



*School Transportation and Safety Study*

# **Canyon Heights Elementary School**

**District of North Vancouver and North  
Vancouver School District 44**





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Vancouver School District 44**

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# Executive Summary

The District of North Vancouver (DNV) and North Vancouver School District 44 (NVSD44) led a school transportation and safety study (study) for Canyon Heights Elementary School, 4501 Highland Boulevard. This report discusses existing conditions, issues, and mitigation for Canyon Heights Elementary. A summary of recommendations is included in the table below.

<b>Term</b>	<b>Recommendation</b>	<b>Responsibility</b>
On-going	<ul style="list-style-type: none"> <li>• More and more extensive walking and cycling incentive programs and resources</li> </ul>	NVSD44, PAC, DNV, Canyon Heights ES
	<ul style="list-style-type: none"> <li>• Active parking management at school front</li> </ul>	NVSD44, School Administration, PAC
	<ul style="list-style-type: none"> <li>• Positive reinforcement of legal use of school drop off/pick up sites</li> </ul>	PAC, RCMP
	<ul style="list-style-type: none"> <li>• Work with residents to maintain clear sight distance by addressing overgrown vegetation</li> </ul>	DNV
Short Term	<ul style="list-style-type: none"> <li>• Expansion of School Zone designation and signage</li> </ul>	DNV, RCMP
	<ul style="list-style-type: none"> <li>• New crosswalks and signage at for the pedestrian pathway crossing Lions Ave</li> </ul>	DNV
	<ul style="list-style-type: none"> <li>• Ranger Avenue / Handsworth Road – Reduce turning vehicle speeds, improve pedestrian amenity, visibility, and safety with build out's at one or more locations.</li> </ul>	DNV
	<ul style="list-style-type: none"> <li>• Tudor Lane / Highland Boulevard – Pavement markings and a curb extension at the NW corner to improve visibility and reduce crossing distances</li> </ul>	DNV
Long Term	<ul style="list-style-type: none"> <li>• New crosswalks and signage potentially on: Highland Boulevard at Montroyal Boulevard; West leg of Highland Boulevard and Belvista Crescent; West leg of Highland Boulevard and Belgrave Avenue; Mapleridge Drive at Montroyal Boulevard; Marineview Crescent at Montroyal Boulevard; Ranger Avenue at Montroyal Boulevard; and Cedarcrest Avenue at Montroyal Boulevard.</li> </ul>	DNV
	<ul style="list-style-type: none"> <li>• Tudor Lane / Highland Boulevard –Curb extension at the NE corner to reduce crossing distances</li> </ul>	DNV
	<ul style="list-style-type: none"> <li>• New sidewalk on Ranger Avenue from Handsworth Road to Sylvan Avenue</li> </ul>	DNV
	<ul style="list-style-type: none"> <li>• Highlands Boulevard corridor study</li> </ul>	DNV

This report is the result of extensive comments and feedback from the DNV and comments from the school's PAC. Recommendations have been identified, refined, and prioritized which are cost-effective and reflect each school's safety priorities – as supported by both the data and stakeholders.

# 1 Introduction

## 1.1 About the Study

The School Transportation and Safety study for Canyon Heights Elementary School (Canyon Heights) was commissioned as a partnership between the District of North Vancouver (DNV) and the North Vancouver School District 44 (NVSD44) to improve transportation safety around schools. Schools studies in the past include Lynn Valley, Seymour Heights, Upper Lynn in 2010, and in 2011 at Braemer, Cleveland, and Ross Road elementary schools.

This study focuses on feasible and cost-effective mitigation that DNV, NVSD44 and the school is capable of implementing in the short and medium/long term. It is not simply a wish list, but rather an attainable plan to improve safety of the school-area environment.

## 1.2 Background

The objectives and focus of this school report closely align with DNV's transportation policies and Official Community Plan (OCP). All of these background policies strongly support increasing the proportion of trips made by walking, cycling, and transit. Increasing safety and the share of school trips made by foot and bicycle is therefore the basis of all the proposed recommendations.

These reports align with and support higher-level policy and site-specific report documentation:

- [District of North Vancouver Official Community Plan \(OCP, 2011\)](#)
- [District of North Vancouver Transportation Plan \(2012\)](#) – outlines background conditions for growth and associated transportation infrastructure to support.
- [North Vancouver Bicycle Master Plan \(2012\)](#) – identifies several routes fronting schools as future on-street bicycle facilities
- [District of North Vancouver Pedestrian Master Plan \(2009, Opus\)](#) – identifies walking and sidewalk priority scores for locations relevant to school report areas
- [Parks and Open Space Strategic Plan \(2012\)](#)
- [Safe Routes Advocates report](#) (from 2013 delegation to Council – from parents group)
- [Edgemont Village Traffic and Parking Technical Report \(2014, Urban Systems\)](#)
- [Capilano Main No. 9 – Phase 2 Traffic Management Study \(2015, MMM Group\)](#)
- [North Vancouver school travel survey \(2013, NVSD44, DNV and City of North Vancouver\)](#)

## 1.3 Methodology

This process proceeded as follows:

1. School stakeholders meeting and school investigations – June 2015
2. Submission of Draft 1 report to DNV – July 2015
3. DNV review of Draft 1 and confirmation of changes for Draft 2 – July-September 2015

4. Submission of Draft 2 to DNV– September 2015
5. School stakeholder meeting to review recommendations– December 2015
6. Draft 2 report review by school stakeholders – December 2015-January 2016
7. Submission of Final Report – 2016

The investigations at Canyon Heights included:

- Close liaison with DNV, NVSD44, and school representatives (administration and parents);
- Walkabouts around each school with school and DNV stakeholders to discuss and identify specific safety issues and areas of concern;
- Follow up site visits at each school to perform traffic counts at key intersections and discuss specific areas of concern with stakeholders;
- Observation of student drop-off and parking survey at drop-off and pick-up times;
- Analysis of ICBC crash data and school catchment data to identify crash trends; and
- Record of transportation issues.

## 2 Existing Situation and Problem Description

There are sidewalks in front of the school and some in the area. Furthermore, encroaching vegetation may obscure visibility of intersections and signage in addition to reducing the effective width of sidewalks.

### 2.1 About Canyon Heights Elementary School

#### 2.1.1 Population and Location

Canyon Heights is located on Highland Boulevard south of Montroyal Boulevard and has a large catchment area, shown in Figure 1 below. Canyon Heights is located in a suburban residential community. Approximately 400 students, from Kindergarten to Grade 7, attend the school. It offers no speciality programs (i.e. French immersion or International Baccalaureate programs). The Canyon Heights Montessori Preschool is located behind the main school building, with access on the north side driveway/parking lot.

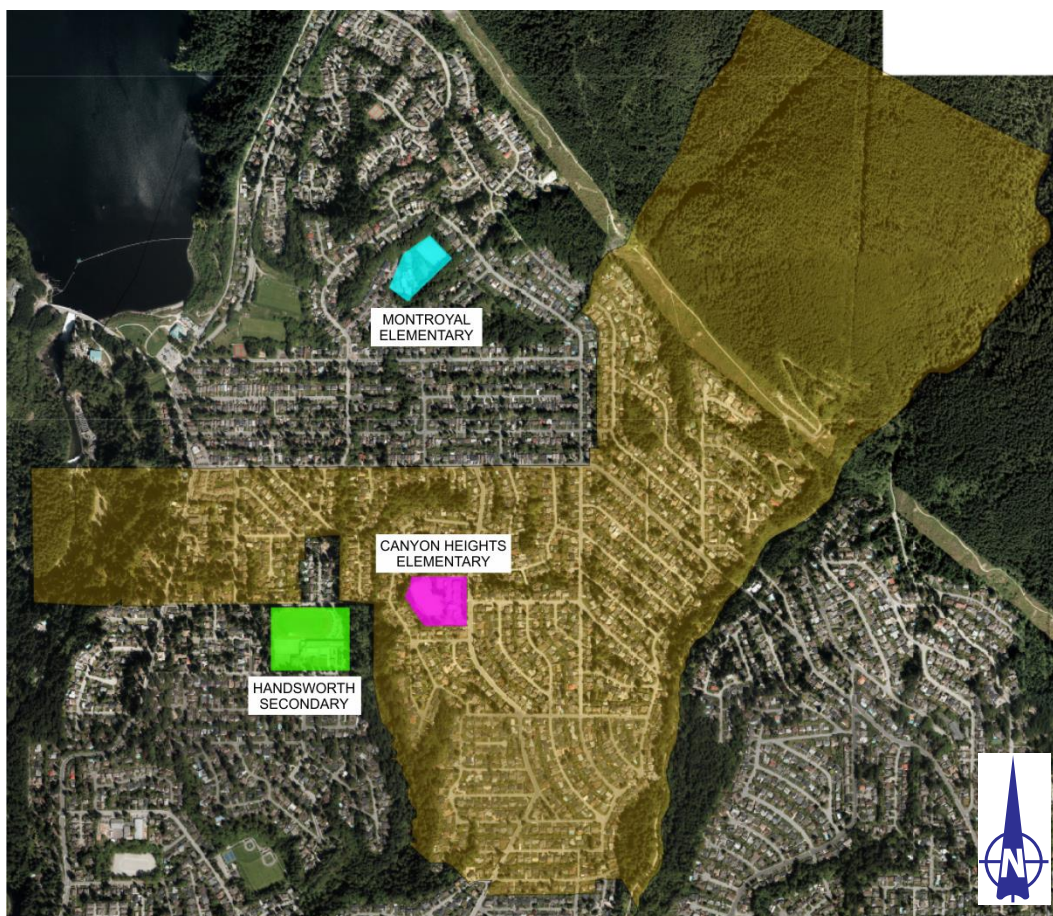


Figure 1: Canyon Heights Elementary School Location and Catchment Area

### 2.1.2 Transportation Network

Canyon Heights fronts Highland Boulevard, a minor arterial. Nearby is Montroyal Boulevard, which is also classified as a minor collector. Handsworth Road leads to the school and is classified as a collector. Other collectors in the vicinity are Ranger Avenue and Tudor Avenue. The remaining roads neighbouring the school are classified as local roads. The local transportation network has some sidewalks, primarily along Handsworth Road, Highlands Boulevard.

A local map showing main access points, road hierarchy, and existing pedestrian infrastructure is shown below in Figure 2.



Figure 2: Canyon Heights Elementary School Road Network



### **2.1.2.1 Access Points**

There are three main access points to the school: a main access at the front of the school on Highland Boulevard, a secondary access point at the back of the school that leads to and crosses Lions Avenue, and a third entrance located on the north side of the school. Access points to main entrances are shown in Figure 2. Volunteer crossing guards assist students crossing Highland Boulevard from Handsworth Road during AM arrival and PM dismissal times. Vehicle access is located for staff on the south side of the school and on the north side for day care centre staff and other service vehicles.

