

REPORT TO
BC ROAD BUILDERS AND HEAVY CONSTRUCTION ASSOCIATION

FREEWAY VEHICLE POLLUTANT PRODUCTION STUDY

2111 02405-0

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1.0 INTRODUCTION

The BC Road Builders and Heavy Construction Association commissioned McElhanney Consulting Services Ltd. (MCSL) to conduct a vehicle pollutant emissions study to analyze the effects of improving an existing four-lane cross-section to a proposed six-lane cross-section freeway. The study is hypothetical in nature, and data used for this analysis were derived based on existing Lower Mainland freeway traffic counts¹ and emission rates².

1.1 STUDY PURPOSE AND OBJECTIVE

A pollutant study was carried out to evaluate the effects of widening an existing four-lane freeway to a six-lane freeway. For calibration purposes, the study section consisted of a 400m section of Highway 1 westbound and an 800m section of Highway 1 eastbound, located south of the Port Mann Bridge, and including the westbound on-ramp from 152 Street (the results are converted to 1.6 km base, or 1 mile). This study is hypothetical in nature and examines the potential for alleviation of vehicle pollutants by decreasing congestion on freeways. For the purpose of this study, the traffic demand on the existing four-lane and the proposed six-lane hypothetical freeway is expected to accommodate approximately double the existing traffic counts. The doubling of existing traffic counts was selected arbitrarily and would yield a westbound (3-lane) at-capacity condition, which is approximately 2,000 vehicles per lane per hour, for the proposed six-lane hypothetical freeway scenario.

¹ Source: Greater Vancouver Transportation Authority, Transportation Research & Technical Services Department. See attachment in Appendix.

² Source: Gateway Project, Mobile 6.2C 2005 Emission Output (see Appendix).

2.0 STUDY METHODOLOGY

2.1 SIMULATION SOFTWARE

VISSIM 4.0, a traffic simulation program, was used for this study. VISSIM is a microscopic behaviour-based traffic simulation program that allows a variety of characteristics to be modelled.

The study model was simulated in VISSIM 4.0 using the following assumptions:

- The existing freeway has a cross-section of four lanes;
- The proposed freeway has a cross-section of six lanes; and
- For comparison purposes, the traffic demand is kept the same for the existing and proposed scenarios – both existing and proposed scenarios modelled for comparison accommodate approximately double the existing traffic counts.

2.2 BACKGROUND TRAFFIC VOLUMES AND POLLUTANT EMISSIONS INFORMATION

The study is based on the following information:

- Vehicle classification / mix and volumes derived from 2004 TransLink traffic counts performed at the Port Mann Bridge (attached in Appendix); and
- Vehicle emissions pollutant information as a function of vehicle type and speed (determined by the Gateway Project emissions information, attached in Appendix).

2.2.1 Traffic Volumes and Vehicle Mix

Existing traffic count information obtained showed a total of 3,963 vehicles westbound and 5,269 vehicles eastbound during the afternoon 2004 PM peak hour. **Table 2-1** below summarizes the traffic count information.

Table 2-1 Traffic Count Summary, 2004 PM Peak Hour

Classification	Direction	
	Westbound	Eastbound
Single Occupancy Vehicle	3,210	3,724
2 Person Vehicle	468	1,012
3+ Person Vehicle	50	71
Light Truck	98	204
Heavy Truck	131	248
Motorcycle	1	3
Taxi	0	4
Bicycle	0	0
Pedestrian	0	0
Other Bus	5	3
Transit	0	0
TOTAL	3,963	5,269

The VISSIM models were calibrated to simulate weekday PM peak hour conditions near the Port Mann Bridge and utilized the above traffic data as the base. It is assumed that the data gathered from TransLink is representative of a normal day within the year.

As mentioned above, both the existing and proposed freeway models utilized traffic volumes double that of the existing counts. A detailed explanation of the volumes can be found in Section 2.3 below.

In addition, from the above traffic mix information, **Table 2-2** summarizes the vehicle mix percentages found.

Table 2-2 Vehicle Mix Percentages

	Passenger Vehicles	Light Trucks	Heavy Trucks
Westbound	94.5%	2.5%	3.0%
Eastbound	91.0%	4.0%	5.0%

2.2.2 Pollutant Information

The emission types studied included CO (carbon monoxide), VOC (Volatile Organic Compounds), NO_x (nitrogen oxide), SO₂ (sulphur dioxide), CO₂ (carbon dioxide), and six different PM-10 (Particulate Matter-10) compounds. Of the 11 emission types, CO, VOC, and NO_x are speed-dependent.

The emissions information modelled by the Gateway Project was summarized for LGDV (Light Duty Gasoline Vehicle - passenger cars), various LGDT (Light Duty Diesel Truck - light trucks), and HDDV (Heavy Duty Diesel Truck - heavy trucks) vehicle types. Specific vehicular percentages were averaged to produce the LGDT category and the HDDV categories. **Tables 2-3 and 2-4** summarize the specific vehicle types and percentages used for these categories.

Table 2-3 LDGT Types, Numbers and Percentages

Type	Total Registered and Licensed to Operate Volume in the GVRD and the FVRD	Percentage
LDGT 12 *	316,290	73%
LDGT 34 **	114,517	27%
TOTAL	430,807	

* LDGT 12 includes Light Duty Trucks 1 (0 to 6,000 lbs GVWR, 0 to 3,750 lbs LVW) and Light Duty Trucks 2 (0 to 6,000 lbs GVWR, 3751 to 5,750 lbs LVW).

** LDGT 34 includes Light-Duty Trucks 3 (6,001 to 8,500 lbs GVWR, 0 to 5,750 lbs ALVW) and Light-Duty Trucks 4 (6,001 to 8,500 lbs GVWR, greater than 5,751 lbs ALVW).

Source: Table C1.4, 2000 Emission Inventory for the Canadian Portion of the Lower Fraser Valley Airshed: Detailed Listing of Results and Methodology, Greater Vancouver Regional District and Fraser Valley Regional District, November 2003, pg C-3.

