



REPORT

ENGINEERING DEPARTMENT

To: Mayor Wright and Member of Council **Date:** October 4, 2010
Committee of the Whole

From: Jim Lowrie **File:** 1800.80
Director of Engineering Services

Subject: Brow of the Hill Traffic Calming Plan – Supplemental Review

RECOMMENDATION

THAT the report titled Brow of the Hill Traffic Calming Plan Supplemental Review dated October 4, 2010 be received for information and that staff be directed to monitor traffic volumes on Queens Avenue and Fourth Avenue upon implementation of the approved Brow of the Hill Traffic Calming Plan.

ORIGIN/PURPOSE

To present a supplemental review of Fourth Avenue and Queens Avenue traffic calming measures as part of the Brow of the Hill Traffic Calming process.

BACKGROUND

The Brow of the Hill Traffic Calming Plan was approved at the June 14, 2010 regular council meeting. A petition was received during the open delegation period that requests traffic volumes on Fourth Avenue and Queens Avenue be reduced to under 1,000 vehicles per day (vpd). The following resolutions were passed:

THAT *The Brow of the Hill Traffic Calming Plan, as set out in the June 14, 2010 report from the Director of Engineering Services be approved;*
THAT *staff implement the traffic calming measures set out in the report; and*
THAT *staff look at traffic calming treatment of Queens and Fourth Avenues.*

Staff engaged Opus International Consultants (Opus) to undertake a supplemental review of the traffic volumes on Fourth Avenue and Queens Avenue and examine any additional calming treatment.

ANALYSIS

Opus conducted the supplemental review in two parts: 1) assess the nature of traffic on Fourth Avenue and Queens Avenue, and 2) identify any optional traffic calming measures.

Traffic Volumes on Fourth Avenue and Queens Avenue

The request to reduce traffic to 1,000 vpd was related to the road design classification system in the Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads. The TAC Guide, which provides typical characteristics for various groups of roads based on their service functions and adjacent land uses, recommends daily traffic volumes of under 1,000 vpd and 3,000 vpd for local residential and local commercial roads respectively. Opus examined the existing land uses on Fourth Avenue and Queens Avenue and calculated the locally generated traffic relative to the observed volumes. The Opus report is attached and Table 1 summarizes the findings:

Table 1 LOCAL AREA ESTIMATED TRAFFIC VS EXISTING ROADWAY VOLUMES (vpd)

LOCATION	LOCAL RESIDENTIAL AND SCHOOL TRIPS	COMMERCIAL LAND-USE TRIPS	TOTAL (REDUCED*) NEIGHBOURHOOD TRIPS	EXISTING VOLUMES
Queens Avenue between 12 th Street & 10 th Street	1865	520	1670	3190 to 3680
Queens Avenue between 10 th Street & 8 th Street	1700	275	1380	3400
Queens Avenue between 8 th Street & 6 th Street	1600	45	1150	3120
Fourth Avenue between 12 th Street & 10 th Street	2540	180	1905	2170 to 2800
Fourth Avenue between 10 th Street & 8 th Street	2520	230	1925	3420
Fourth Avenue between 8 th Street & 6 th Street	1040	870	1335	3950

*Volumes reduced by 30% to reflect those trips conducted by bike, foot, or transit

The report noted that daily trips generated locally on Fourth Avenue are between 1,300 to 1,900 vpd. The locally generated traffic on Queens Avenue including school trips are between 1,200 to 1,700 vpd. This finding shows that even without external traffic, local trips on Fourth and Queens Avenue would exceed

the 1,000 vpd threshold. In other words, it would be unrealistic to reduce traffic below 1,000 vpd given the density of land use (multi-family, commercial and institutional) on these streets. The local residential street classification of the TAC Guide is more reflective of the single family nature of traditional local residential streets.

As the existing volumes on the two streets are between 2,000 to 4,000 vpd, Opus suggested that the local street – commercial, institutional/mixed use designation (with daily traffic volume of under 3,000 vpd) as described in the city Downtown Community Plan may be a more realistic service level for these streets.

Potential Additional Measures on Fourth Avenue and Queens Avenue

The currently approved Brow of the Hill traffic calming plan already includes traffic calming measures on Fourth Avenue and Queens Avenue. Opus investigated whether further measures would be feasible and the findings are summarized below:

Table 2

Location	Currently approved Brow of the Hill traffic calming plan	Potential Additional Measures
Fourth Avenue	Speed humps west of 11 th Street and west of 7 th Street. Full closure of left-turn access from Stewardson Way at 13 th Street.	Additional speed humps between 8 th Street and 11 th Street. Traffic diverter west of 8th Street ¹
Queens Avenue	Left-Turn Restriction 4-6PM from 12th Street, raised crosswalk at 9 th Street (at school)	Additional eastbound speed hump west of 10 th Street. A traffic circle at 7 th Street. ²

Different devices have varying degrees of effectiveness in reducing rat-running traffic volumes. Devices such as speed humps and traffic circles are primarily speed reducing measures but also make streets less attractive for rat-running. Drastic measures such as directional closures, diverters or full closure are more effective in reducing external traffic but also limit the accessibility of the neighbourhood for local residents. For example, a diverter was originally proposed for Fourth Avenue west of 8th Street in the draft plan but the community feedback in the final survey (53%) did not support this drastic measure (see Table 3)

¹ A diverter on 4 Avenue west of 8 Street was previously included in the draft plan but 53% of the survey responses oppose it.

² Queens Street need to accommodate existing and future school traffic.