### **2.1.2.2 Road Hierarchy**

Canyon Heights is located on Highland Boulevard, a minor arterial road. Other roads in the immediate vicinity are outlined in Figure 2 and are colour coded by their road classification.

### **2.1.3 Modes of Travel**

A survey provided to parents was conducted by the DNV and NVSD44 in 2013. Of 64 responses from Highlands' parents, 26% of students' travel behaviours were represented. The survey found that 30% of survey respondents drive their children to school, 54% walk and 16% cycle.

As part of a May 2015 walking and biking initiative led by the school, a 'hands up' survey was conducted in school classrooms that indicated that 50% of the students are driven by their parents to/from school on a typical day. However, this survey did not report how often students were driven (i.e., every day or 1-2 days/week) or if there were seasonal variations in parents' driving behaviour. It did also not note patterns of behaviour taken before the initiative or after.

#### **2.1.3.1 Transit**

There are two TransLink bus stops located on either side of Highland Boulevard in front of the school. The bus stops service route 246 Highland heading northbound on Highland Boulevard and 246 Vancouver heading southbound on Highland Boulevard.

Four bus routes travel within Canyon Heights' catchment as follows:

- » Route 246 – travels up/down Highland Boulevard and comes from/goes to Montroyal Boulevard, east of Highland Boulevard (route passes in front of school);
- » Route 247 – travels up/down Capilano Road, briefly in catchment along Montroyal Boulevard, west of Highland Boulevard; and
- » Route 232 and 236 – travels up/down Capilano Road.

#### **2.1.3.2 Cycle Facilities and Routes**

There are uncovered bicycle racks (space for six bicycles) located just to the south of the main entrance adjacent to the staff parking lot. During the June site visits, these racks were generally full and spillover parking was observed against the chain link fence separating the staff parking lot from the adjacent sidewalk.

According to the DNV's Cycle Master Plan, both Montroyal Boulevard and Highland Boulevard are considered for on-street cycle lanes in the future.

### 2.1.3.3 Pedestrian Facilities and Routes

There are sidewalks on the west side of Highland Boulevard, north and south of the school and sidewalks on the east side of Highland Boulevard south of the school. Crosswalks are provided crossing Handsworth Road on the east side of Highland Boulevard and crossing Highland Boulevard north of Handsworth Road. Figure 2 illustrates the immediate surrounding road network and pedestrian facilities - crosswalks and sidewalks.

Sidewalks in front of the school are 1.5m wide, but their effective width is reduced to 1.3m due to a barrier fence between the sidewalk and grass berm in front of the school. This is reduced further to 1.0m where several power poles are installed in the sidewalk itself.

Sidewalks are found on arterials and collectors, with limited sidewalks provided on local streets. The approximate area shown in Figure 2 contains 5,400m of total roadway – or 10,800m of sidewalk demand area. With 2,400m of actual sidewalk, this provides roughly 22% of local area coverage.

The DNV's Pedestrian Master Plan prioritized sidewalks for Montroyal Boulevard, Highland Boulevard, and portions of Handsworth Street. Ranger Avenue, which had the lowest priority score, does not yet have sidewalks.

Two marked crosswalks are provided within the shown area adjacent to the school. The crossing point on Lions Avenue, to the west of the school, is not marked, but has crossing signs.

### 2.1.4 School Transportation Facilities and Layout

#### 2.1.4.1 Drop-off / Pick-Up

Canyon Heights has a dedicated drop-off and pick-up zone on the west side of Highland Boulevard, north of Handsworth Road. It is approximately 50m in length along the school frontage from the crosswalk north of Handsworth Road to the entrance of the staff parking area.

#### 2.1.4.2 Signage

The following parking restrictions exist along the front of the school entrance:

- » West side of Highland Boulevard, north of Handsworth crossing 30m to drop off zone – No Stopping Anytime / Bus Stop;
- » West side of Highland Boulevard, north of Handsworth at drop off zone – No Parking 8AM-4PM school days;
- » West side of Highland, south of Handsworth – No Stopping Anytime / Bus Stop;
- » East side of Highland, south of Handsworth – No Stopping Anytime (corner to 12.0m from corner) and No Parking 8AM-4PM School Days (from 12.0m from corner south to Bus Stop at 4407 Highland Boulevard); and,
- » East side of Highland, north of Handsworth – No Stopping Anytime / Bus Stop.

The general condition of signage will be discussed in greater detail in the next section.

### 2.1.4.3 School Zone

The area for one block in all directions of the school entrances are designated as official School Zones, with 30km/hr restrictions in effect 8AM-4PM on school days. This zone extends on Highland Boulevard to Belvista Crescent in the north and Derby Place in the south; and on Handsworth from Highland Boulevard to Rialto Place in the east. School Zone restrictions do not extend to Lions Avenue, Belgrave, or Belvista. The remaining areas adjacent to the school and within the catchment are 50km/hr zones.

### 2.1.4.4 Traffic Control

All minor roads approaching Montroyal Boulevard, Ranger Avenue, Handsworth Road, and Highland Boulevard are stop-controlled. No stop-control or priority control exists at the intersection of Lions Avenue and Cheviot Road.

### 2.1.5 Collision History

ICBC data shows a relatively small number of crashes reported in the Canyon Heights catchment between 2008 and 2013. None of the reported crashes included pedestrians or cyclists as shown in Table 1. The greatest number of crashes were reported at Capilano/Montroyal, Montroyal/Highland and Capilano/Handsworth intersections. Further crash data for the school catchment area is in Appendix A.

**Table 1: Highest volume of catchment crashes (ICBC) 2008-2013**

Intersection	# Crashes	Pedestrian Crashes (Yes/No)
Capilano Road and Montroyal Boulevard	23	No
Montroyal Boulevard and Highland Boulevard	15	No
Capilano Road and Handsworth Road	14	No
Montroyal Boulevard and Skyline Drive	7	No
Montroyal Boulevard and Ranger Ave	5	No
Sylvan Avenue and Skyline Drive	5	No
Montroyal Boulevard and Cliffridge Avenue	4	No
Montroyal Boulevard and Cedarcrest Avenue	4	No
Highland Boulevard and Tudor Avenue	3	No
Highland Boulevard and Handsworth Road	3	No
Skyline Drive and Chalet Place	3	No

### 2.1.6 Existing Transportation Demand Management Programs

Transportation Demand Management (TDM) is a strategy of programs and initiatives to influence transportation demand to shift private automobile use to other modes, disperse travel from times or routes of peak demand, or eliminate travel all together. Canyon Heights has implemented seasonal programs with the assistance of PAC. In May 2015, the PAC and school implemented the Walk + Roll challenge as a form of TDM.



**Figure 3: Walk + Roll Challenge - Bicycle Incentive**

The idea of the Walk + Roll challenge is to encourage students to walk, bicycle, scooter or use other active transportation modes to/from school instead of being driven by their parents. To further encourage students to arrive/depart school by active transportation modes, earned incentives and raffles are part of the challenge. According to one PAC representative, the average daily number of bikes increased from three to between six and 24 (weather dependent).

## **2.2 Observed Conditions and Issues**

On Monday June 1<sup>st</sup>, 2015 DNV led a walkabout with Canyon Heights' Principal, two Canyon Heights' PAC members, and two DNV representatives. NVSD44 staff were invited. The walkabout started inside the school for initial background discussion, strategy session, and marking out the walkabout route.

Following this initial meeting, Opus revisited the school on June 4<sup>th</sup>, 2015 to collect quantitative and qualitative data relating to school area conditions at arrival and dismissal times.

Observed findings from both sets of site visits were:



- Vegetation encroachments;
- Limited formal amenities for walking and cycling;
- Wide local streets; and
- Non-compliant usage of school drop off zone.

**2.2.1 Network Observations**

**2.2.1.1 Vegetation encroachment**

Vegetation and planted landscaping may grow into the public right of way and may obscure visibility of signage and reduce effective sidewalk width. Table 2 illustrates some of the safety issues discussed.




**Table 2: Issues - Sight Obstructions**

Issue	Picture
<p>Example of obstructing sidewalks, signage visibility, etc.</p>	
<p>Natural environment profile (hills, curves, etc.) may impact sightlines.</p>	

**2.2.1.2 Pedestrian Facilities (Connectivity, Treatments, etc.)**

There is sidewalk coverage along school-area collectors and arterials noted in the previous section. Sidewalks are generally in good condition with some form of curb drop. Total width averages 1.5m but as noted, this width is reduced to 1.0m – 1.2m in some locations due to vegetation encroachment. Table 3 highlights some of the specific locations.

**Table 3: Issues - Pedestrian Facilities**


Issue	Picture
<p>Sidewalks narrowed by encroaching hedges along west side of Highland Boulevard at Belvista.</p>	
<p>No sidewalks on Ranger Avenue.</p>	
<p>Skewed intersection at Highland Boulevard at Tudor Avenue increases crossing distance for people crossing on foot.</p>	

### 2.2.1.3 Road and Intersection Design

Most of the local roads in the vicinity of the school are approximately 8.0m wide and permit two-way traffic with on-street parking on both sides. Handsworth Road and Ranger Avenue are approximately 10m wide. Tudor Avenue, Highland Boulevard, and Montroyal Boulevard are 10.5m – 11.0m wide. These widths are consistent with TAC and similar best practice guidelines for their respective places on the road hierarchy and context.

These corridor widths are appropriate to retain parking and ensure adequate mobility. In addition, there are a number of skewed intersections.

**Table 4: Issues - Road Network Design**

Issue	Picture
<p>Skewed intersection increases crossing distances for people crossing on foot.</p>	

### 2.2.2 Signage and Markings

#### 2.2.2.1 Signage

The majority of signage in the vicinity of the school is either related to parking restrictions near intersections or stop signs at minor approaches to Highland, Montroyal, and Ranger. More varied parking restriction signage is located along Highland and Montroyal, in accordance with their designations as bus routes. A complete signage and markings inventory of the school vicinity is shown in Appendix B.

Overall, the condition of signage was fair-to-good and signs were appropriately placed to convey their accompanying restrictions. Some observations include:

- Some signs obscured by vegetation;
- Parking restriction (No Parking) signage could be added at some intersections where illegal parking was observed; and
- Some ‘Pedestrian Crossing’ signage where ‘School Zone Crossing’ signage could exist. School crossing signage is intended to make drivers aware that a school is close by and to use extra caution for students playing and crossing in the area. Pedestrian crossing signage is for areas of high pedestrian traffic to let drivers know to yield or to stop for pedestrians.

### 2.2.2.2 Markings

The type and location of road markings were not consistently applied throughout the study area. More information about road markings can be found in Appendix B.

Several yellow curbs are found along Highland Boulevard but in all instances are accompanied by signage. On Lions Avenue, curbs have been painted yellow to show parking restrictions on either side of both approaches of the back pathway to the school and high-visibility 'pedestrian crossing' signs are installed, though no accompanying parking restriction signage is installed.