Table 2-4 HDDV Class, Numbers and Percentages

Vehicle Class / GVWR (kg)	Volume of Vehicles Operating in Lower Fraser Valley (2003)	%
HDDBT* or HDDVBS**	2,082	6.4
HDDV2b 3,864 to 4,545	7,390	22.7
HDDV3 4,545 to 6,363	6,360	19.6
HDDV4 6,363 to 7,272	945	2.9
HDDV5 7,272 to 8,863	1,447	4.4
HDDV6 8,863 to 11,818	1,300	4.0
HDDV7 11,818 to 15,000	3,263	10.0
HDDV8a 15,000 to 27,272	3,608	11.1
HDDV8b > 27,272	6,126	18.8
TOTAL	35,521	100.0

* Transit or Urban

** School Bus

Source: Table 6.1, Emission Reduction Options for Heavy Duty Diesel Fleet Vehicles in the Lower Fraser Valley: Final Report, prepared for Greater Vancouver Regional District, October 17, 2005, pg. 126.

The emissions produced per speed category are summarized in **Figures 2-1 to 2-3** (for vehicle classification) below.

Figure 2-1 LDGV Emissions

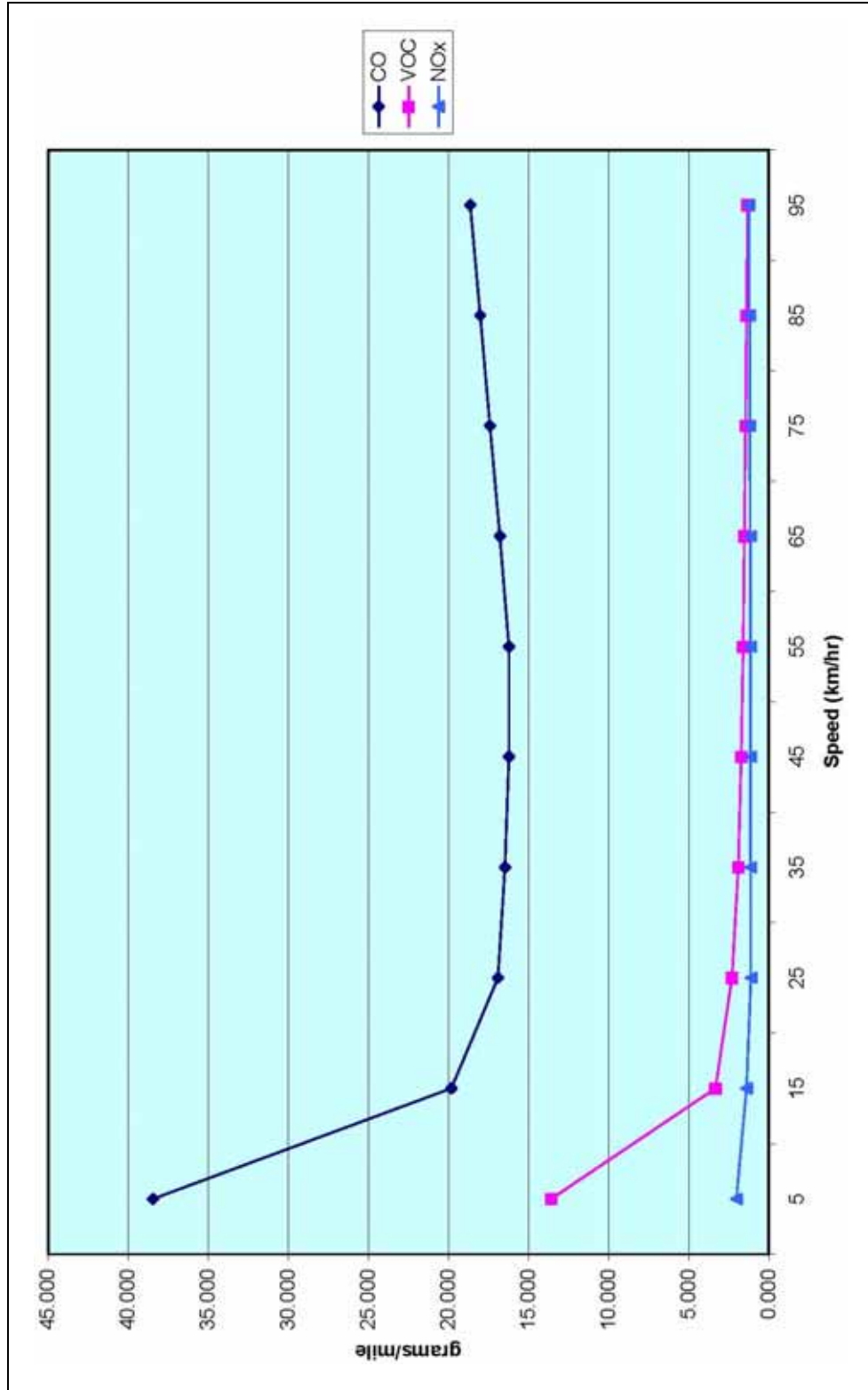


Figure 2-2 LDGT Emissions

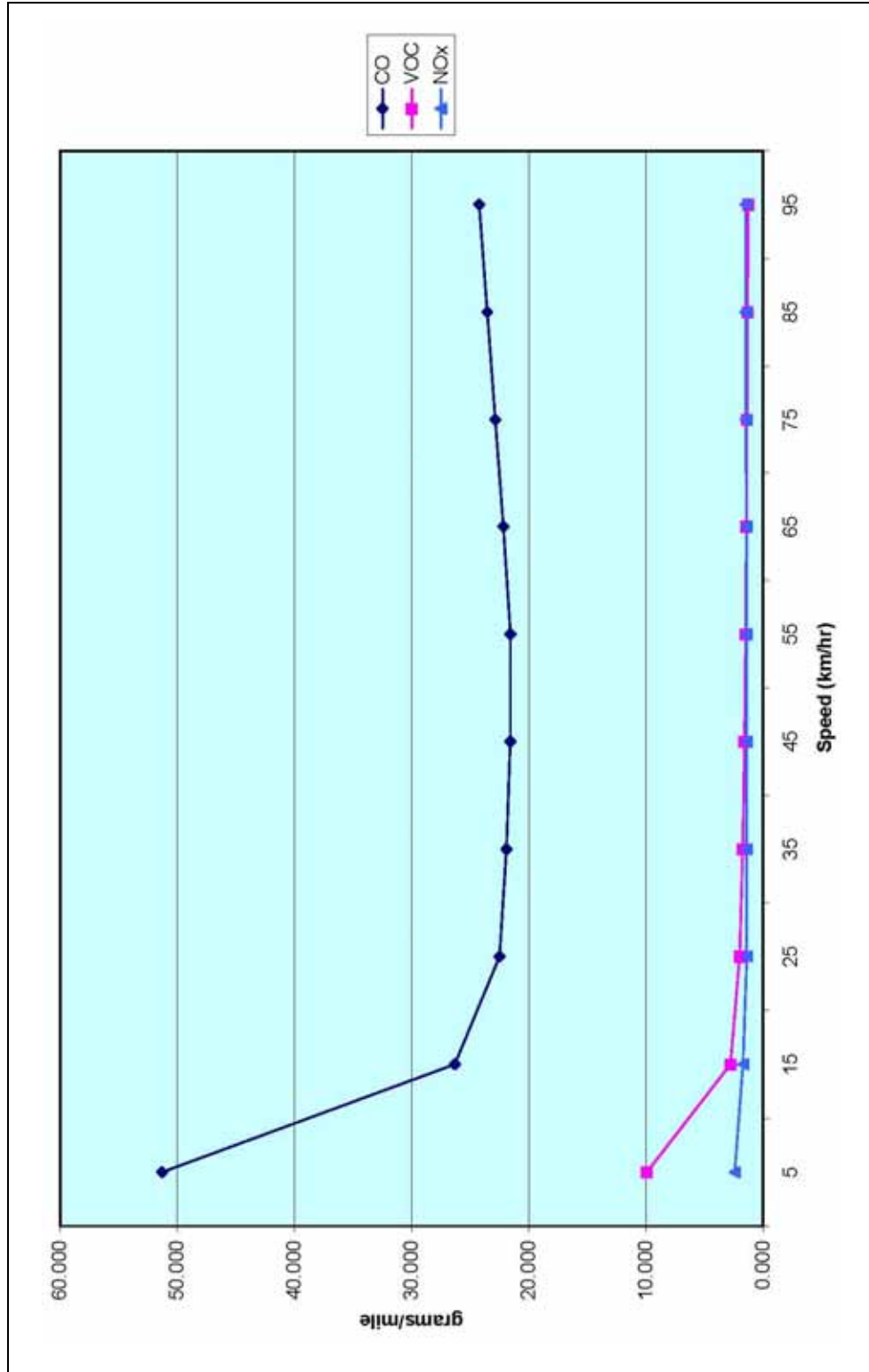
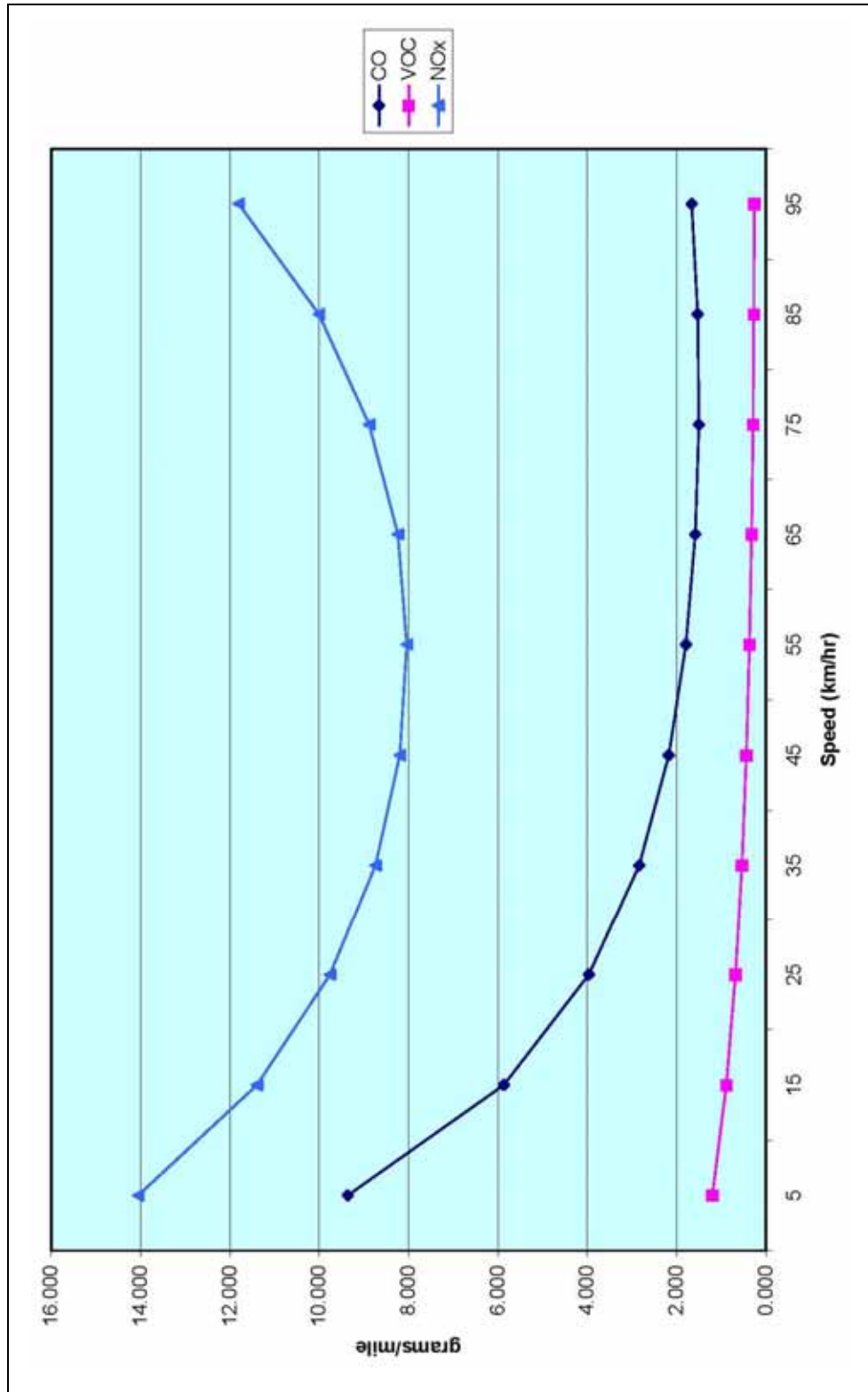


Figure 2-3 HDDV Emissions



Emission rates data for each vehicle type are attached in the Appendix.