Table 3 Brow of Hill draft Traffic Calming Plan – Survey Results, Element Support

Item	Location	Support			Combo	Total Responses	Percentage	
		Yes	No	No Opin.	Y & No Op		In Favor	Opposed
Full Street Closure	Stewardson at 14 St	179	68	81	260	328	79%	21%
	Stewardson at Kamloops	171	72	83	254	326	78%	22%
	Stewardson at 4 Ave	173	91	64	237	328	72%	28%
	Stewardson at 13 St	176	81	72	248	329	75%	25%
	Stewardson at McPhadden	178	73	76	254	327	78%	22%
Diverter	Third Ave east of 12 St	139	144	46	185	329	56%	44%
	Fourth Ave west of 8 St	108	176	46	154	330	47%	53%
Speed Humps	Fourth Ave	200	89	46	246	335	73%	27%
	Seventh St	171	83	72	243	326	75%	25%
	Queens Ave	209	75	45	254	329	77%	23%
LTurn Restriction (4-6)	12 St at Queens (SB)	145	123	63	208	331	63%	37%
Ped. Refuge Median	10 St at Fourth Ave	185	73	61	246	319	77%	23%
Curb Extensions	various	179	98	55	234	332	70%	30%
Crosswalk Improvements	Queens Ave at Ninth St	267	19	40	307	326	94%	6%
	Sixth St at Blackford St	247	21	57	304	325	94%	6%
	Sixth Ave at Ninth St	268	25	36	304	329	92%	8%

Recommended Next steps:

- Design and implement trial measures on Stewardson Way at minor streets and on Third Ave east of Twelfth Street. Install speed humps and raised crosswalk on Fourth Street and Queens Avenue in accordance to the council approved plan;
- Monitor traffic behavior;
- Implement curb extensions, parking restrictions and crosswalk improvements (subject to future budget approval);
- Consider additional measures on Fourth Avenue and Queens Avenue as outlined in this report if warranted from monitoring results and with further consultation with Brow of the Hill Residents Association.

FINANCIAL IMPACT

The currently approved Plan is in the range of \$300,000 to \$600,000. The high end of the range depends on the level of crosswalk enhancement selected for each of the three locations. Additional measures outlined in this report are in the order of \$80,000. Funding for traffic calming initiatives has been allocated in the City's 5 year Capital Plan to be phased over the next 2 to 3 years.

OPTIONS

1. Receive this report for information purposes and direct staff to monitor traffic volumes on Queens Avenue and Fourth Avenue upon implementation of the approved Brow of the Hill Traffic Calming Plan;

2. Amend the approved Brow of the Hill Traffic Calming Plan by incorporating the additional measures identified in the Opus Supplemental Report.

Staff recommend Option 1.

INTERDEPARTMENTAL LIAISON


Staff from Engineering Operations, Fire, Police and Development Services departments were consulted previously in regards to the approved traffic calming plan.

CONCLUSION


A technical review concluded that as Fourth Avenue and Queens Avenue have a range of multi-family residential, commercial and institutional land uses, the locally generated traffic (excluding external traffic) exceeds the theoretical 1,000 vehicle per day for a local residential street. These streets function more as mixed-use local streets than typical local residential streets and as such are capable of accommodating approximately 3,000 vehicles per day.

The review identified some additional calming measures such as speed humps and a diverter that can be considered for Fourth Avenue and Queens Street. However, staff recommend that the approved plan be implemented first and that traffic be monitored and if warranted, additional measures be considered with further consultation.

Report Author,

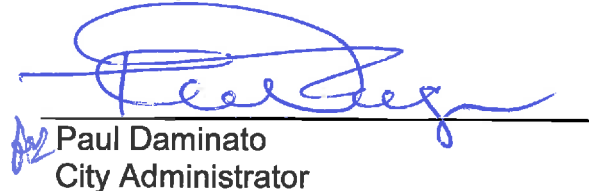


Eugene Wat, P.Eng. PTOE
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Jim Lowrie
Director of Engineering Services

Approved for Presentation
to Council



Paul Daminato
City Administrator

Doc #143958

Attachment 1-Brow of the Hill - Fourth Avenue and Queens Avenue Traffic Calming Review Sept 28, 2010

28 September, 2010

Eugene Wat
 Manager-Infrastructure and Planning
 Engineering Department
 Corporation of the City of New Westminster
 511 Royal Avenue
 New Westminster, BC. V3L 1H9



Our File: H-90076.04

Dear Mr. Wat:

RE: Brow of the Hill - 4th Avenue and Queens Avenue Traffic Calming Review

Background

Opus International Consultants (Opus) was retained by the City of New Westminster to develop a traffic calming plan for the Brow of the Hill neighbourhood in the City of New Westminster (the City). The plan as set out in the June 14, 2010 report from the City's Director of Engineering Services to City Council was approved; however, Council has requested further consideration of traffic calming treatment for Queens and 4th Avenues. As a result of this resolution, the City has asked Opus to conduct further analysis regarding traffic volumes on 4th Avenue and Queens Avenue between 12th and 6th Streets. This letter report summarizes Opus' findings as per the work outlined in our Terms of Reference dated June 17, 2010. Specifically, with respect to 4th Avenue and Queens Avenue, this report reviews:

- The feasibility of reducing the daily traffic to under 1,000 vehicles per day on 4th Avenue and Queens Avenue;
- Impacts of the recently approved traffic calming measures in the neighbourhood and on Stewardson Way;
- Identification of appropriate volume thresholds for 4th Avenue and Queens Avenue ; and,
- Potential measures to further reduce traffic.

I LOCALLY GENERATED TRAFFIC ON 4th AVENUE AND QUEENS AVENUE

The Transportation Association of Canada's (TAC) Geometric Design Guide for Canadian Roads recommends the typical daily traffic volumes on residential local roads be less than 1000 vehicles per day (vpd); however, it recognizes acceptable traffic volumes of less than 3000 vpd for commercial local roadways. The City has in fact classified roads as Local Street – Commercial, Institutional / Mixed Used (with daily volumes up to 3000 permitted) in the most recent Community Plan for the Downtown neighbourhood.

