Traffic Impact Study
220 Bradford Street
Condominium Development

Chayell Hospitality Group Inc.

P/N 3266 | February 7, 2020

Skelton Brumwell & Associates Inc.
ENGINEERING PLANNING ENVIRONMENTAL CONSULTANTS

93 Bell Farm Road, Suite 107, Barrie, Ontario L4M 5G1
Telephone (705) 726-1141 Toll Free: (877) 726-1141
mail@skeltonbrumwell.ca www.skeltonbrumwell.ca

City of Barrie
220 Bradford Street

Table of Contents

Page

Appendix A

Traffic Count Information

Appendix B

ITE Trip Generation Data

Appendix C

Figures – Traffic Volumes

Appendix D

Level of Service Definition

Appendix E

HCS 7 Intersection Analysis

Traffic Impact Study
220 Bradford Street Condominium Development
Chayell Hospitality Group Inc.
City of Barrie

P/N 19-3266 February 7, 2020

1.0 Introduction

Chayell Hospitality Group Inc. (Chayell) is proposing to develop an existing vacant lot located at 220 Bradford Street in the City of Barrie into a fourteen (14) storey, one hundred and twenty–one (121) unit residential condominium building, complete with four levels of indoor parking plus 97 sq.m. of ground floor commercial space. The subject property is located on the west side of Bradford Street, northwest of the intersection of Bradford Street and Essa Road/Tiffin Street.

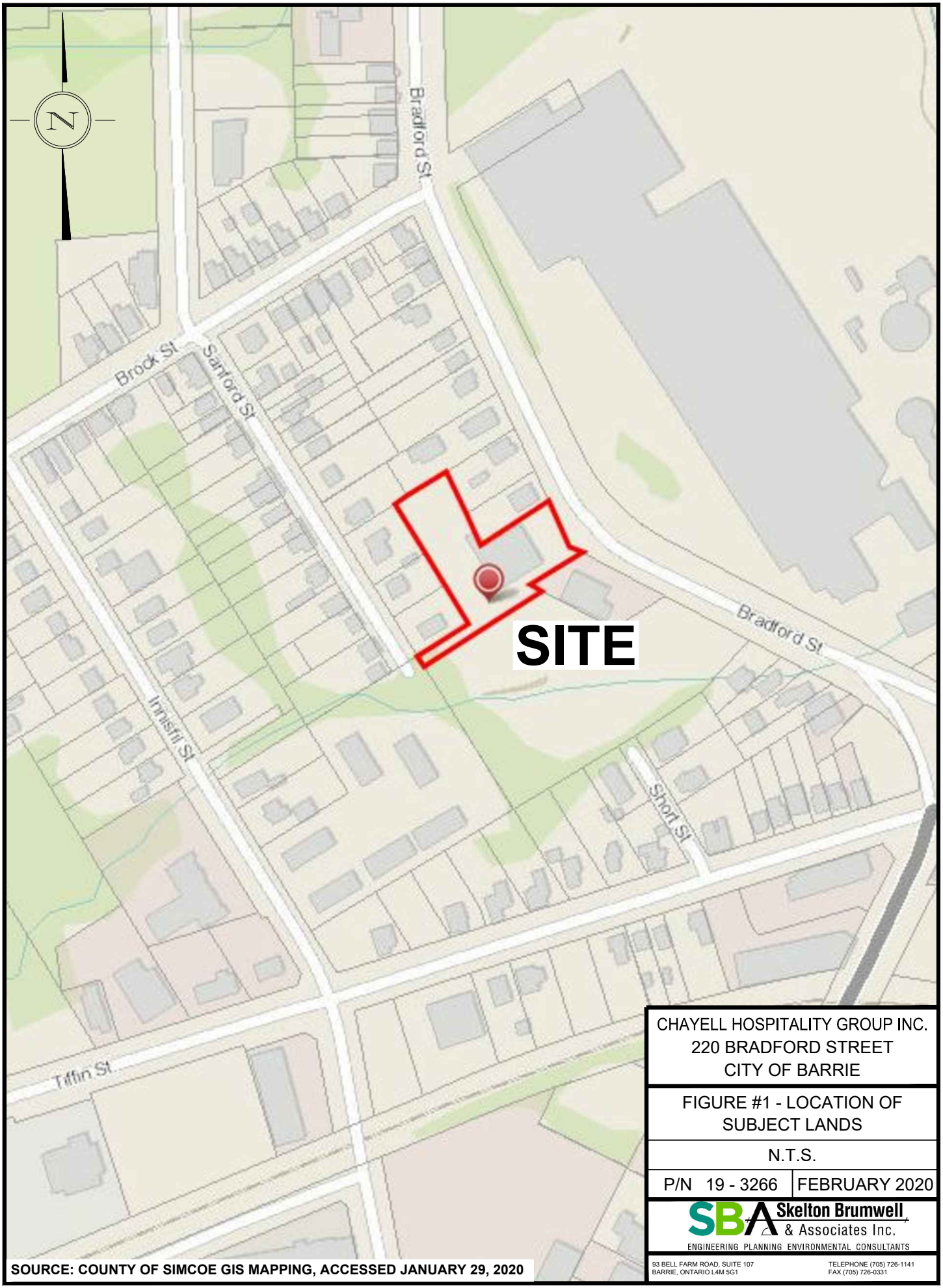
The property is irregular in shape and comprises an area of approximately 3,442 m^2 (0.34 ha), and the proposed building has a footprint area of approximately 1,908 m^2, which provides about 55% lot coverage. The total gross floor area will be 17,291 sq.m.

The subject property is legally described as Part of Lot 26, Concession 5, Geographic Township of Vespra, County of Simcoe, now in the City of Barrie. It is further described as Part of Park Lot 15, and Lots 16, 17, and 18, all on the west side of Bradford Street, Plan 15, and as Part 4 of Registered Plan 51R–7586, all in the City of Barrie. The location is shown on Figure #1 – Location of Subject Lands.

Skelton, Brumwell & Associates Inc. (SBA) has been retained to provide consulting engineering services in support of the redevelopment of the subject property. The Traffic Impact Study has been prepared in support of the Site Plan Application for the proposed development.

2.0 Context

The subject site is currently vacant, however, there was formerly a used car dealership, auto body shop and a residential dwelling located on the subject lands which were demolished in July 2012. Site access is directly from Bradford Street, which has a four-lane cross section at this location with a width of about 14 metres. Sidewalks are present on both sides of the roadway. Bradford Street is defined as an Arterial Road in the City of Barrie's Official Plan and in their Transportation Study. The closest traffic signals are at the intersection of Bradford Street, Tiffin Street and Essa Road, which is located about 200 metres south of the property. There are also traffic signals at the intersection of Bradford and Victoria Streets, which is about 600 metres to the north.



SOURCE: COUNTY OF SIMCOE GIS MAPPING, ACCESSED JANUARY 29, 2020

CHAYELL HOSPITALITY GROUP INC.
220 BRADFORD STREET
CITY OF BARRIE

FIGURE #1 - LOCATION OF SUBJECT LANDS

N.T.S.

P/N 19 - 3266 | FEBRUARY 2020

Skelton Brumwell & Associates Inc.
ENGINEERING PLANNING ENVIRONMENTAL CONSULTANTS
93 BELL FARM ROAD, SUITE 107
BARRIE, ONTARIO L4M 5G1
TELEPHONE (705) 726-1141
FAX (705) 726-0331

The former used car dealership and auto body shop included two entrances from Bradford Street, as evidenced by the curb cuts that presently exist. The new condominium development also proposes two entrances at similar locations to what previously existed. The northerly entrance will be used primarily for larger vehicles such as garbage trucks, moving vans and delivery trucks, while passenger vehicles will enter and exit using the southerly entrance.

For vehicles approaching from the north on Bradford Street, the sight distance to the driveway location was measured at about 174 metres. From the south the sight distance is even greater. The available sight distance exceeds the minimum stopping sight distance for a 60 km/hr design speed as prescribed by the Ministry of Transportation Design Guidelines.

3.0 2013 Traffic Impact Study

A Traffic Impact Study was prepared for this property in February of 2013 in support of an application for a Zoning By-Law amendment to allow for a 100 unit residential apartment building. The report concluded that vehicles would be able to turn into and out of the site without any unreasonable delays and no mitigating measures would be required. The study was approved by the City of Barrie Engineering Department and the site was subsequently re-zoned to Transition Centre Commercial with Special Provisions and a Holding Zone (C2-2)(SP-492)(H-124).

This new study has been prepared to update the analysis based on the current development proposal and to incorporate more up-to-date traffic data.

4.0 City of Barrie Transportation Master Plan

The City of Barrie's latest Transportation Master Plan was issued in June of 2019. The study provides a framework a transportation network that can accommodate the City's anticipated growth out to 2014.

For Bradford Street between Simcoe Street and Tiffin Street, the report recommends that the roadway be four lanes with a two-way left turn lane. Ultimately, the rightmost lanes in each direction are to be High Occupancy Vehicle (HOV) lanes. To provide for active transportation, a cycle track is recommended, which would consist of a separate space for bicycles behind the roadway curb. The ultimate right-of-way width is recommended to be 34 metres.

5.0 Travel Demand

5.1 Horizon Year and Time Period of Analysis

It was assumed for the purpose of this study that the development could be fully occupied some time in 2021. A study horizon of 10 years to 2031 was therefore considered in this analysis.

5.2 Historical Traffic Volumes

Historical Average Annual Daily Traffic (AADT) volumes for Bradford Street between Brock and Tiffin Streets were obtained from the City of Barrie's GIS mapping system and are shown in Table 1.

Table 1 – City of Barrie Traffic Counts

Year	AADT
2000	10,828
2001	10,637
2005	9,429
2006	9,701
2010	10,494
2011	9,099
2012	11,524
2013	11,569
2015	9,701
2017	10,865

The data shows that although the population of Barrie has increased substantially between 2010 and 2017, the traffic volume on Bradford Street has not. Although volumes were a bit higher in 2012 and 2013, the 2017 volume was almost the same as in 2000. The City's 1999 Transportation Study predicted volumes of 18,000 vehicles per day (vpd) in 2008 and 20,000 vpd in 2021, however it is now evident that the predicted volume increase never materialized.

Hourly traffic volumes were provided for the 2010 data, based on a count from September 14th. It shows a morning peak hour volume (two way) of 677 vehicles (59% northbound, 41% southbound) occurring between 8 and 9 a.m. An afternoon peak hour of 999 vehicles (43% northbound, 57% southbound) occurred between 4 and 5 p.m. The afternoon peak hour volume represents about 9.5% of the total traffic volume for that day while the morning peak hour volume is about 6.5%.

Intersection counts were also obtained for the intersection of Bradford Street / Essa Road and Tiffin Street for September 29, 2010 and December 29, 2012. For the 2010 count, the morning peak hour for the north leg (Bradford Street) was 673 vehicles (59% northbound, 41% southbound) and occurred from 8 to 9 a.m. The afternoon peak hour occurred between 4:15 and 5:15 p.m. and was 1,067 vehicles (41% northbound, 59% southbound). For 2012, the morning peak hour volume, recorded from 7:45 to 8:45 a.m. was 799 vehicles (58% northbound, 42%

southbound). The afternoon peak hour volume was 1,083 vehicles (49% northbound, 51% southbound), occurring between 4:30 and 5:30 p.m.

Additional count data was provided by the City of Barrie for the Bradford Street / Tiffin Street intersection on April 2, 2019. The morning peak hour was observed from 7:45 to 8:45 with 811 vehicles counted at the north leg (64% northbound, 36% southbound). The afternoon peak occurred from 4:30 to 5:30 with 1,156 vehicles at the north leg (47% northbound, 53% southbound). The annual increase in the peak hour traffic between 2012 and 2019 works out to just 0.2% in the morning and 0.9% in the afternoon.

The traffic count data referenced above can be found in Appendix A.

5.3 Future Background Traffic Volumes

As noted in Section 5.2, while the traffic volume is fluctuated somewhat, there has been basically no increase in the traffic volume on Bradford Street between 2000 and 2017. Given the expected growth in the City over the next 20 years, and developments expected to occur in the downtown area, an allowance should still be made to account for future growth. Figure 1-1 from the City of Barrie Transportation Master Plan shows that the population is expected to grow from 145,800 in 2016 to 210,000 in 2031, which is a rate of about 2.5% per year. As much of the new growth will be within the new Secondary Plans in the south part of Barrie, the impact likely won't be as great in the central part of the City. The traffic volume on Bradford Street has never exhibited the growth that was predicted back in 1999, but for the purpose of this analysis an annual increase of 2.5% per year has been assumed which is probably higher than what will actually occur.