The graphs tend to show a similar trend of decreasing emissions at mid-range speeds and increasing emissions at very low or higher than mid-range speeds.

The following table summarizes speed-independent emission rates. These emission rates are found to be constant regardless of speed. Note that PM-10 GASPM is not found in heavy trucks while PM-10 ECarbon and PM-10 OCarbon emissions are only found in heavy duty trucks.

Table 2-5 Speed-Independent Emission Rates (grams/mile)

	LDGV	LDGT	Heavy Duty Diesel Vehicle
SO ₂	0.0068	0.009	0.193
CO ₂	349.200	487.912	1,236.322
PM10 Brake	0.0125	0.013	0.125
PM10 ECarbon	--	--	0.140
PM10 GASPM	0.004	0.010	--
PM10 OCarbon	--	--	0.095
PM10 SO ₄	0.001	0.001	0.013
PM10 Tire	0.001	0.008	0.018

Assumptions:

LDGV = Light Duty Gas Vehicle (i.e. regular cars)

LDGT = average of LDGT1, LDGT2, LDGT3 and LDGT4

HDDV = average of all heavy duty diesel vehicles (HDDV2b, HDDV3, HDDV4, HDDV5, HDDV6, HDDV7, HDDV8a, HDDV8b, HDDBT)

2.3 MODEL CONDITIONS

For the four-lane cross-section freeway scenario, the modelling area for the westbound direction consisted of two basic lanes with a third merging lane approximately 100m in length. The westbound merge section is located south of the Port Mann Bridge. The mainline is modelled to carry 75% (5,950 vehicles) of the total westbound traffic volume and the merge section introduces 25% (1,950 vehicles) of the total westbound volume.

As mentioned above, traffic volumes utilized for the existing and proposed models were double that of the traffic count volumes. As a result, the existing traffic volume of approximately 3,900 vehicles is doubled.

The eastbound direction consists of a two-lane cross-section without any on / off ramps or other obstructions. However, as the actual conditions include an HOV (High Occupancy Vehicle) lane in addition to two general purpose lanes, the actual volumes were adjusted for the model, which has only two freeway lanes and no HOV lane. The resulting model traffic volume for the eastbound direction is 9,500 vehicles. This volume is derived from the assumption that only half of the HOV (2+ occupancy vehicles) traffic volumes would remain if the HOV lane did not exist and is also doubled from the traffic counts.

As noted the traffic counts were arbitrarily doubled to arrive at the model traffic volumes to anticipate possible growth in the region and to test out the emission levels for the westbound direction when it is at or near capacity.

In addition, both directions are posted with an 80 km/h speed limit.

2.4 ANALYSIS PROCEDURE

Two VISSIM scenarios were modelled: the existing condition (four-lane cross-section) and the proposed condition (six-lane cross-section). Since the existing condition is a model for a congested situation, it is anticipated that westbound vehicles will split equally between the two lanes within its cross-section when confronted with the merging area. As a result, a vehicle route change rule was imposed on the area to distribute traffic equally between the two lanes. The westbound three-lane cross-section for the six-lane cross-section proposed freeway scenario is expected to be less congested and, as a result, it is expected that faster moving vehicles would be in the left lanes and slower vehicles would be in the right lanes. Therefore, no traffic distribution rules were imposed for this model.

For each VISSIM scenario, speed profiles of 50 randomly selected vehicles per direction of movement were studied for the provided pollutant emissions rates.

Average vehicle speeds, per type and in total, were taken from an average of all speeds recorded from the VISSIM raw data output.

Speeds of a specific time step (short time intervals) were also taken from the VISSIM raw data output. The corresponding emission rates output is matched to the corresponding speed and vehicle type. The emissions are then added together for the entire length of study for each vehicle and, in turn, adjusted upwards for all vehicles present.

The emissions output and average speeds were then compared.

3.0 ANALYSIS RESULTS

3.1 AVERAGE SPEEDS

Average speeds for the four-lane and six-lane cross-section models are shown in **Figure 3-1**.

The westbound direction is anticipated to have approximately 5,950 vehicles before the merging area and 7,950 vehicles after the merging area. The resulting average speed of the westbound two-lane cross-section is approximately 14 km/h. This is indicative of a stop / start freeway speed.

Although the eastbound direction for the two-lane cross-section model assumes free-flow conditions, the traffic volume (9,450 vehicles) is higher than the capacity for the two- and three-lane cross-sections, which is normally approximately 2,000 vphpl. As a result, the average speed is only 56 km/h, which is less than the posted speed of 80 km/h.

Of special note, due to traffic volumes exceeding the capacity of the roadway, VISSIM was not able to create all vehicles for all movements for the four-lane scenario, and the eastbound direction and merging sections for the six-lane scenario. Emissions information is calculated assuming all traffic volumes are created and, therefore, might span longer than the anticipated one hour.

In addition, when traffic volumes exceed capacity, traffic generally automatically re-routes to other less congested roadways. However, for the purpose of this hypothetical analysis, it is assumed that traffic will not be re-routed.