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Trip Generation

In order to assess whether it is feasible to maintain a daily traffic volume under 1000 vpd on 4 Avenue and Queens Avenue, the locally generated traffic on these streets were estimated. Trip generation for 4th Avenue and Queens Avenue for the weekday afternoon peak periods was estimated using trip generation rates published in *Trip Generation* (Institute of Transportation Engineers (ITE), 8th Edition).

The analysis included the portions of roadway on 4th Avenue and Queens Avenue between 12th and 6th Streets. Addresses gathered for the Brow of the Hill mail-out survey were used for approximating the number and types of residences. For the purposes of this study it was assumed that 50 percent of the multi-unit dwelling types were owned, and 50 percent were rentals. It is noted the relative split between dwelling types has minor impact on the expected trip generation. Traffic generated by John Robson Elementary School was derived from a traffic impact analysis study Opus conducted for the City in 2008.

In lieu of more accurate data and based on the City's suggestion, the Official Community Plan (OCP) was referenced to estimate which properties are non-residential, and ITE commercial land use trips were generated based on approximate floor areas estimated from Google Earth Pro.

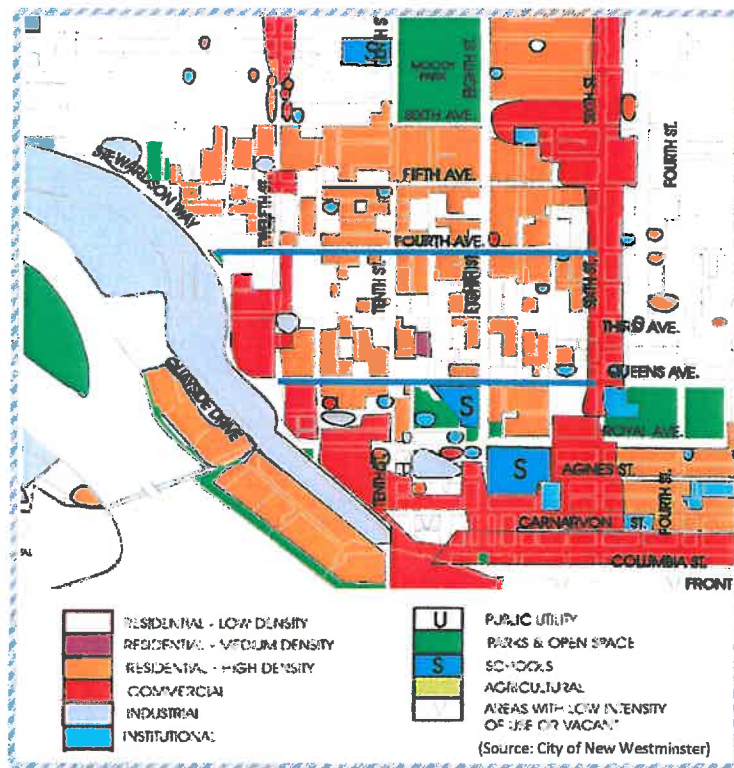


FIGURE 1 – LAND USE ZONING



As ITE trip generation data is typically obtained from suburban sites where auto dependency is much higher than in New Westminster, the possibility that trip generation characteristics for the Brow of the Hill neighbourhood would be less than the rates outlined in *Trip Generation* was explored. Statistical data from the 2006 Census for the two Census Tracts within the study area was examined to determine contemporary mode splits in the neighbourhood. The mode split for commuting to work ranged between 28 to 35 percent for public transit and 5 to 12 for walking and cycling, indicating a **reduction from ITE rates of 30 percent is appropriate** for estimating trip generation.¹ This value (30 percent reduction from ITE rates) was similarly used for the traffic impact analysis of the proposed John Robson School development on Queens Avenue conducted in 2008.

An average daily volume was determined by assuming that the p.m. peak hour represents approximately 10 percent of the total daily traffic, as is typical for Canadian urban locations. This assumption was validated using existing volume data from 2010 counts on both Queens Avenue and 4th Avenue, west of 8th Street. A three day average of the p.m. peak period indicated that the hourly volume was approximately 10.7 percent and 11.2 percent of the total daily traffic on Queens Avenue and 4th Avenue, respectively. The p.m. peak period occurs between the hours 16:00 and 17:00 for both locations.

It should be noted that the generated trip values for residential dwelling units was conducted for residences directly fronting 4th Avenue and Queens Avenues and does not consider buildings facing adjacent or parallel streets. The trip volume estimate is therefore conservative as it does not include trips generated from residences off 4th Avenue and Queens Avenue that might legitimately need to these routes to access their destination. Trips were generated on a block-by-block basis and have been combined to illustrate the number generated between the collector or arterial roadways intersecting 4th Avenue and Queens Avenue between 6th Street and 12th Street. A more detailed analysis is provided in ATTACHMENT A.

**TABLE 1 –GENERATED TRIP RATES PER BLOCK SEGMENT
 BEFORE ASSIGNMENT & WITHOUT REDUCTION FACTOR**

LOCATION	RESIDENTIAL UNITS	LOCAL RESIDENTIAL GENERATED TRIPS (vpd)	CONTRIBUTING COMMERCIAL LANDUSE	LOCAL COMMERCIAL GENERATED TRIPS (vpd)
Queens Avenue between 12 th Street & 10 th Street	211	1260	Auto Shop (Prime Auto)	1000
Queens Avenue between 10 th Street & 8 th Street	44	805	Convenience Market (Rex Grocery)	550

¹ Walking and cycling trips are grouped together. Typically, bicycle trips are considered in the total generated trip volumes for a roadway.



