2
Total Delay	8.1	14.0
Queue Length 50th (m)	0.7	33.2
Queue Length 95th (m)	5.8	48.1
Internal Link Dist (m)	123.2	51.2
Turn Bay Length (m)		
Base Capacity (vph)	454	1694
Starvation Cap Reductn	0	527
Spillback Cap Reductn	0	0
Storage Cap Reductn	0	0
Reduced v/c Ratio	0.09	0.90

Intersection Summary

HCM Signalized Intersection Capacity Analysis
9: Bay & Sparks

24/06/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	0	10	30	5	1000	20	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)					3.0			4.4				
Lane Util. Factor					1.00			0.95				
Frpb, ped/bikes					0.95			1.00				
Flpb, ped/bikes					1.00			1.00				
Frt					0.90			1.00				
Flt Protected					1.00			1.00				
Satd. Flow (prot)					1367			3021				
Flt Permitted					1.00			1.00				
Satd. Flow (perm)					1367			3021				
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	0	0	0	10	31	5	1020	20	0	0	0
RTOR Reduction (vph)	0	0	0	0	21	0	0	2	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	20	0	0	1043	0	0	0	0
Confl. Peds. (#/hr)	50		10	10		50	60		150	150		60
Confl. Bikes (#/hr)						10			60			
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	10%	1%	8%	1%	1%	1%
Turn Type					NA		Perm	NA				
Protected Phases		4			8			2				
Permitted Phases	4						2					
Actuated Green, G (s)					18.0			32.6				
Effective Green, g (s)					19.0			33.6				
Actuated g/C Ratio					0.32			0.56				
Clearance Time (s)					4.0			5.4				
Vehicle Extension (s)					3.0			3.0				
Lane Grp Cap (vph)					432			1691				
v/s Ratio Prot					c0.01							
v/s Ratio Perm								0.35				
v/c Ratio					0.05			0.62				
Uniform Delay, d1					14.2			8.9				
Progression Factor					1.00			1.00				
Incremental Delay, d2					0.0			1.7				
Delay (s)					14.3			10.6				
Level of Service					B			B				
Approach Delay (s)		0.0			14.3			10.6			0.0	
Approach LOS		A			B			B			A	

Intersection Summary				
HCM 2000 Control Delay	10.7	HCM 2000 Level of Service		B
HCM 2000 Volume to Capacity ratio	0.41			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)		7.4
Intersection Capacity Utilization	58.8%	ICU Level of Service		B
Analysis Period (min)	15			

c Critical Lane Group

Queues
11: Lyon & Sparks

24/06/2015

Lane Group	EBR	SBT
Lane Group Flow (vph)	26	810
v/c Ratio	0.11	0.29
Control Delay	2.0	1.3
Queue Delay	0.0	0.0
Total Delay	2.0	1.3
Queue Length 50th (m)	0.0	0.0
Queue Length 95th (m)	1.1	15.3
Internal Link Dist (m)		25.7
Turn Bay Length (m)		
Base Capacity (vph)	479	2756
Starvation Cap Reductn	0	0
Spillback Cap Reductn	0	0
Storage Cap Reductn	0	0
Reduced v/c Ratio	0.05	0.29

Intersection Summary

HCM Signalized Intersection Capacity Analysis
11: Lyon & Sparks

24/06/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	0	25	0	0	725	45
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Total Lost time (s)		3.8			4.3	
Lane Util. Factor		1.00			0.95	
Frpb, ped/bikes		0.89			0.99	
Flpb, ped/bikes		1.00			1.00	
Frt		0.86			0.99	
Flt Protected		1.00			1.00	
Satd. Flow (prot)		1236			2935	
Flt Permitted		1.00			1.00	
Satd. Flow (perm)		1236			2935	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	26	0	0	763	47
RTOR Reduction (vph)	0	25	0	0	3	0
Lane Group Flow (vph)	0	1	0	0	807	0
Confl. Peds. (#/hr)	140	100	100			160
Confl. Bikes (#/hr)						30
Heavy Vehicles (%)	1%	1%	1%	1%	3%	1%
Turn Type		Perm			NA	
Protected Phases					6	
Permitted Phases		4				
Actuated Green, G (s)		1.1			41.6	
Effective Green, g (s)		2.1			42.6	
Actuated g/C Ratio		0.04			0.81	
Clearance Time (s)		4.8			5.3	
Vehicle Extension (s)		3.0			3.0	
Lane Grp Cap (vph)		49			2368	
v/s Ratio Prot					c0.27	
v/s Ratio Perm		c0.00				
v/c Ratio		0.02			0.34	
Uniform Delay, d1		24.4			1.4	
Progression Factor		1.00			1.00	
Incremental Delay, d2		0.2			0.4	
Delay (s)		24.5			1.8	
Level of Service		C			A	
Approach Delay (s)	24.5			0.0	1.8	
Approach LOS	C			A	A	

Intersection Summary				
HCM 2000 Control Delay	2.5	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.33			
Actuated Cycle Length (s)	52.8	Sum of lost time (s)	9.1	
Intersection Capacity Utilization	45.7%	ICU Level of Service	A	
Analysis Period (min)	15			

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
12: Queen & Parking Dwy

24/06/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	165	0	0	460	0	45	0	35	60	0	45
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	0	176	0	0	489	0	48	0	37	64	0	48
Pedestrians								60			60	
Lane Width (m)								3.6			3.6	
Walking Speed (m/s)								1.2			1.2	
Percent Blockage								5			5	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)		79			67							
pX, platoon unblocked	0.82						0.82	0.82		0.82	0.82	0.82
vC, conflicting volume	549			236			773	785	236	762	785	549
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	341			236			613	628	236	600	628	341
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			82	100	95	77	100	91
cM capacity (veh/h)	949			1265			266	296	763	283	296	547

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	176	489	85	112
Volume Left	0	0	48	64
Volume Right	0	0	37	48
cSH	949	1265	372	357
Volume to Capacity	0.00	0.00	0.23	0.31
Queue Length 95th (m)	0.0	0.0	6.1	9.2
Control Delay (s)	0.0	0.0	17.5	19.6
Lane LOS			C	C
Approach Delay (s)	0.0	0.0	17.5	19.6
Approach LOS			C	C

Intersection Summary				
Average Delay	4.3			
Intersection Capacity Utilization	40.1%	ICU Level of Service	A	
Analysis Period (min)	15			

APPENDIX E:
Vehicle Manoeuvring

RESIDENTIAL
ENTRANCE

OFFICE
ENTRANCE

HOTEL
ENTRANCE

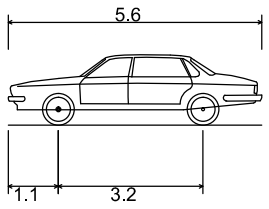
TAC P Car

TAC P Car

QUEEN STREET

● PROPOSED BOLLARD

Design Vehicle - TAC P CAR



Overall Length	5.60m
Overall Width	2.00m
Overall Body Height	1.56m
Inside Turning Radius	3.40m
Outside Turning Radius	6.90m

BA Group

PASSENGER CAR (TAC P)
VEHICLE MANOEUVRE DIAGRAM

PICK-UP / DROP-OFF CUL DE SAC

Project: 350 SPARKS STREET
Project No. 5890-41
Date: APRIL 24, 2015
Revised: JUNE 24, 2015

Scale 1:200
0 1 2 3 4 5 10m

Drawing No.
VMD-11-5

Date Plotted: June 24, 2015 Filename: J:\5890-41\BA\2015\Ground Courtyard Level Review\SPA Submission\VMD11-CY-02-589041-SPA.dwg

APPENDIX F:
As of Right Comparison, Mode Split and Routing

350 Sparks
5890-41

As of Right Trip Generation

Existing Site

			AM Peak			SAT Peak		
			in	**out**	**two-way**	**in**	**out**	**two-way**
Office	Office Garage	Existing Counts	115	5	120	0	105	105
	Office PUDO	Existing Counts	5	10	15	15	15	30
			120	**15**	**135**	**15**	**120**	**135**