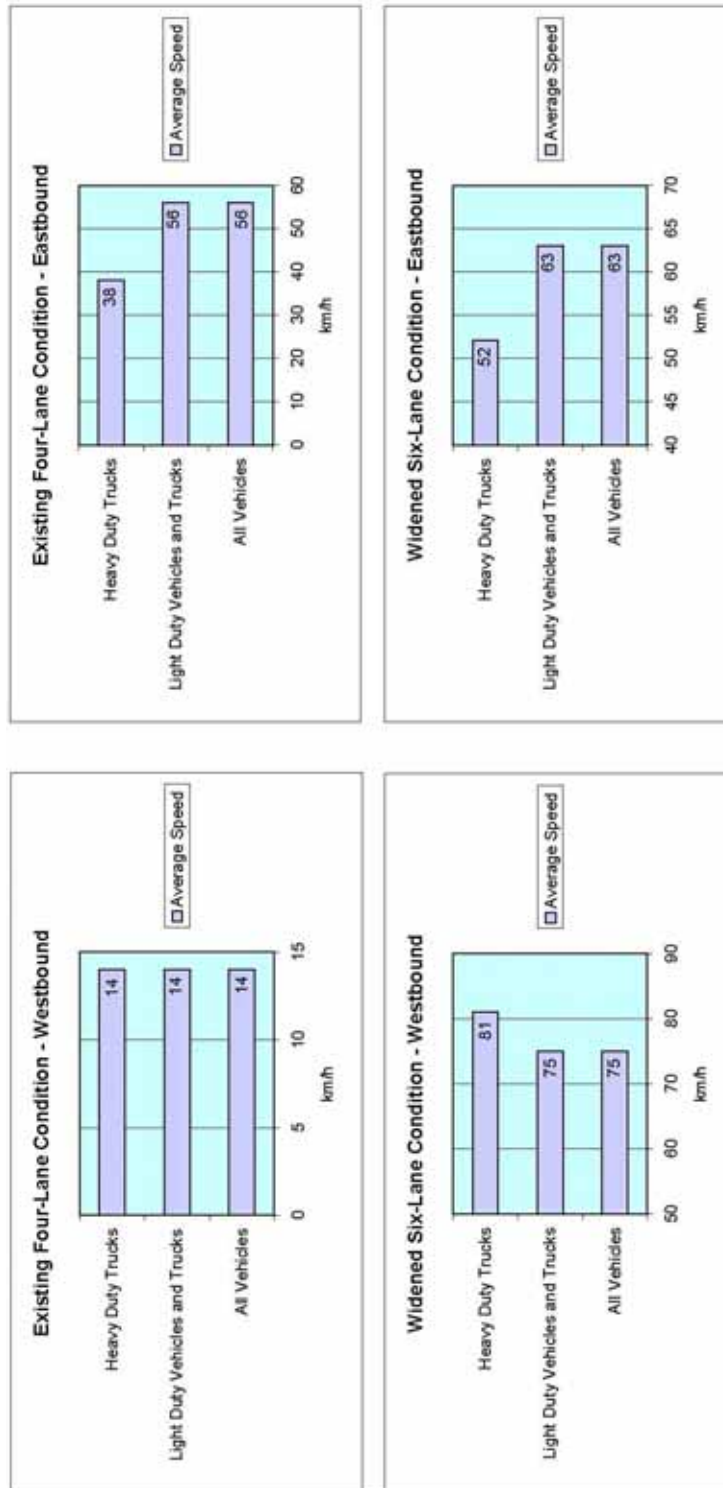
The average speed of the six-lane cross-section models was found to be between 75 and 63 km/h. This is consistent with a posted speed of 80 km/h along a freeway with the proposed conditions.

Table 3-1 VISSIM Average Speeds

Cross-Section	Westbound	Eastbound
Four-lane	14 km/h	56 km/h
Six-lane	75 km/h	63 km/h

Figure 3-1 graphically illustrates average speeds for light trucks, heavy trucks and all vehicles.

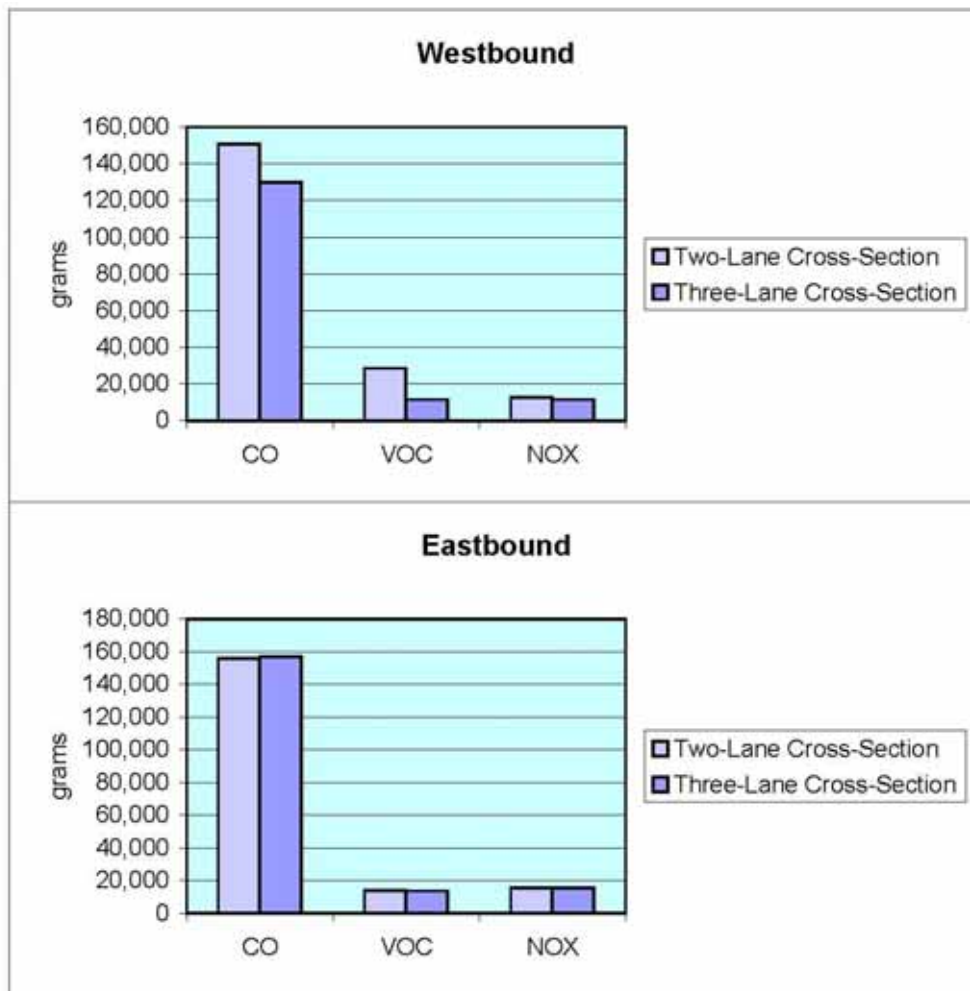
Figure 3-1 Average Speeds: Existing and Widened Conditions



3.2 **EMISSIONS OUTPUT**

Emissions output was calculated using speeds from the different vehicle types and correlating the speeds to emissions rates. **Figure 3-2** summarizes the emission output of CO, VOC and NO_x for the total traffic volume mix per direction and per mile of movement.