The most significant findings with regards to pavement markings:

- Some painted crosswalks;
- Some stop signs without stop lines; and
- Many painted stop lines are located within 1.0m of intersecting curb plane and do not provide setback for pedestrian desire paths where these exist (for locations without sidewalks).

### 2.2.3 Arrival and Dismissal time traffic conditions

The consultant's survey staff were positioned at three intersections in the Canyon Heights catchment area – Highland Boulevard at Montroyal Boulevard, Ranger Avenue at Handsworth Road and Handsworth Road at Highland Boulevard; to observe traffic conditions at the school entrance, verify volumes and to observe driver behaviour. Turning movement counts for vehicles, buses, bicycles, and pedestrians were recorded in those locations at arrival and dismissal times. The weather was sunny and approximately 20 degrees Celsius during the AM and 24 degrees Celsius for PM dismissal.

General arrival is between 08:30 and 08:50 for first bell at 08:50. Dismissal is at 14:50. Survey and observing staff were out recording from 08:15 to 09:15 and again from 14:15 to 15:15. The delays or blockages of traffic occurred due to the school entrance crossing. At arrival and dismissal times, southbound and northbound vehicles on Highland Boulevard are stopped when groups of students cross the street to or from Handsworth Avenue. These delays are generally fewer than 20 seconds. Vehicles parked in the school's drop off zone re-enter into the southbound lane to re-enter the flow of traffic.

Speeding was not verified with radar, but was a perceived problem in the study area by school representatives. No obvious or perceived instances of speeding were recorded during the June 1<sup>st</sup> or June 4<sup>th</sup> site visits. Traffic volumes and summaries are provided in Section 2.2.3.1.

#### 2.2.3.1 Traffic Patterns and Volumes

This section describes each intersection and the volumes for the following intersection movements:

- EBL/EBT/EBR = Eastbound Left Turn/Through/Right Turn
- WBL/WBT/WBR = Westbound Left Turn/Through/Right Turn
- NBL/NBT/NBR = Northbound Left Turn/Through/Right Turn
- SBL/SBT/SBR = Southbound Left Turn/Through/Right Turn



Handsworth Road at Ranger Avenue

The Handsworth Road at Ranger Avenue intersection is a partially skewed intersection with four legs and is stop-controlled for both Handsworth Road legs. Left, through and right movements are accommodated for all legs.

The Handsworth Road at Ranger Avenue intersection experienced relatively low volume of vehicles, pedestrians and cyclists during the hours surrounding each of the drop-off and pick-up times. The following tables provide a summary of the number of vehicles, and pedestrians counted, respectively, by 15 minute interval. A total of two cyclists were observed in the morning period and four in the afternoon.

**Table 5: Handsworth Road at Ranger Avenue - Vehicles**

Handsworth Road @ Ranger Avenue													
Movement													
Time	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Whole Intersection
8:15 am	3	2		4	5			3		1	11	6	35
8:30 am	10	2	1		2		1	4	1		13	12	46
8:45 am	7	2	2		1	1	2	3	1		8	2	29
9:15 am	1	2				2	1	4			7	2	19
<b>Total</b>	<b>21</b>	<b>8</b>	<b>3</b>	<b>4</b>	<b>8</b>	<b>3</b>	<b>4</b>	<b>14</b>	<b>2</b>	<b>1</b>	<b>39</b>	<b>22</b>	<b>129</b>
Time	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Whole Intersection
2:30 pm				1	1		1	3			9	1	16
2:45 pm	2		1	1	2	1		4			4	10	25
3:00 pm	12	5			3	1	1	7			6	5	40
3:15 pm	8		3		2		1	10		1	9	2	36
<b>Total</b>	<b>22</b>	<b>5</b>	<b>4</b>	<b>2</b>	<b>8</b>	<b>2</b>	<b>3</b>	<b>24</b>	<b>0</b>	<b>1</b>	<b>28</b>	<b>18</b>	<b>117</b>

**Table 6: Handsworth Road at Ranger Avenue - Pedestrians**

Handsworth Road @ Ranger Avenue													
Movement													
Time	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Whole Intersection
8:15 am					1		2					8	11
8:30 am	1				4		1			2		15	23
8:45 am	3	1						1					5
9:15 am		1											1
<b>Total</b>	<b>4</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>5</b>	<b>0</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>23</b>	<b>40</b>
Time	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Whole Intersection
2:30 pm											1		1
2:45 pm												3	3
3:00 pm	10	1	2	1								1	15
3:15 pm	8	6									2		16
<b>Total</b>	<b>18</b>	<b>7</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>4</b>	<b>35</b>

Handsworth Road at Highland Boulevard

The Handsworth Road at Highland Boulevard intersection is a 3-legged, one way stop-controlled intersection. Northbound motorists can travel through or turn right at the intersection, southbound motorists can travel through or turn left at the intersection and westbound motorists can turn left or right at the intersection. This intersection is situated in front of the main entrance of Canyon Heights.

Handsworth Road at Highland Boulevard intersection had most of its pedestrian and vehicle traffic during the drop-off period from 8:30 am – 8:45 am and pick-up period 3:00 pm – 3:15 pm. The following tables summarize the vehicles and pedestrians observed in 15 minute increments. Ten cyclists were observed in the morning hour and two in the afternoon.

**Table 7: Handsworth Road at Highland Boulevard - Vehicles**

Handsworth Road @ Highland Boulevard							
Movement							
Time	WBR	WBL	NBT	NBR	SBL	SBT	Whole Intersection
8:15	4	4	16	4	4	30	62
8:30	5	4	21	5	8	69	112
8:45	2	5	14	7	6	27	61
9:00	4	6	19	4	2	17	52
<b>Total</b>	<b>15</b>	<b>19</b>	<b>70</b>	<b>20</b>	<b>20</b>	<b>143</b>	<b>287</b>
14:30	2	1	26	3	1	26	59
14:45	4	7	28	3	4	33	79
15:00	9	1	31	9	11	40	101
15:15	2	4	31	8	1	36	82
<b>Total</b>	<b>17</b>	<b>13</b>	<b>116</b>	<b>23</b>	<b>17</b>	<b>135</b>	<b>321</b>

**Table 8: Handsworth Road at Highland Boulevard - Pedestrians**

Handsworth Road @ Highland Boulevard									
Movement									
Time	WBR	WBL	NBT	NBR	SBL	SBT	Crossing to School	Crossing from School	Whole Intersection
8:15	7	14				1	4		26
8:30	15	10				1	135	13	174
8:45		1	4			6	19	6	36
9:00							2		2
<b>Total</b>	<b>22</b>	<b>25</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>8</b>	<b>160</b>	<b>19</b>	<b>238</b>
14:30							4	1	5
14:45	7	1					12	1	21
15:00							29	162	191
15:15			1				2	30	33
<b>Total</b>	<b>7</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>47</b>	<b>194</b>	<b>250</b>

### Highland Boulevard at Montroyal Boulevard

The Highland Boulevard at Montroyal Boulevard intersection is a 3-legged, one-way stop controlled intersection. Stop control is implemented for northbound motorists from Highland Boulevard. Eastbound motorists on Montroyal Boulevard can travel through or turn right at the intersection, westbound motorists on Montroyal Boulevard can travel through or turn left at the intersection, and northbound motorists on Highland Boulevard can turn left or right at the intersection.

The Highland Boulevard at Montroyal Boulevard intersection vehicle and pedestrian volumes are displayed in Table 9 and Table 10 by 15 minute increments. There were three cyclists observed in the morning period and seven in the afternoon.

**Table 9: Highland Boulevard at Montroyal Boulevard - Vehicles**

Highland Boulevard @ Montroyal Boulevard							
Movement							
Time	EBT	EBR	WBL	WBT	NBL	NBR	Whole Intersection
8:15	90	23	18	125	17	6	279
8:30	75	54	35	60	17	7	248
8:45	48	12	15	40	13	15	143
9:00	25	17	3	27	11	3	86
<b>Total</b>	<b>238</b>	<b>106</b>	<b>71</b>	<b>252</b>	<b>58</b>	<b>31</b>	<b>756</b>
14:30	31	19	12	40	14	7	123
14:45	45	30	24	52	16	10	177
15:00	62	26	19	65	21	21	214
15:15	76	18	11	45	16	17	183
<b>Total</b>	<b>214</b>	<b>93</b>	<b>66</b>	<b>202</b>	<b>67</b>	<b>55</b>	<b>697</b>

**Table 10: Highland Boulevard at Montroyal Boulevard - Pedestrians**

Highland Boulevard @ Montroyal Boulevard							
Movement							
Time	1 EBT	2 EBR	3 WBL	4 WBT	5 NBL	6 NBR	Whole Intersection
8:15		1					1
8:30		9	5		1		15
8:45					5		5
9:00		5					5
<b>Total</b>	<b>0</b>	<b>15</b>	<b>5</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>26</b>
14:30				2			2
14:45							0
15:00					5		5
15:15		2			8	1	11
<b>Total</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>2</b>	<b>13</b>	<b>1</b>	<b>18</b>

On Montroyal Boulevard, westbound through vehicles were observed driving around westbound left-turning vehicles.

## 2.2.4 Drop-Off/Pick-Up Observations

On Thursday, June 4<sup>th</sup> 2015 Opus went to Canyon Heights to perform a parking occupancy survey and to observe drop-off and pick-up behaviours. On the whole, arrival and dismissal times had different parking and driving behaviour from parents; mostly involving the use of all or portions of the drop off zone for medium-term parking. Weather conditions were sunny with temperatures between 20 and 23 degrees Celsius.

### 2.2.4.1 Drop-Off / Arrival

Although some parents arrived prior to 8:30, the busiest drop-off period is between 8:35 and 8:45 am. The majority of parking issues were due to non-compliance of parking regulations within the drop off zone; although some vehicles were illegally parked in the 'No Stopping' or 'No Parking' zone close to the Belvista intersection. The authors of this report note that the presence of surveyors in high-visibility vests may have promoted better driving behaviour.

A total of 81 vehicles were observed parking – either legally or illegally – during the AM arrival time. The majority of these vehicles used the drop off zone or to the north of the drop-off zone. Several vehicles parked near the crosswalk on Highlands or in the vicinity of the northbound bus stop, to the north of Handsworth Road.