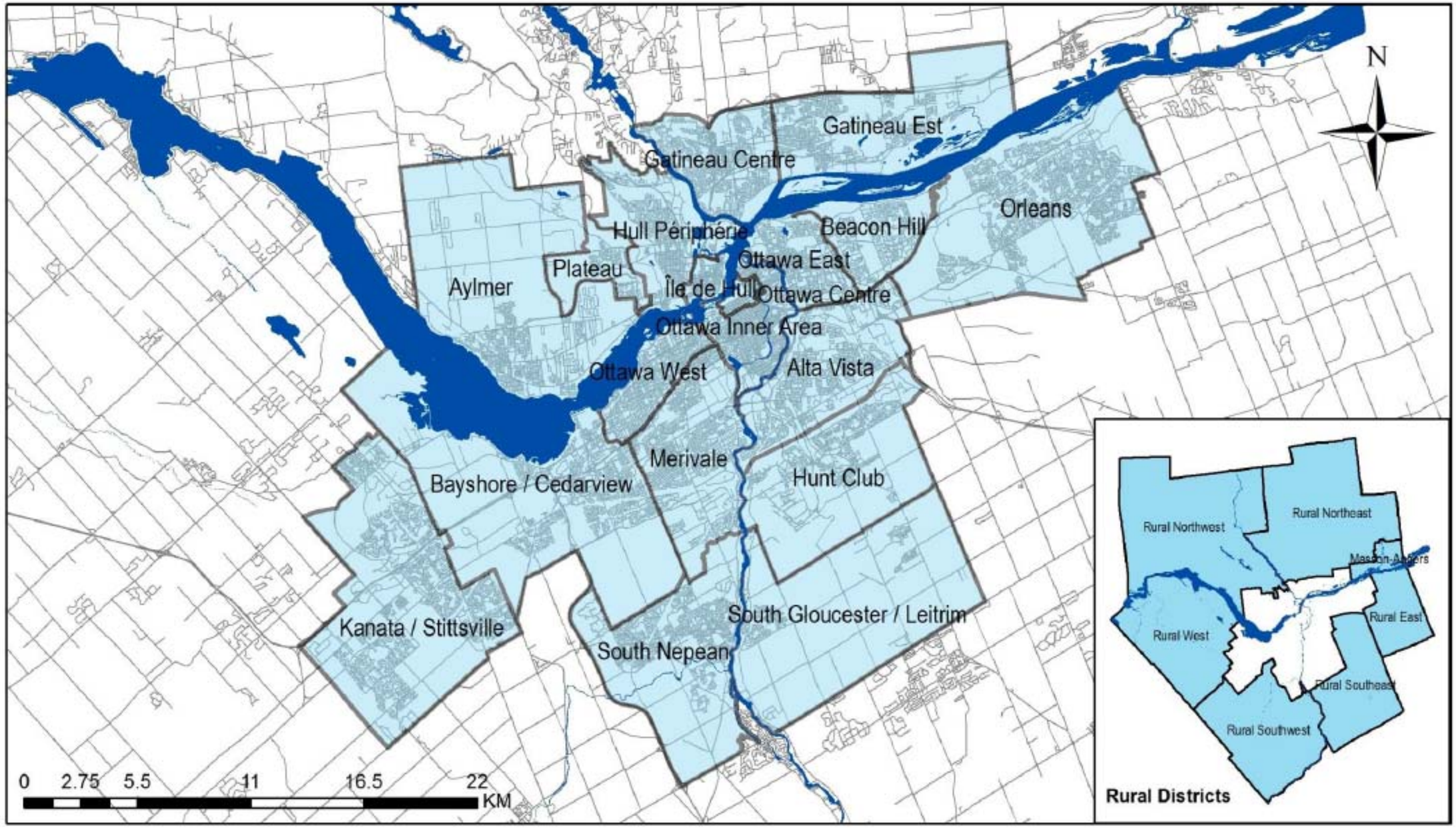
As of Right Trip Generation

			AM Peak			SAT Peak		
			in	**out**	**two-way**	**in**	**out**	**two-way**
Apartment	ITE Baseline Vehicular Trip Gen. Rate	ITE 232 - High Rise Apartment	0.08	0.23	0.31	0.95	0.60	1.55
10 units	Person Trip Rate (1,2)	1.09 passengers per vehicle	0.09	0.27	0.36	1.08	0.69	1.78
	Person Trips		**0**	**5**	**5**	**10**	**5**	**20**
	Car Driver	40%	0	2	2	4	2	8
	Car Passenger	10%	0	1	1	1	1	2
	Transit	25%	0	1	1	3	1	5
	Non-Motorized	25%	0	1	1	3	1	5
Equivalent Rate		***100%***	***0.00***	***0.20***	***0.20***	***0.40***	***0.20***	***0.80***
Vehicular Trips	***Rounded to Nearest 5***		***0***	***0***	***0***	***5***	***0***	***5***
Hotel	ITE Baseline Vehicular Trip Gen. Rate	ITE 310 - Hotel	0.40	0.29	0.69	0.34	0.36	0.70
328 units	Person Trip Rate (1,2)	1.26 passengers per vehicle	0.50	0.36	0.87	0.43	0.45	0.88
	Person Trips		**155**	**110**	**265**	**130**	**135**	**265**
	Car Driver	45%	69.8	49.5	119.3	58.5	60.8	119.3
	Car Passenger	10%	15.5	11.0	26.5	13.0	13.5	26.5
	Non-Motorized	10%	15.5	11.0	26.5	13.0	13.5	26.5
	Transit	15%	23.3	16.5	39.8	19.5	20.3	39.8
	Taxi - primary passenger	15%	23.3	16.5	39.8	19.5	20.3	39.8
	Taxi - Second passenger	5%	7.8	5.5	13.3	6.5	6.8	13.3
	Passenger Car Trips		***70***	***50***	***120***	***60***	***60***	***120***
	straight to garage	*50%*	*35*	*25*	*60*	*30*	*30*	*60*
	using PUDO / Valet		*35*	*25*	*60*	*30*	*30*	*60*
			(70)	*(50)*	*(120)*	*(60)*	*(60)*	*(120)*
	Taxi Calls		*25*	*15*	*40*	*20*	*20*	*40*
	Taxi Trips (in and out of PUDO)		*25*	*25*	*50*	*20*	*20*	*40*
Vehicular Trips	***Rounded to Nearest 5***							
AS OR RIGHT TOTAL			***190***	***65***	***255***	***80***	***180***	***260***
			225	***90***	***315***	***110***	***210***	***320***

Notes:

1. Analysis assumes inherent 5% modal split in Baseline ITE data.
2. Vehicular occupancy adopted from ITE Trip Generation Manual Handbook, Appendix C - 1.09 for apartments, 1.26 for hotels
3. Mode split based on review of information in 2011 Trans O-D Survey Report for Ottawa Centre (AM outbound trips from district)
4. ( ) Bracketed values reflect the entry / exit at the PUDO and the parking garage which effective dou8bles the in and out volumes at the site driveways.
5. Statistics based on information provided by Morguard Properties and WZMH.

Figure 5-1: Map of TRANS Districts



350 Sparks Street

Mixed Use Development
5890-41
Trip Generation
OD-Trans Information

Vehicle Ownership
Ottawa Centre
Households by vehicle availability

0	53%
1	40%
2	7%
3	0%
4	0%
	100%

Information from 2011 TRANS-OD Survey Report (p.78)

Average ownership 0.54

Trips by Primary Travel Mode

Ottawa Centre Information

AM Peak Period	From District		To District		Within District	
Auto Driver	2620	52%	19790	29%	400	12%
Auto Passenger	270	5%	5620	8%	10	0%
Transit	1200	24%	34440	51%	380	11%
Bicycle	60	1%	2490	4%	40	1%
Walk	840	17%	4920	7%	2580	74%
Other	60	1%	480	1%	60	2%
Total	5050	100%	67740	100%	3470	100%

Residential Mode Split - Selected for Study (based on AM outbound From District)

Auto Driver	55%
Auto Passenger	5%
Transit	20%
Non-Motorized	20%
	100%

350 Sparks Street

Mixed Use Development
5890-41
Trip Generation
ITE Person Trips

Baseline Weekday AM Peak Period Mode Share and Vehicle Occupancy Examples

Land Use	Vehicle Occupancy
Apartments	1.09
Motel	1.26
Office	1.06

Notes:
Averages from ITE Trip Generation Manual Handbook, Appendix C, Table C.1.

2011 ORIGIN-DESTINATION SURVEY IN THE NATIONAL CAPITAL REGION
PERSON TRIPS BY TRANS DISTRICTS

Trips from all parts to Ottawa Centre

TRIP PURPOSES: WORK
MODES: AUTO DRIVER
TIME PERIOD: AM Peak Period (06:30 to 08:59)

Route Assignment

Origin \ Destination	Centre	Percentage	W-Sir John A. Mac / Wellington	W-Albert/Scott	W-Highway 417	W-Sparks (local)	W-Queen (local)	E-Highway 417 (via Bronson, Lyon)	E-Queen (local)	E. Wellington	E-Slater	S-Lyon / Bay (loca)	S. Bronson	S-Hwy 416	N-Pont du Portage	N-Rue Eddy	N-Alexandra Bridge	Total
001 - Ottawa Centre	300	2%				0.25	0.25		0.25			0.25						1.00
050 - Ottawa Inner Area	1,300	7%	0.10				0.10	0.10		0.20		0.25	0.25					1.00
100 - Ottawa East	700	4%						1.00										1.00
120 - Beacon Hill	700	4%						1.00										1.00
140 - Alta Vista	1,100	6%						0.50				0.50						1.00
180 - Hunt Club	900	5%										0.25	0.25	0.50				1.00
200 - Merivale	1,700	10%			1.00													1.00
240 - Ottawa West	800	5%	1.00															1.00
260 - Bayshore / Cedarview	800	5%			1.00													1.00
300 - Orléans	1,900	11%							1.00									1.00
350 - Rural East	200	1%							1.00									1.00
360 - Rural Southeast	400	2%											1.00					1.00
400 - South Gloucester / Leitrim	400	2%											1.00					1.00
425 - South Nepean	1,100	6%												1.00				1.00
450 - Rural Southwest	200	1%												1.00				1.00
500 - Kanata / Stittsville	1,400	8%			1.00													1.00
560 - Rural West	100	1%			1.00													1.00
600 - Île de Hull	200	1%													1.00			1.00
625 - Hull Périphérie	600	3%													1.00			1.00
650 - Plateau	500	3%													1.00			1.00
700 - Aylmer	700	4%													1.00			1.00
750 - Rural Northwest	400	2%													1.00			1.00
800 - Pointe Gatineau	500	3%													1.00			1.00
820 - Gatineau Est	500	3%													1.00			1.00
840 - Rural Northeast	300	2%													1.00			1.00
845 - Buckingham / Masson-Angers	-	0%													1.00			1.00
900 - External	-	0%													1.00			1.00
Total	17,600		5.3%	0.0%	22.6%	0.4%	1.2%	11.8%	12.3%	1.5%	0.0%	6.6%	7.6%	9.9%	20.9%	0.0%	0.0%	
	17,700				11%	via Bronson		6%	via Bronson					5%	via Bronson			
					11%	via Lyon		6%	via Lyon					5%	via Lyon			

Orientation

Outbound (To)		**Rounded**
Queen Street - East	12.3%	15%
Lyon Street - South	28.8%	30%
Bay Street - North	27.6%	25%
Queen Street - West	30.9%	25%
Sparks Street - West	0%	5%
Total	100.0%	100%

Inbound (From)		**Rounded**
Queen Street - East	12.3%	15.0%
Lyon Street - North	27.6%	25.0%
Bay Street - South	28.8%	30.0%
Queen Street - West	30.9%	25.0%
Sparks Street - West	0%	5%
Total	100.0%	100%

