VALLEY GEOTECHNICAL
ENGINEERING SERVICES LTD.

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December 16, 2011 Project 43451-06

van der Zalm & associates inc.
#1, 8938 – 192nd Street
Surrey, BC V4N 3W8

Attention: Mark van der Zalm, csla, bcsla, oala, asla
Regarding: Mackin Park Renovation
1046 Brunette Ave, Coquitlam

Valley Geotechnical Engineering Services Ltd. (Valley Geo) has been retained by van der Zalm & associates inc. to conduct a site investigation and provide geotechnical recommendations for the proposed renovations to Mackin Park in Coquitlam, BC. This report summarizes the soil and groundwater conditions and the presents our recommendations pertinent to the construction of the proposed splash pads, skate park, plaza stage, and a concession building.

1.0 SITE DESCRIPTION

Mackin Park is located at 1046 Brunette Avenue in Coquitlam BC. The park is bounded by Brunette Avenue to the north, King Edward Street to the east, Lougheed Highway to the south and Nelson Street to the west. Entrance to the park is from Nelson Street and King Edwards Street. The park consists of several baseball diamonds, soccer fields to the south, tennis courts at the north east, and a wading pool at the northwest. The overall gradient of the site is approximately 9%, and slopes down from north to south. Elevations of the site range from 18m to 8m over a horizontal distance of 110m.

2.0 PROPOSED DEVELOPMENT

It is proposed to renovate the existing northern portion of Mackin Park. The renovations will include removal of the existing wading pool and several park amenities, construction of new splash pads, skate park, new playground, and concession building. A conceptual plan of the proposed renovation is attached in Figure 1.

3.0 SOIL AND GROUND WATER CONDITIONS

According to the published Geological Survey of Canada Map 1484A, the native subsurface soil is Vashon Drift and Capiliano Sediments; Glacial drift including: lodgment and minor flow till, lenses and interbeds of substratified glaciofluvial sand to gravel, and lenses and interbeds of glacio-lacustrine laminated stony silt; up to 25m thick but in places less than 8m thick.

Valley Geo carried out an investigation using a drill rig on November 18, 2011. Eight auger holes (AH1 to AH8) were put down to a depth up to 3.3m throughout the northern portion of the park (except the northeast corner of the site).

Soil stratigraphy generally consists of loose dark brown organic silt mixed with gravel fill up 1.5m thick, underlain by very dense native grey silty sand and gravel, with DCPT values of more than 90 blows per 300mm of penetration. Ground water wass observed to perch above the dense grey silty sand and gravel. In AH6 & AH8, 2.5m of fill was encountered.

AH6 and AH8 where drilled in ground outside the proposed construction/renovation area where additional previous fill was placed to raise the grade.

Auger hole logs and a location plan of the auger holes are presented in Appendix A.

4.0 SEISMIC CONSIDERATIONS

In accordance with British Columbia Building Code (2006) and based upon the soils conditions encountered at the site, the Site Class is C. Data provided by Earthquakes Canada indicates this site would be subject to a Peak Ground Acceleration of 0.480g and seismic hazard values of Sa(0.2)=0.968 and Sa(1.0)=0.325 during a 1 in 2475 design earthquake.

The dense silty sand and gravel encountered at the site is considered non-liquefiable.

5.0 Slope Stability

The overall slope gradient at the site is approximately 9%. Slope stability is not a concern due to its relatively gentle gradient.

6.0 RECOMMENDATIONS

The following subsection provides recommendations for construction of the propose renovations to Mackin Park. Provided the recommendations are followed, the site may be used safely for its intended purpose. The renovations will have no detrimental effects to the surrounding properties.

6.1 Site Preparation

The fill at the site is loose consists of organics and is not suitable for support of structures. The loose organic fill should be removed from the proposed structures/building areas and replaced with structural fill up to the underside of foundations. Structural fill should be granular material compacted in lifts of not more than 200mm to 100% Standard Proctor Maximum Dry Density (SPMDD).

6.2 Excavation

For worker's safety, all excavations must conform to Worksafe BC excavation regulations which can be found in Part 20 from Section 20.78 to 20.95 of the Occupational Health and Safety Regulation posted on the website of Worksafe BC. Excavations deeper than 1.2m must be carried out in accordance with the instruction of a Geotechnical Professional Engineer and approved by the Engineer prior to workers entering the excavations.

All trench excavations must be backfilled with structural fill, and should not be left open overnight. Dewatering of trenches may be achieved using sumps equipped with pumps.