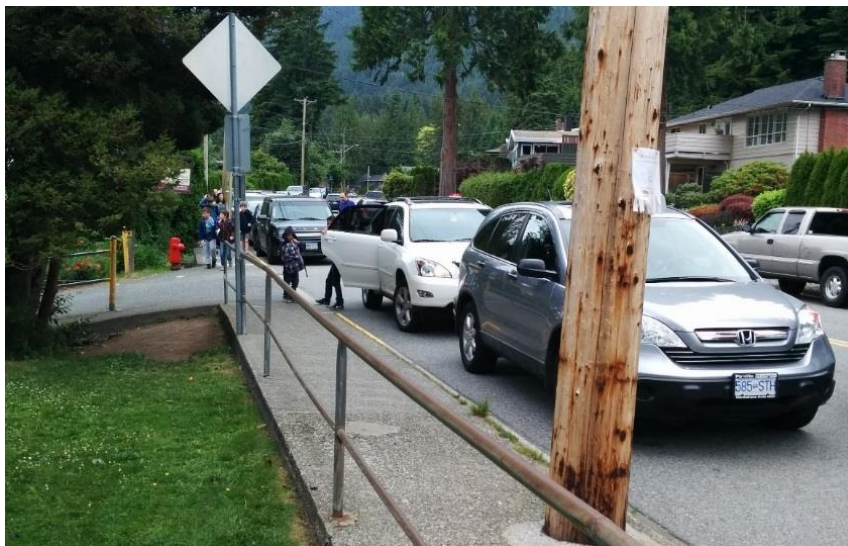
**Table 11: Parking Occupancy - Morning Drop-Off**

Zone Time	Drop off Area	No Parking North of Driveway	No Parking North of Crosswalk (Illegal)	East Side of Highland	Total
8:15	6	4	0	3	13
8:30	31 (2 from 8:15)	11 (2 from 8:15)	0	8	50
8:45	13 (3 from 8:30)	2	0	5	20
9:00	4	0	0	1	5
<b>Total*</b>	<b>49</b>	<b>15</b>	<b>0</b>	<b>17</b>	<b>81</b>

» \* Total value does not include the carry over, this is the total number of different vehicles that park.

There were two different parking patterns observed in the school drop off zone in the AM. The southern half of the zone was used appropriately by parents for very short term drop off. These students proceeded to the main entrance opposite of Handsworth Road.

The northern half of the drop off zone was used as medium-term parking by parents whose children either proceeded to the entrance on the north side of the school or by parents who were observed to escort children to the day care centre also located on the north side of the building. This day care parking constituted most of the vehicles parked north of the drop off zone as well. These vehicles were parked on average between 10 and 25 minutes (see Figure 4, overleaf).



**Figure 4: North end of drop off zone observed to be used for day care parking (stayed 10 mins +)**

Demand for day care-related parking partially blocked portions of the driveway on the north side of the school. Vehicles attempting to parallel park at these two ends of the bay sometimes parked too far from the curb and partially blocked the southbound lane.

The western sidewalk of Highland Boulevard, north of the day care entrance, was well used by pedestrians at dismissal times. With hedge encroachment, the effective width of this sidewalk is approximately 1.0m – 1.2m. Some children and parents were observed stepping in between parked cars to allow strollers and other groups of pedestrians to pass.

### 2.2.4.2 Pick-Up / Dismissal

In the PM dismissal time, the entire drop off zone, west side of Highland Boulevard, and much of the east side of Highland Boulevard was observed to be used for long-term parking (20 mins +). There were no observed instances of short term pullover and pick up. As with the AM drop off time, this report does note that weather conditions were optimal and the presence of surveyors in high-visibility vests may have encouraged better driving behaviour.

There was less turnover and therefore fewer vehicles observed at the school entrance during the PM dismissal period (see Figure 4).

**Table 12: Parking Occupancy - Afternoon Pick-Up**

Zone Time	Drop off Area	No Parking North of Driveway	No Parking North of Crosswalk (Illegal)	East Side of Highland	Total
14:30	3	4	0	2	9
14:45	7 (3 from 14:30)	8 (4 from 14:30)	0	8 (1 from 14:30)	23
15:00	6	5	0	0	11
15:15	5	2	0	1	8
<b>Total*</b>	<b>18</b>	<b>15</b>	<b>0</b>	<b>10</b>	<b>43</b>

» \* Total value does not include the carry over, this is the total number of different vehicles that park.

### 2.2.4.3 Issues Identified in “A DNV Citizens’ Report” by Safe Routes Advocates

On January 20, 2014 the Safe Routes Advocates (SRAs), a parents advocacy group in the Handsworth catchment of schools, spoke to DNV’s Council and gave a Safe Routes Recommendations report. The report highlighted general areas of concern and school specific safety issues. The summary in Table 13 identifies concerns by SRA on Highland Boulevard, along Montroyal Boulevard, and crossing Lions Avenue.

**Table 13: SRA Identified Concerns - Canyon Heights Elementary School**

Concern	SRA Suggested Mitigation Measure	Opus Review
No pedestrian facilities on Lions Ave and is a heavily travelled route to/from Canyon Heights.	Traffic calming along Lions Avenue. Traffic calming measures include 30 km/hr reduced speed school zones.	<ul style="list-style-type: none"> <li>• Crosswalk recommended</li> <li>• Sidewalk ranks low in pedestrian master plan</li> </ul>
Pathway crossing Lions Avenue does not have a crosswalk and the crossing is situated such that minor sight obstructions exist due to vegetation.	A zebra stripe crosswalk installed crossings Lions Avenue.	DNV to install zebra crosswalk.
Steps leading up to school are busy and dangerous.	Add handrails to the steps.	Hand rails installed between 2013 report and 2015 investigation by Opus.
Ranger Avenue is a well-used route to/from Canyon Heights and motorists travel at high speeds up and down the hills surrounding Handsworth Road.	Traffic calming and/or warning signage. Suggest potential reduced speed zone. Warning signage – watch for children.	Study recommends painted walkway on Ranger Avenue for pedestrian space.
Motorists travelling down Handsworth Road toward the school travel as fast speeds and do not watch for pedestrians.	Traffic calming measures, particularly speed humps, to reduce speeds coming down the hill.	DNV not considering speed humps as per revised traffic calming policy.
Highland Boulevard is a busy arterial road connecting from Edgemont Village to Montroyal Boulevard. A lot of traffic travels along Highland Boulevard in front of the school.	Introduce a reduced speed school zone along Highland Boulevard close to the school.	School zone designation and signage introduced in proximity of Highland Blvd since 2013 SRA report.
Montroyal Boulevard is a busy arterial road and many families cross Montroyal Boulevard to get to Canyon Heights.	Install a crosswalk on Montroyal Boulevard at one of the following intersections: <ul style="list-style-type: none"> <li>- Belvedere Avenue and Montroyal Boulevard</li> <li>- Cliffridge Avenue and Montroyal Boulevard</li> </ul>	DNV installed new crosswalks across Montroyal at Cliffridge Avenue and Shirley Avenue in 2015.
Highland Boulevard and Tudor Avenue intersection is a wide intersection due to its skewed angle and the width of Highland. A crosswalk is on the north leg.	Improve the crossing at this intersection. Suggest flashing lights.	Curb buildouts recommended.

Opus reviewed this report prior to conducting the initial site walk-through and data collection. Opus' follow-up investigation corroborated some of these concerns as noted in Table 13, but also noted:

- Overgrown vegetation commonly obscuring signage and intersection visibility as well as reducing useable sidewalk width where it exists;
- Limited sidewalk network and few school or pedestrian crosswalks;
- Very few reported crashes involving pedestrians, but a pattern of right-angle ('T-bone') crashes involving vehicles turning onto and off of Montroyal Boulevard;
- Skewed intersections; and
- The southern half of the drop off lane in front of the school operates appropriately during AM drop off, with most vehicles staying less than two minutes. The northern half of the same drop off area is used for medium-term parking for parents walking their younger children into the day care on the north side of the school. The entire lane is used for medium-term parking during PM pick-up.

### 3 Mitigation Options and Recommendations

This section summarizes the improvement options to respond to the high level gaps identified in the previous section. All options are feasible and are accompanied by high-level cost estimates. Short term projects can be implemented quickly whereas long term projects require more substantial planning. Priority projects were identified by the PAC and the school, and are indicated with an asterisk.

**Table 14: Recommended Improvements**

Location	Infrastructure Cost Estimate	Suggested Mitigation	Short / Long Term	Who?
Canyon Heights Elementary	N/A	Expand School Travel Demand and Mode Shift Programs -Section 3.1.1	On-going	Canyon Heights ES NVSD44 North Shore SRA
Canyon Heights Elementary	N/A	Improved traffic management around school – Section 3.1.2	On-going	Canyon Heights ES PAC Group RCMP
Highland Boulevard*	\$2,000	School Zone signage expansion upgrade - Section 3.1.3	Short Term	DNV
DNV	N/A	Work with residents to maintain clear sight distance by addressing overgrown vegetation. – Section 3.1.4	On-going	DNV
Study Area*	\$1,000	Signage and marking upgrades at the pedestrian pathway and Lions Avenue crossing - Section 3.1.5	Short Term	DNV
	\$8,000	Signage and marking upgrades at other locations - Section 3.1.5	Long Term	DNV
Highland Boulevard from Edgemont Blvd to Montroyal Blvd	\$50-150,000	Corridor study to determine long-term needs and multi-modal connectivity and access – Section 3.1.6	Long Term	DNV
Ranger Avenue and Handsworth Road*	\$11,000	Curb buildout, new painted pedestrian walkway – Section 3.2.1	Short Term	DNV
Highland Boulevard and Tudor Avenue*	\$2,600	Pavement markings and signage - Section 3.2.2	Short Term	DNV
	\$12,000	Curb buildout – northwest corner - Section 3.2.2		
	\$10,000	Curb buildout – northeast corner - Section 3.2.2	Long Term	
Ranger Avenue from Handsworth Road to Sylvan Avenue	\$48,600	Sidewalk, Section 3.2	Long Term	DNV
Sum of Short Term + Priority Items	\$38,600			



## 3.1 Short Term Improvements

All of these projects are relatively low cost either to the DNV or NVSD44 and can be provided in the short term. DNV-related recommendations can be provided under the Capital or Operations budget, with some potential for reimbursement via school-related transportation grants.

### 3.1.1 Expand School Travel Demand and Mode Shift Programs

**Responsibility of:** NVSD44, School Administration, PAC, DNV

The school and PAC have collaborated on incentive programs to encourage and reward active travel modes to school. This resulted in a marked increase in students cycling to school during May and June. This and similar programs should be encouraged and expanded through the following means.

#### 3.1.1.1 Encourage Parent Volunteers

The North Vancouver school travel survey in 2013 conducted by NVSD44 and the two North Vancouver municipalities found that families who attend schools with parent-led traffic safety information campaigns, and that are involved in Travel Smart® programs reported higher satisfaction about conditions for pedestrians and cyclists accessing the school.

One example of a current parent volunteer group is the North Shore Safe Route Advocates (SRA), an independent advocate group of parents. Parent volunteers may organize walking or cycling programs; for example, “Walk Or Wheel” days (Highlands) or “Freedom Fridays” (Canyon Heights) to encourage walking, cycling or other active modes to travel to school. The programs may have incentives, such as a draw for a bike (Canyon Heights) or a scanned QR code tag to electronically tally walking and cycling trips by students and award points (Highlands). The study recommends support of these type of parent-led initiatives.