2011 ORIGIN-DESTINATION SURVEY IN THE NATIONAL CAPITAL REGION
PERSON TRIPS BY TRANS DISTRICTS

Trips from all parts to Ottawa Centre

TRIP PURPOSES: WORK
MODES: AUTO DRIVER
TIME PERIOD: AM Peak Period (06:30 to 08:59)

Route Assignment

Origin \ Destination	Centre	Percentage	W-Sir John A. Mac / Wellington	W-Albert/Scott	W-Highway 417	W-Sparks (local)	W-Queen (local)	E-Highway 417 (via Bronson, Lyon)	E-Queen (local)	E. Wellington	E-Slater	S-Lyon / Bay (loca)	S. Bronson	S-Hwy 416	N-Pont du Portage	N-Rue Eddy	N-Alexandra Bridge	Total
001 - Ottawa Centre	400	14%				0.25	0.25		0.25			0.25						1.00
050 - Ottawa Inner Area	300	10%	0.10				0.10	0.10		0.20		0.25	0.25					1.00
100 - Ottawa East	300	10%						1.00										1.00
120 - Beacon Hill	100	3%						1.00										1.00
140 - Alta Vista	400	14%						0.50				0.50						1.00
180 - Hunt Club	200	7%										0.25	0.25	0.50				1.00
200 - Merivale	300	10%			1.00													1.00
240 - Ottawa West	200	7%	1.00															1.00
260 - Bayshore / Cedarview	200	7%			1.00													1.00
300 - Orléans	100	3%							1.00									1.00
350 - Rural East	-	0%							1.00									1.00
360 - Rural Southeast	-	0%											1.00					1.00
400 - South Gloucester / Leitrim	-	0%											1.00					1.00
425 - South Nepean	-	0%												1.00				1.00
450 - Rural Southwest	-	0%												1.00				1.00
500 - Kanata / Stittsville	100	3%			1.00													1.00
560 - Rural West	-	0%			1.00													1.00
600 - Île de Hull	100	3%													1.00			1.00
625 - Hull Périphérie	200	7%													1.00			1.00
650 - Plateau	-	0%													1.00			1.00
700 - Aylmer	-	0%													1.00			1.00
750 - Rural Northwest	-	0%													1.00			1.00
800 - Pointe Gatineau	-	0%													1.00			1.00
820 - Gatineau Est	-	0%													1.00			1.00
840 - Rural Northeast	-	0%													1.00			1.00
845 - Buckingham / Masson-Angers	-	0%													1.00			1.00
900 - External	-	0%													1.00			1.00
Total	3,000		7.9%	0.0%	20.7%	3.4%	4.5%	21.7%	6.9%	2.1%	0.0%	14.7%	4.3%	3.4%	10.3%	0.0%	0.0%	
	2,900				10%	via Bronson		11%	via Bronson					2%	via Bronson			
					10%	via Lyon		11%	via Lyon					2%	via Lyon			

Orientation

Outbound (To)		**Rounded**
Queen Street - East	6.9%	10%
Lyon Street - South	37.6%	35%
Bay Street - North	20.3%	20%
Queen Street - West	31.7%	30%
Sparks Street - West	3%	5%
Total	100.0%	100%

Inbound (From)		**Rounded**
Queen Street - East	6.9%	10.0%
Lyon Street - North	20.3%	20.0%
Bay Street - South	37.6%	35.0%
Queen Street - West	31.7%	30.0%
Sparks Street - West	3%	5%
Total	100.0%	100%

Summary of Results

Orientation	Office	Residential	Hotel
Outbound (To)			
Queen Street - East	15.0%	10.0%	15.0%
Lyon Street - South	30.0%	35.0%	30.0%
Bay Street - North	25.0%	20.0%	25.0%
Queen Street - West	25.0%	30.0%	25.0%
Sparks Street - West	5.0%	5.0%	5.0%
Total	100.0%	100.0%	100.0%

Inbound (From)	Office	Residential	Hotel
Queen Street - East	15.0%	10.0%	15.0%
Lyon Street - North	25.0%	20.0%	25.0%
Bay Street - South	30.0%	35.0%	30.0%
Queen Street - West	25.0%	30.0%	25.0%
Sparks Street - West	5.0%	5.0%	5.0%
Total	100.0%	100.0%	100.0%

APPENDIX G:
Future Traffic Operations – Capacity Analysis Sheets

Queues
3: Bay & Queen

24/06/2015

Lane Group	EBT	WBT	WBR	NBT
Lane Group Flow (vph)	310	232	126	627
v/c Ratio	0.65	0.38	0.24	0.52
Control Delay	21.2	9.1	1.9	12.3
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	21.2	9.1	1.9	12.3
Queue Length 50th (m)	23.5	10.7	0.3	19.2
Queue Length 95th (m)	#46.4	21.3	m3.5	31.0
Internal Link Dist (m)	50.7	34.0		61.4
Turn Bay Length (m)			20.0	
Base Capacity (vph)	480	603	527	1199
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.65	0.38	0.24	0.52

Intersection Summary
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis
3: Bay & Queen

24/06/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	140	155	0	0	220	120	35	410	150	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.1			4.1	4.1		4.1				
Lane Util. Factor		1.00			1.00	1.00		0.95				
Frpb, ped/bikes		1.00			1.00	0.92		0.94				
Flpb, ped/bikes		0.98			1.00	1.00		0.99				
Frt		1.00			1.00	0.85		0.96				
Flt Protected		0.98			1.00	1.00		1.00				
Satd. Flow (prot)		1450			1397	1074		2653				
Flt Permitted		0.75			1.00	1.00		1.00				
Satd. Flow (perm)		1114			1397	1074		2653				
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	147	163	0	0	232	126	37	432	158	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	64	0	55	0	0	0	0
Lane Group Flow (vph)	0	310	0	0	232	62	0	572	0	0	0	0
Confl. Peds. (#/hr)	40		80	80		40	70		150	150		70
Confl. Bikes (#/hr)			5			50			25			
Heavy Vehicles (%)	7%	8%	1%	1%	16%	18%	3%	6%	1%	1%	1%	1%
Turn Type	Perm	NA			NA	Perm	Perm	NA				
Protected Phases		4			8			2				
Permitted Phases	4					8	2					
Actuated Green, G (s)		24.9			24.9	24.9		24.9				
Effective Green, g (s)		25.9			25.9	25.9		25.9				
Actuated g/C Ratio		0.43			0.43	0.43		0.43				
Clearance Time (s)		5.1			5.1	5.1		5.1				
Vehicle Extension (s)		3.0			3.0	3.0		3.0				
Lane Grp Cap (vph)		480			603	463		1145				
v/s Ratio Prot					0.17							
v/s Ratio Perm		c0.28				0.06		0.22				
v/c Ratio		0.65			0.38	0.13		0.50				
Uniform Delay, d1		13.4			11.6	10.3		12.4				
Progression Factor		1.00			0.62	0.37		1.00				
Incremental Delay, d2		6.6			1.7	0.6		1.6				
Delay (s)		20.0			8.9	4.3		13.9				
Level of Service		C			A	A		B				
Approach Delay (s)		20.0			7.3			13.9			0.0	
Approach LOS		C			A			B			A	

Intersection Summary					
HCM 2000 Control Delay	13.5	HCM 2000 Level of Service		B	
HCM 2000 Volume to Capacity ratio	0.57				
Actuated Cycle Length (s)	60.0	Sum of lost time (s)		8.2	
Intersection Capacity Utilization	67.7%	ICU Level of Service		C	
Analysis Period (min)	15				

c Critical Lane Group

Queues
6: Lyon & Queen

24/06/2015

Lane Group	EBT	WBT	SBT
Lane Group Flow (vph)	294	283	1784
v/c Ratio	0.71	0.52	0.62
Control Delay	43.9	39.2	14.4
Queue Delay	0.0	0.0	48.1
Total Delay	43.9	39.2	62.6
Queue Length 50th (m)	49.9	26.8	62.7
Queue Length 95th (m)	80.8	40.0	72.9
Internal Link Dist (m)	64.7	41.1	46.0
Turn Bay Length (m)			
Base Capacity (vph)	417	546	2878
Starvation Cap Reductn	0	0	1267
Spillback Cap Reductn	0	0	0
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.71	0.52	1.11

Intersection Summary

HCM Signalized Intersection Capacity Analysis
6: Lyon & Queen

24/06/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	220	65	80	195	0	0	0	0	375	1225	130
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.5			4.4						4.4	
Lane Util. Factor		1.00			0.95						0.86	
Frpb, ped/bikes		0.92			1.00						0.96	
Flpb, ped/bikes		1.00			0.96						0.89	
Frt		0.97			1.00						0.99	
Flt Protected		1.00			0.99						0.99	
Satd. Flow (prot)		1382			2741						4564	
Flt Permitted		1.00			0.66						0.99	
Satd. Flow (perm)		1382			1841						4564	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	227	67	82	201	0	0	0	0	387	1263	134
RTOR Reduction (vph)	0	9	0	0	0	0	0	0	0	0	9	0
Lane Group Flow (vph)	0	285	0	0	283	0	0	0	0	0	1775	0
Confl. Peds. (#/hr)	310		240	240		310				200		200
Confl. Bikes (#/hr)			40			40						110
Heavy Vehicles (%)	1%	4%	6%	13%	3%	1%	1%	1%	1%	2%	1%	2%
Turn Type		NA		Perm	NA					Perm	NA	
Protected Phases		4			8						1 2	
Permitted Phases				8						1 2		
Actuated Green, G (s)		34.5			34.6						74.0	
Effective Green, g (s)		35.5			35.6						75.0	
Actuated g/C Ratio		0.30			0.30						0.62	
Clearance Time (s)		5.5			5.4							
Vehicle Extension (s)		3.0			3.0							
Lane Grp Cap (vph)		408			546						2852	
v/s Ratio Prot		c0.21										
v/s Ratio Perm					0.15						0.39	
v/c Ratio		0.70			0.52						0.62	
Uniform Delay, d1		37.5			35.1						13.8	
Progression Factor		0.97			1.00						1.00	
Incremental Delay, d2		8.2			3.5						0.4	
Delay (s)		44.6			38.6						14.2	
Level of Service		D			D						B	
Approach Delay (s)		44.6			38.6			0.0			14.2	
Approach LOS		D			D			A			B	