The 2.5% annual increase was then applied to the most recent intersection count data from 2019. Table 1 summarizes the estimated future peak hour background traffic volumes based on this assumption.

Table 2: Future Background Traffic on Bradford Street

Peak Hour	Direction	2019	2021	2031
A.M.	All	811	852	1,091
	Northbound	521	547	701
	Southbound	290	305	390
P.M.	All	1,156	1,214	1,555
	Northbound	607	638	816
	Southbound	549	576	739

5.4 Site Traffic

5.4.1 Site Traffic Volumes

Traffic volumes for the proposed apartment were estimated using data from the Institute of Transportation Engineers (ITE) Trip Generation Manual, 10th Edition.

For the residential portion of the subject site the applicable land use from the Trip Generation Manual is Multifamily Housing (Mid-Rise), which is appropriate for apartment buildings having between three and ten floors. Although this building is proposed to have 14 floors, the first four floors are for the parking garage, so it has only ten floors of residential use. Traffic data is provided for a number of independent variables, the most appropriate being Vehicle Trips per Dwelling Unit. For the Peak Hour of the Generator, the average rates are 0.32 trips per unit in the a.m. peak hour, and 0.41 trips per unit in the p.m. peak hour.

At this time, it is not known what the commercial use may consist of. One possibility is a Convenience Market, that would serve residents in the apartment building and in the local area. Trip generation data is available based on 1,000 sq.ft. of gross floor area. The average rates are 68.83 trips per 1,000 sq.ft. in the a.m. peak hour and 53.51 trips per 1,000 sq.ft. in the p.m. peak hour.

Table 3 shows the expected traffic volumes based on these rates. The ITE trip generation data can be found in Appendix B.

Table 3 – Site Generated Traffic Volumes

Land Use	Units or 1,000 G.F.A.	A.M. Peak Hour			P.M. Peak Hour		
		Trips	in	out	Trips	in	Out
Apartment (Mid-Rise)	121	39	11 (27%)	28 (73%)	50	30 (60%)	20 (40%)
Convenience Store	1.04	72	36 (50%)	36 (50%)	56	29 (51%)	27 (49%)
Total	167	111	47	64	106	59	47

5.4.2 Directional Distribution

The directional distribution of the site-generated traffic was assumed to be similar to the distribution of the background traffic on Bradford Street. Therefore, in the A.M. peak hour, 60% of the traffic exiting the site is expected to turn left to go north while 40% would turn right to go south. For traffic entering the property, 60% would come from the south and turn left while 40% would come from the north and turn right. In the P.M. peak hour, the assumed distribution is 55% southbound and 45% northbound.

Based on these assumptions, the assumed turning movements and background traffic volumes are shown on the figures included in Appendix C. Separate drawings are provided for the A.M. and P.M. peak hour conditions for 2021 and 2031.

6.0 Evaluation of Impacts

6.1 Methodology

The operation of the intersection formed by the new driveway entrance and Bradford Street was evaluated using the methods described in the Highway Capacity Manual[1] in order to determine the expected Level of Service for both the existing and future traffic conditions. The Level of Service definitions are included in Appendix D. The traffic software program "HCS7" by McTrans was used to carry out the calculations.

The objective of the analysis is to identify "problem" intersections and traffic movements. For urban areas, "problem" intersections and movements are typically defined as those where a Level of Service "E" is incurred, meaning that motorists attempting to turn at intersections would experience very long delays.

Generally, traffic impacts should be mitigated when site generated traffic creates or worsens a "problem" situation.

6.2 Intersection Analysis

The calculations sheets from the HCS7 analysis can be found in Appendix E. Table 4 shows the results of the HCS7 calculations for the driveway.

At unsignalized intersections, the Level of Service analysis is specific to traffic that has to come to a stop at an intersection. At the proposed driveway location, it applies only to traffic turning left and right from the driveway, and to northbound traffic turning left from Bradford Street.

[1] Highway Capacity Manual 2010 - Transportation Research Board, National Research Council, Washington, D.C., 2010.

Table 4 – Level of Service Calculation Results

Time	Location	Turn	2021		2031	
			Delay (s)	L.O.S.	Delay (s)	L.O.S.
A.M. Peak	Driveway (exiting)	Left / Right	14.9	B	18.4	C
A.M. Peak	Bradford St. (northbound)	Left	8.0	A	8.3	A
P.M. Peak	Driveway (exiting)	Left / Right	19.1	C	27.8	D
P.M. Peak	Bradford St. (northbound)	Left	9.0	A	9.6	A

From Table 4, it can be seen that the intersection is expected to operate at a good level of service for all traffic movements in both the A.M. and P.M. peak hours. The highest delays are expected for traffic turning out onto Bradford Street during the P.M. Peak hour, however the calculated delays are not unreasonable. The delays will increase a small amount due to the increase in traffic that was assumed for the 2031 study horizon, but are still not expected to be unreasonable. The analysis did not account for the future two-way left turn lane that is proposed in the Transportation Master Plan. Once that additional lane is constructed, the delays will decrease.

7.0 Driveway Design

The driveway from Bradford Street is to be designed in accordance with the City of Barrie Urban Design Manual. The driveway shall have a minimum grade of 2% and a maximum of 7%. Since Bradford Street is classified as an Arterial Road, the driveway shall have a width of 9 metres. The driveway shall have a minimum of 50 mm of asphalt over 200 mm of Granular 'A'. Ideally, a Geotechnical Consultant should be engaged to review the existing soils conditions and provide recommendations for the asphalt and granular depth.

8.0 Public Transit

The proposed apartment condominium development at 220 Bradford Street is very well served by several modes of public transit. In the northbound direction there are five Barrie Transit Bus Routes running on Bradford Street include 1A (Georgian Mall), 4A (East Bayfield), 7A (Grove), 8A (RVH) and 8B (Crosstown / Essa). The southbound routes are 1B (Welham), 4B (South GO), 7B (Bear Creek) and 8B (Crosstown Essa). On the west side of the road, the closest bus stop is about 50 metres south of the property limit. On the east side, there is a stop just south of Brock Street, which is about 150 metres away.

Residents at this location would also have the benefit of being close to the Allandale Waterfront GO Train and Bus Station, which is located east of Essa Road and south of Tiffin Street. The station is roughly 400 metres from the site, which is a short walking distance.

9.0 Conclusions

Based on our research and analysis, we conclude the following.

(i) The proposed Condominium Development at 220 Bradford Street, consisting of 121 residential units and 97 sq.m. of commercial use, is expected to generate a total of about 111 vehicle trips in the A.M. peak hour, and 106 trips in the P.M. Peak hour.

(ii) Vehicles turning into and out of the proposed Condominium Development driveway are expected to be able to do so without experiencing any unreasonable delays, both in the existing and future background traffic conditions.

(iii) The proposed Condominium Development will be well served by several Barrie Transit bus routes. The site's close proximity to the Allandale Waterfront GO Train and Bus station is also of great benefit.

10.0 Disclaimer of Responsibilities to Third Parties

This report was prepared by Skelton, Brumwell & Associates Inc. for the account of Chayell Hospitality Group Inc.

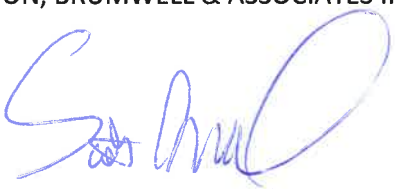
The material in it reflects Skelton, Brumwell & Associates Inc.'s best judgement in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties.

Skelton, Brumwell & Associates Inc. accepts no responsibility for damages, if any, suffered by a third party as a result of decisions made or actions based on this report.

All of which is respectfully submitted,

SKELTON, BRUMWELL & ASSOCIATES INC.

per:



Scott W. Brumwell, P.Eng.

President

Appendix A

Traffic Count Information

Ontario Traffic Inc.
17705 Leslie St., Unit 6
Newmarket, Ontario, L3Y 3E3
Tel: (905) 898-7711 Fax: (905) 898-3664

Site Code: 35
Station ID: T4/T30
Bradford St btw Brock St & Tiffin St

Date Start: 14-Sep-10
Date End: 14-Sep-10

NB

Start Time	1 15	16 23	24 31	32 39	40 47	48 55	56 63	64 71	72 79	80 88	89 96	97 104	105 112	113 120	121 9999	Total
9/14/10	0	2	0	2	6	10	8	2	0	0	0	0	0	0	0	30
01:00	0	0	0	1	3	8	2	2	0	0	0	0	0	0	0	16
02:00	0	0	0	0	5	9	3	1	0	0	0	0	0	0	0	18
03:00	0	0	0	0	2	5	1	1	0	0	0	0	0	0	0	9
04:00	0	0	0	1	5	4	2	2	0	0	0	0	0	0	0	14
05:00	0	0	0	3	10	16	5	4	0	0	0	0	0	0	0	38
06:00	0	1	0	3	20	71	16	9	1	0	0	0	0	0	0	121
07:00	0	0	0	2	51	184	84	11	1	0	0	0	0	0	0	333
08:00	0	0	1	5	68	228	87	10	1	0	0	0	0	0	0	400
09:00	1	0	2	7	86	160	52	8	0	0	0	0	0	0	0	316
10:00	0	0	0	6	75	145	44	3	0	0	0	0	0	0	0	273
11:00	0	1	1	6	72	171	68	5	0	0	0	0	0	0	0	324
12 PM	0	1	2	25	105	194	59	10	3	0	0	0	0	0	0	399
13:00	1	0	0	5	76	190	51	5	0	0	0	0	0	0	0	328
14:00	0	0	1	4	76	211	95	10	1	0	0	0	0	0	0	398
15:00	0	0	0	3	73	233	92	12	1	0	0	0	0	0	0	414
16:00	0	0	1	15	80	217	106	11	1	0	0	0	0	0	0	431
17:00	0	0	0	4	49	176	145	14	2	1	0	0	0	0	0	391
18:00	0	0	2	0	35	188	102	15	3	0	0	0	0	0	0	345
19:00	0	0	0	3	43	106	32	5	2	0	0	0	0	0	0	191
20:00	0	0	0	2	36	101	35	5	2	0	0	0	0	0	0	181
21:00	0	0	0	3	27	61	30	3	0	0	1	0	0	0	0	125
22:00	0	0	0	2	20	51	17	7	2	0	0	0	0	0	0	99
23:00	0	0	0	0	11	31	8	0	0	0	0	0	0	0	0	50
Total	2	5	10	102	1034	2770	1144	155	20	1	1	0	0	0	0	5244
Grand Total	2	5	10	102	1034	2770	1144	155	20	1	1	0	0	0	0	5244

Stats

15th Percentile :	45 KPH
50th Percentile :	52 KPH
85th Percentile :	59 KPH
95th Percentile :	63 KPH
Mean Speed(Average) :	52 KPH
10 KPH Pace Speed :	48-57 KPH
Number in Pace :	3056
Percent in Pace :	58.3%
Number of Vehicles > 40 KPH :	4996
Percent of Vehicles > 40 KPH :	95.3%

Ontario Traffic Inc.
17705 Leslie St., Unit 6
Newmarket, Ontario, L3Y 3E3
Tel: (905) 898-7711 Fax: (905) 898-3664