The North Shore SRA is one additional resource to share ideas and learn from similar school contexts.

#### 3.1.1.2 Include more Traffic Safety into Curriculum

According to the 2013 school travel survey, traffic safety was listed as a significant contributor to parents’ decisions to drive their children to school. The school can broaden its efforts to expand traffic safety into the background curriculum at the school.

ICBC offers age-appropriate teaching resources for traffic safety free of charge through its *RoadSense Kids* and *SMART Board RoadSense Kids* activities. These materials can be supplemented with individual ICBC and RCMP speakers to demonstrate appropriate behaviour at intersections and when near road traffic. Individual lessons and strategies can assist both children and parents gain confidence for walking or cycling to school in all weather conditions. This can extend to a modal choice curriculum for staff and faculty through TransLink’s *Travel Smart* program, an informational site to assist schools with making smarter choices about their travel habits.

#### 3.1.1.3 Drive to Five Program

Drive to Five is an initiative that aims to map out where students travel to and from the school and then designate safe locations along those routes at roughly a five minute walk to or from the school. This provides pick up and drop off away from the front school entrance at arrival and dismissal times.

Providing trustworthy and monitored pick up and drop off could eliminate a number of vehicle trips from the front school entrance at arrival and dismissal times.

Canyon Heights started a Drive to Five Program in the Fall of 2015 and will continue to monitor its impact and success throughout the remainder of the 2015-2016 school year. This report recommends ongoing monitoring and adjustments to the program as required.

#### **3.1.1.4 Walking School Bus**

A Walking School Bus is a group of children walking together under the supervision of one or more adults following a prescribed route and schedule. This is an idea for schools to consider to offer a safe, dependable, and healthy way for children to get to school versus being driven in a car. It can be informally planned when two or three families take turns walking or cycling with their children to school or it might be a more formally developed and organized program with specific stops, specific participants and volunteer Walking School Bus leaders.

Walking School Buses can contribute to reducing vehicle trips to schools, contribute to at least a modicum-recommended daily exercise regime for children, and improve parental involvement in school affairs. This type of program is recommended for younger elementary school students and daycare-attending children as well. This program could be implemented on a volunteer schedule for the school or day care with a number of suitable routes mapped out as required by participants' addresses.

#### **3.1.2 Improved Traffic Management at School – Priority**

**Responsibility of:** NVSD44, School Administration, PAC

Sustained efforts to manage or control traffic movements in and around school at arrival and dismissal times will reduce risk and the potential for pedestrian/vehicle conflicts.

##### **3.1.2.1 Enforcement and Reinforcement of Existing Parking Regulations**

The existing 'No Parking 8AM-4PM School Days' regulatory signage on Highland Boulevard is routinely ignored – especially at dismissal times. The signage and regulations exist partially to ensure adequate turnover and availability of drop off space for parents.

The options for enforcement and reinforcement range from school communication reminders to active parent volunteer monitoring of parking behaviour to ticketing by RCMP.

North Vancouver *Speed Watch* is another resource that the school or parents can request to come to a location to monitor vehicle speeds. It is a program by the RCMP, volunteers and ICBC.

##### **3.1.2.2 Alter Existing Parking Regulations**

It is clear that arrival and dismissal times provide two clearly distinct demand profiles for parking. If the RCMP is unwilling to enforce an unpopular ticketing regime, the option exists to revise the existing parking regulation to match current parking demand and behaviour. The drop off zone would remain 'No Parking School Days', from 7:30 to 9:30, corresponding to arrival times. Restrictions on parking during dismissal times would be removed. This would not serve to alter existing behaviour but would technically reduce routine non-compliance.

### 3.1.3 Expand School Zone – Priority

**Responsibility of:** DNV, RCMP

The BC Ministry of Transportation and Infrastructure (MoTI) supplement to Transportation Association of Canada (TAC) recommends that school zones not be less than 100m from the property of the school, where warranted. TAC's *School and Playground Areas and Zones: Guidelines for Application and Implementation* (2006) references the *Geometric Design Guide for Canadian Roads* (1999) to note that the actual distance of a school zone should be the safest Sight Stopping Distance (SSD) from the school's property line based on the road's terrain, topography, and design speed.

For the flat surface on Highland Boulevard, SSD is 60m-65m (see Table 1.2.5.3, *Geometric Design Guide to Canadian Roads*). On the downhill grade Handsworth Road from Ranger Avenue to the Highland Boulevard crossing (9.2%), the SSD is 73m (formulae 1.2.5 and 1.2.6, *Geometric Design Guide to Canadian Roads*).

Based on the minimum length and SSD guidelines for school zones, the existing school zone, with all accompanying signage and regulatory authority, should be extended to:

- Highland Boulevard to the intersection of Belvedere – signs posted just south of intersection at a cost of approximately \$175 each sign installation (estimate sources are located in Appendix D)

### 3.1.4 Vegetation Maintenance

**Responsibility of:** DNV

Maintaining sight distance is an important element on streets and at intersections. Landscape vegetation may impede sight distance when it is not properly maintained. In addition, maintaining vegetation is also important so that it does not obscure signage or reduce the effective width of sidewalks.

Case-by-case vegetation trimming inquiries can be made to the general DNV engineering email or phone line.

### 3.1.5 Signage and Markings Enhancements

**Responsibility of:** DNV, RCMP

#### 3.1.5.1 Install New Pedestrian and/or School Crosswalks and Crossing Markings

New pedestrian crosswalks should be installed at locations with existing stop control, sidewalks, demonstrated pedestrian demand, and along demonstrated pedestrian desire paths as per TAC and BC MoTI guidelines. If the previous conditions are met, then new crosswalk markings could be installed across the minor approaches at the intersections of:

- Highland Boulevard at Montroyal Boulevard;
- West leg of Highland Boulevard and Belvista Crescent (directly connected to the block on which the school is located); and
- West leg of Highland Boulevard and Belgrave Avenue (directly connected to the block on which the school is located).

With consideration of pedestrian demand and other conditions, crosswalk markings could also be installed at the following intersections:

- Pedestrian pathway across Lions Avenue;
- Mapleridge Drive at Montroyal Boulevard;
- Marineview Crescent at Montroyal Boulevard;
- Ranger Avenue at Montroyal Boulevard; and
- Cedarcrest Avenue at Montroyal Boulevard.

The installation of these new crosswalks will also require existing stop lines be moved back to a minimum 1.5m distance from the nearest crosswalk line. New pedestrian crossings also require new accompanying signage at each approach.

### 3.1.5.2 Standardize Signage as per TAC

Standardizing signage in the study area primarily concerns parking regulations and school zone-related signage, as follows:

- Parking Regulations – consider installing ‘No Stopping’ or ‘No Parking’ signage at intersections where vehicles are observed to frequently park too close to the intersection (Street and Traffic Bylaw states no parking is allowed within 11 m of street intersections). This may help reduce vehicles parking too close to the intersection. This would require a minimum of eight signs/poles per 4-way intersection and six signs/poles per ‘T’ intersection, for the following intersections:
  - Highland Boulevard and Handsworth Road (T-intersection);
  - Highland Boulevard and Belgrave Avenue (T-intersection);
  - Highland Boulevard and Belvista Crescent (T-intersection);
  - Handsworth Road and Parliament Crescent (T-intersection); and
  - Handsworth Road and Canterbury Crescent/Rialto Place (4-way intersection).
- School Zone-Related Signage – consider installing ‘School Crosswalk Ahead’ signs (sign number WC-16R/L) and ‘School Crosswalk’ signs (sign number RA-3R/L) on the north side of Handsworth Road toward the approach of the Highland Boulevard school crossing, and toward the proposed new school crossings at Belvista Cres and Belgrave Avenue.

### 3.1.6 Highland Boulevard Corridor Study

#### Responsibility of: DNV

Highland Boulevard is a north-south arterial between Montroyal Boulevard and Edgemont Village. As demonstrated in this report, it serves a number of uses and multi-modal operations. In addition to its function as a vehicular arterial and transit route, it is a future cycle route in the Bicycle Master Plan.

As also demonstrated in this report, there are a number of wider issues along the corridor that are outside the scope of this investigation to address.

These include:

- Perceived speeding on Highland Boulevard (uncorroborated) and some motorists not stopping at pedestrian crossings (also uncorroborated); and
- Retro-fitting the existing alignment to encourage slower vehicle speeds and provide amenities for transit, cycling, and pedestrians creates trade-offs, such as on-street parking.

This report recommends that DNV undertake a study to assess the future function of the corridor and identify specific safety and walkability upgrades to bring the local network. This study could include, but not be limited to:

- Speed assessment and driver compliance of crosswalk priority;
- Preventative crash analysis;
- Safety review of current alignment;
- Parking survey;
- Transit infrastructure survey;
- Stakeholder engagement;
- Development and assessment of alternative corridor designs;
- Transit and active modes;
- Visibility (e.g. vegetation and sightlines); and
- Bicycle facilities (e.g. bike paths/routes and parking).

This corridor study could cost in the range of \$50,000 to \$150,000 depending on how many of the above-mentioned elements are included.

## 3.2 Long Term Improvements

These proposals respond to conditions identified at specific locations. They all provide pedestrian enhancements.

### 3.2.1 Ranger Avenue and Handsworth Road – Priority

**Responsibility of:** DNV

As shown in Figure 5, the proposal provides two upgrades:

1. Curb buildout at the northwest corner to shorten the Ranger Avenue crossing; and,
2. New painted pedestrian walkway on west side of Ranger Avenue between Handsworth Road and Crystal Court (1.5m with 0.5m buffer for approximately 200m). This can be achieved by restricting parking and painting a line to demarcate pedestrian space.

The curb bulge and west side painted walkway narrows the road width, and provides dedicated space for walking on-street. Steep slopes away from west side of the road may require retaining structures which may add cost to a traditional concrete sidewalk.

Other future options to consider could include:

- New curb build-outs to provide a 90-degree east approach for Handsworth Road at Ranger Avenue;
- New curb buildouts or channeling islands through the intersection to reduce road width along Ranger Avenue and reduce speeds; and,
- A sidewalk on Ranger Avenue is in the DNV Pedestrian Master Plan, however it is ranked as a low priority compared to other major streets without sidewalks.

All or part of this treatment can be implemented in the short term with temporary curbs or asphalt rollover curbs. The high-level costs for this and more permanent, concrete treatments are shown in Table 15.