Intersection Summary					
HCM 2000 Control Delay	20.9	HCM 2000 Level of Service		C	
HCM 2000 Volume to Capacity ratio	0.67				
Actuated Cycle Length (s)	120.0	Sum of lost time (s)		13.9	
Intersection Capacity Utilization	76.8%	ICU Level of Service		D	
Analysis Period (min)	15				

c Critical Lane Group

Queues
9: Bay & Sparks

24/06/2015

Lane Group	EBT	WBT	NBT
Lane Group Flow (vph)	5	41	698
v/c Ratio	0.01	0.09	0.44
Control Delay	14.2	8.1	5.6
Queue Delay	0.0	0.0	0.2
Total Delay	14.2	8.1	5.8
Queue Length 50th (m)	0.4	0.7	13.8
Queue Length 95th (m)	2.1	5.8	15.1
Internal Link Dist (m)	24.8	21.0	51.2
Turn Bay Length (m)			
Base Capacity (vph)	507	466	1580
Starvation Cap Reductn	0	0	284
Spillback Cap Reductn	0	0	0
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.01	0.09	0.54

Intersection Summary

HCM Signalized Intersection Capacity Analysis
9: Bay & Sparks

24/06/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	5	0	0	10	30	15	480	175	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		3.0			3.0			4.4				
Lane Util. Factor		1.00			1.00			0.95				
Frpb, ped/bikes		1.00			0.98			0.96				
Flpb, ped/bikes		1.00			1.00			1.00				
Frt		1.00			0.90			0.96				
Flt Protected		1.00			1.00			1.00				
Satd. Flow (prot)		1604			1406			2716				
Flt Permitted		1.00			1.00			1.00				
Satd. Flow (perm)		1604			1406			2716				
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	5	0	0	10	31	16	500	182	0	0	0
RTOR Reduction (vph)	0	0	0	0	21	0	0	59	0	0	0	0
Lane Group Flow (vph)	0	5	0	0	20	0	0	639	0	0	0	0
Confl. Peds. (#/hr)	20		20	20		20	70		100	100		70
Confl. Bikes (#/hr)									50			
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	5%	4%	1%	1%	1%
Turn Type		NA			NA		Perm	NA				
Protected Phases		4			8			2				
Permitted Phases	4						2					
Actuated Green, G (s)		18.0			18.0			32.6				
Effective Green, g (s)		19.0			19.0			33.6				
Actuated g/C Ratio		0.32			0.32			0.56				
Clearance Time (s)		4.0			4.0			5.4				
Vehicle Extension (s)		3.0			3.0			3.0				
Lane Grp Cap (vph)		507			445			1520				
v/s Ratio Prot		0.00			c0.01							
v/s Ratio Perm								0.24				
v/c Ratio		0.01			0.04			0.42				
Uniform Delay, d1		14.1			14.2			7.6				
Progression Factor		1.00			1.00			0.78				
Incremental Delay, d2		0.0			0.0			0.8				
Delay (s)		14.1			14.3			6.7				
Level of Service		B			B			A				
Approach Delay (s)		14.1			14.3			6.7			0.0	
Approach LOS		B			B			A			A	

Intersection Summary					
HCM 2000 Control Delay	7.1	HCM 2000 Level of Service		A	
HCM 2000 Volume to Capacity ratio	0.28				
Actuated Cycle Length (s)	60.0	Sum of lost time (s)		7.4	
Intersection Capacity Utilization	49.5%	ICU Level of Service		A	
Analysis Period (min)	15				

c Critical Lane Group

Queues
11: Lyon & Sparks

24/06/2015

Lane Group	EBR	SBT
Lane Group Flow (vph)	101	1829
v/c Ratio	0.63	0.77
Control Delay	47.2	10.4
Queue Delay	0.0	0.0
Total Delay	47.2	10.4
Queue Length 50th (m)	12.4	77.6
Queue Length 95th (m)	27.4	150.6
Internal Link Dist (m)		25.7
Turn Bay Length (m)		
Base Capacity (vph)	232	2387
Starvation Cap Reductn	0	0
Spillback Cap Reductn	0	0
Storage Cap Reductn	0	0
Reduced v/c Ratio	0.44	0.77

Intersection Summary

HCM Signalized Intersection Capacity Analysis
11: Lyon & Sparks

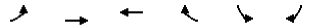
24/06/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	0	95	0	0	1635	85
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Total Lost time (s)		3.8			4.3	
Lane Util. Factor		1.00			0.95	
Frpb, ped/bikes		0.80			0.99	
Flpb, ped/bikes		1.00			1.00	
Frt		0.86			0.99	
Flt Protected		1.00			1.00	
Satd. Flow (prot)		973			2976	
Flt Permitted		1.00			1.00	
Satd. Flow (perm)		973			2976	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	0	101	0	0	1739	90
RTOR Reduction (vph)	0	18	0	0	3	0
Lane Group Flow (vph)	0	83	0	0	1826	0
Confl. Peds. (#/hr)	70	100	100			160
Confl. Bikes (#/hr)		10				30
Heavy Vehicles (%)	1%	15%	1%	1%	1%	4%
Turn Type		Perm			NA	
Protected Phases					6	
Permitted Phases		4				
Actuated Green, G (s)		11.8			74.8	
Effective Green, g (s)		12.8			75.8	
Actuated g/C Ratio		0.13			0.78	
Clearance Time (s)		4.8			5.3	
Vehicle Extension (s)		3.0			3.0	
Lane Grp Cap (vph)		128			2332	
v/s Ratio Prot					c0.61	
v/s Ratio Perm		c0.09				
v/c Ratio		0.65			0.78	
Uniform Delay, d1		39.8			5.8	
Progression Factor		1.00			1.00	
Incremental Delay, d2		10.7			2.7	
Delay (s)		50.5			8.6	
Level of Service		D			A	
Approach Delay (s)	50.5			0.0	8.6	
Approach LOS	D			A	A	

Intersection Summary				
HCM 2000 Control Delay	10.8	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.77			
Actuated Cycle Length (s)	96.7	Sum of lost time (s)	9.1	
Intersection Capacity Utilization	76.8%	ICU Level of Service	D	
Analysis Period (min)	15			

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
12: Queen & Pick-Up /Drop-Off 24/06/2015



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	35	265	275	50	20	65
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	37	279	289	53	21	68
Pedestrians		150	150		150	
Lane Width (m)		3.6	3.6		3.6	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		12	12		12	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)		58	89			
pX, platoon unblocked	0.92				0.92	0.92
vC, conflicting volume	492				968	616
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	405				922	539
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				90	82
cM capacity (veh/h)	929				203	382

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	316	342	89
Volume Left	37	0	21
Volume Right	0	53	68
cSH	929	1700	316
Volume to Capacity	0.04	0.20	0.28
Queue Length 95th (m)	0.9	0.0	8.0
Control Delay (s)	1.4	0.0	20.8
Lane LOS	A		C
Approach Delay (s)	1.4	0.0	20.8
Approach LOS			C

Intersection Summary			
Average Delay		3.1	
Intersection Capacity Utilization		59.7%	ICU Level of Service B
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
16: New Driveway & Sparks 24/06/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	25	155	40	35	15	70
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	26	161	42	36	16	73
Pedestrians	20			20	20	
Lane Width (m)	3.6			3.6	3.6	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	2			2	2	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)	45			102		
pX, platoon unblocked						
vC, conflicting volume			208		267	147
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			208		267	147
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		98	92
cM capacity (veh/h)			1341		677	870

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	188	78	89
Volume Left	0	42	16
Volume Right	161	0	73
cSH	1700	1341	829
Volume to Capacity	0.11	0.03	0.11
Queue Length 95th (m)	0.0	0.7	2.5
Control Delay (s)	0.0	4.3	9.9
Lane LOS		A	A
Approach Delay (s)	0.0	4.3	9.9
Approach LOS			A

Intersection Summary			
Average Delay		3.4	
Intersection Capacity Utilization		37.6%	ICU Level of Service A
Analysis Period (min)		15	

Queues
3: Bay & Queen

24/06/2015

Lane Group	EBT	WBT	WBR	NBT
Lane Group Flow (vph)	310	232	126	627
v/c Ratio	0.65	0.38	0.24	0.52
Control Delay	21.2	8.9	1.6	12.3
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	21.2	8.9	1.6	12.3
Queue Length 50th (m)	23.5	9.8	0.0	19.2
Queue Length 95th (m)	#46.4	m14.4	m0.9	31.0
Internal Link Dist (m)	50.7	34.0		61.4
Turn Bay Length (m)			20.0	
Base Capacity (vph)	480	603	527	1199
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.65	0.38	0.24	0.52

Intersection Summary
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis
3: Bay & Queen