Queens Avenue between 8 th Street & 6 th Street	302	1600	Church (Olivet Baptist Church) Other (negligible)	40
Fourth Avenue west of 12 th Street	62	630	-	-
Fourth Avenue between 12 th Street & 10 th Street	317	1800	Corporate Inn / Bar & Grill	250
Fourth Avenue between 10 th Street & 8 th Street	137	1165	-	-
Fourth Avenue between 8 th Street & 6 th Street	95	1040	Convenience Store (7-11); Auto Repair Shop; Animal Hospital; Fast food (Burger Burger); Hair Salon; Walk-in Bank (CIBC) Church (First Presbyterian Church); fast food (Royal Crown Pizza, barber shop; various	3850

Commercial Land Use either fronting the study corridors or at intersection corners were included, and traffic generated from the businesses was distributed on the adjacent roadways. Based on ITE trip generation rates and assumed trip distribution, it is assumed approximately 128 trips are made in the p.m. peak hour along 4th Avenue between 12th Street and 6th Street to access the businesses along the corridor. On Queens Avenue, 84 vehicle trips in the afternoon peak hour can be reasonably expected.

Residential Trip Assignment

Trips generated from a block face were assumed to run in both directions between collector or arterial roadways. Where available, traffic movement splits from existing counts were reviewed for 4th Avenue and Queens Avenue to determine more appropriate assignments of the generated trips along the corridors. It should be noted that the counts were not conducted on the same days so assumptions were based on relativity. A map of the study area showing the trip distribution for local residential generated trips is shown in FIGURE 2. Trip assignment assumptions are documented in ATTACHMENT A, and include the following considerations:

4th Avenue

- o Traffic movement counts were available on 4th Avenue at 12th Street, 10th Street and 6th Street, marked by red circles on FIGURE 2;



- Turning movement counts at 12th and 10th Streets indicate that the majority of traffic travels eastbound.
- Trips generated only from fronting residential properties on 4th Avenue were considered; additional traffic from the adjacent and parallel streets was not considered;
- Due to the high percentage of traffic generated from 4th Avenue west of 10th Street that is travelling eastbound and through the intersection at 10th Street, a percentage of traffic generated between 12th and 10th Streets (75%) was added to the local traffic volumes on 4th Avenue between 10th Street and 8th Street.

Queens Avenue

- Traffic movement counts were available on Queens Avenue at 12th Street, 10th Street, 9th Street and 8th Street, marked by red circles on FIGURE 2;
- Trips generated only from fronting residential properties on Queens Avenue were considered; additional traffic from the adjacent and parallel streets was not considered;
- Turning movement counts at 10th Street indicate that, as with 4th Avenue, the majority of traffic generated west of 10th Street travels eastbound towards 8th Street; accordingly a percentage of overlap (60%) was assumed for local residential traffic volumes on Queens Avenue between 10th Street and 8th Street.
- since the analysis is not sensitive to traffic entering Queens Avenue from adjacent and parallel streets, and it can be assumed that traffic can use their local roadway in between arterial roadways, no traffic generated west of 8th Street was added to the corridor east of the intersection, and similarly, it was assumed that all traffic generated between 6th Street and 8th Street can turn onto these roadways (6th and 8th Streets) and travel north or south to a collector or arterial roadway for east/west travel.



FIGURE 2 – TRIP DISTRIBUTION

Commercial Trip Assignment

Traffic generated from fronting commercial land uses were divided into the block segments based on assumed origin/ destinations and adjacent roadway classifications. These assumptions have been documented in APPENDIX A for future reference. For example, it was assumed that 70 percent of the trips generated by Royal Crown Pizza and the neighbouring businesses at the intersection of 8th Street and 4th Avenue should be assigned to 8th Street, and the remaining trips distributed along 4th Avenue, 50 percent north and 50 percent south of 8th Street. For Rex Grocery Convenience store on Queens Avenue, it was assumed that 100 percent of the generated trips are along Queens Avenue, with 50 percent assigned between 12th Street and 10th Street, the remaining assigned north of 10th Street.

TABLE 2 compares the generated trips with assumed distributions for residences, commercial establishments, and schools on 4th Avenue and Queens Avenue with existing volumes on the corridors. The trips generated from John Robson school site were added between 10th Street and 9th Street on Queens Avenue.



TABLE 2 – LOCAL AREA ESTIMATED TRAFFIC VS EXISTING ROADWAY VOLUMES (vpd)

LOCATION	LOCAL RESIDENTIAL AND SCHOOL TRIPS	COMMERCIAL LAND-USE TRIPS	TOTAL (REDUCED*) NEIGHBOURHOOD TRIPS	EXISTING VOLUMES
Queens Avenue between 12 th Street & 10 th Street	1865	520	1670	3190 to 3680
Queens Avenue between 10 th Street & 8 th Street	1700	275	1380	3400
Queens Avenue between 8 th Street & 6 th Street	1600	45	1150	3120
Fourth Avenue between 12 th Street & 10 th Street	2540	180	1905	2170 to 2800
Fourth Avenue between 10 th Street & 8 th Street	2520	230	1925	3420
Fourth Avenue between 8 th Street & 6 th Street	1040	870	1335	3950

*Volumes reduced by 30% to reflect those trips conducted by bike, foot, or transit

When adjusting for transit use and walking and cycling trips, the trips due to the land uses on the study corridor account for approximately at least **40 percent** of the total existing daily traffic on Queens Avenue between 12th Street and 6th Street. Similarly, along 4th Avenue, the adjusted trips generated from the residences alone account for at least **50 to 60 percent of the total daily traffic** between 12th Street and 8th Street. For the segment between 8th Street and 6th Street, the background residential and local commercially-generated traffic accounts for approximately **35 percent** of the total existing daily traffic.