Site Code: 35
Station ID: T4/T30
Bradford St btw Brock St & Tiffin St

Date Start: 14-Sep-10
Date End: 14-Sep-10

SB

Start Time	1 15	16 23	24 31	32 39	40 47	48 55	56 63	64 71	72 79	80 88	89 96	97 104	105 112	113 120	121 9999	Total
9/14/10	1	1	0	0	5	15	6	1	0	0	0	0	0	0	0	29
01:00	0	0	0	1	3	7	6	2	1	0	0	0	0	0	0	20
02:00	0	0	0	0	5	6	6	1	0	0	0	0	0	0	0	18
03:00	0	0	0	0	2	5	2	0	0	0	0	0	0	0	0	9
04:00	0	0	0	0	7	9	2	1	0	1	0	0	0	0	0	20
05:00	0	0	0	0	10	31	21	5	1	0	0	0	0	0	0	68
06:00	1	0	0	1	19	76	38	6	0	0	0	0	0	0	0	141
07:00	0	1	1	1	37	135	78	18	0	1	0	0	0	0	0	272
08:00	1	0	1	5	43	127	88	11	1	0	0	0	0	0	0	277
09:00	0	1	0	5	52	143	54	6	0	0	0	0	0	0	0	261
10:00	2	0	1	2	57	165	70	11	4	0	0	0	0	0	0	312
11:00	0	0	1	3	66	185	71	14	3	1	0	0	0	0	0	344
12 PM	0	0	0	3	64	172	96	13	2	1	0	0	0	0	0	351
13:00	0	0	0	6	70	161	80	12	1	1	0	0	0	0	0	331
14:00	0	1	0	10	62	194	96	12	0	0	0	0	0	0	0	375
15:00	0	0	0	3	80	267	94	23	4	0	0	0	0	0	0	471
16:00	0	0	0	5	59	289	190	23	2	0	0	0	0	0	0	568
17:00	2	0	0	2	46	265	185	24	3	0	0	0	0	0	0	527
18:00	0	0	0	3	22	128	74	11	5	0	0	0	0	0	0	243
19:00	1	0	0	5	34	86	66	8	0	0	0	0	0	0	0	200
20:00	0	0	0	5	26	79	26	11	1	0	0	0	0	0	0	148
21:00	0	0	0	4	23	76	38	4	1	0	0	0	0	0	0	146
22:00	0	0	1	2	9	37	14	6	1	0	0	0	0	0	0	70
23:00	0	0	0	1	8	22	14	4	0	0	0	0	0	0	0	49
Total	8	4	5	67	809	2680	1415	227	30	5	0	0	0	0	0	5250
Grand Total	8	4	5	67	809	2680	1415	227	30	5	0	0	0	0	0	5250

Stats

15th Percentile :	46 KPH
50th Percentile :	53 KPH
85th Percentile :	61 KPH
95th Percentile :	63 KPH
Mean Speed(Average) :	53 KPH
10 KPH Pace Speed :	48-57 KPH
Number in Pace :	3034
Percent in Pace :	57.8%
Number of Vehicles > 40 KPH :	5065
Percent of Vehicles > 40 KPH :	96.5%

Ontario Traffic Inc.
17705 Leslie St., Unit 6
Newmarket, Ontario, L3Y 3E3
Tel: (905) 898-7711 Fax: (905) 898-3664

Site Code: 35
Station ID: T4/T30
Bradford St btw Brock St & Tiffin St

Date Start: 14-Sep-10
Date End: 14-Sep-10

NB, SB

Start Time	1 15	16 23	24 31	32 39	40 47	48 55	56 63	64 71	72 79	80 88	89 96	97 104	105 112	113 120	121 9999	Total
9/14/10	1	3	0	2	11	25	14	3	0	0	0	0	0	0	0	59
01:00	0	0	0	2	6	15	8	4	1	0	0	0	0	0	0	36
02:00	0	0	0	0	10	15	9	2	0	0	0	0	0	0	0	36
03:00	0	0	0	0	4	10	3	1	0	0	0	0	0	0	0	18
04:00	0	0	0	1	12	13	4	3	0	1	0	0	0	0	0	34
05:00	0	0	0	3	20	47	26	9	1	0	0	0	0	0	0	106
06:00	1	1	0	4	39	147	54	15	1	0	0	0	0	0	0	262
07:00	0	1	1	3	88	319	162	29	1	1	0	0	0	0	0	605
08:00	1	0	2	10	111	355	175	21	2	0	0	0	0	0	0	677
09:00	1	1	2	12	138	303	106	14	0	0	0	0	0	0	0	577
10:00	2	0	1	8	132	310	114	14	4	0	0	0	0	0	0	585
11:00	0	1	2	9	138	356	139	19	3	1	0	0	0	0	0	668
12 PM	0	1	2	28	169	366	155	23	5	1	0	0	0	0	0	750
13:00	1	0	0	11	146	351	131	17	1	1	0	0	0	0	0	659
14:00	0	1	1	14	138	405	191	22	1	0	0	0	0	0	0	773
15:00	0	0	0	6	153	500	186	35	5	0	0	0	0	0	0	885
16:00	0	0	1	20	139	506	296	34	3	0	0	0	0	0	0	999
17:00	2	0	0	6	95	441	330	38	5	1	0	0	0	0	0	918
18:00	0	0	2	3	57	316	176	26	8	0	0	0	0	0	0	588
19:00	1	0	0	8	77	192	98	13	2	0	0	0	0	0	0	391
20:00	0	0	0	7	62	180	61	16	3	0	0	0	0	0	0	329
21:00	0	0	0	7	50	137	68	7	1	0	1	0	0	0	0	271
22:00	0	0	1	4	29	88	31	13	3	0	0	0	0	0	0	169
23:00	0	0	0	1	19	53	22	4	0	0	0	0	0	0	0	99
Total	10	9	15	169	1843	5450	2559	382	50	6	1	0	0	0	0	10494
Grand Total	10	9	15	169	1843	5450	2559	382	50	6	1	0	0	0	0	10494

Stats

15th Percentile :	45 KPH
50th Percentile :	52 KPH
85th Percentile :	60 KPH
95th Percentile :	63 KPH
Mean Speed(Average) :	52 KPH
10 KPH Pace Speed :	48-57 KPH
Number in Pace :	6090
Percent in Pace :	58.0%
Number of Vehicles > 40 KPH :	10061
Percent of Vehicles > 40 KPH :	95.9%

Ontario Traffic Inc.

Morning Peak Diagram

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

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

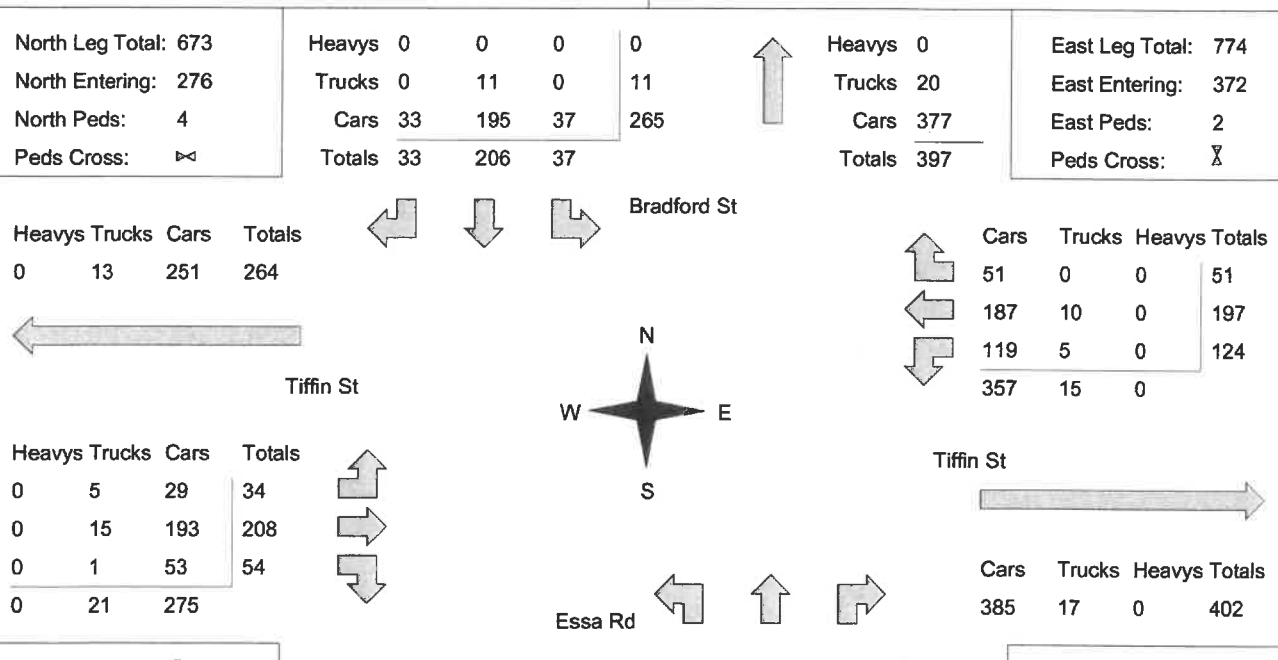
Municipality: Barrie
Site #: 1013900016
Intersection: Tiffin St & Essa Rd
TFR File #: 1
Count date: 29-Sep-10

Weather conditions:

Person(s) who counted:

**** Signalized Intersection ****

Major Road: Tiffin St runs W/E



Comments

Ontario Traffic Inc.

Afternoon Peak Diagram

Specified Period
From: 15:00:00
To: 18:00:00

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

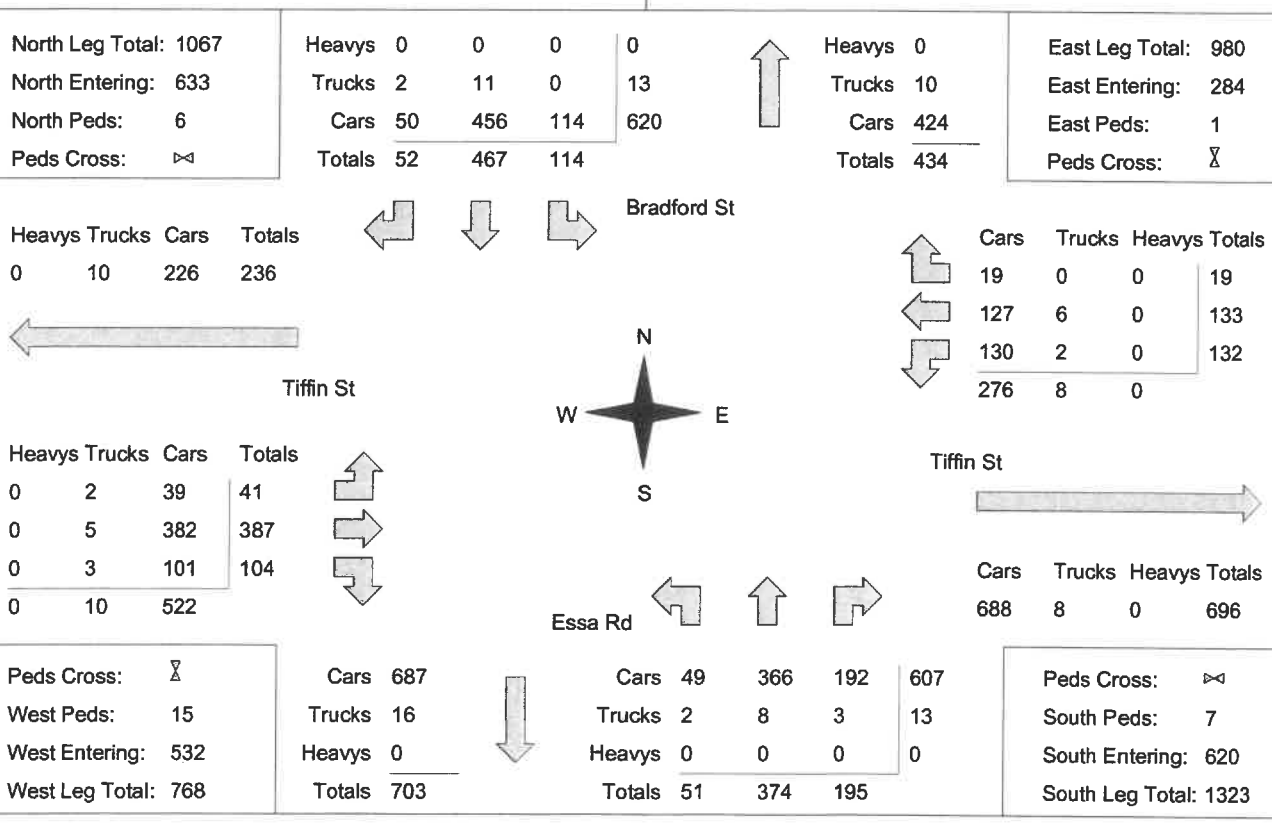
Municipality: Barrie
Site #: 1013900016
Intersection: Tiffin St & Essa Rd
TFR File #: 1
Count date: 29-Sep-10

Weather conditions:

Person(s) who counted:

**** Signalized Intersection ****

Major Road: Tiffin St runs W/E



Comments

Ontario Traffic Inc.