24/06/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	140	155	0	0	220	120	35	410	150	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.1			4.1	4.1		4.1				
Lane Util. Factor		1.00			1.00	1.00		0.95				
Frpb, ped/bikes		1.00			1.00	0.92		0.94				
Flpb, ped/bikes		0.98			1.00	1.00		0.99				
Frt		1.00			1.00	0.85		0.96				
Flt Protected		0.98			1.00	1.00		1.00				
Satd. Flow (prot)		1450			1397	1074		2653				
Flt Permitted		0.75			1.00	1.00		1.00				
Satd. Flow (perm)		1114			1397	1074		2653				
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	147	163	0	0	232	126	37	432	158	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	64	0	55	0	0	0	0
Lane Group Flow (vph)	0	310	0	0	232	62	0	572	0	0	0	0
Confl. Peds. (#/hr)	40		80	80		40	70		150	150		70
Confl. Bikes (#/hr)			5			50			25			
Heavy Vehicles (%)	7%	8%	1%	1%	16%	18%	3%	6%	1%	1%	1%	1%
Turn Type	Perm	NA			NA	Perm	Perm	NA				
Protected Phases		4			8			2				
Permitted Phases	4					8	2					
Actuated Green, G (s)		24.9			24.9	24.9		24.9				
Effective Green, g (s)		25.9			25.9	25.9		25.9				
Actuated g/C Ratio		0.43			0.43	0.43		0.43				
Clearance Time (s)		5.1			5.1	5.1		5.1				
Vehicle Extension (s)		3.0			3.0	3.0		3.0				
Lane Grp Cap (vph)		480			603	463		1145				
v/s Ratio Prot					0.17							
v/s Ratio Perm		c0.28				0.06		0.22				
v/c Ratio		0.65			0.38	0.13		0.50				
Uniform Delay, d1		13.4			11.6	10.3		12.4				
Progression Factor		1.00			0.60	0.23		1.00				
Incremental Delay, d2		6.6			1.7	0.5		1.6				
Delay (s)		20.0			8.7	2.9		13.9				
Level of Service		C			A	A		B				
Approach Delay (s)		20.0			6.7			13.9			0.0	
Approach LOS		C			A			B			A	

Intersection Summary					
HCM 2000 Control Delay	13.4	HCM 2000 Level of Service		B	
HCM 2000 Volume to Capacity ratio	0.57				
Actuated Cycle Length (s)	60.0	Sum of lost time (s)		8.2	
Intersection Capacity Utilization	67.7%	ICU Level of Service		C	
Analysis Period (min)	15				

c Critical Lane Group

Queues
6: Lyon & Queen

24/06/2015

Lane Group	EBT	WBL	WBT	SBT
Lane Group Flow (vph)	294	82	201	1784
v/c Ratio	0.71	0.59	0.43	0.78
Control Delay	43.9	55.6	37.6	19.0
Queue Delay	0.0	0.0	0.0	47.9
Total Delay	43.9	55.6	37.6	66.9
Queue Length 50th (m)	49.9	15.1	35.1	94.9
Queue Length 95th (m)	80.8	#35.3	55.6	113.9
Internal Link Dist (m)	64.7		41.1	46.0
Turn Bay Length (m)		30.0		
Base Capacity (vph)	417	139	466	2289
Starvation Cap Reductn	0	0	0	836
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.71	0.59	0.43	1.23

Intersection Summary
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis
6: Lyon & Queen

24/06/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	220	65	80	195	0	0	0	0	375	1225	130
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.5		4.4	4.4						4.4	
Lane Util. Factor		1.00		1.00	1.00						0.91	
Frpb, ped/bikes		0.92		1.00	1.00						0.96	
Flpb, ped/bikes		1.00		0.85	1.00						0.89	
Frt		0.97		1.00	1.00						0.99	
Flt Protected		1.00		0.95	1.00						0.99	
Satd. Flow (prot)		1382		1159	1573						3622	
Flt Permitted		1.00		0.38	1.00						0.99	
Satd. Flow (perm)		1382		469	1573						3622	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	227	67	82	201	0	0	0	0	387	1263	134
RTOR Reduction (vph)	0	9	0	0	0	0	0	0	0	0	8	0
Lane Group Flow (vph)	0	285	0	82	201	0	0	0	0	0	1776	0
Confl. Peds. (#/hr)	310		240	240		310				200		200
Confl. Bikes (#/hr)			40			40						110
Heavy Vehicles (%)	1%	4%	6%	13%	3%	1%	1%	1%	1%	2%	1%	2%
Turn Type		NA		Perm	NA					Perm	NA	
Protected Phases		4			8						1 2	
Permitted Phases				8						1 2		
Actuated Green, G (s)		34.5		34.6	34.6						74.0	
Effective Green, g (s)		35.5		35.6	35.6						75.0	
Actuated g/C Ratio		0.30		0.30	0.30						0.62	
Clearance Time (s)		5.5		5.4	5.4							
Vehicle Extension (s)		3.0		3.0	3.0							
Lane Grp Cap (vph)		408		139	466						2263	
v/s Ratio Prot		c0.21			0.13							
v/s Ratio Perm				0.17							0.49	
v/c Ratio		0.70		0.59	0.43						0.78	
Uniform Delay, d1		37.5		36.0	34.0						16.6	
Progression Factor		0.97		1.00	1.00						1.00	
Incremental Delay, d2		8.2		17.1	2.9						1.9	
Delay (s)		44.6		53.0	36.9						18.4	
Level of Service		D		D	D						B	
Approach Delay (s)		44.6			41.6			0.0			18.4	
Approach LOS		D			D			A			B	

Intersection Summary					
HCM 2000 Control Delay	24.5	HCM 2000 Level of Service	C		
HCM 2000 Volume to Capacity ratio	0.79				
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.9		
Intersection Capacity Utilization	77.0%	ICU Level of Service	D		
Analysis Period (min)	15				

c Critical Lane Group

Queues
9: Bay & Sparks

24/06/2015

Lane Group	EBT	WBT	NBT
Lane Group Flow (vph)	5	41	698
v/c Ratio	0.01	0.09	0.44
Control Delay	14.2	8.1	5.6
Queue Delay	0.0	0.0	0.2
Total Delay	14.2	8.1	5.8
Queue Length 50th (m)	0.4	0.7	13.8
Queue Length 95th (m)	2.1	5.8	17.3
Internal Link Dist (m)	24.8	21.0	51.2
Turn Bay Length (m)			
Base Capacity (vph)	507	466	1580
Starvation Cap Reductn	0	0	284
Spillback Cap Reductn	0	0	0
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.01	0.09	0.54

Intersection Summary

HCM Signalized Intersection Capacity Analysis
9: Bay & Sparks

24/06/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	5	0	0	10	30	15	480	175	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		3.0			3.0			4.4				
Lane Util. Factor		1.00			1.00			0.95				
Frpb, ped/bikes		1.00			0.98			0.96				
Flpb, ped/bikes		1.00			1.00			1.00				
Frt		1.00			0.90			0.96				
Flt Protected		1.00			1.00			1.00				
Satd. Flow (prot)		1604			1406			2716				
Flt Permitted		1.00			1.00			1.00				
Satd. Flow (perm)		1604			1406			2716				
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	5	0	0	10	31	16	500	182	0	0	0
RTOR Reduction (vph)	0	0	0	0	21	0	0	59	0	0	0	0
Lane Group Flow (vph)	0	5	0	0	20	0	0	639	0	0	0	0
Confl. Peds. (#/hr)	20		20	20		20	70		100	100		70
Confl. Bikes (#/hr)									50			
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	5%	4%	1%	1%	1%
Turn Type		NA			NA		Perm	NA				
Protected Phases		4			8			2				
Permitted Phases	4						2					
Actuated Green, G (s)		18.0			18.0			32.6				
Effective Green, g (s)		19.0			19.0			33.6				
Actuated g/C Ratio		0.32			0.32			0.56				
Clearance Time (s)		4.0			4.0			5.4				
Vehicle Extension (s)		3.0			3.0			3.0				
Lane Grp Cap (vph)		507			445			1520				
v/s Ratio Prot		0.00			c0.01							
v/s Ratio Perm								0.24				
v/c Ratio		0.01			0.04			0.42				
Uniform Delay, d1		14.1			14.2			7.6				
Progression Factor		1.00			1.00			0.78				
Incremental Delay, d2		0.0			0.0			0.8				
Delay (s)		14.1			14.3			6.7				
Level of Service		B			B			A				
Approach Delay (s)		14.1			14.3			6.7			0.0	
Approach LOS		B			B			A			A	

Intersection Summary					
HCM 2000 Control Delay	7.2	HCM 2000 Level of Service		A	
HCM 2000 Volume to Capacity ratio	0.28				
Actuated Cycle Length (s)	60.0	Sum of lost time (s)		7.4	
Intersection Capacity Utilization	49.5%	ICU Level of Service		A	
Analysis Period (min)	15				

c Critical Lane Group

Queues
11: Lyon & Sparks

24/06/2015

Lane Group	EBR	SBT
Lane Group Flow (vph)	101	1829
v/c Ratio	0.63	0.77
Control Delay	47.2	10.4
Queue Delay	0.0	0.0
Total Delay	47.2	10.4
Queue Length 50th (m)	12.4	77.6
Queue Length 95th (m)	27.4	150.6
Internal Link Dist (m)		25.7
Turn Bay Length (m)		
Base Capacity (vph)	232	2387
Starvation Cap Reductn	0	0
Spillback Cap Reductn	0	0
Storage Cap Reductn	0	0
Reduced v/c Ratio	0.44	0.77

Intersection Summary

HCM Signalized Intersection Capacity Analysis
11: Lyon & Sparks

24/06/2015

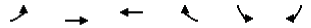
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	0	95	0	0	1635	85
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Total Lost time (s)		3.8			4.3	
Lane Util. Factor		1.00			0.95	
Frpb, ped/bikes		0.80			0.99	
Flpb, ped/bikes		1.00			1.00	
Frt		0.86			0.99	
Flt Protected		1.00			1.00	
Satd. Flow (prot)		973			2976	
Flt Permitted		1.00			1.00	
Satd. Flow (perm)		973			2976	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	0	101	0	0	1739	90
RTOR Reduction (vph)	0	18	0	0	3	0
Lane Group Flow (vph)	0	83	0	0	1826	0
Confl. Peds. (#/hr)	70	100	100			160
Confl. Bikes (#/hr)		10				30
Heavy Vehicles (%)	1%	15%	1%	1%	1%	4%
Turn Type		Perm			NA	
Protected Phases					6	
Permitted Phases		4				
Actuated Green, G (s)		11.8			74.8	
Effective Green, g (s)		12.8			75.8	
Actuated g/C Ratio		0.13			0.78	
Clearance Time (s)		4.8			5.3	
Vehicle Extension (s)		3.0			3.0	
Lane Grp Cap (vph)		128			2332	
v/s Ratio Prot					c0.61	
v/s Ratio Perm		c0.09				
v/c Ratio		0.65			0.78	
Uniform Delay, d1		39.8			5.8	
Progression Factor		1.00			1.00	
Incremental Delay, d2		10.7			2.7	
Delay (s)		50.5			8.6	
Level of Service		D			A	
Approach Delay (s)	50.5			0.0	8.6	
Approach LOS	D			A	A	