Although residents have requested traffic calming measures be implemented to reduce traffic volumes below 1000 vpd on each of 4th Avenue and Queens Avenue, TABLE 2 clearly indicates that locally generated trips exceed that amount on all blocks. The estimated trips are quite conservative for several reasons, including:

- Neighbourhood trips along the study corridors does not consider residential properties facing adjacent streets that might legitimately travel along Queens Avenue or 4th Avenue;
- Businesses on adjacent or parallel streets were not considered unless those businesses had frontage on the study corridors;



- Traffic generated from residential land-use east of 12th Street and west of 6th Street was excluded and assumed to travel north or south along the arterial roadway to a collector or arterial east/west roadway rather than continuing along Queens Avenue or 4th Avenue; and,
- ITE theoretical vehicle trip rates were reduced by 30 percent in consideration of trips conducted by alternate modes of transportation.

As noted in the Traffic Calming Plan, several streets in Brow of the Hill carry traffic volumes in excess of Transportation Association of Canada's (TAC) recommended levels for their road classifications. As development intensifies in the neighbourhood, the volumes noted in the TAC guidelines may no longer be appropriate for some local roads. The high proportion of multiple-family dwellings on both 4th Avenue and Queens Avenue does not reflect the typical Canadian local residential roadway, which generally are fronted by a larger portion of single family units. Indeed, Brow of the Hill has a 17 percent higher proportion of residents living in apartments compared with other parts of the City.

II IMPACT OF THE TRAFFIC CALMING MEASURES

Measures recommended in the approved Traffic Calming Plan to mitigate volumes throughout the Brow of the Hill neighbourhood, such as road closures and turn restrictions, will have some impact on volumes throughout the area, including along the Fourth Avenue and Queens Avenue corridors. Closures and right-in/right-out diverters preventing Stewardson Way ingress and egress are to be implemented at the following locations:

- Closure at 14th Street
- Closure at Kamloops Street
- Closure at 4th Avenue
- Right-in/Right out at 13th Street
- Right-in/Right-out at McPhadden Avenue

Without follow-up traffic counts, their impacts are difficult to quantify; however, based on theoretical effectiveness of the various devices and existing traffic patterns based on available turning movement counts, reasonable assumptions of the impacts can be made:

- Traffic on 4th Avenue east of 12th Street may increase due to diverted traffic on 3rd Avenue at 12th Street
- Slight increase in traffic on Queens Avenue east of 12th Street may result from the new diverter at 3rd Avenue at 12th Street. The signed p.m. peak left-turn restriction for 12th Street southbound traffic will likely deter most of the traffic that would otherwise make this left-turn onto Queens Avenue.



The impacts of the closures and diverters along Stewardson Way are also difficult to quantify at this time but are expected to be beneficial in reducing non-residential traffic throughout the neighbourhood. At least some of the traffic presently entering the neighbourhood via 4th Avenue and McPhadden Street will enter at 3rd Avenue.

Vehicles entering and exiting Brow of the Hill neighbourhood via McPhadden Street is minimal, with less than 5 vph entering and less than 10 vph exiting during either the morning and afternoon peaks. It is highly likely that this traffic is local and will not affect traffic on 4th or Queens Avenues.

Recent traffic counts indicate that the left-turn volumes from Stewardson Way onto 4th Avenue are around 10 vph in the a.m. peak hour and 125 vph during the afternoon peak. Right-turns onto 4th Avenue from Stewardson Way occur much less frequently, with less than 5 vph in both the a.m. and p.m. peak periods. Turning movement counts suggest that the majority of these vehicles entering Brow of the Hill via 4th Avenue from Stewardson Way use Cameron Street to access 12th Street and return to 4th Avenue. For these vehicles, it is likely that they will be diverted to 3rd Avenue to access the neighbourhood, and will subsequently turn left onto 12th Street and a right onto 4th Avenue eastbound. Therefore, it is not assumed that traffic on 4th Avenue west of 12th Street that currently access the neighbourhood via 4th Avenue will be reduced by the diverters along Stewardson Way.

With the afternoon peak period turn restriction in place at Queens Avenue and diverter at 3rd Avenue, it is likely the majority of traffic from Stewardson Way that would otherwise turn left at 3rd Avenue to access Queens Avenue will either use 4th Avenue, Stewardson Way or continue northbound on 12th Street onto 5th or 6th Avenue.

For the majority of traffic presently using 3rd, 4th and Queens Avenues to shortcut through the neighbourhood, it is felt that traffic calming measures will result in the increased use of Royal Avenue to travel to and from Stewardson Way.

III IDENTIFICATION OF APPROPRIATE VOLUME THRESHOLDS

Based on the expected trips generated only from local commercial and residential properties on the corresponding roadways and from school activity on Queens Avenue, **it is unreasonable to expect less than 1000 vpd** on either 4th Avenue or Queens Avenue west of 8th Street.

Traffic movement counts indicate significant traffic generated west of 10th Street that travels eastbound through the intersection towards 8th Street. As 10th Street is not an arterial roadway, traffic continuing eastbound would not be considered rat-running. Furthermore, the trip generation calculation considered properties fronting 4th Avenue; and it is reasonable to expect residents living on 8th Street, Ash Street, and 7th Street may appropriately utilize 4th Avenue as an east/west connection to 6th Street or 8th Street. These factors are likely the reason why traffic volumes on 4th Avenue between 6th and 8th Streets are significantly higher than the fronting properties and commercially-



generated trips contribute. Therefore, based on land usage for the portion of 4th Avenue between 8th Street and 6th Street, a 1000vpd threshold may be appropriate when looking at the segment in isolation; however, as part of the roadway running between Stewardson Way and 6th Street, the arterial and collector roads bordering the neighbourhood, 4th Avenue should logically be classified as carrying more significant traffic than a local residential road.