Figure 3-2 Total Emission Output of CO, VOC and NOX for All Vehicles by Direction of Movement



The average speed for the existing two-lane westbound and eastbound cross-section is approximately 14 km/h and 56 km/h, respectively, while the average speed for the three-lane westbound and eastbound cross-section is approximately 75 km/h and

63 km/h, respectively. Although speeds for the eastbound direction increased as a result of increasing capacity (via adding another lane), both scenarios imposed higher-than-capacity traffic volumes on the roadway. As a result, the change in speed was not high enough to constitute a large change in emissions. The change in westbound emissions was much greater than the eastbound direction and resulted in emissions reductions ranging from -9% to -60%.

Table 3-2 below summarizes the change in CO, VOC, and NO_x when the cross-section is widened to six lanes

Table 3-2 Percent Change in CO, VOC, and NO_x from Four-lane to Six-lane Cross-Section Freeway

	CO	VOC	NO _x
Two-Lane to Three-Lane Westbound	-14%	-60%	9%
Two-Lane to Three-Lane Eastbound	1%	-3%	1%

Since SO₂, CO₂, and PM-10 compounds are independent of speed, the output of emissions per km is the same for the 4- and six-lane cross-section models. The following table summarizes the speed-independent emissions output.

Table 3-3 Speed Independent Emissions Output (All Vehicles Simulated)

Emission (g/mile)	Westbound		Eastbound	
	2 Lane	3 Lane	2 Lane	3 Lane
SO ₂	74	74	153	153
CO ₂	2,257,000	2,256,725	3,771,538	3,772,000
PM10 Brake	95	95	171	171
PM10 ECarbon	833	833	1,323	1,323
PM10 GASPM	25	25	40	40
PM10 OCarbon	565	565	898	898
PM10 SO ₄	8	8	15	15
PM10 Tire	10	10	20	20

4.0 CONCLUSION

Emissions output of 11 different compounds were analyzed by increasing capacity (increasing cross-section) while maintaining traffic demand at approximately double the traffic volumes counted for both hypothetical freeway scenarios.

CO (carbon monoxide), VOC (volatile organic compounds), and NO_x (nitrogen oxide) are found to be speed dependent, while CO₂ (carbon dioxide), SO₂ (sulphur dioxide), PM10 Brake, PM10 ECarbon, PM10 GASPM, PM10 SO₄ and PM10 Tire are found to be speed-independent.

Upon increasing the directional cross-section of a freeway from two lanes to three lanes, the following results were found:

- The CO, VOC, and NO_x, which are speed-dependent, generally decrease in emissions output when a roadway cross-section is widened. However, there are mid-range speeds between stop / start and free-flow conditions that yield lower vehicle emissions than the free-flow conditions. For an analysis under the current assumptions, the westbound traffic volumes exhibited a decrease in emissions when the cross-section was widened. Since the eastbound traffic volumes operated at above-capacity conditions for both the existing and proposed freeway cross-sections, the 7 km/h speed improvement yielded nearly unchanged emissions output when the cross-section was widened.
- The speed-independent compounds remain at constant levels regardless of speed.

APPENDIX

2005 EMISSION RATES (grams/mile) BY SPEED (km/hr)

Speed Bin:	1	2	3	4	5	6	7	8	9	10
Speed Ending	5	15	25	35	45	55	65	75	85	95
LDGV										
CO	38.452	19.814	16.906	16.467	16.220	16.230	16.781	17.402	18.017	18.627
VOC	13.584	3.327	2.289	1.897	1.720	1.594	1.509	1.440	1.376	1.322
NOx	2.009	1.381	1.100	1.120	1.131	1.134	1.151	1.177	1.203	1.230
SO2	0.0068	0.0068	0.0068	0.0068	0.0068	0.0068	0.0068	0.0068	0.0068	0.0068
CO2	349.200	349.200	349.200	349.200	349.200	349.200	349.200	349.200	349.200	349.200
PM10 Brake	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125
PM10 GASPM	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
PM10-Lead	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PM10-SO4	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.000	0.000
PM10-Tire	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
LDGT										
CO	51.284	26.296	22.479	21.895	21.567	21.541	22.153	22.848	23.535	24.217
VOC	9.899	2.763	1.980	1.709	1.571	1.467	1.407	1.357	1.306	1.260
NOx	2.409	1.701	1.374	1.393	1.404	1.407	1.424	1.450	1.477	1.506
SO2	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009
CO2	487.912	487.912	487.912	487.912	487.912	487.912	487.912	487.912	487.912	487.912
PM10 Brake	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013
PM10 GASPM	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
PM10-Lead	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PM10-SO4	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
PM10-Tire	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
HEAVY DUTY DIESEL VEHICLE										
CO	9.361	5.865	3.964	2.838	2.172	1.788	1.578	1.499	1.525	1.658
VOC	1.196	0.884	0.679	0.534	0.434	0.366	0.319	0.288	0.269	0.259
NOx	14.049	11.393	9.760	8.739	8.196	8.037	8.239	8.877	10.003	11.800
SO2	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
CO2	1236.322	1236.322	1236.322	1236.322	1236.322	1236.322	1236.322	1236.322	1236.322	1236.322
PM10 Brake	0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.125
PM10-Ecarbon	0.140	0.140	0.140	0.140	0.140	0.140	0.140	0.140	0.140	0.140
PM10 GASPM	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PM10-Ocarbon	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095
PM10-SO4	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013
PM10-Tire	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018

Assumptions:

LDGV = Light Duty Gas Vehicle (i.e. regular cars)

LDGT = average of LDGT1, LDGT2, LDGT3, and LDGT4.