**Table 15: High Level costs – Handsworth and Ranger treatments**

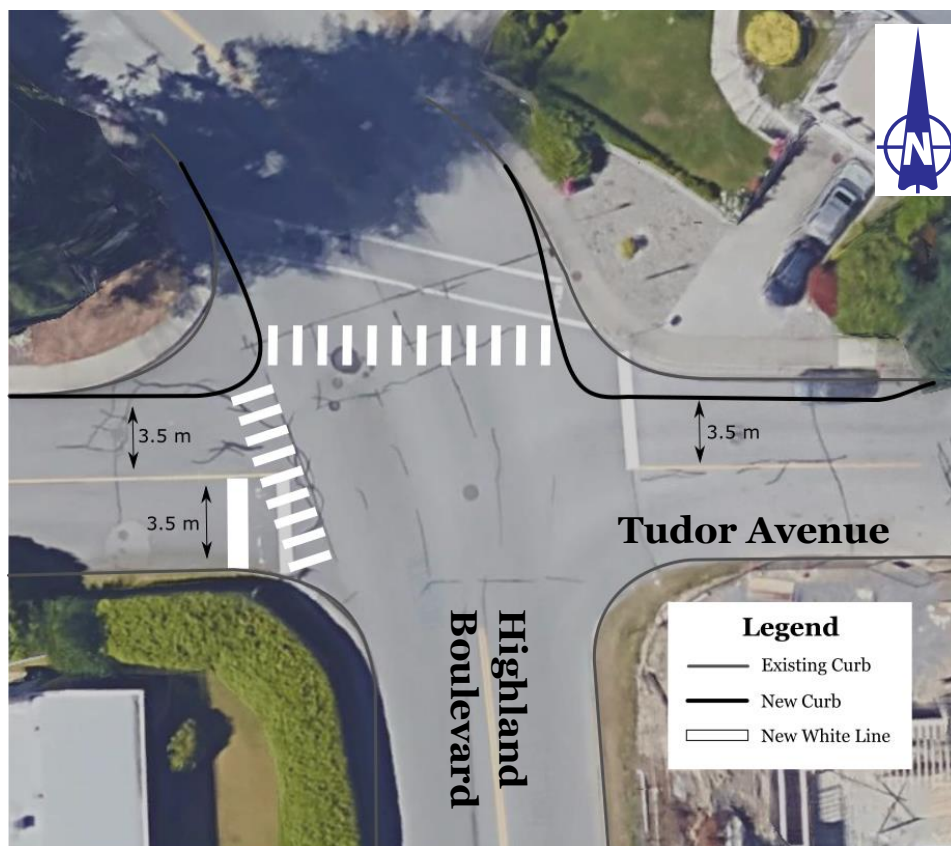
**Figure 5: High-level proposal for Handsworth and Ranger**

Handsworth and Ranger				
Short Term Improvements	Cost	Unit	Qty	Price
Signs (each)	\$ 175.00	each	1	\$ 175.00
Concrete curbs (m)	\$ 150.00	m	10	\$ 1,500.00
Concrete sidewalk (m)	\$ 250.00	m	10	\$ 2,500.00
Curb Let Downs	\$ 1,200.00	each	1	\$ 1,200.00
Pavement Markings (Median)	\$ 13.00	m	180	\$ 2,340.00
Contingency/Risk/Design	40%			\$ 3,100.00
	<b>TOTAL</b>			<b>\$ 10,815.00</b>

### 3.2.2 Highland Boulevard and Tudor Avenue

**Responsibility of:** DNV

One option to improve pedestrian visibility at this intersection is to add a crosswalk to the west leg as shown in Figure 6. As well, this option builds out the northwest and northeast corners of the intersection to reduce crossing distance (and times) and increase visibility of pedestrians. Out of the two buildouts, the northwest buildout would have the largest improvement.



**Figure 6: High-level proposal for Highland and Tudor**

The high-level costs for the Highland and Tudor intersection pavement markings/signage, northwest corner, and northeast corner are shown in Table 16.

**Table 16: High-level costs – Highland and Tudor treatments**

Highland and Tudor - Pavement Markings and Signage				
Long Term Improvements	Cost	Unit	Qty	Price
Pavement Markings (Stop Bar)	\$ 175.00	each	1	\$ 175.00
School Crossing and Signage	\$ 800.00	each	2	\$ 1,600.00
Contingency/Risk/Design	40%			\$ 800.00
<b>TOTAL</b>				<b>\$ 2,575.00</b>
Highland and Tudor - Northwest Corner				
Long Term Improvements	Cost	Unit	Qty	Price
Concrete curbs (m)	\$ 150.00	m	10	\$ 1,500.00
Concrete sidewalk (m)	\$ 250.00	m	10	\$ 2,500.00
School Crossing and Signage	175	each	0	\$ -
Curb Let Downs	\$1,200.00	each	1	\$ 1,200.00
Move Catchbasin	\$3,000.00	each	1	\$ 3,000.00
Contingency/Risk/Design	40%			\$ 3,300.00
<b>TOTAL</b>				<b>\$11,500.00</b>
Highland and Tudor - Northeast Corner				
Long Term Improvements	Cost	Unit	Qty	Price
Concrete curbs (m)	\$ 150.00	m	15	\$ 2,250.00
Concrete sidewalk (m)	\$ 250.00	each	15	\$ 3,750.00
Curb Let Downs	\$1,200.00	each	1	\$ 1,200.00
Contingency/Risk/Design	40%			\$ 2,400.00
<b>TOTAL</b>				<b>\$ 9,600.00</b>

## 4 Conclusions

This report recommends a combination of programming and infrastructure upgrades to improve safety around the school in a manner consistent with the availability of DNV resources. School and PAC representatives have further reviewed the draft list of proposals and indicated which they view as a priority for quick implementation. Table 17 summarizes the short-term and priority projects for implementation.

**Table 17: Short-Term and Priority Projects for Implementation**

Proposal	Partners
Greater uptake of school-supported programs (Section 3.1.1)	Canyon Heights ES NVSD44 North Shore SRA
Traffic management around school to promote quicker turnover, illegal and obstructive parking (Section 3.1.2)	Canyon Heights ES PAC Group RCMP
Work with residents to maintain clear sight distance by addressing overgrown vegetation (Section 3.1.4)	DNV
Signage and marking upgrade for pedestrian pathway crossing Lions Ave (Section 3.1.5)	DNV
Curb buildout, new painted pedestrian walkway (Section 3.2.1)	DNV



# **APPENDIX A**

## Crash Report Memo





# **APPENDIX B**

## Signs and Markings Inventory



## Canyon Heights Elementary School Study

A complete signage and markings inventory of the school vicinity is shown here with reference table of respective condition notes below.