In consultation with the City of New Westminster and in consideration of TAC's roadway classification's, 4th Avenue and Queens Avenue within the bounds of the neighbourhood have been identified as more reflective of Local Street – Commercial, Institutional / Mixed Used as described in the Downtown Community Plan. TABLE 3 provides a comparison of the typical and existing volumes along these corridors with this proposed designation.

TABLE 3 – COMPARISON OF EXISTING VOLUMES WITH TYPICAL MAXIMUMS

LOCATION	ESTIMATED LOCALLY GENERATED TRIPS* (vpd)	TYPICAL VOLUMES (vpd)	EXISTING VOLUMES (vpd)	TARGET REDUCTION
Queens Avenue between 12 th Street & 10 th Street	1670	3000	3190 to 3680	6 – 23 %
Queens Avenue between 10 th Street & 8 th Street	1380	3000	3400	13 %
Queens Avenue between 8 th Street & 6 th Street	1150	3000	3120	4 %
Fourth Avenue between 12 th Street & 10 th Street	1905	3000	2170 to 2800	N/A
Fourth Avenue between 10 th Street & 8 th Street	1925	3000	3420	14 %
Fourth Avenue between 8 th Street & 6 th Street	1335	3000	3950	32 %

*Volumes reduced by 30% to reflect those trips conducted by bike, foot, or transit



Effectiveness of Typical Traffic Calming Measures for Volume Reduction

The following measures are identified as those that will provide either minor or significant volume reductions according to TAC's Canadian Guide to Neighbourhood Traffic Calming. Theoretical volume reductions are estimated from a variety of sources, including Traffic Calming: State of the Practice.²

TABLE 4 – THEORETICAL VOLUME REDUCTION FOR TRAFFIC CALMING MEASURES

MEASURE	Theoretical Volume Reduction
Chicane – one lane	10-50%
Directional Closure	≤ 40%
Diverter	35-80%
Full Closure	≤ 45%*
Raised Median through Intersection	50%
Right-in / right-out island	40-50%
Speed Hump	5-20%
Traffic Circle	0-15%
Intersection channelization	n/a**
Signage – one way	n/a
Signage – turn restrictions	n/a
Signage – stop signs	n/a
Signage – through traffic prohibited	n/a

* = volume reduction varies on closure type and location

**n/a = not available: although these measures were identified as resulting in minor impact with respect to volume reduction, quantitative estimates on their effectiveness was not found.

IV POTENTIAL MEASURES TO FURTHER REDUCE TRAFFIC ON 4th AVENUE AND QUEENS AVENUE

Speed humps will be installed on 4th Avenue west of 11th Street and west of 7th Street, and on Queens Avenue west of 8th Street as part of the Traffic Calming Plan, ratified by Council in June, 2010. A left-turn restriction from 12th Street to Queens Avenue will also be implemented. The effectiveness of these measures are proposed to be evaluated in the short to medium term as they may provide adequate disincentives for current rat-runners, and result in reduced acceptable volumes along the corridors.

If it is determined that additional traffic calming measures are warranted to mitigate excessive volumes despite these measures, additional solutions have been identified in TABLE 5 below to further reduce rat-running traffic volume along 4th Avenue and Queens Avenue. ATTACHMENT B at the end of this

² Published by the U.S. Department of Transportation (August, 1999)



report graphically displays these additional measures along with those adopted as part of the Traffic Calming Plan.

It should be noted that these additional measures may create severe inconvenience for local residents who may not necessarily support them. A diverter on the west approach at 4th Avenue and 8th Street proposed as part of the Traffic Calming Plan was overwhelmingly rejected by residents. This diverter is still suggested in the table below as a traffic calming solution, however it should be considered only after other recommended measures have been implemented. Further study and consultation with the community would be required to proceed with this measure.

Measurement of neighbourhood support, as well as the plan approval and implementation process should conform to the City's Draft Traffic Calming Guidelines. The guidelines indicate that a mail-out survey should be distributed to gauge support for diverters or road closures.

TABLE 5 – PROPOSED SOLUTIONS

LOCATION	EXISTING vs. (ACCEPTABLE) VOLUMES	REQUIRED REDUCTION	APPROVED SOLUTIONS	ADDITIONAL MEASURES
Queens Avenue between 12 th Street & 10 th Street	3190 - 3680 vpd (3000 vpd)	6 – 23 %	Left-turn restriction (≤1%)	The steep grades and median present on this segment of Queens Avenue restrict most traditional traffic calming measures. Speed humps could be implemented for the eastbound (uphill) direction.
Queens Avenue between 10 th Street & 8 th Street	3400 vpd (3000 vpd)	13 %	Speed humps (≤20%)	Approved speed humps may reduce volumes. Additional measures between 11 th and 10 th Streets would further reduce volumes.
Queens Avenue between 8 th Street & 6 th Street	3120 vpd (3000 vpd)	4 %	n/a	Monitor effectiveness of implemented measures and review need for further traffic calming measures. A traffic circle at Queens Avenue and 7 th Street could also be considered.
4 th Avenue between 12 th Street & 10 th Street	2170 – 2800 vpd (3000 vpd)	N/A	Speed humps (≤20%)	No reduction required. Approved measures including curb extensions at 4 th Avenue and 11 th Street may further reduce volumes, and would have similar calming effects as the addition of a traffic circle. Speed humps between 10 th Street and 11 th Street could also be considered.