Intersection Summary				
HCM 2000 Control Delay	10.8	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.77			
Actuated Cycle Length (s)	96.7	Sum of lost time (s)	9.1	
Intersection Capacity Utilization	76.8%	ICU Level of Service	D	
Analysis Period (min)	15			

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
12: Queen & Pick-Up /Drop-Off

24/06/2015



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	35	265	275	50	20	65
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	37	279	289	53	21	68
Pedestrians		150	150		150	
Lane Width (m)		3.6	3.6		3.6	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		12	12		12	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)		58	89			
pX, platoon unblocked	0.91				0.91	0.91
vC, conflicting volume	492				968	616
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	388				913	524
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				90	82
cM capacity (veh/h)	928				202	384

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	316	342	89
Volume Left	37	0	21
Volume Right	0	53	68
cSH	928	1700	317
Volume to Capacity	0.04	0.20	0.28
Queue Length 95th (m)	0.9	0.0	7.9
Control Delay (s)	1.4	0.0	20.8
Lane LOS	A		C
Approach Delay (s)	1.4	0.0	20.8
Approach LOS			C

Intersection Summary			
Average Delay		3.1	
Intersection Capacity Utilization		59.7%	ICU Level of Service
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
16: New Driveway & Sparks

24/06/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	25	155	40	35	15	70
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	26	161	42	36	16	73
Pedestrians	20			20	20	
Lane Width (m)	3.6			3.6	3.6	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	2			2	2	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)	45			102		
pX, platoon unblocked						
vC, conflicting volume			208		267	147
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			208		267	147
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		98	92
cM capacity (veh/h)			1341		677	870

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	188	78	89
Volume Left	0	42	16
Volume Right	161	0	73
cSH	1700	1341	829
Volume to Capacity	0.11	0.03	0.11
Queue Length 95th (m)	0.0	0.7	2.5
Control Delay (s)	0.0	4.3	9.9
Lane LOS		A	A
Approach Delay (s)	0.0	4.3	9.9
Approach LOS			A

Intersection Summary			
Average Delay		3.4	
Intersection Capacity Utilization		37.6%	ICU Level of Service
Analysis Period (min)		15	

Queues
3: Bay & Queen

24/06/2015

Lane Group	EBT	WBT	WBR	NBT
Lane Group Flow (vph)	239	351	287	850
v/c Ratio	0.75	0.70	0.71	0.61
Control Delay	33.8	23.1	23.0	12.3
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	33.8	23.1	23.0	12.3
Queue Length 50th (m)	18.6	22.8	14.8	26.5
Queue Length 95th (m)	#47.9	m33.6	m24.4	40.4
Internal Link Dist (m)	50.7	34.0		61.4
Turn Bay Length (m)			20.0	
Base Capacity (vph)	319	505	406	1391
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.75	0.70	0.71	0.61

Intersection Summary
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis
3: Bay & Queen

24/06/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	110	115	0	0	330	270	20	710	70	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.1			4.1	4.1		4.1				
Lane Util. Factor		1.00			1.00	1.00		0.95				
Frpb, ped/bikes		1.00			1.00	0.88		0.98				
Flpb, ped/bikes		0.98			1.00	1.00		1.00				
Frt		1.00			1.00	0.85		0.99				
Flt Protected		0.98			1.00	1.00		1.00				
Satd. Flow (prot)		1447			1397	1031		2819				
Flt Permitted		0.60			1.00	1.00		1.00				
Satd. Flow (perm)		882			1397	1031		2819				
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	117	122	0	0	351	287	21	755	74	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	33	0	13	0	0	0	0
Lane Group Flow (vph)	0	239	0	0	351	254	0	837	0	0	0	0
Confl. Peds. (#/hr)	60		70	70		60	40		170	170		40
Confl. Bikes (#/hr)			10			80			10			10
Heavy Vehicles (%)	7%	8%	1%	1%	16%	18%	3%	6%	1%	1%	1%	1%
Turn Type	Perm	NA			NA	Perm	Perm	NA				
Protected Phases		4			8			2				
Permitted Phases	4					8	2					
Actuated Green, G (s)		18.9			18.9	18.9		25.9				
Effective Green, g (s)		19.9			19.9	19.9		26.9				
Actuated g/C Ratio		0.36			0.36	0.36		0.49				
Clearance Time (s)		5.1			5.1	5.1		5.1				
Vehicle Extension (s)		3.0			3.0	3.0		3.0				
Lane Grp Cap (vph)		319			505	373		1378				
v/s Ratio Prot					0.25							
v/s Ratio Perm		c0.27				0.25		0.30				
v/c Ratio		0.75			0.70	0.68		0.61				
Uniform Delay, d1		15.4			15.0	14.9		10.2				
Progression Factor		1.00			1.03	1.05		1.00				
Incremental Delay, d2		14.9			6.0	7.5		2.0				
Delay (s)		30.3			21.4	23.2		12.2				
Level of Service		C			C	C		B				
Approach Delay (s)		30.3			22.2			12.2			0.0	
Approach LOS		C			C			B			A	

Intersection Summary					
HCM 2000 Control Delay	18.4	HCM 2000 Level of Service		B	
HCM 2000 Volume to Capacity ratio	0.67				
Actuated Cycle Length (s)	55.0	Sum of lost time (s)		8.2	
Intersection Capacity Utilization	75.5%	ICU Level of Service		D	
Analysis Period (min)	15				

c Critical Lane Group

Queues
6: Lyon & Queen

24/06/2015

Lane Group	EBT	WBT	SBT
Lane Group Flow (vph)	236	656	1102
v/c Ratio	0.45	0.86	0.49
Control Delay	15.9	30.4	10.6
Queue Delay	0.0	0.0	0.3
Total Delay	15.9	30.4	10.9
Queue Length 50th (m)	13.6	28.4	18.1
Queue Length 95th (m)	m25.3	#53.6	25.0
Internal Link Dist (m)	64.7	41.1	46.0
Turn Bay Length (m)			
Base Capacity (vph)	522	766	2258
Starvation Cap Reductn	0	0	500
Spillback Cap Reductn	0	0	0
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.45	0.86	0.63

Intersection Summary
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis
6: Lyon & Queen

24/06/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	165	55	220	390	0	0	0	0	135	725	165
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.5			4.4						5.0	
Lane Util. Factor		1.00			0.95						0.86	
Frpb, ped/bikes		0.95			1.00						0.92	
Flpb, ped/bikes		1.00			0.95						0.98	
Frt		0.97			1.00						0.98	
Flt Protected		1.00			0.98						0.99	
Satd. Flow (prot)		1438			2827						4752	
Flt Permitted		1.00			0.75						0.99	
Satd. Flow (perm)		1438			2149						4752	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	177	59	237	419	0	0	0	0	145	780	177
RTOR Reduction (vph)	0	12	0	0	0	0	0	0	0	0	13	0
Lane Group Flow (vph)	0	224	0	0	656	0	0	0	0	0	1089	0
Confl. Peds. (#/hr)	270		210	210		270	300		120	120		300
Confl. Bikes (#/hr)			10			80			10			10
Heavy Vehicles (%)	1%	4%	1%	3%	1%	1%	1%	1%	1%	6%	2%	2%
Turn Type		NA		Perm	NA					Perm	NA	
Protected Phases		4			8						6	
Permitted Phases				8						6		
Actuated Green, G (s)		18.5			18.6						25.0	
Effective Green, g (s)		19.5			19.6						26.0	
Actuated g/C Ratio		0.35			0.36						0.47	
Clearance Time (s)		5.5			5.4						6.0	
Vehicle Extension (s)		3.0			3.0						3.0	
Lane Grp Cap (vph)		509			765						2246	
v/s Ratio Prot		0.16										
v/s Ratio Perm					c0.31						0.23	
v/c Ratio		0.44			0.86						0.48	
Uniform Delay, d1		13.6			16.4						9.9	
Progression Factor		1.03			1.00						1.00	
Incremental Delay, d2		2.4			11.9						0.8	
Delay (s)		16.4			28.3						10.7	
Level of Service		B			C						B	
Approach Delay (s)		16.4			28.3			0.0			10.7	
Approach LOS		B			C			A			B	

Intersection Summary					
HCM 2000 Control Delay	17.2	HCM 2000 Level of Service		B	
HCM 2000 Volume to Capacity ratio	0.65				
Actuated Cycle Length (s)	55.0	Sum of lost time (s)		9.5	
Intersection Capacity Utilization	68.8%	ICU Level of Service		C	
Analysis Period (min)	15				

c Critical Lane Group

Queues
9: Bay & Sparks

24/06/2015

Lane Group	WBT	NBT
Lane Group Flow (vph)	92	1112
v/c Ratio	0.20	0.67
Control Delay	10.0	11.6
Queue Delay	0.0	4.9
Total Delay	10.0	16.5
Queue Length 50th (m)	3.2	36.2
Queue Length 95th (m)	11.2	53.2
Internal Link Dist (m)	21.0	51.2
Turn Bay Length (m)		
Base Capacity (vph)	457	1655
Starvation Cap Reductn	0	467
Spillback Cap Reductn	0	0
Storage Cap Reductn	0	0
Reduced v/c Ratio	0.20	0.94