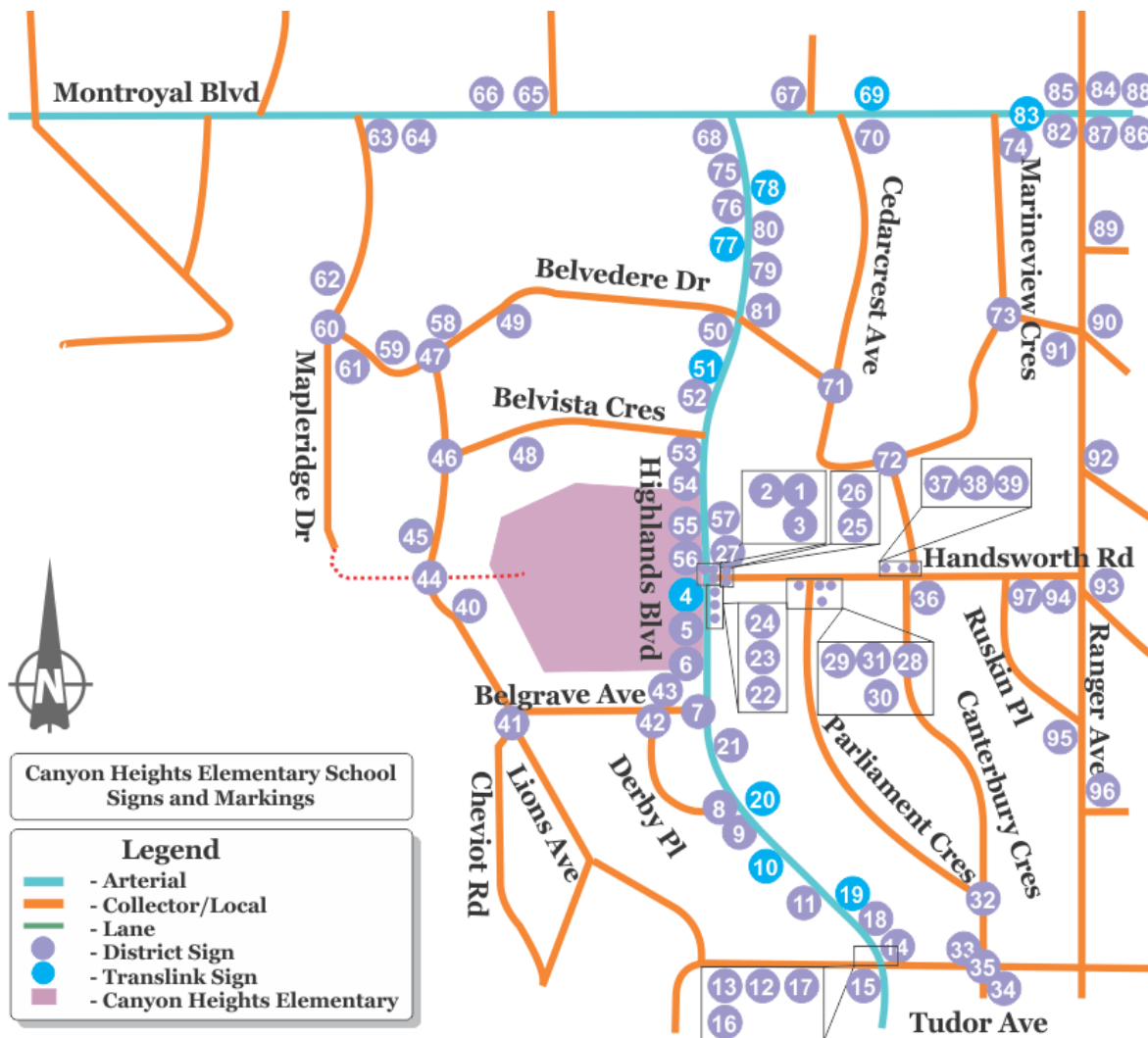


Figure B.1: Signage inventory in school vicinity

## Canyon Heights Elementary School Study

No. On Map	Sign/Pavement Marking Name	TAC Sign Code	BCMoTI Sign Code	Condition	Elaborate on Fair/Poor Condition	Location
1	School Crossing Signs	RA-3L & RA-3R	PS-005-L & PS-005-R	Good		Highland @ Handsworth - E & W Side of North Leg
2	Crosswalk	NA	NA	Fair	Fading	Highland @ Handsworth - North Leg
3	Crosswalk	NA	NA	Fair	Fading	Highland @ Handsworth - East Leg
4	Translink Bus Stop	NA	NA	Good		Highland - West Side, North of Handsworth
5	No Parking Pick-up/Drop-off Zone & No Stopping, Buses Excepted	RB-52 / ? / RB-60	P-008/?/?	Good		Highland - West Side, North of Handsworth
6	No Parking, Drop Off/Pick up Zone, Idle Free Zone	RB-52 / ? / ?	P-008/?/NA	Good/Poor/Poor	Old/Damaged	Highland - West Side, North of Handsworth
7	Lack of Drop-Curb, Stop Sign No Stop Bar	NA / RA-1	NA / R-001	Poor/Good	No drop curb - not accessible by all	Highland @ Belgrave - NW and SW Corners
8	Lack of Drop-Curb	NA	NA	Poor	No drop curb - not accessible by all	Highland @ Derby - NW Corner
9	Stop Sign, No Stop Bar	RA-1	R-001	Fair	Faded/Old	Highland @ Derby - SW Corner
10	Translink Bus Stop	NA	NA	Fair	Loose Pole	Highland - West Side, South of Derby
11	Pedestrian Crossing Warning Sign	WC-2R	PS-002	Good		Highland - West Side, South of Derby
12	Pedestrian Crossing Sign, reflective tape on pole	RA-4R & RA-4L	PS-003-R & PS-003-L	Good		Highland @ Tudor - NW Corner
13	Crosswalk	NA	NA	Fair	Fading	Highland @ Tudor - North Leg
14	Stop Sign and Stop Bar	RA-1	R-001	Good		Highland @ Tudor - NE Corner
15	Stop Sign and Stop Bar	RA-1	R-001	Good		Highland @ Tudor - SW Corner
16	No Crosswalk	NA	NA	Poor		Highland @ Tudor - West Leg
17	Pedestrian Crossing Sign, reflective tape on pole	RA-4R & RA-4L	PS-003-R & PS-003-L	Good		Highland @ Tudor - NE Corner
18	No Parking, Bus Stop	RB-60	NA	Good		Highland @ Tudor - East Side of Highland
19	Translink Bus Stop and No Parking, Bus Stop	NA / RB - 60	NA	Good		Highland - East Side, North of Tudor
20	Translink Bus Stop	NA	NA	Fair	Loose Pole	Highland - East Side, North of Tudor
21	School Zone Signage, Reduced Speed	NOT TAC	PS-001/PS-001-Ta	Fair	Loose Pole	Highland - East Side, South of Belgrave
22	School Crossing Warning Sign, No Parking School Days	WC-16L / RB-52	PS-004 / P-008	Poor	Damaged, weathered	Highland - East Side, North of Belgrave (School Front)
23	No Stopping, No Parking School Days	RB-57 / RB-52	? / P-008	Fair/Good	Weathered	Highland - East Side, North of Belgrave (School Front)
24	No Stopping, Do Not Block Intersection	RB-57 / ?	? / R-106	Good/Fair	Weathered	Highland @ Handsworth - SE Corner
25	No Stopping to Corner	RB-55	P-058	Fair	Weathered	Handsworth - South Side
26	No Stopping to Corner	RB-55	P-058	Good		Handsworth - North Side
27	Stop Sign and Stop Bar	RA-1	R-001	Good		Handsworth @ Highland - NE Corner
28	No Stopping to Corner	RB-55	P-058	Fair		Handsworth @ Parliament - East of Parl
29	No Stopping to Corner	RB-55	P-058	Good		Handsworth @ Parliament - West of Parl
30	No Stopping to Corner	RB-55	P-058	Food		Parliament @ Handsworth - East Side
31	Stop Sign, No Stop Bar	RA-1	R-001	Good		Parliament @ Handsworth - NE Corner
32	No Stop Control	NA	NA	Poor		Parliament @ Canterbury
33	Stop Sign, No Stop Bar	RA-1	R-001	Good		Canterbury @ Tudor - NW Corner
34	Stop Sign, No Stop Bar	RA-1	R-001	Good		Canterbury @ Tudor - SE Corner
35	No Crosswalk	NA	NA	Poor		Canterbury @ Tudor
36	Stop Sign, No Stop Bar	RA-1	R-001	Good		Canterbury @ Handsworth - SE Corner
37	School Zone Signage, Reduced Speed	NOT TAC	PS-001/PS-001-Ta	Good		Handsworth - North Side, West of Rialto
38	Stop Sign, No Stop Bar	RA-1	R-001	Good		Rialto @ Handsworth - NW Corner
39	No Crosswalk	NA	NA	Poor		Rialto @ Handsworth - North Leg
40	Pedestrian Crossing Warning Sign	WC-2R	PS-002	Good		Lions - East Side
41	No Stop Control or R.O.W Indication	NA	NA	Poor		Belgrave @ Lions @ Cheviot
42	No Stop Control or R.O.W Indication	NA	NA	Poor		Derby @ Belgrave
43	No Stopping to Corner	RB-55	P-058	Fair		Belgrave @ Highlands - NW Corner
44	Yellow Painted Curbs	NA	NA	Good		Lions - East and West Side - N and S of Pathway
45	Pedestrian Crossing Warning Sign	WC-2R	PS-002	Good		Lions - West Side
46	No Stop Control or R.O.W Indication	NA	NA	Poor		Lions @ Belvedere
47	No Stop Control or R.O.W Indication	NA	NA	Poor		Lions @ Belvista
48	Single Curve Warning Sign, Speed Advisory	WA-3R / WA-7S	W-001-R / W-022	Fair		Belvista - South Side
49	Single Curve Warning Sign, Speed Advisory	WA-3R / WA-7S	W-001-R / W-022	Fair		Belvedere - South Side

## Canyon Heights Elementary School Study

50	Stop Sign, No Stop Bar	R-001	R-001	Fair	Good condition, Vegetation Obstruction	Belvedere @ Highland - SW Corner
51	Translink Bus Stop	NA	NA	Good		Highland - South of Belvedere, West Side
52	No Stopping, Bus Stop	RB-60	NA	Good	Unwarranted - driveway proximity	Highland - South of Belvedere, West Side
53	Stop Sign, No Stop Bar	RA-1	R-001	Good	Obstructed by Vegetation	Belvista @ Highland - SW Corner
54	School Zone Signage, Reduced Speed	NOT TAC	PS-001/PS-001-Ta	Good	Slightly Obstructed by Vegetation	Highland - South of Belvista, West Side
55	School Crossing Warning Sign	WC-16L	PS-004	Poor	Dirty, does not stand out	Highland - South of Belvista, West Side
56	No Stopping, Bus Stop, No Parking Drop off/Pick Up Zone, Paint on Curb	RB-60 / RB-52 / ? / NA	? / P-008/? / NA	Fair	Slightly damaged, dirty	Highland - West Side, in front of School
57	Translink Bus Stop	NA	NA	Good		Highland - East Side, in front of School
58	Single Curve Warning Sign, Speed Advisory	WA-3R / WA-7S	W-001-R / W-022	Fair	Slightly Obstructed by Vegetation	Belvedere - North Side
59	Stop Ahead	WB-1	W-011	Good		Belvedere - North Side before Mapleridge
60	Stop Sign and Stop Bar, All approaches, Suppl. 3 Way Tab	RA-1	R-001 / R-001-Ta	Good		Belvedere @ Mapleridge
61	Single Curve Warning Sign, Speed Advisory	WA-3L / WA-7S	W-001-L / W-022	Good		Belvedere - South Side, before Mapleridge
62	Stop Ahead	WB-1	W-011	Good		Mapleridge - West Side, North of Belvedere
63	Stop Sign, No Stop Bar	RA-1	R-001	Good		Mapleridge @ Montroyal
64	No Parking X2	RB-52	P-008	Good		Montroyal - South Side, East of Mapleridge
65	Stop Sign, No Stop Bar	RA-1	R-001	Good		Shirley @ Montroyal
66	No Stopping to Corner	RB-55	P-058	Good		Montroyal - North Side, West of Shirley
67	Stop Sign, No Stop Bar	RA-1	R-001	Good		Cedarcrest @ Montroyal - North Leg
68	No Stopping to Corner	RB-55	P-058	Good		Montroyal - South Side, East of Highland
69	Translink Bus Stop	NA	NA	Good		Montroyal - North Side, East of Cedarcrest
70	Stop Sign, No Stop Bar	RA-1	R-001	Good		Cedarcrest @ Montroyal - South Leg
71	No Stop Control or R.O.W Indication	NA	NA	Poor		Cedarcrest @ Belvedere
72	No Stop Control or R.O.W Indication	NA	NA	Poor		Rialto @ Marineview
73	No Stop Control or R.O.W Indication	NA	NA	Poor		Crystal @ Marineview
74	Stop Sign, No Stop Bar	RA-1	R-001	Good		Marineview @ Montroyal
75	No Parking x3	RB-52	P-008	Good		Montroyal - Cedarcrest to Highland
76	No Stopping x3	RB-55	P-058	Good		Highland - West Side to Bus Stop
77	Translink Bus Stop	NA	NA	Good		Highland - West Side, North of Belvedere
78	Translink Bus Stop, No Stopping	NA / RB-55	NA / P-058	Good		Highland - East Side, North of Belvedere
79	No Parking	RB-52	P-008	Good		Highland - West Side, North of Belvedere
80	No Stopping, Bus Stop	RB-60	NA	Good		Highland - West Side, North of Belvedere
81	Stop Sign, No Stop Bar	RA-1	R-001	Good		Belvedere @ Highland - NE Corner
82	Single Curve Warning Sign, Speed Advisory	WA-3L / WA-7S	W-001-L / W-022	Good	Slightly Obstructed by Vegetation	Montroyal - East of Marineview, South side
83	Translink Bus Stop x2	NA	NA	Good		Montroyal - East of Marineview, South and North Sides
84	No Parking to Corner	RB-55	P-058	Good		Ranger @ Montroyal - East Side
85	Stop Sign and Stop Bar	RA-1	R-001	Good		Ranger @ Montroyal - NW Corner
86	No Parking to Corner	RB-55	P-058	Good		Montroyal - South Side, East of Ranger
87	Stop Sign and Stop Bar	RA-1	R-001	Good		Ranger @ Montroyal - SE Corner
88	No Parking to Corner	RB-55	P-058	Good		Montroyal - North Side, East of Ranger
89	Stop Sign, No Stop Bar	RA-1	R-001	Good		Sylvan @ Rnager - NE Corner
90	Stop Sign, No Stop Bar	RA-1	R-001	Good		Crystal @ Ranger - NE Corner
91	Stop Sign, No Stop Bar	RA-1	R-001	Good		Crystal @ Ranger - SW Corner
92	Stop Sign, No Stop Bar	RA-1	R-001	Good		Winona @ Ranger - NE Corner
93	Stop Sign, No Stop Bar	RA-1	R-001	Good		Handsworth @ Ranger - NE Corner
94	Stop Sign, No Stop Bar	RA-1	R-001	Good		Handsworth @ Ranger - SW Corner
95	Stop Sign, No Stop Bar	RA-1	R-001	Good		Ruskin @ Ranger - SW Corner
96	Stop Sign, No Stop Bar	RA-1	R-001	Good		Edgewood @ Ranger - NE Corner
97	Stop Sign, No Stop Bar	RA-1	R-001	Good		Ruskin @ Handsworth - SE Corner