Morning Peak Diagram

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

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

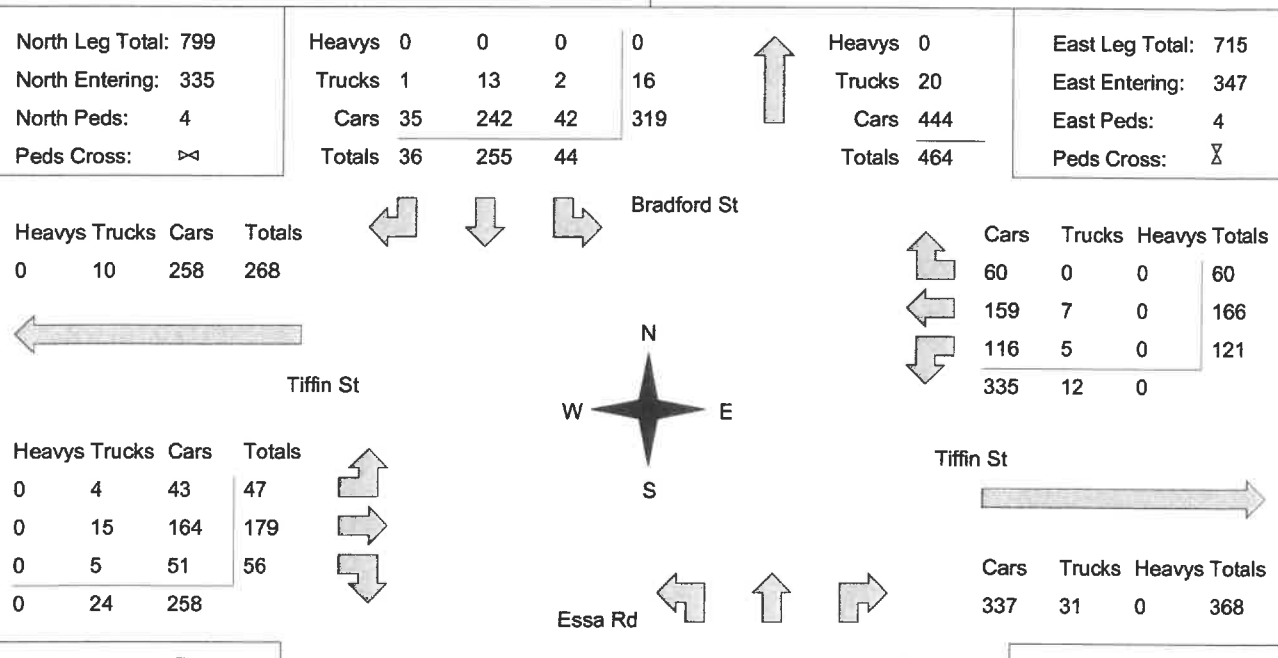
Municipality: Barrie
Site #: 1201300042
Intersection: Essa Rd & Tiffin St
TFR File #: 3
Count date: 19-Dec-12

Weather conditions:

Person(s) who counted:

**** Signalized Intersection ****

Major Road: Essa Rd runs N/S



Comments

Ontario Traffic Inc.

Afternoon Peak Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 16:30:00
To: 17:30:00

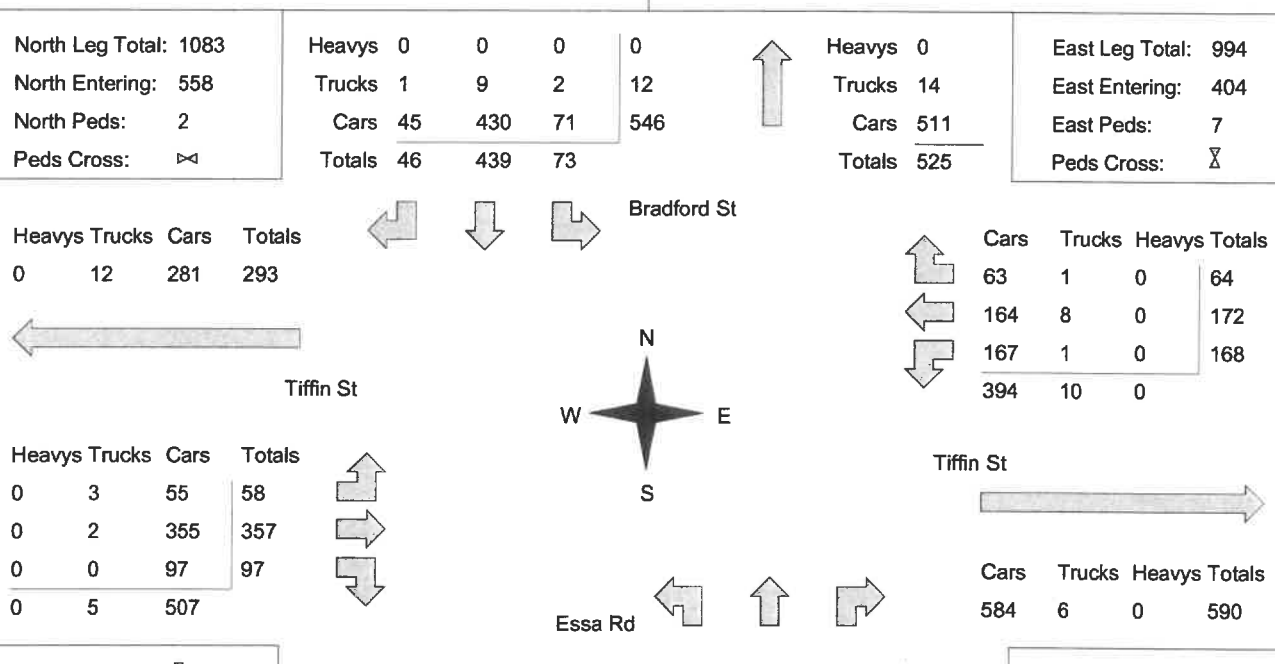
Municipality: Barrie
Site #: 1201300042
Intersection: Essa Rd & Tiffin St
TFR File #: 3
Count date: 19-Dec-12

Weather conditions:

Person(s) who counted:

**** Signalized Intersection ****

Major Road: Essa Rd runs N/S



Comments

Trans-Plan Transportation Inc.

Site ID Code:
Intersection Location: Essa Road & Tiffin Street
Municipality: Barrie, Ontario
Count Date: Tuesday April 2, 2019
Weather and Temperature: Sunny, 7 Degrees
Surveyor: TP

AM	NORTH APPROACH										Total	EAST APPROACH										Total	SOUTH APPROACH										Total	WEST APPROACH										Total	Grand Total
	CAR			TRUCKS			CYCLISTS			Peds		CAR			TRUCKS			CYCLISTS			Peds		CAR			TRUCKS			CYCLISTS			Peds		CAR			TRUCKS			CYCLISTS			Peds		
	L	T	R	L	T	R	L	T	R			L	T	R	L	T	R	L	T	R			L	T	R	L	T	R	L	T	R			L	T	R	L	T	R	L	T	R			
7:00	9	45	3	0	2	0	0	1	0	0	60	14	44	21	3	3	3	0	0	0	0	88	8	37	18	0	4	1	0	0	0	1	69	4	31	8	0	4	2	0	0	0	0	49	266
7:15	3	33	5	0	2	0	0	0	0	0	43	17	44	21	5	1	0	0	0	0	1	89	12	35	12	0	0	0	0	0	0	0	59	3	33	11	0	2	1	0	0	0	0	50	241
7:30	5	55	7	0	1	0	0	0	0	0	68	32	53	35	2	1	3	0	0	0	2	128	17	52	17	1	1	0	0	0	0	0	88	4	34	24	1	1	3	0	0	0	0	67	351
7:45	6	70	7	0	5	0	0	0	0	0	88	21	73	38	1	1	1	0	0	0	2	137	14	70	18	0	3	0	0	0	0	1	106	13	52	18	0	0	0	0	0	0	0	83	414
8:00	9	59	4	0	2	0	0	0	0	0	74	21	48	20	3	0	2	0	0	0	0	94	12	69	18	1	2	1	0	0	0	0	103	4	43	14	0	2	1	0	0	0	0	64	335
8:15	8	52	4	0	6	0	0	0	0	1	71	20	38	30	1	3	0	0	0	0	1	93	7	91	21	1	1	1	0	0	0	0	122	20	52	11	0	1	1	0	0	0	0	85	371
8:30	9	41	6	0	2	0	0	0	0	0	58	24	53	28	1	3	3	0	0	0	3	115	17	105	24	0	4	2	0	0	0	1	153	17	38	8	0	4	1	0	0	0	2	70	396
8:45	7	65	7	0	9	2	0	0	0	0	90	16	55	31	2	3	0	0	0	0	0	107	9	86	27	0	4	0	0	0	0	0	126	13	51	16	0	3	1	0	0	0	0	84	407
MD																																													
11:00	20	67	9	0	2	0	0	0	0	2	100	33	40	21	1	1	2	0	0	0	0	98	17	68	23	1	2	1	0	0	0	1	113	5	48	12	0	1	1	0	0	0	0	67	378
11:15	4	63	8	0	3	0	0	0	0	4	82	28	28	17	3	1	1	0	0	0	0	78	13	71	28	0	0	0	0	0	0	0	112	10	40	18	0	1	0	0	0	0	1	70	342
11:30	16	76	8	0	4	0	0	0	0	2	106	30	36	10	1	2	2	0	0	0	3	84	17	76	38	0	2	1	0	0	0	3	137	8	52	7	0	2	1	0	0	0	3	73	400
11:45	14	60	8	1	4	0	0	0	0	3	90	33	47	22	3	1	2	0	1	0	0	109	8	58	32	0	2	1	0	0	0	3	104	12	47	16	0	0	0	0	0	0	2	77	380
12:00	18	75	13	0	6	0	0	0	0	2	114	40	39	12	3	0	3	0	0	0	0	97	4	61	35	0	1	1	0	0	0	3	105	2	54	6	0	2	1	0	0	0	0	65	381
12:15	11	71	2	0	5	1	0	0	0	4	94	39	55	12	3	1	0	0	0	0	0	110	18	62	38	0	2	0	0	0	0	2	122	10	53	9	0	1	1	0	0	0	5	79	405
12:30	10	52	10	0	0	0	0	0	0	2	74	21	45	17	3	2	3	0	0	0	0	91	12	74	34	0	1	0	0	0	0	0	121	9	43	13	0	2	1	0	0	0	0	68	354
12:45	9	66	12	0	5	0	0	0	0	2	94	29	44	19	1	2	1	0	0	0	0	96	11	76	31	1	5	0	0	0	0	1	125	5	43	10	0	2	1	0	0	0	1	62	377
13:00	12	69	9	0	2	1	0	0	0	0	93	27	30	11	2	2	3	0	0	0	2	77	18	85	26	0	1	1	0	0	0	2	133	5	66	13	0	2	1	0	0	0	0	87	390
13:15	10	65	9	0	4	2	0	0	0	6	96	37	34	14	1	6	0	0	0	0	5	97	11	78	32	0	2	0	0	0	0	1	124	5	46	23	1	0	0	0	0	0	2	77	394
13:30	8	68	2	0	1	0	0	0	0	2	81	26	45	21	3	2	2	0	0	0	2	101	13	75	31	0	4	2	0	1	0	0	126	9	63	11	2	0	5	0	0	0	2	92	400
13:45	11	66	9	0	5	1	0	0	0	2	94	31	41	14	1	2	2	0	0	0	3	94	17	84	41	1	1	1	0	0	0	2	147	12	41	13	0	3	0	0	0	0	0	69	404
PM																																													
15:00	22	87	15	0	2	0	0	0	0	1	127	35	41	12	1	3	2	0	0	0	1	95	18	89	34	0	1	2	0	0	0	0	144	13	59	20	0	1	2	0	0	0	3	98	464
15:15	9	74	7	0	5	2	0	0	0	0	97	18	41	9	1	5	0	0	0	0	0	74	18	89	37	0	1	0	0	0	0	0	145	6	66	25	0	0	3	0	0	0	0	100	416
15:30	17	81	7	0	0	0	0	0	0	4	109	23	57	18	3	2	3	0	0	0	2	108	27	96	34	1	4	0	0	0	0	6	168	10	66	17	0	0	2	0	0	0	2	97	482
15:45	10	78	9	0	3	1	0	0	0	0	101	31	37	17	2	3	0	0	0	0	4	94	17	103	37	1	0	0	0	0	0	2	160	13	55	14	0	2	1	0	0	0	3	88	443
16:00	27	88	11	0	3	0	0	0	0	0	129	23	64	33	2	1	3	0	0	0	0	126	17	93	40	0	4	0	0	0	0	0	154	11	89	29	0	0	1	0	0	0	2	132	541
16:15	23	86	8	0	4	0	0	0	0	0	121	25	35	9	2	1	0	0	0	0	2	74	23	87	33	0	3	0	0	0	0	3	149	12	82	17	0	0	0	0	0	0	1	112	456
16:30	27	111	12	0	3	0	0	0	0	2	155	31	47	16	2	0	2	0	0	0	2	100	18	90	34	0	1	0	0	0	0	0	143	6	81	16	0	1	1	0	0	0	1	106	504
16:45	41	107	14	0	2	1	0	0	0	0	165	24	46	18	3	1	2	0	0	0	2	96	20	112	33	0	1	0	0	1	0	0	167	10	71	18	1	1	2	0	0	0	1	104	532
17:00	27	124	11	0	2	0	0	0	0	2	166	20	46	16	2	0	3	0	0	0	0	87	19	108	42	0	2	0	0	0	0	1	172	10	86	15	0	0	2	0	0	0	1	114	539
17:15	34	82	6	0	3	0	0	0	0	0	125	28	48	11	1	1	1	0	0	0	3	93	21	127	42	0	0	0	0	0	0	0	190	11	81	23	0	1	1	0	0	0	1	118	526
17:30	23	92	14	0	2	0	0	0	0	0	131	21	62	13	1	0	2	0	0	0	1	100	26	101	38	0	2	0	0	0	0	3	170	10	67	9	0	0	1	0	0	0	0	87	488
17:45	13	60	9	0	3	0	0	0	0	2	87	18	53	17	2	1	1	0	0	0	3	95	17	76	28	0	0	0	0	0	0	0	121	6	46	6	0	0	0	0	0	0	5	63	366