Intersection Summary

HCM Signalized Intersection Capacity Analysis
9: Bay & Sparks

24/06/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	0	15	75	5	985	100	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)					3.0			4.4				
Lane Util. Factor					1.00			0.95				
Frpb, ped/bikes					0.94			0.98				
Flpb, ped/bikes					1.00			1.00				
Frt					0.89			0.99				
Flt Protected					1.00			1.00				
Satd. Flow (prot)					1342			2933				
Flt Permitted					1.00			1.00				
Satd. Flow (perm)					1342			2933				
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	0	0	0	15	77	5	1005	102	0	0	0
RTOR Reduction (vph)	0	0	0	0	32	0	0	13	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	60	0	0	1099	0	0	0	0
Confl. Peds. (#/hr)	50		10	10		50	60		150	150		60
Confl. Bikes (#/hr)						10			60			
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	10%	1%	8%	1%	1%	1%
Turn Type					NA		Perm	NA				
Protected Phases		4			8			2				
Permitted Phases	4						2					
Actuated Green, G (s)					18.0			32.6				
Effective Green, g (s)					19.0			33.6				
Actuated g/C Ratio					0.32			0.56				
Clearance Time (s)					4.0			5.4				
Vehicle Extension (s)					3.0			3.0				
Lane Grp Cap (vph)					424			1642				
v/s Ratio Prot					c0.04							
v/s Ratio Perm								0.37				
v/c Ratio					0.14			0.67				
Uniform Delay, d1					14.7			9.3				
Progression Factor					1.00			1.00				
Incremental Delay, d2					0.2			2.2				
Delay (s)					14.8			11.5				
Level of Service					B			B				
Approach Delay (s)		0.0			14.8			11.5			0.0	
Approach LOS		A			B			B			A	

Intersection Summary				
HCM 2000 Control Delay	11.7	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.48			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	7.4	
Intersection Capacity Utilization	61.8%	ICU Level of Service	B	
Analysis Period (min)	15			

c Critical Lane Group

Queues
11: Lyon & Sparks

24/06/2015

Lane Group	EBR	SBT
Lane Group Flow (vph)	179	973
v/c Ratio	0.56	0.50
Control Delay	18.9	7.2
Queue Delay	0.0	0.0
Total Delay	18.9	7.2
Queue Length 50th (m)	8.8	19.7
Queue Length 95th (m)	21.8	42.2
Internal Link Dist (m)		25.7
Turn Bay Length (m)		
Base Capacity (vph)	454	1964
Starvation Cap Reductn	0	0
Spillback Cap Reductn	0	0
Storage Cap Reductn	0	0
Reduced v/c Ratio	0.39	0.50

Intersection Summary

HCM Signalized Intersection Capacity Analysis
11: Lyon & Sparks

24/06/2015

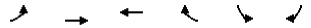
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	0	170	0	0	860	65
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Total Lost time (s)		3.8			4.3	
Lane Util. Factor		1.00			0.95	
Frpb, ped/bikes		0.89			0.99	
Flpb, ped/bikes		1.00			1.00	
Frt		0.86			0.99	
Flt Protected		1.00			1.00	
Satd. Flow (prot)		1240			2924	
Flt Permitted		1.00			1.00	
Satd. Flow (perm)		1240			2924	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	179	0	0	905	68
RTOR Reduction (vph)	0	41	0	0	8	0
Lane Group Flow (vph)	0	138	0	0	965	0
Confl. Peds. (#/hr)	140	100	100			160
Confl. Bikes (#/hr)						30
Heavy Vehicles (%)	1%	1%	1%	1%	3%	1%
Turn Type		Perm			NA	
Protected Phases					6	
Permitted Phases		4				
Actuated Green, G (s)		9.4			31.9	
Effective Green, g (s)		10.4			32.9	
Actuated g/C Ratio		0.20			0.64	
Clearance Time (s)		4.8			5.3	
Vehicle Extension (s)		3.0			3.0	
Lane Grp Cap (vph)		250			1871	
v/s Ratio Prot					c0.33	
v/s Ratio Perm		c0.11				
v/c Ratio		0.55			0.52	
Uniform Delay, d1		18.4			5.0	
Progression Factor		1.00			1.00	
Incremental Delay, d2		2.6			1.0	
Delay (s)		21.1			6.0	
Level of Service		C			A	
Approach Delay (s)	21.1			0.0	6.0	
Approach LOS	C			A	A	

Intersection Summary				
HCM 2000 Control Delay	8.3	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.54			
Actuated Cycle Length (s)	51.4	Sum of lost time (s)	9.1	
Intersection Capacity Utilization	56.1%	ICU Level of Service	B	
Analysis Period (min)	15			

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
12: Queen & Pick-Up /Drop-Off

24/06/2015



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	25	160	545	55	25	55
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	27	170	580	59	27	59
Pedestrians					60	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					5	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)		58	89			
pX, platoon unblocked	0.81				0.81	0.81
vC, conflicting volume	698				892	669
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	511				750	475
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				91	87
cM capacity (veh/h)	812				282	454

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	197	638	85
Volume Left	27	0	27
Volume Right	0	59	59
cSH	812	1700	381
Volume to Capacity	0.03	0.38	0.22
Queue Length 95th (m)	0.7	0.0	5.9
Control Delay (s)	1.6	0.0	17.1
Lane LOS	A		C
Approach Delay (s)	1.6	0.0	17.1
Approach LOS			C

Intersection Summary			
Average Delay			1.9
Intersection Capacity Utilization			45.9%
Analysis Period (min)			15
ICU Level of Service			A

HCM Unsignalized Intersection Capacity Analysis
16: New Driveway & Sparks

24/06/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	20	80	20	40	50	145
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	20	82	20	41	51	148
Pedestrians					50	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					4	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)	45			102		
pX, platoon unblocked						
vC, conflicting volume			152		193	111
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			152		193	111
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		93	84
cM capacity (veh/h)			1369		751	903

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	102	61	199
Volume Left	0	20	51
Volume Right	82	0	148
cSH	1700	1369	858
Volume to Capacity	0.06	0.01	0.23
Queue Length 95th (m)	0.0	0.3	6.3
Control Delay (s)	0.0	2.6	10.5
Lane LOS		A	B
Approach Delay (s)	0.0	2.6	10.5
Approach LOS			B

Intersection Summary			
Average Delay			6.2
Intersection Capacity Utilization			31.6%
Analysis Period (min)			15
ICU Level of Service			A

Queues
3: Bay & Queen

24/06/2015

Lane Group	EBT	WBT	WBR	NBT
Lane Group Flow (vph)	239	351	287	850
v/c Ratio	0.75	0.70	0.71	0.61
Control Delay	33.8	21.9	22.0	12.3
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	33.8	21.9	22.0	12.3
Queue Length 50th (m)	18.6	20.4	12.9	26.5
Queue Length 95th (m)	#47.9	m36.8	m#28.7	40.4
Internal Link Dist (m)	50.7	34.0		61.4
Turn Bay Length (m)			20.0	
Base Capacity (vph)	319	505	406	1391
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.75	0.70	0.71	0.61

Intersection Summary
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis
3: Bay & Queen

24/06/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	110	115	0	0	330	270	20	710	70	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.1			4.1	4.1		4.1				
Lane Util. Factor		1.00			1.00	1.00		0.95				
Frpb, ped/bikes		1.00			1.00	0.88		0.98				
Flpb, ped/bikes		0.98			1.00	1.00		1.00				
Frt		1.00			1.00	0.85		0.99				
Flt Protected		0.98			1.00	1.00		1.00				
Satd. Flow (prot)		1447			1397	1031		2819				
Flt Permitted		0.60			1.00	1.00		1.00				
Satd. Flow (perm)		882			1397	1031		2819				
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	117	122	0	0	351	287	21	755	74	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	33	0	13	0	0	0	0
Lane Group Flow (vph)	0	239	0	0	351	254	0	837	0	0	0	0
Confl. Peds. (#/hr)	60		70	70		60	40		170	170		40
Confl. Bikes (#/hr)			10			80			10			10
Heavy Vehicles (%)	7%	8%	1%	1%	16%	18%	3%	6%	1%	1%	1%	1%
Turn Type	Perm	NA			NA	Perm	Perm	NA				
Protected Phases		4			8			2				
Permitted Phases	4					8	2					
Actuated Green, G (s)		18.9			18.9	18.9		25.9				
Effective Green, g (s)		19.9			19.9	19.9		26.9				
Actuated g/C Ratio		0.36			0.36	0.36		0.49				
Clearance Time (s)		5.1			5.1	5.1		5.1				
Vehicle Extension (s)		3.0			3.0	3.0		3.0				
Lane Grp Cap (vph)		319			505	373		1378				
v/s Ratio Prot					0.25							
v/s Ratio Perm		c0.27				0.25		0.30				
v/c Ratio		0.75			0.70	0.68		0.61				
Uniform Delay, d1		15.4			15.0	14.9		10.2				
Progression Factor		1.00			0.93	0.94		1.00				
Incremental Delay, d2		14.9			6.3	7.9		2.0				
Delay (s)		30.3			20.3	21.8		12.2				
Level of Service		C			C	C		B				
Approach Delay (s)		30.3			21.0			12.2			0.0	
Approach LOS		C			C			B			A	

Intersection Summary					
HCM 2000 Control Delay	17.9	HCM 2000 Level of Service		B	
HCM 2000 Volume to Capacity ratio	0.67				
Actuated Cycle Length (s)	55.0	Sum of lost time (s)		8.2	
Intersection Capacity Utilization	75.5%	ICU Level of Service		D	
Analysis Period (min)	15				

c Critical Lane Group

Queues
6: Lyon & Queen

24/06/2015

Lane Group	EBT	WBL	WBT	SBT
Lane Group Flow (vph)	236	237	419	1102
v/c Ratio	0.45	0.84	0.73	0.61
Control Delay	15.9	45.9	25.3	12.3
Queue Delay	0.0	0.0	0.0	1.0
Total Delay	15.9	45.9	25.3	13.3
Queue Length 50th (m)	13.6	19.3	32.5	24.7
Queue Length 95th (m)	m25.3	#50.9	#66.8	35.3
Internal Link Dist (m)	64.7		41.1	46.0
Turn Bay Length (m)		30.0		
Base Capacity (vph)	522	283	571	1795
Starvation Cap Reductn	0	0	0	408
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.45	0.84	0.73	0.79