6.3 Foundations

Foundations for splash pads, skate park, plaza stage, and concession building may be designed to base on native undisturbed till or on structural fill placed over native subgrade approved by Valley Geo. The following geotechnical design parameters that may be used for footings and foundations design:

Ultimate Limit State (ULS)	144kPa (3000psf)
Serviceability Limit State (SLS)	96kPa (2000psf)
Site class	C
Peak ground acceleration (PGA)	0.480 (1:2475 year)

Spread and strip footings should have minimum width of 0.9m and 0.6m, respectively. A minimum soil cover of 450mm should be provided.

It us our understanding that a standard pre-cast 1.2m deep pyramid concrete footing will be used for each of the lamp posts around the park.

6.4 Concession Building Floor Slabs

A 150mm thick layer 19mm (road mulch) gravel compacted to 100% SPMDD should be placed immediately below the slab over approved sub-grade. A vapor barrier below the slab is recommended. Slabs should be suitably reinforced and should incorporate adequate control joints to minimize crack development.

6.5 Drainage

Roof run-off should be connected to a sediment sump, and then to the storm water deposal system.

Landscape grade should be sloped at a minimum gradient of 1.5% and shed water away from structures/building.

6.6 Pathway Recommendations

It is assumed that pathway structures will be designed to accommodate maintenance vehicles. Pathways should be excavated to accommodate the combined thickness of paving stone/asphaltic concrete, base and sub-base recommended below. The exposed sub-grade should be approved by Valley Geo prior to gravel placement. Over-excavation and replacement with structural fill may be required if deteriorated soil conditions are encountered at sub-grade level. The following pathway section is recommended:

- minimum of 150mm of 75mm minus pit run gravel sub-base
- 100mm of 19mm minus road mulch gravel base course and
- 50mm of asphaltic concrete compacted to 97% Marshall density or paving stones

7.0 CLOSURE

We trust that this report provides you with information required. If you have any questions, please do not hesitate to call.

Regards,
Prepared by:

Roberto Avendaño, Dipl.T.
Geotechnical Engineering Technologist

Reviewed by:

Dec. 16/2011

Patrick Chiu, P.Eng.
Senior Geotechnical Engineer

Attachments:
Figure 1: Conceptual Plan
Appendix A: Auger Hole Location Plan and Auger Hole Logs

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Figure

Concept Site Plan

1. Parterre Garden - located at park entries and nodes
2. Grande Arrival - formal drop-off for families and plaza gathering space
3. Concession Building - for washrooms, public use and storage
4. Tennis courts - to remain as is, with upgraded gate entry and gardens
5. Rain Garden - to infiltrate splash park water and site storm water as an amenity
6. Splash Park - centrally located near washrooms, and family amenities
7. Playground area - to make use of grade changes and incorporate some playscape elements along the riparian area
8. Plaza stage - centrally located for large crowd gatherings and community use
9. Skate Park - carefully nestled between the Brunette Avenue entrance and parking area