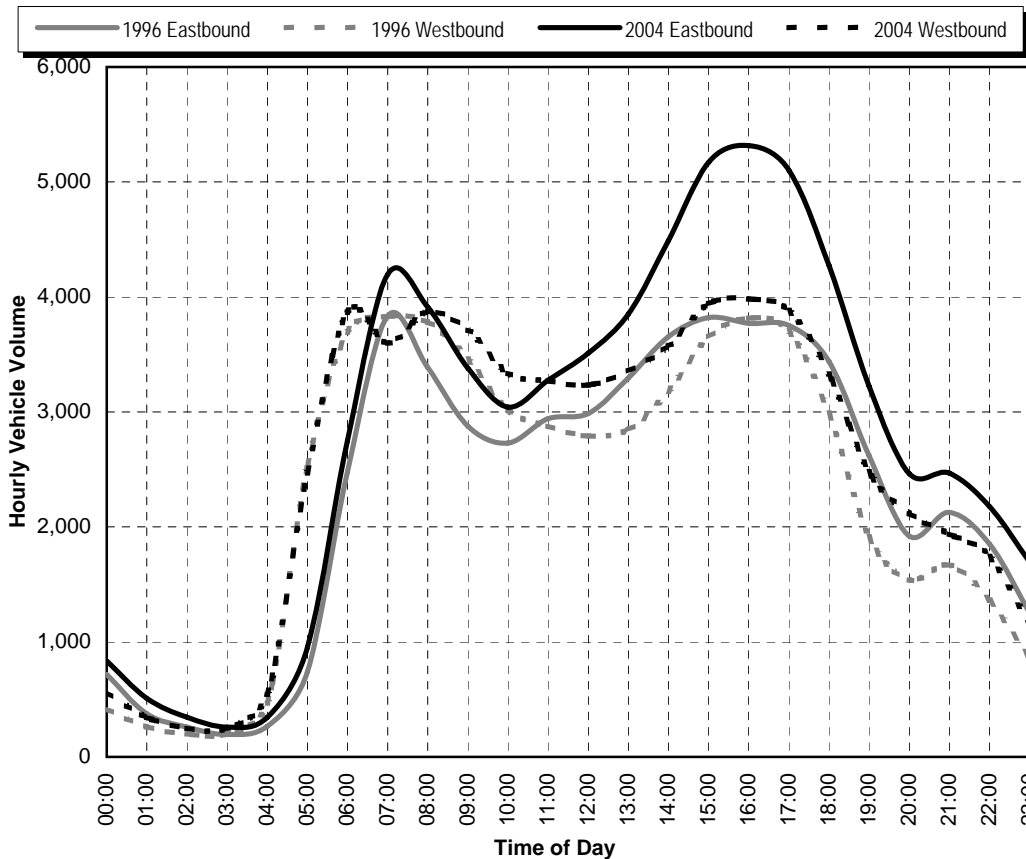
HDDV = average of all heavy duty diesel vehicles (HDDV2b, HDDV3, HDDV4, HDDV5, HDDV6, HDDV7, HDDV8a, HDDV8b, HDDBT)



Historical Comparison

Planning Division

Route 1 at Port Mann Bridge



Time	1996			2004			% chg 96 to 04
	Eastbound	Westbound	Two-way	Eastbound	Westbound	Two-way	
00:00	717	417	1,134	836	563	1,399	23%
01:00	376	261	637	510	346	856	34%
02:00	260	199	459	346	249	595	30%
03:00	196	201	397	258	249	507	28%
04:00	266	468	734	345	545	890	21%
05:00	741	2,533	3,274	951	2,469	3,420	4%
06:00	2,478	3,696	6,174	2,747	3,868	6,615	7%
07:00	3,836	3,828	7,664	4,198	3,599	7,797	2%
08:00	3,388	3,783	7,171	3,914	3,870	7,784	9%
09:00	2,874	3,459	6,333	3,378	3,713	7,091	12%
10:00	2,730	3,014	5,744	3,043	3,338	6,381	11%
11:00	2,942	2,878	5,820	3,275	3,270	6,545	12%
12:00	2,985	2,791	5,776	3,512	3,235	6,747	17%
13:00	3,294	2,848	6,142	3,851	3,357	7,208	17%
14:00	3,654	3,181	6,835	4,488	3,574	8,062	18%
15:00	3,820	3,655	7,475	5,170	3,941	9,111	22%
16:00	3,770	3,816	7,586	5,315	3,983	9,298	23%
17:00	3,752	3,704	7,456	5,102	3,883	8,985	21%
18:00	3,441	2,991	6,432	4,275	3,331	7,606	18%
19:00	2,621	1,915	4,536	3,226	2,480	5,706	26%
20:00	1,919	1,539	3,458	2,462	2,118	4,580	32%
21:00	2,125	1,669	3,794	2,468	1,939	4,407	16%
22:00	1,851	1,364	3,215	2,176	1,741	3,917	22%
23:00	1,253	858	2,111	1,696	1,155	2,851	35%
Total	55,289	55,068	110,357	67,542	60,816	128,358	16%

	1996			2004			% change 96 to 04
	Eastbound	Westbound	Two-way	Eastbound	Westbound	Two-way	
AM Peak Hour (07:30-08:30)	3,735	3,855	7,590	4,299	3,651	7,950	5%
AM Peak Period (06:00-09:00)	9,702	11,307	21,009	10,859	11,337	22,196	6%
PM Peak Hour (16:30-17:30)	3,790	3,814	7,604	5,253	3,958	9,211	21%
PM Peak Period (15:00-18:00)	11,342	11,175	22,517	15,587	11,807	27,394	22%
Off Peak Total	34,245	32,586	66,831	41,096	37,672	78,768	18%