# **APPENDIX C**

## **MMM Group Traffic Volume Survey Summary**

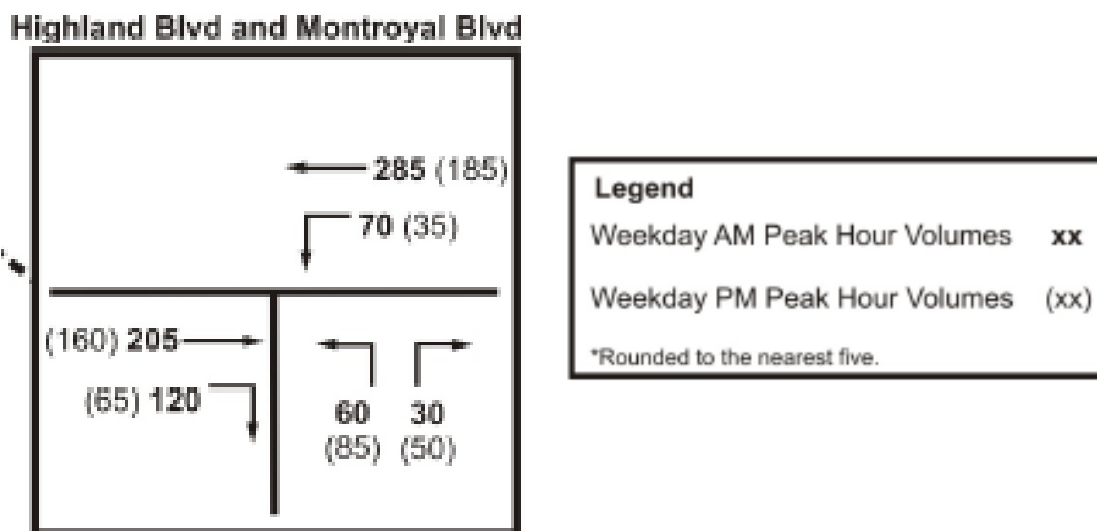


## MMM Group study and local volumes

MMM Group Limited (MMM Group) produced a Traffic Management Strategy (TMS) for the Capilano Water Main Project for Metro Vancouver. In the report, traffic counts were provided for various intersections effected by the project. Traffic counts were conducted in AM and PM peaks at the Highland Boulevard and Montroyal Boulevard intersection within the Canyon Heights catchment. MMM Groups’ counts are shown below.

**Table D.1: MMM Group Traffic Counts - Highland Boulevard at Montroyal Boulevard**

Highland Boulevard @ Montroyal Boulevard							
Movement							
Time	1 EBT	2 EBR	3 WBL	4 WBT	5 NBL	6 NBR	Whole Intersection
AM	205	120	70	285	60	30	770
PM	160	65	35	185	85	50	580



**Figure D.1: Snapshot of Existing AM and PM volumes – 2015 MMM Group report**

The report found approximately 190 vehicles heading southbound past the school entrance in the AM peak (report peak recorded between 7AM and 9AM) and 90 vehicles headed north. The report’s PM peak (between 4PM and 6PM) does not correspond to school dismissal time, but shows approximately 90 vehicles proceeding southbound during that peak time and 135 vehicles proceeding north. Both of these sets of figures, despite not an exact match of school peak times, demonstrate between 1.5 and 3.2 vehicles per minute in each direction.

Opus traffic counts for the morning period were similar to those taken by MMM Group for their TMS; however, the PM counts taken by Opus were higher than those taken by MMM Group. There were 100 more vehicles counted for the PM period. Some of the discrepancy may be due to the difference in data collection timeframe.



# **APPENDIX D**

## Concept-level Estimate Sources



## Canyon Heights Elementary School Study

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### Assumptions

Landscaping and demolition costs are not included.

Description of Work	Cost	Unit	Source
Temporary Curb Stops (m)	\$25.00	m	<a href="https://www.trafficsafetystore.com/parking-blocks/recycled-rubber">https://www.trafficsafetystore.com/parking-blocks/recycled-rubber</a>
Pavement Markings (Stop Bar)	\$175.00	each	<a href="http://www.transportation.alberta.ca/Content/docType257/Production/UnitPriceList.pdf">http://www.transportation.alberta.ca/Content/docType257/Production/UnitPriceList.pdf</a>
Signs (each)	\$175.00	each	DNV
School Crossing and Signage (each)	\$800.00	each	Assume 15m crosswalks + 2 signs
1. Crosswalk	\$30.00	m	Fineline
2. Crosswalk Signage	\$175.00	each	DNV
Concrete curbs (m)	\$150.00	m	<a href="http://www.transportation.alberta.ca/Content/docType257/Production/UnitPriceList.pdf">http://www.transportation.alberta.ca/Content/docType257/Production/UnitPriceList.pdf</a>
Concrete sidewalk (m)	\$250.00	m	DNV
Curb Let Downs	\$1,200.00	each	Quote for other project
Pavement Markings (Longitudinal)	\$2.00	m	<a href="http://www.transportation.alberta.ca/Content/docType257/Production/UnitPriceList.pdf">http://www.transportation.alberta.ca/Content/docType257/Production/UnitPriceList.pdf</a>
Pavement Markings (Gore)	\$1,000.00	each	<a href="http://www.transportation.alberta.ca/Content/docType257/Production/UnitPriceList.pdf">http://www.transportation.alberta.ca/Content/docType257/Production/UnitPriceList.pdf</a>
Pavement Markings (Median)	\$13.00	m	Fineline
Coloured Paint (Sidewalk/Bike Lane)	\$125.00	m2	Fineline
Move Catchbasin	\$3,000.00	each	Opus File System
Clear Vegetation (m2)	\$80.00	m2	Chesterfield proposal - cost to trim each tree - Assumed 1 m2 = 1 tree
Pavement Markings (arrows)	\$200.00	each	Fineline
Raised Crosswalk (asphalt)	\$5,000.00	each	DNV
Bollards	\$200.00	each	<a href="http://www.reliance-foundry.com/bollard/all-bollards">www.reliance-foundry.com/bollard/all-bollards</a>
Gravel Sidewalk (m2)	\$40.00	m2	Duncan Paving Quote for installing sub base
Stairs (m)		m	
Handrail	\$111.00	m	Quote from Simplified Building
Relocate Existing Signs	\$125.00	each	Assume approximately 70-75% of supply and install cost

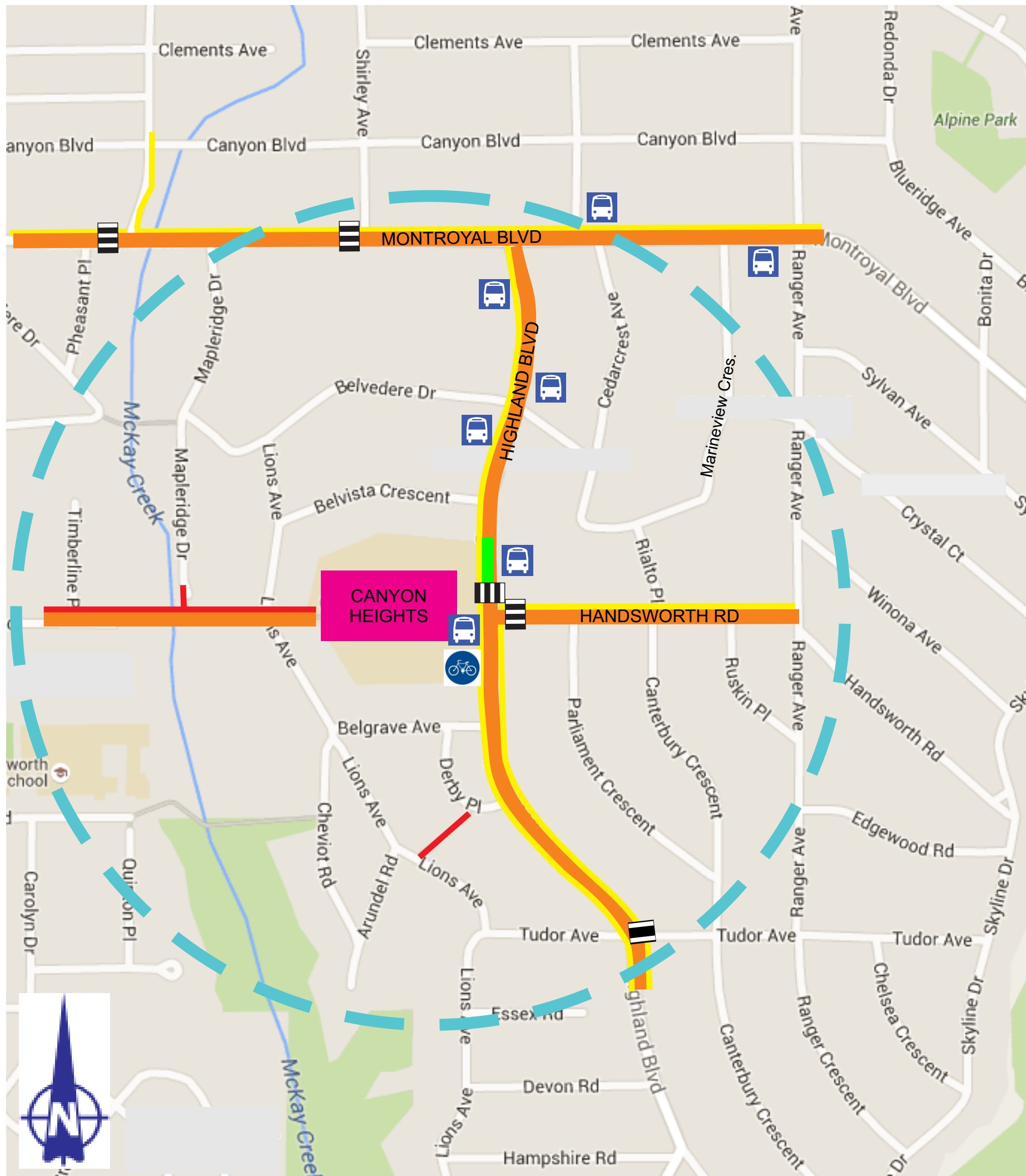
# **APPENDIX E**

## **Safe-Routes-to-School Map**





# Canyon Heights Elementary School Safe Routes to School Map



## Legend - Canyon Heights Elementary School

	<b>Best Walking Routes</b>		<b>Drop off/Pick up</b>		<b>Sidewalk</b>
	<b>5 Minute Walk Radius</b>		<b>Bus Stop</b>		<b>Trail</b>
	<b>Pedestrian Crosswalk</b>		<b>Bicycle Parking</b>		



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