<p>4th Avenue between 10th Street & 8th Street</p>	<p>3420 vpd (3000 vpd)</p>	<p>14 %</p>	<p>n/a</p>	<p>Speed humps west of 11th Street will likely contribute to reduced volumes east of 10th Street. Additional speed humps between 8th Street and 9th Street could be considered.</p> <p>A diverter west of 8th Street could significantly reduce non-residential traffic (up to 75%) from 6th Street or 8th Street.*</p>
<p>4th Avenue between 8th Street & 6th Street</p>	<p>3950 vpd (3000 vpd)</p>	<p>32 %</p>	<p>Speed humps (≤20%)</p>	<p>Speed humps west of 7th Street will likely contribute to reduced volumes between 8th Street and 6th Street.</p> <p>A traffic circle at 4th Avenue and 7th Street would have similar calming effects to the already approved curb extensions.</p> <p>A diverter west of 8th Street could significantly reduce non-residential traffic (up to 75%) from this portion of 4th Avenue*</p>

*Proposed in the Draft Traffic Calming Plan, rejected by neighbourhood.

We trust that this letter report meets the objective as set out in the terms of reference for this work. Please do not hesitate to contact the undersigned if you have any questions or concerns.

Yours truly,

OPUS INTERNATIONAL CONSULTANTS

Sarah Rocchi, P.Eng.,PTOE
 Vice-President, Vancouver, Partner

**ATTACHMENT A
TRIP GENERATION AND DISTRIBUTION ANALYSIS**

RESIDENTIAL – TRIP GENERATION

BLOCK SEGMENT	PM PEAK HOUR (vph)					PROJECTED DAILY VOLUMES (vpd)			
	Single Family Units	Multi-Family Units	SFU TRIPS	MFU TRIPS	Total Residential Trips	School Trip Contributions	Projected Daily Volumes without Reduction Factor	Projected Daily Volumes with Applied Reduction Factor (30%)	
4th Avenue	west of 12th St	9	53	13	50	63	-	630	440
	Between 10th & 12th St	4	45	6	47	53	-	1800	1260
		4	202	6	120	127	-	1166	815
	Between 8th & 10th St	0	46	0	47	47	-	1041	730
Queens Avenue	Between 6th & 8th St	1	90	2	68	70	-	1446	1010
	Between 10th & 12th St	0	29	0	39	39	187	1599	585
		0	57	0	52	52	-	833	1120
	Between 8th & 10th St	9	0	13	0	13	-	1599	1120
Between 10th & 12th St	1	0	2	0	2	187	1446	1010	
	0	210	0	124	124	-	1599	1120	
Between 8th & 10th St	3	6	5	28	33	30	833	585	
	5	30	8	39	47	-	1599	1120	
Between 6th & 8th St	4	263	6	149	155	-	1599	1120	
	4	31	6	40	46	-	1599	1120	

RESIDENTIAL – TRIP DISTRIBUTION¹

BLOCK SEGMENT	Projected Daily Trip Generation (vpd)	Trip Assignment Assumptions	Additional trips per block segment (vpd)	Projected Daily Trip Volumes (rounded)
4th Avenue	west of 12th St	Assume 25% of traffic volumes generated west of 12 th Street travel eastbound and are therefore added to the segment between 10 th & 12 th Streets	-	630
	Between 10th & 12th St	Add 75% of traffic generated between 10 th & 12 th Street to the block between 10 th St & 8 th Streets	158vpd from west of 12 th Street; 583vpd from east of 10 th Street	2540
	Between 8th & 10th St	Add 50% of traffic generated between 8 th & 10 th Street to the block between 10 th St & 12 th Streets	1350vpd from west of 10 th Street	2520
	Between 6th & 8th St	Although TMC indicate that 50% of WB traffic generated east of 8 th St may travel west through 8 th St, and 40% EB traffic from west of 8 th St travel through along 4 th Avenue, as 8 th Street is an arterial and the origins of traffic is unknown (i.e unknown if it is neighbourhood or short-cutting traffic), traffic east and west of 8 th Street are not combined	-	1040
	Between 10th & 12th St	Add 60% of traffic generated west of 10 th Street (between 12 th and 10 th Streets) to volumes east of 10 th St (between 10 th Street and 8 th Street)	417vpd from east of 10 th Street and west of 8 th Street	1865
	Between 8th & 10th St	Add 50% of traffic generated east of 10 th Street (between 10 th and 8 th Streets) to volumes west of 10 th street (between 10 th and 12 th Streets)	868vpd from west of 10 th Street	1700
Queens Avenue	1599	Similarly to 4 th Street assumption, assume 8 th Street acts as a dividing arterial, as traffic generated east and west of the intersection can travel north/south along 8 th Street to a collector or arterial east/west connection.	-	1600