TRANS-PLAN

Turning Movement Count Diagram

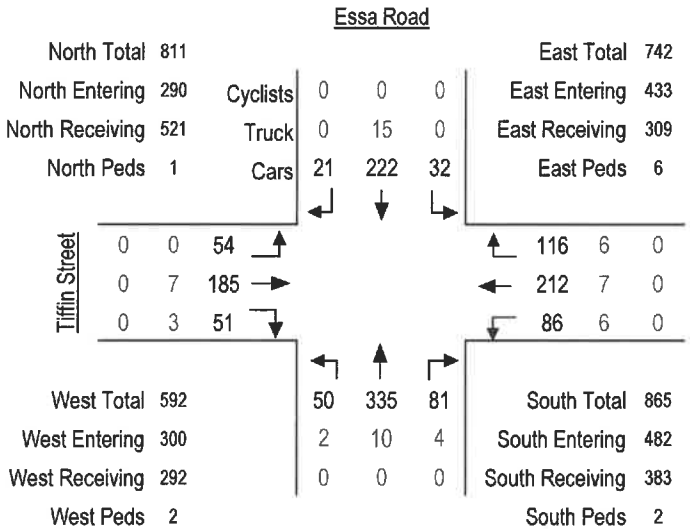
Intersection: Essa Road & Tiffin Street

Intersection ID:

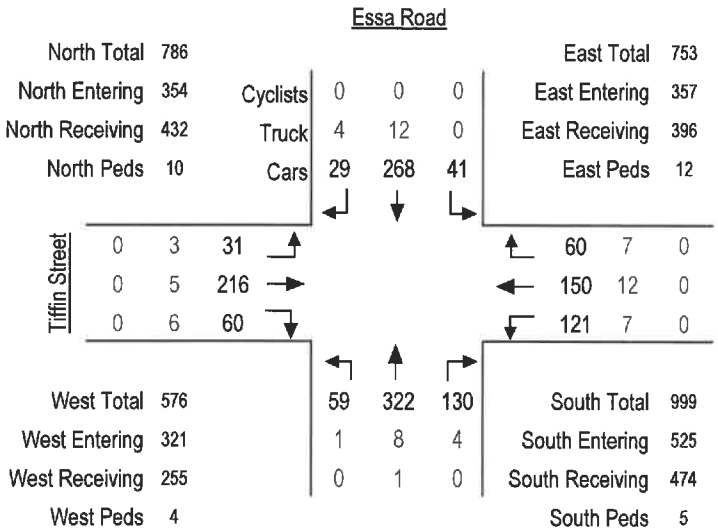
Municipality: Barrie, Ontario

Date: Tuesday April 2, 2019

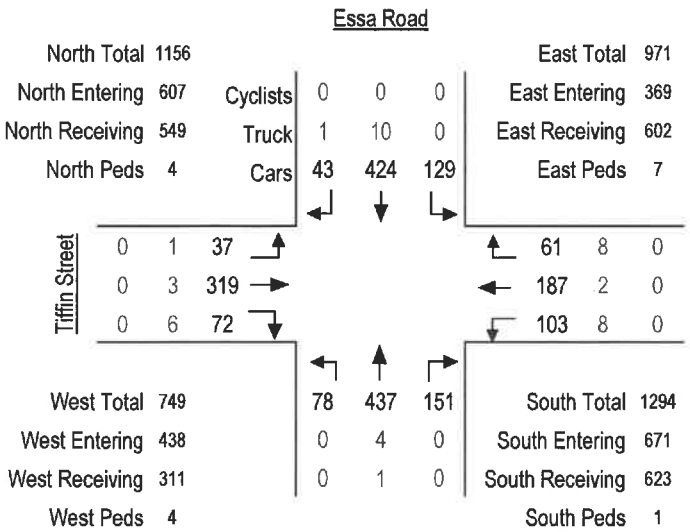
AM Peak Hour: 7:45 to 8:45



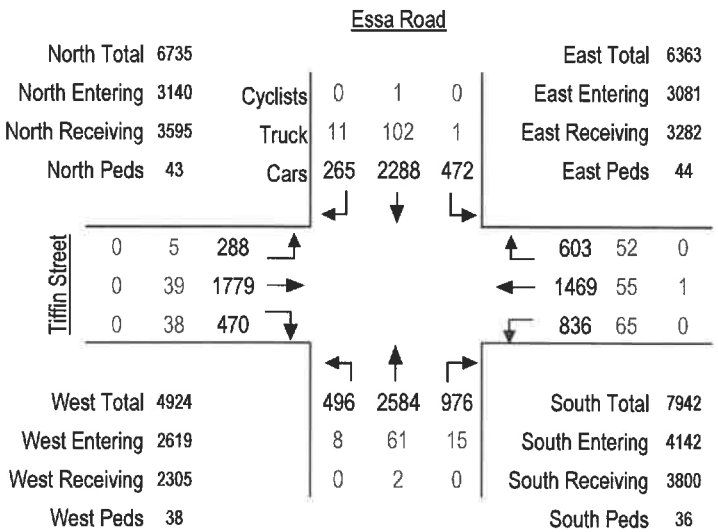
MD Peak Hour: 13:00 to 14:00



PM Peak Hour: 16:30 to 17:30



Total 8-Hour Count



Appendix B

ITE Trip Generation Data

Multifamily Housing (Mid-Rise)
(221)

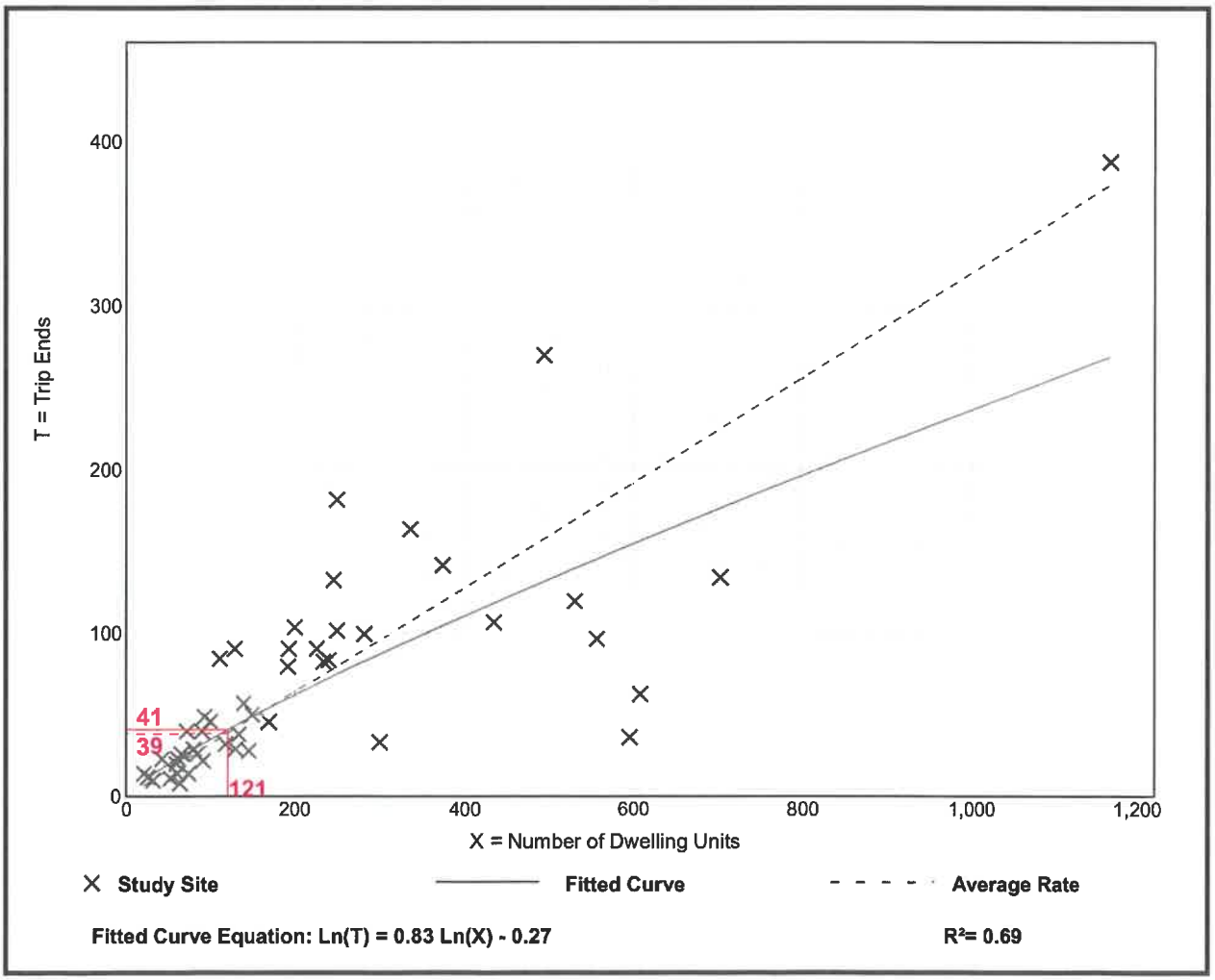
Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
AM Peak Hour of Generator

Setting/Location: **General Urban/Suburban**
Number of Studies: 48
Avg. Num. of Dwelling Units: 225
Directional Distribution: 27% entering, 73% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.32	0.06 - 0.77	0.17

Data Plot and Equation



Trip Gen Manual, 10th Edition • Institute of Transportation Engineers

Multifamily Housing (Mid-Rise)
(221)