2004 Greater Vancouver Screenline Survey
Vehicle Volumes, Classifications and Occupancies

Count Station: **10.3**
Transportation Research & Technical Services

Port Mann Bridge

Time Begin	Total Vehicle	Single Occ. Vehicle	2 Person Vehicle	3+ Person Vehicle	Light Truck	Heavy Truck	Moto cycle	Taxi	Bicycle	Pedes trian	Other Bus	Transit Bus	Transit Passenger	Transit Person Trip	Auto Occupancy	Transit Mode Split
2004 Northbound																
06:00	3752	3132 (83.5%)	329 (8.8%)	31 (0.8%)	102	146	3	5	0	0	4	0	0	4151	1.11	0.0%
07:00	4008	3358 (83.8%)	325 (8.1%)	34 (0.8%)	130	152	4	2	0	0	3	0	0	4406	1.11	0.0%
08:00	3902	3072 (78.7%)	465 (11.9%)	41 (1.1%)	152	168	3	0	0	0	1	0	0	4456	1.16	0.0%
09:00	3689	2725 (73.9%)	528 (14.3%)	48 (1.3%)	174	199	3	5	0	0	5	2	24	4384	1.19	0.5%
10:00	3449	2421 (70.2%)	607 (17.6%)	42 (1.2%)	162	203	3	7	0	0	2	2	18	4170	1.23	0.4%
11:00	3309	2280 (68.9%)	600 (18.1%)	36 (1.1%)	178	209	0	0	0	0	6	0	0	4022	1.23	0.0%
12:00	3309	2327 (70.3%)	551 (16.7%)	32 (1.0%)	166	225	1	6	0	0	1	0	0	3953	1.21	0.0%
13:00	3194	2245 (70.3%)	539 (16.9%)	29 (0.9%)	156	215	0	7	0	0	2	1	16	3837	1.21	0.4%
14:00	3487	2517 (72.2%)	554 (15.9%)	43 (1.2%)	158	203	0	5	0	0	3	4	22	4181	1.21	0.5%
15:00	3895	2867 (73.6%)	651 (16.7%)	67 (1.7%)	138	165	1	2	0	0	4	0	0	4692	1.22	0.0%
16:00	3963	3210 (81.0%)	468 (11.8%)	50 (1.3%)	98	131	1	0	0	0	5	0	0	4542	1.16	0.0%
17:00	3621	2972 (82.1%)	414 (11.4%)	37 (1.0%)	77	113	2	5	1	0	1	0	0	4115	1.15	0.0%
18:00	3501	2683 (76.6%)	593 (16.9%)	55 (1.6%)	57	98	2	7	0	0	6	0	0	4268	1.22	0.0%
19:00	2417	1805 (74.7%)	434 (18.0%)	45 (1.9%)	39	72	0	16	0	0	5	1	8	3047	1.23	0.3%
20:00	1777	1295 (72.9%)	349 (19.6%)	32 (1.8%)	26	54	0	16	0	0	4	1	8	2244	1.25	0.4%
21:00	1818	1328 (73.0%)	362 (19.9%)	35 (1.9%)	23	51	0	15	0	0	3	1	8	2302	1.26	0.3%
Average	3318	2515 (75.8%)	486 (14.6%)	41 (1.2%)	115	150	1	6	0	0	3	1	7	3923	1.19	0.2%
2004 Southbound																
06:00	2893	2333 (80.6%)	302 (10.4%)	14 (0.5%)	72	167	1	1	0	0	3	0	0	3233	1.13	0.0%
07:00	4325	3433 (79.4%)	514 (11.9%)	34 (0.8%)	149	177	4	6	0	0	8	0	0	4966	1.15	0.0%
08:00	3929	3027 (77.0%)	462 (11.8%)	47 (1.2%)	173	213	1	4	0	0	2	0	0	4538	1.16	0.0%
09:00	3291	2376 (72.2%)	465 (14.1%)	47 (1.4%)	173	214	2	7	0	0	6	1	16	3982	1.20	0.4%
10:00	3068	2102 (68.5%)	535 (17.4%)	42 (1.4%)	160	214	2	8	0	0	3	2	31	3774	1.23	0.8%
11:00	3262	2264 (69.4%)	474 (14.5%)	24 (0.7%)	171	317	1	10	0	0	1	0	0	3794	1.19	0.0%
12:00	3551	2467 (69.5%)	573 (16.1%)	18 (0.5%)	207	284	0	1	0	0	1	0	0	4196	1.20	0.0%
13:00	3858	2680 (69.5%)	630 (16.3%)	18 (0.5%)	220	305	0	2	0	0	1	2	27	4586	1.20	0.6%
14:00	4645	3312 (71.3%)	715 (15.4%)	36 (0.8%)	248	325	0	0	0	0	3	6	26	5495	1.20	0.5%
15:00	5124	3561 (69.5%)	1010 (19.7%)	61 (1.2%)	196	280	4	7	0	0	5	0	0	6377	1.25	0.0%
16:00	5269	3724 (70.7%)	1012 (19.2%)	71 (1.3%)	204	248	3	4	0	0	3	0	0	6463	1.24	0.0%
17:00	5066	3639 (71.8%)	1034 (20.4%)	67 (1.3%)	146	163	3	9	0	0	5	0	0	6281	1.25	0.0%
18:00	3981	3148 (79.1%)	579 (14.5%)	36 (0.9%)	84	121	3	4	0	0	6	0	0	4777	1.18	0.0%
19:00	2933	2261 (77.1%)	457 (15.6%)	35 (1.2%)	61	95	1	17	0	0	5	1	53	3640	1.19	1.5%
20:00	2260	1702 (75.3%)	389 (17.2%)	27 (1.2%)	43	75	1	18	0	0	4	1	8	2832	1.21	0.3%
21:00	2324	1755 (75.5%)	406 (17.5%)	30 (1.3%)	41	71	0	17	0	0	3	1	8	2917	1.22	0.3%
Average	3736	2737 (73.2%)	597 (16.0%)	38 (1.0%)	147	204	2	7	0	0	4	1	11	4491	1.20	0.2%

Note: 3+ Person Vehicle occupancy factor is set at ->
 DRAFT: This information is still under review

3.25 Transit information is based on manual count estimates

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