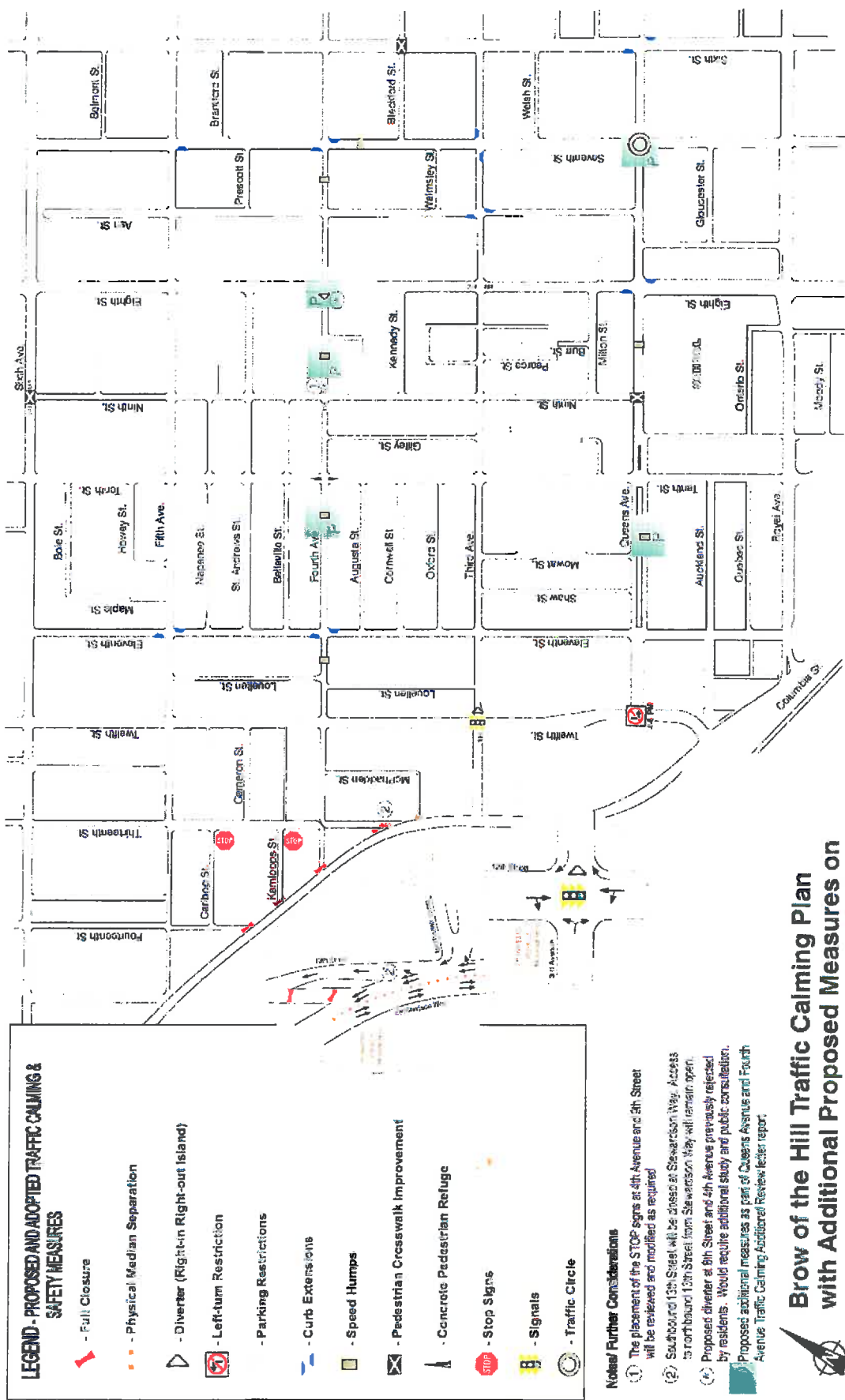
(1) Trip Distribution is based on existing intersection count data. For traffic movement count summaries, refer to Figure 2.6 & 2.7 of the *Brow of the Hill Neighbourhood Traffic Calming Plan Report (2010)*, prepared by Opus International Consultants Ltd.

COMMERCIAL – TRIP GENERATION & DISTRIBUTION

	ITE Land Use Code/ Description	Approx. GFA (1000sq. ft)	PM Peak Total Trips (vph)		Inbound		Outbound		Study Corridor Block Segment Affected	Trip Assignments	Projected Daily Trip Volumes (vpd)
			%	vph	%	vph	%	vph			
4th Avenue											
7-11	851: Convenience Store	3.4	52	182	94	48	87			450	
Auto Repair Shop	943: Auto Parts & Service Centre	2.99	42	13	6	58	8			30	
Animal Hospital	640: Animal Hospital / Vet Clinic	2.2	39	10	4	61	6			30	
Burger Burger	933: Fast food without Drive-through	0.5	51	26	13	49	13		Assume 1/4 of traffic down 4th Ave south of 6th St.	70	
First Choice Hair Cutters	918: Hair Salon	0.4	38	1	0	62	0			-	
CIBC	911: Walk-in Bank	0.7	44	8	4	56	5			20	
Pres. Church	560: Church	6.8	48	4	2	52	2	Between 6th & 8th St	100% of traffic on 4th Ave	40	
Royal Crown Pizza et al.	933: Fast food without Drive-through	2.64	51	138	71	49	68	Between 6th & 8th St and between 8th & 10th St	Assume 2/3 down 8th St and 1/3 down 4th Ave	230	
Barber Shop	918: Hair Salon	1.03	38	2	1	62	1	Between 6th & 8th St and between 8th & 10th St	(then split 50/50 north and south of 8th St)	-	
Corporate Inn / Bar & Grill	925: Drinking Place	6.4	66	73	48	34	25	Between 12th & 10th St	Assume 1/4 up 4th Ave (rest south of 12th St or along 12th St)	180	

	ITE Land Use Code/ Description	Approx. GFA (1000sq.ft)	PM Peak Total Trips (vph)		Inbound		Outbound		Study Corridor Block Segment Affected	Trip Assignments	Projected Daily Trip Volumes (vpd)
			%	vph	%	vph	%	vph			
Queens Avenue	Olivet Baptist Church	7.77	48	2	52	2		40	Between 6th & 8th St	100% along Queens Avenue	40
	Rex Grocery	1.53	49	27	51	28		280	Between 8th & 10th St and between 10th & 12th St	Assume 100% trips along Queens Ave: 50% north & 50% south of 10th St (and extending to 8th St and 12th St)	280
	Prime Auto	21.9	42	41	58	57		240	Between 12th & 10th St	Assume 1/4 north of 12th St, and extending only to 10th St	240

ATTACHMENT B ADOPTED AND PROPOSED ADDITIONAL TRAFFIC CALMING & SAFETY MEASURES



**Brow of the Hill Traffic Calming Plan
with Additional Proposed Measures on
4th Avenue and Queens Avenue**