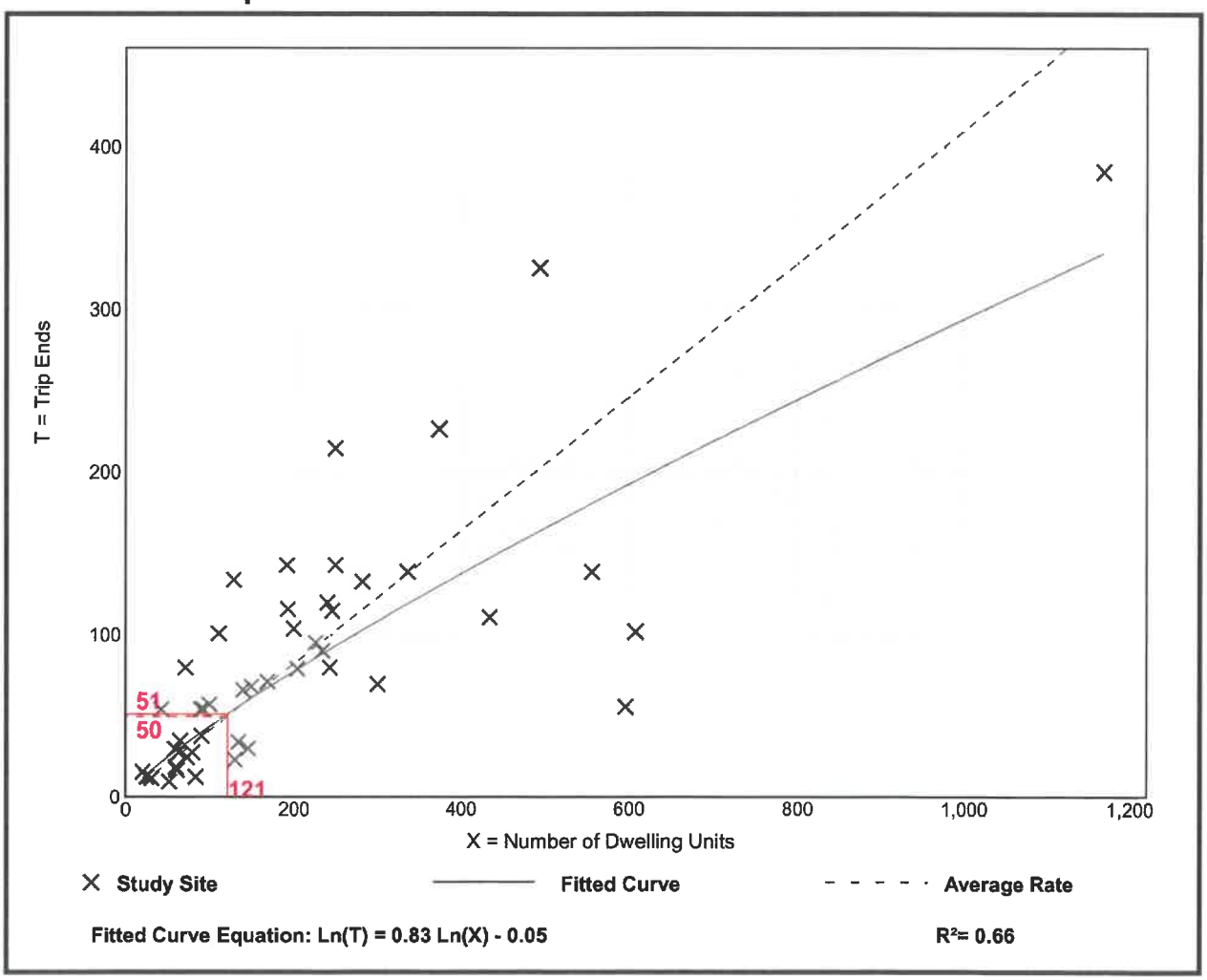
Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
PM Peak Hour of Generator

Setting/Location: **General Urban/Suburban**
Number of Studies: 47
Avg. Num. of Dwelling Units: 211
Directional Distribution: 60% entering, 40% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.41	0.09 - 1.26	0.22

Data Plot and Equation



Trip Gen Manual, 10th Edition ● Institute of Transportation Engineers

Convenience Market
(851)

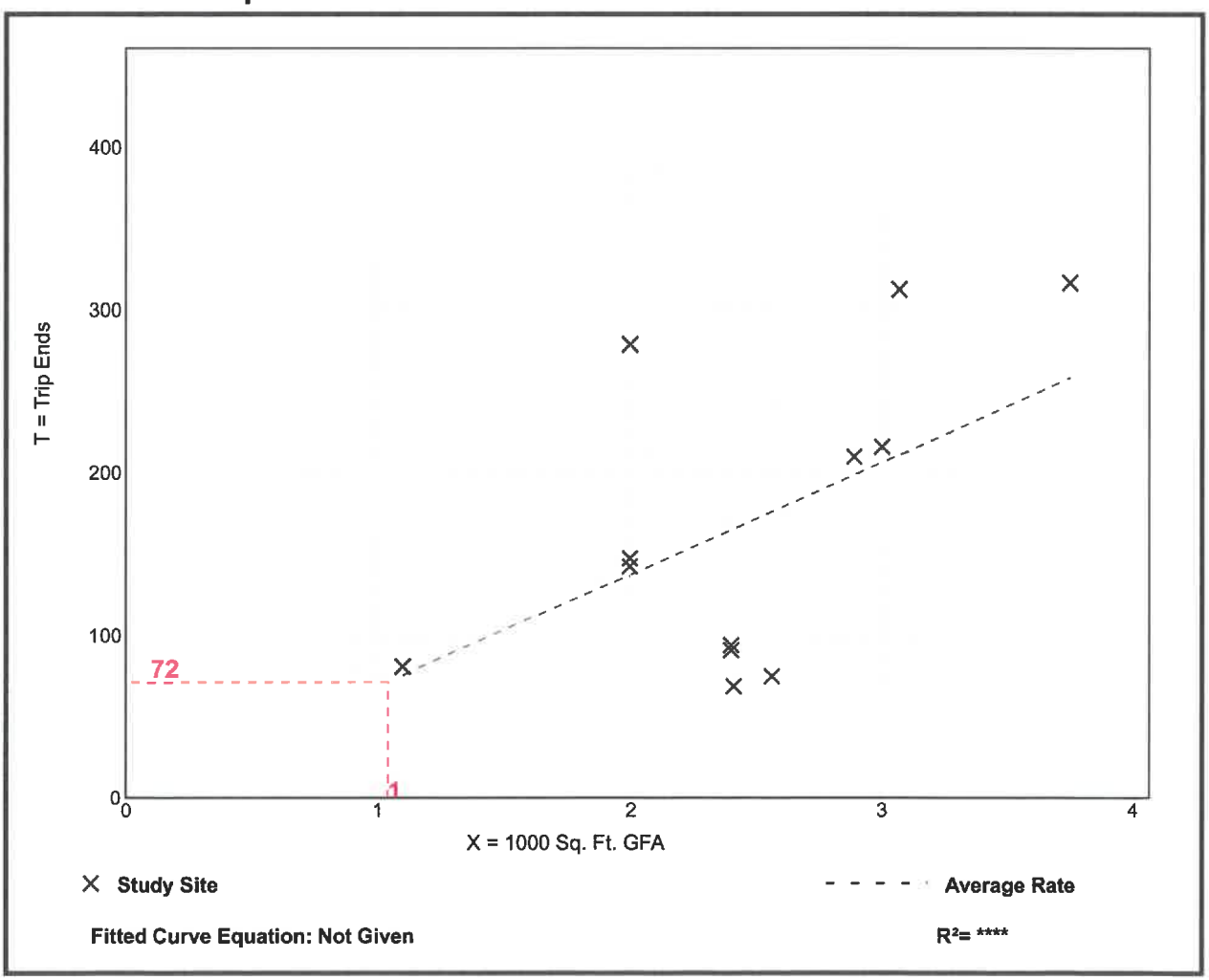
Vehicle Trip Ends vs: **1000 Sq. Ft. GFA**
On a: **Weekday,**
AM Peak Hour of Generator

Setting/Location: **General Urban/Suburban**
Number of Studies: 12
Avg. 1000 Sq. Ft. GFA: 2
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
68.83	28.63 - 139.50	31.41

Data Plot and Equation



Trip Gen Manual, 10th Edition • Institute of Transportation Engineers

Convenience Market
(851)

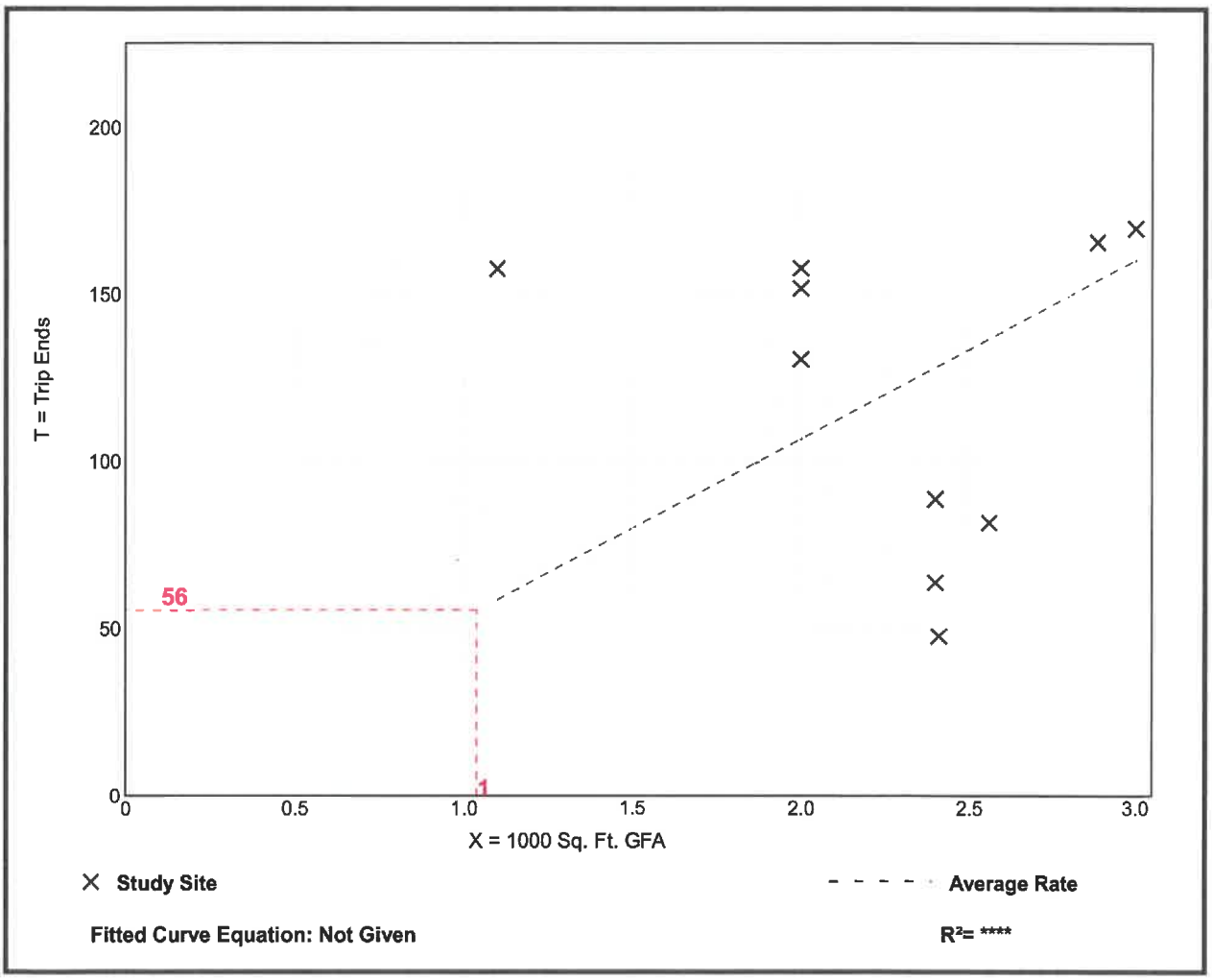
Vehicle Trip Ends vs: **1000 Sq. Ft. GFA**
On a: **Weekday,**
PM Peak Hour of Generator

Setting/Location: **General Urban/Suburban**
Number of Studies: 10
Avg. 1000 Sq. Ft. GFA: 2
Directional Distribution: 51% entering, 49% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
53.51	19.92 - 143.64	29.55