Intersection Summary

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis
6: Lyon & Queen

24/06/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	165	55	220	390	0	0	0	0	135	725	165
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.5		4.4	4.4						5.0	
Lane Util. Factor		1.00		1.00	1.00						0.91	
Frpb, ped/bikes		0.95		1.00	1.00						0.92	
Flpb, ped/bikes		1.00		0.86	1.00						0.98	
Frt		0.97		1.00	1.00						0.98	
Flt Protected		1.00		0.95	1.00						0.99	
Satd. Flow (prot)		1438		1292	1604						3771	
Flt Permitted		1.00		0.59	1.00						0.99	
Satd. Flow (perm)		1438		796	1604						3771	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	177	59	237	419	0	0	0	0	145	780	177
RTOR Reduction (vph)	0	12	0	0	0	0	0	0	0	0	13	0
Lane Group Flow (vph)	0	224	0	237	419	0	0	0	0	0	1089	0
Confl. Peds. (#/hr)	270		210	210		270	300		120	120		300
Confl. Bikes (#/hr)			10			80			10			10
Heavy Vehicles (%)	1%	4%	1%	3%	1%	1%	1%	1%	1%	6%	2%	2%
Turn Type		NA		Perm	NA					Perm	NA	
Protected Phases		4			8						6	
Permitted Phases				8						6		
Actuated Green, G (s)		18.5		18.6	18.6						25.0	
Effective Green, g (s)		19.5		19.6	19.6						26.0	
Actuated g/C Ratio		0.35		0.36	0.36						0.47	
Clearance Time (s)		5.5		5.4	5.4						6.0	
Vehicle Extension (s)		3.0		3.0	3.0						3.0	
Lane Grp Cap (vph)		509		283	571						1782	
v/s Ratio Prot		0.16			0.26							
v/s Ratio Perm				c0.30							0.29	
v/c Ratio		0.44		0.84	0.73						0.61	
Uniform Delay, d1		13.6		16.2	15.4						10.8	
Progression Factor		1.03		1.00	1.00						1.00	
Incremental Delay, d2		2.4		24.5	8.1						1.6	
Delay (s)		16.4		40.8	23.6						12.3	
Level of Service		B		D	C						B	
Approach Delay (s)		16.4			29.8			0.0			12.3	
Approach LOS		B			C			A			B	

Intersection Summary

HCM 2000 Control Delay	18.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	55.0	Sum of lost time (s)	9.5
Intersection Capacity Utilization	69.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Queues
9: Bay & Sparks

24/06/2015

Lane Group	WBT	NBT
Lane Group Flow (vph)	92	1112
v/c Ratio	0.20	0.67
Control Delay	10.0	11.6
Queue Delay	0.0	4.9
Total Delay	10.0	16.5
Queue Length 50th (m)	3.2	36.2
Queue Length 95th (m)	11.2	53.2
Internal Link Dist (m)	21.0	51.2
Turn Bay Length (m)		
Base Capacity (vph)	457	1655
Starvation Cap Reductn	0	467
Spillback Cap Reductn	0	0
Storage Cap Reductn	0	0
Reduced v/c Ratio	0.20	0.94

Intersection Summary

HCM Signalized Intersection Capacity Analysis
9: Bay & Sparks

24/06/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	0	15	75	5	985	100	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)					3.0			4.4				
Lane Util. Factor					1.00			0.95				
Frpb, ped/bikes					0.94			0.98				
Flpb, ped/bikes					1.00			1.00				
Frt					0.89			0.99				
Flt Protected					1.00			1.00				
Satd. Flow (prot)					1342			2933				
Flt Permitted					1.00			1.00				
Satd. Flow (perm)					1342			2933				
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	0	0	0	15	77	5	1005	102	0	0	0
RTOR Reduction (vph)	0	0	0	0	32	0	0	13	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	60	0	0	1099	0	0	0	0
Confl. Peds. (#/hr)	50		10	10		50	60		150	150		60
Confl. Bikes (#/hr)						10			60			
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	10%	1%	8%	1%	1%	1%
Turn Type					NA		Perm	NA				
Protected Phases		4			8			2				
Permitted Phases	4						2					
Actuated Green, G (s)					18.0			32.6				
Effective Green, g (s)					19.0			33.6				
Actuated g/C Ratio					0.32			0.56				
Clearance Time (s)					4.0			5.4				
Vehicle Extension (s)					3.0			3.0				
Lane Grp Cap (vph)					424			1642				
v/s Ratio Prot					c0.04							
v/s Ratio Perm								0.37				
v/c Ratio					0.14			0.67				
Uniform Delay, d1					14.7			9.3				
Progression Factor					1.00			1.00				
Incremental Delay, d2					0.2			2.2				
Delay (s)					14.8			11.5				
Level of Service					B			B				
Approach Delay (s)		0.0			14.8			11.5			0.0	
Approach LOS		A			B			B			A	

Intersection Summary					
HCM 2000 Control Delay	11.7	HCM 2000 Level of Service		B	
HCM 2000 Volume to Capacity ratio	0.48				
Actuated Cycle Length (s)	60.0	Sum of lost time (s)		7.4	
Intersection Capacity Utilization	61.8%	ICU Level of Service		B	
Analysis Period (min)	15				

c Critical Lane Group

Queues
11: Lyon & Sparks

24/06/2015

Lane Group	EBR	SBT
Lane Group Flow (vph)	179	973
v/c Ratio	0.56	0.50
Control Delay	18.9	7.2
Queue Delay	0.0	0.0
Total Delay	18.9	7.2
Queue Length 50th (m)	8.8	19.7
Queue Length 95th (m)	21.8	42.2
Internal Link Dist (m)		25.7
Turn Bay Length (m)		
Base Capacity (vph)	454	1964
Starvation Cap Reductn	0	0
Spillback Cap Reductn	0	0
Storage Cap Reductn	0	0
Reduced v/c Ratio	0.39	0.50

Intersection Summary

HCM Signalized Intersection Capacity Analysis
11: Lyon & Sparks

24/06/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	0	170	0	0	860	65
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Total Lost time (s)		3.8			4.3	
Lane Util. Factor		1.00			0.95	
Frpb, ped/bikes		0.89			0.99	
Flpb, ped/bikes		1.00			1.00	
Frt		0.86			0.99	
Flt Protected		1.00			1.00	
Satd. Flow (prot)		1240			2924	
Flt Permitted		1.00			1.00	
Satd. Flow (perm)		1240			2924	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	179	0	0	905	68
RTOR Reduction (vph)	0	41	0	0	8	0
Lane Group Flow (vph)	0	138	0	0	965	0
Confl. Peds. (#/hr)	140	100	100			160
Confl. Bikes (#/hr)						30
Heavy Vehicles (%)	1%	1%	1%	1%	3%	1%
Turn Type		Perm			NA	
Protected Phases					6	
Permitted Phases		4				
Actuated Green, G (s)		9.4			31.9	
Effective Green, g (s)		10.4			32.9	
Actuated g/C Ratio		0.20			0.64	
Clearance Time (s)		4.8			5.3	
Vehicle Extension (s)		3.0			3.0	
Lane Grp Cap (vph)		250			1871	
v/s Ratio Prot					c0.33	
v/s Ratio Perm		c0.11				
v/c Ratio		0.55			0.52	
Uniform Delay, d1		18.4			5.0	
Progression Factor		1.00			1.00	
Incremental Delay, d2		2.6			1.0	
Delay (s)		21.1			6.0	
Level of Service		C			A	
Approach Delay (s)	21.1			0.0	6.0	
Approach LOS	C			A	A	

Intersection Summary				
HCM 2000 Control Delay	8.3	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.54			
Actuated Cycle Length (s)	51.4	Sum of lost time (s)	9.1	
Intersection Capacity Utilization	56.1%	ICU Level of Service	B	
Analysis Period (min)	15			

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
12: Queen & Pick-Up /Drop-Off

24/06/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	25	160	545	55	25	55
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	27	170	580	59	27	59
Pedestrians					60	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					5	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)		58	89			
pX, platoon unblocked	0.78				0.78	0.78
vC, conflicting volume	698				892	669
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	477				725	440
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				91	87
cM capacity (veh/h)	808				282	460

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	197	638	85
Volume Left	27	0	27
Volume Right	0	59	59
cSH	808	1700	384
Volume to Capacity	0.03	0.38	0.22
Queue Length 95th (m)	0.7	0.0	5.8
Control Delay (s)	1.6	0.0	17.0
Lane LOS	A		C
Approach Delay (s)	1.6	0.0	17.0
Approach LOS			C

Intersection Summary			
Average Delay		1.9	
Intersection Capacity Utilization		45.9%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
16: New Driveway & Sparks

24/06/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	20	80	20	40	50	145
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	20	82	20	41	51	148
Pedestrians					50	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					4	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)	45			102		
pX, platoon unblocked						
vC, conflicting volume			152		193	111
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			152		193	111
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		93	84
cM capacity (veh/h)			1369		751	903

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	102	61	199
Volume Left	0	20	51
Volume Right	82	0	148
cSH	1700	1369	858
Volume to Capacity	0.06	0.01	0.23
Queue Length 95th (m)	0.0	0.3	6.3
Control Delay (s)	0.0	2.6	10.5
Lane LOS		A	B
Approach Delay (s)	0.0	2.6	10.5
Approach LOS			B

Intersection Summary			
Average Delay		6.2	
Intersection Capacity Utilization		31.6%	ICU Level of Service A
Analysis Period (min)		15	