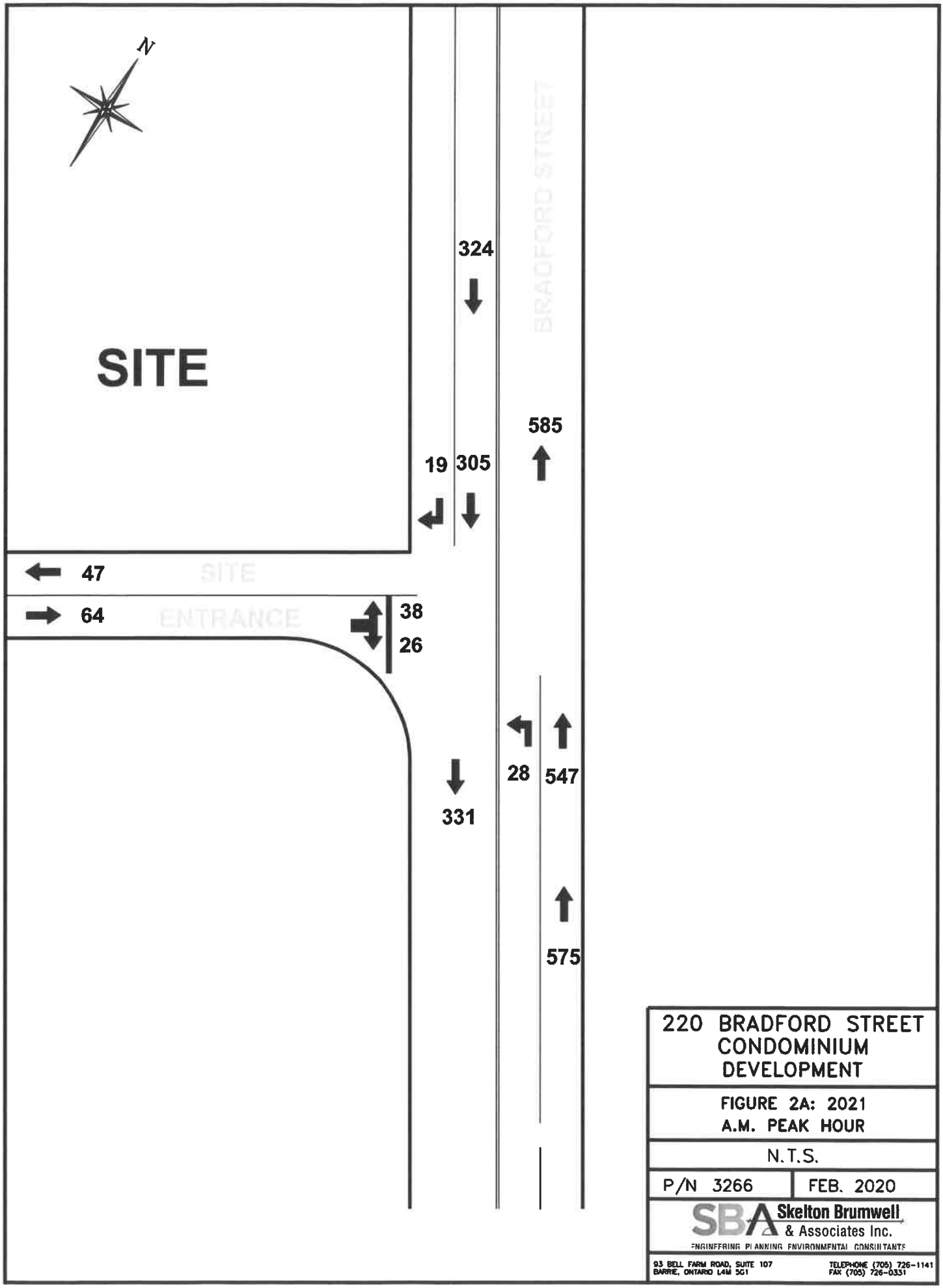
Data Plot and Equation



Trip Gen Manual, 10th Edition • Institute of Transportation Engineers

Appendix C

Figures – Traffic Volumes



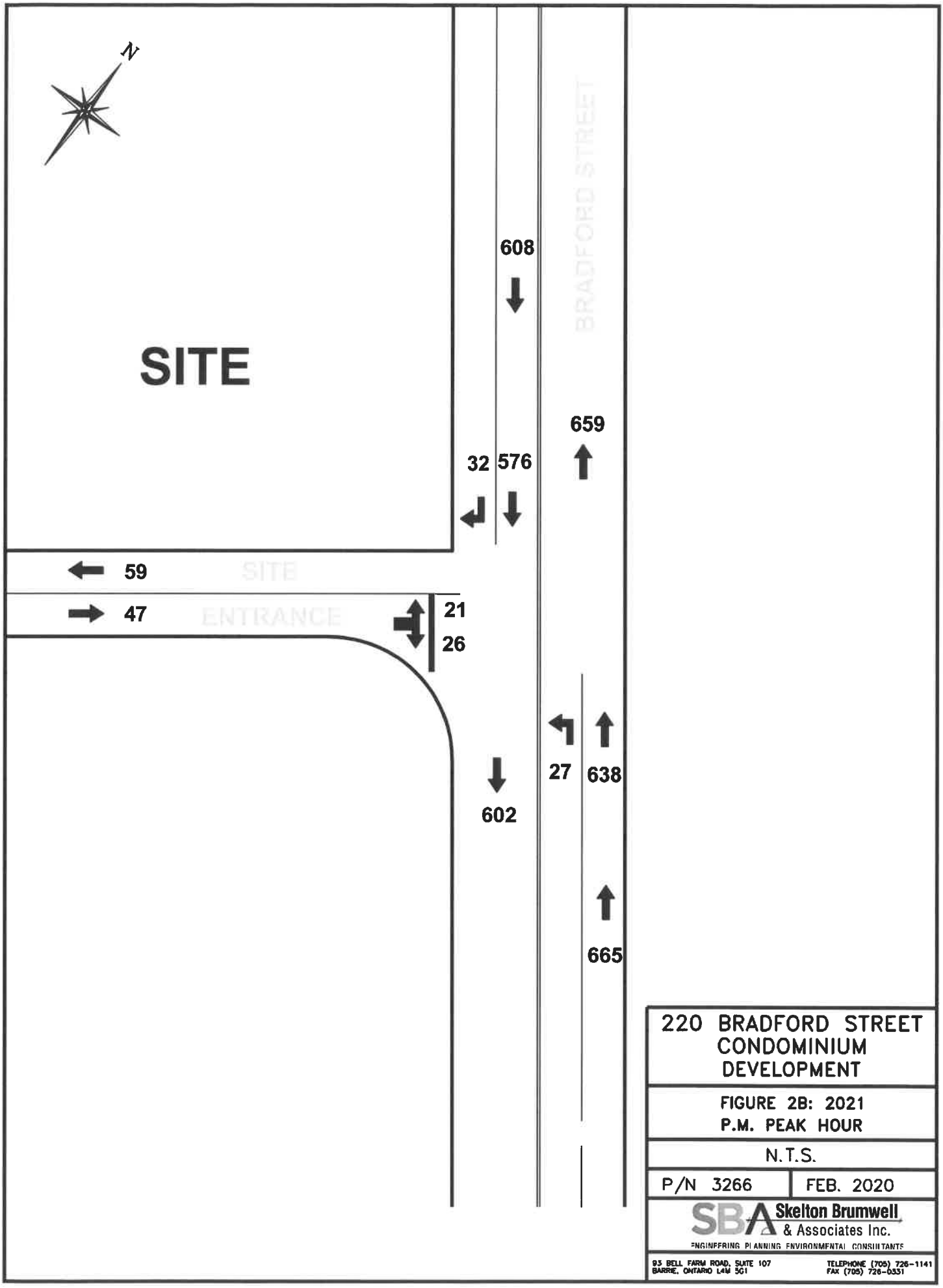
220 BRADFORD STREET
CONDOMINIUM
DEVELOPMENT

FIGURE 2A: 2021
A.M. PEAK HOUR

N.T.S.

P/N 3266 | FEB. 2020

SBA Skelton Brumwell & Associates Inc.
ENGINEERING PLANNING ENVIRONMENTAL CONSULTANTS
93 BELL FARM ROAD, SUITE 107
BARRIE, ONTARIO L4M 5G1
TELEPHONE (705) 726-1141
FAX (705) 726-0331



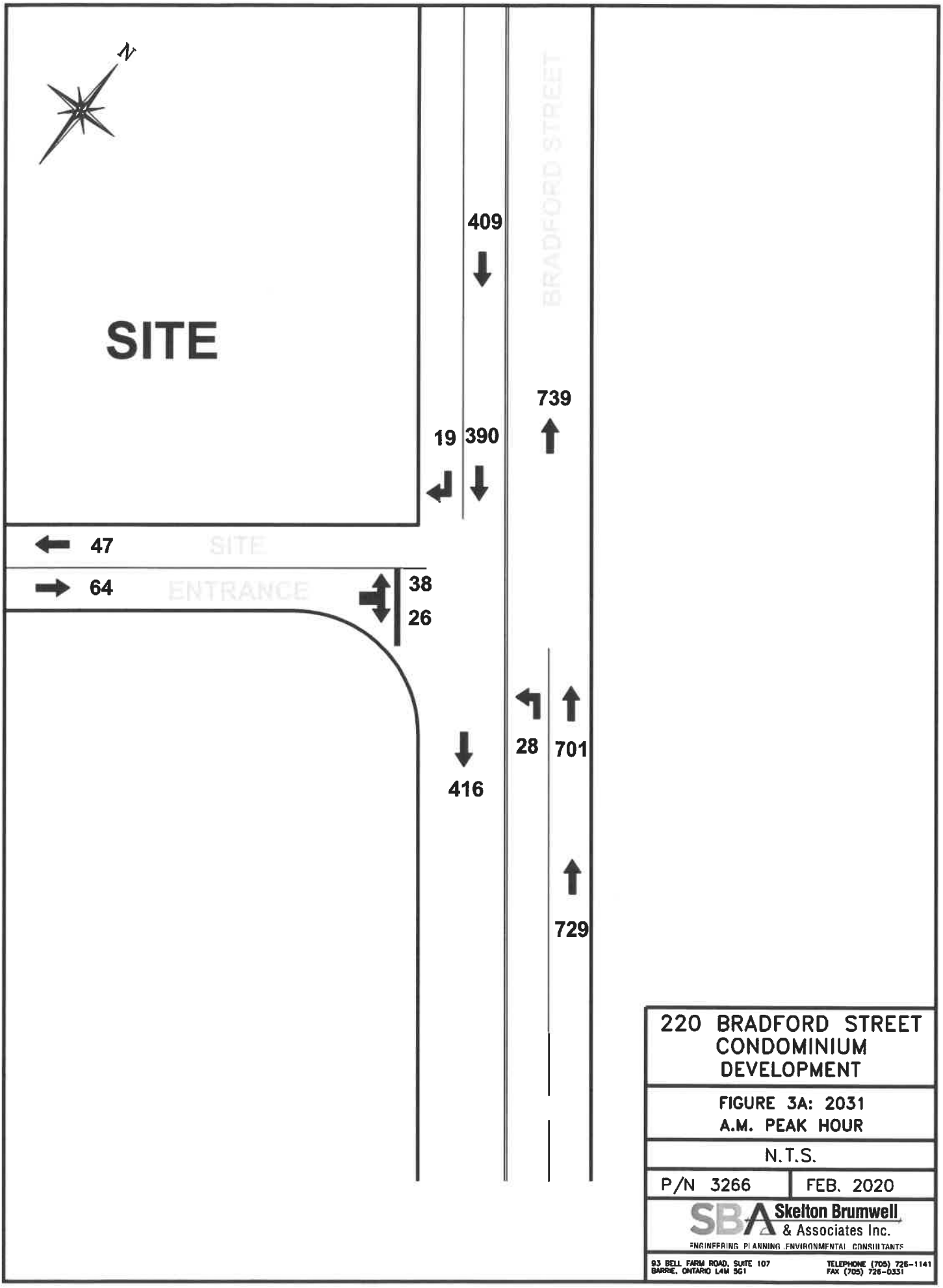
220 BRADFORD STREET CONDOMINIUM DEVELOPMENT

FIGURE 2B: 2021 P.M. PEAK HOUR

N.T.S.

P/N 3266 | FEB. 2020

Skelton Brumwell & Associates Inc.
ENGINEERING PLANNING ENVIRONMENTAL CONSULTANTS
93 BELL FARM ROAD, SUITE 107
BARRIE, ONTARIO L4M 5G1
TELEPHONE (705) 726-1141
FAX (705) 726-0331



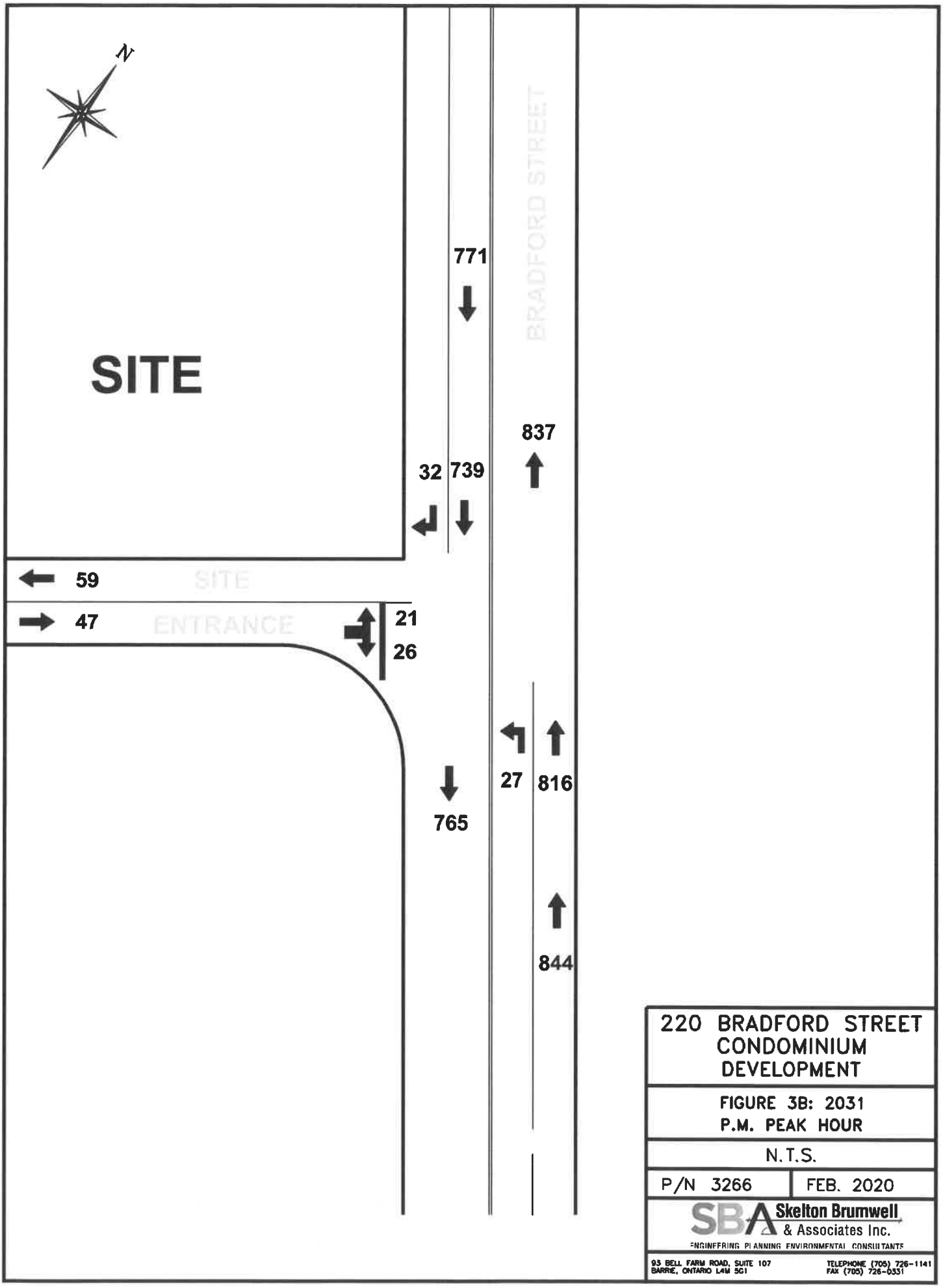
220 BRADFORD STREET
CONDOMINIUM
DEVELOPMENT

FIGURE 3A: 2031
A.M. PEAK HOUR

N.T.S.

P/N 3266 | FEB. 2020

SBA Skelton Brumwell & Associates Inc.
ENGINEERING PLANNING ENVIRONMENTAL CONSULTANTS
93 BELL FARM ROAD, SUITE 107
BARRIE, ONTARIO L4M 5G1
TELEPHONE (705) 726-1141
FAX (705) 726-0331



220 BRADFORD STREET CONDOMINIUM DEVELOPMENT

FIGURE 3B: 2031 P.M. PEAK HOUR

N.T.S.

P/N 3266 | FEB. 2020

SBA Skelton Brumwell & Associates Inc.
ENGINEERING PLANNING ENVIRONMENTAL CONSULTANTS
93 BELL FARM ROAD, SUITE 107
BARRIE, ONTARIO L4M 5G1
TELEPHONE (705) 726-1141
FAX (705) 726-0331

Appendix D

Level of Service Definition

LEVEL OF SERVICE AT UNSIGNALIZED INTERSECTIONS

The assessment of unsignalized intersections is based on the methods described in the "Highway Capacity Manual 2000", published in 2000 by the Transportation Research Board.

The term "Level of Service" is often used to assist in clarifying the arithmetic analysis associated with traffic engineering. "Level of Service" implies a qualitative measure of traffic flow at an intersection, and is dependent upon vehicle delay and vehicle queue lengths at the approaches. The Level of Service can be determined based on the ratio between traffic volumes and approach capacity or "V/C" ratio. The following table describes the characteristics of each level:

Level of Service	Description	Control Delay (sec)
A	Little or no traffic delay occurs. Approaches appear open, turning movements are easily made, and drivers have freedom of operation.	≤10
B	Short traffic delays occur. Many drivers begin to feel somewhat restricted in terms of freedom of operation.	10 to 15
C	Average traffic delays occur. Operations are generally stable, but drivers emerging from the minor street may experience difficulty in completing their movement. This may occasionally impact on the stability of flow on the major street.	15 to 25
D	Longer traffic delays occur. Motorists emerging from the minor street experience longer delays in making turns. Drivers on the major street will experience congestion and delay as drivers emerging from the minor street interfere with the major through movements.	25 to 35
E	Very long traffic delays occur. Operations approach the capacity of the intersection.	35 to 50
F	Saturation occurs, with vehicle demand exceeding the available capacity. Extremely long traffic delays occur.	>50

Appendix E

HCS 7 Intersection Analysis

HCS7 Two-Way Stop-Control Report

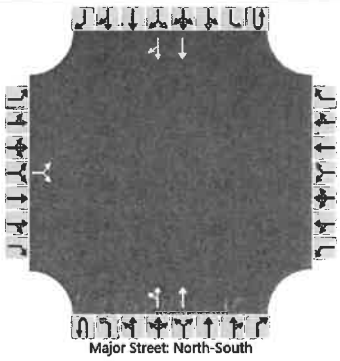
General Information

Analyst	S. Brumwell
Agency/Co.	City of Barrie
Date Performed	2/6/2020
Analysis Year	2021
Time Analyzed	A.M. Peak Hour
Intersection Orientation	North-South
Project Description	220 Bradford Street

Site Information

Intersection	Driveway & Bradford St.
Jurisdiction	City of Barrie
East/West Street	220 Bradford St. Driveway
North/South Street	Bradford Street
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	2	0	0	0	2	0
Configuration			LR							LT	T				T	TR
Volume (veh/h)		38		26						28	547				305	19
Percent Heavy Vehicles (%)		0		0						0						
Proportion Time Blocked		0.000		0.000						0.000						
Percent Grade (%)		2														
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.5		6.9						4.1						
Critical Headway (sec)		7.20		7.10						4.10						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.50		3.30						2.20						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			70							30						
Capacity, c (veh/h)			432							1218						
v/c Ratio			0.16							0.02						
95% Queue Length, Q_{95} (veh)			0.6							0.1						
Control Delay (s/veh)			14.9							8.0						
Level of Service (LOS)			B							A						
Approach Delay (s/veh)		14.9								0.5						
Approach LOS		B														

HCS7 Two-Way Stop-Control Report

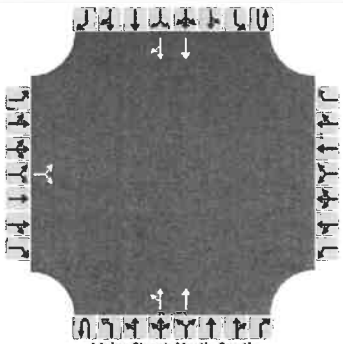
General Information

Analyst	S. Brumwell
Agency/Co.	City of Barrie
Date Performed	2/6/2020
Analysis Year	2031
Time Analyzed	A.M. Peak Hour
Intersection Orientation	North-South
Project Description	220 Bradford Street

Site Information

Intersection	Driveway & Bradford St.
Jurisdiction	City of Barrie
East/West Street	220 Bradford St. Driveway
North/South Street	Bradford Street
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	2	0	0	0	2	0
Configuration			LR							LT	T				T	TR
Volume (veh/h)		38		26						28	701				390	19
Percent Heavy Vehicles (%)		0		0						0						
Proportion Time Blocked		0.000		0.000						0.000						
Percent Grade (%)		2														
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.5		6.9						4.1						
Critical Headway (sec)		7.20		7.10						4.10						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.50		3.30						2.20						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			70							30						
Capacity, c (veh/h)			339							1126						
v/c Ratio			0.21							0.03						
95% Queue Length, Q_{95} (veh)			0.8							0.1						
Control Delay (s/veh)			18.4							8.3						
Level of Service (LOS)			C							A						
Approach Delay (s/veh)		18.4								0.5						
Approach LOS		C														

HCS7 Two-Way Stop-Control Report

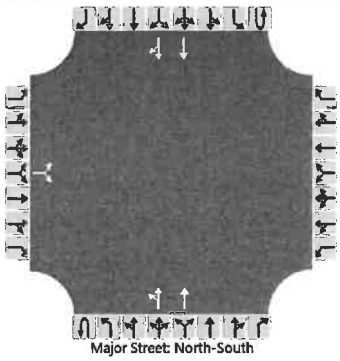
General Information

Analyst	S. Brumwell
Agency/Co.	City of Barrie
Date Performed	2/7/2020
Analysis Year	2021
Time Analyzed	P.M. Peak Hour
Intersection Orientation	North-South
Project Description	220 Bradford Street

Site Information

Intersection	Driveway & Bradford St.
Jurisdiction	City of Barrie
East/West Street	220 Bradford St. Driveway
North/South Street	Bradford Street
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	2	0	0	0	2	0
Configuration			LR							LT	T				T	TR
Volume (veh/h)		21		26						27	638				576	32
Percent Heavy Vehicles (%)		0		0						0						
Proportion Time Blocked		0.000		0.000						0.000						
Percent Grade (%)		2														
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.5		6.9						4.1						
Critical Headway (sec)		7.20		7.10						4.10						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.50		3.30						2.20						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			51							29						
Capacity, c (veh/h)			306							937						
v/c Ratio			0.17							0.03						
95% Queue Length, Q_{95} (veh)			0.6							0.1						
Control Delay (s/veh)			19.1							9.0						
Level of Service (LOS)			C							A						
Approach Delay (s/veh)		19.1								0.6						
Approach LOS		C														

HCS7 Two-Way Stop-Control Report

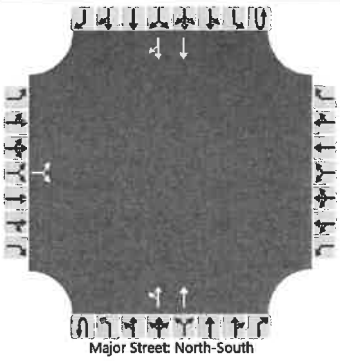
General Information

Analyst	S. Brumwell
Agency/Co.	City of Barrie
Date Performed	2/7/2020
Analysis Year	2031
Time Analyzed	P.M. Peak Hour
Intersection Orientation	North-South
Project Description	220 Bradford Street

Site Information

Intersection	Driveway & Bradford St.
Jurisdiction	City of Barrie
East/West Street	220 Bradford St. Driveway
North/South Street	Bradford Street
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	2	0	0	0	2	0
Configuration			LR							LT	T				T	TR
Volume (veh/h)		21		26						27	816				739	32
Percent Heavy Vehicles (%)		0		0						0						
Proportion Time Blocked																
Percent Grade (%)		2														
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.5		6.9						4.1						
Critical Headway (sec)		7.20		7.10						4.10						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.50		3.30						2.20						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			51							29						
Capacity, c (veh/h)			208							805						
v/c Ratio			0.25							0.04						
95% Queue Length, Q_{95} (veh)			0.9							0.1						
Control Delay (s/veh)			27.8							9.6						
Level of Service (LOS)			D							A						
Approach Delay (s/veh)		27.8								0.6						
Approach LOS		D														