Mackin Park Renovation

Coquitlam

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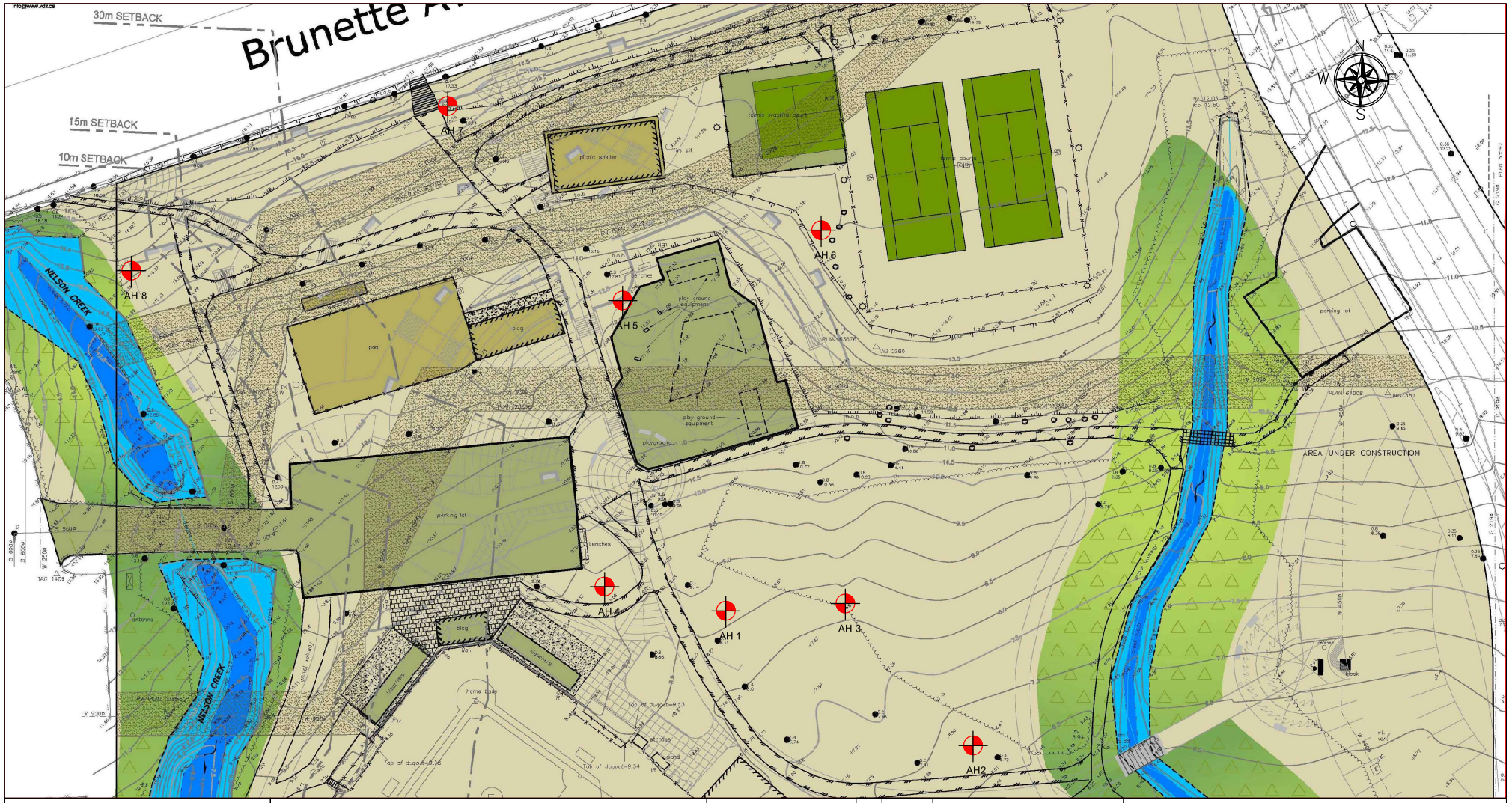
Appendix A:



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Client: Van der Zalm + Associates Inc.

Location: Mackin Park
Coquitlam, BC

FILE No.	DATE
43451-06	November 25, 2011

SEAL

REV.	DATE	DESCRIPTION

Auger Hole Loaction Plan

Base Drawing By Van der Zalm

DRAWN:	RA	Figure No.
CHECKED:	TL	1
SCALE:	1:500	

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AUGER HOLE #1

MOISTURE CONTENT (%)	BLOWS (DCPT) PER FOOT	SAMPLE TYPE	DEPTH (m)	DEPTH (ft)	WATER LEVEL			Remarks
	1			0	▽	OH	BLACK/BROWN ORGANIC SILT with gravel (wet)(loose)(roots)[FILL]	
23%	7	☒						
	3							
44%	3	☒	1	5				
	43					GC	GREY SILTY SAND AND GRAVEL (very dense) (moist)	
	90		2					
10%		☒	3	10				
			4	15				
			5					
			6	20				
			7	25				
			8					
			9	30				
			10	35				
			11					
				40				

NOTE:
- End of Drill Hole at 3m
-Groundwater was note observed
-Following completion of logging, the drill hole was backfilled with the extracted soils, and bentonite chips
-Auger Hole 1 was completed on November 18, 2011 by track mounted drill rig provided by Uniwide Drilling

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AUGER HOLE #2

MOISTURE CONTENT (%)	BLOWS (DCPT) PER FOOT	SAMPLE TYPE	DEPTH (m)	DEPTH (ft)	WATER LEVEL			Remarks
	7		0			OH	BLACK/BROWN ORGANIC SILT with gravel (wet)(loose)(roots)[FILL]	
49%	11							
	1							
	1		1			GC	BROWN SILTY SAND AND GRAVEL (wet) (loose)	
	18			5				
	100					GC	GREY SILTY SAND AND GRAVEL (very dense) (moist)	
11%			2					
			3	10				
			4					
				15				
			5					
			6	20				
			7					
				25				
			8					
			9	30				
			10					
				35				
			11					
				40				

NOTE:
- End of Drill Hole at 3m
-Groundwater was observed perched above the dense sand and gravel layer
-Following completion of logging, the drill hole was backfilled with the extracted soils, and bentonite chips
-Auger Hole 1 was completed on November 18, 2011 by track mounted drill rig provided by Uniwide Drilling

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AUGER HOLE #3

MOISTURE CONTENT (%)	BLOWS (DCPT) PER FOOT	SAMPLE TYPE	DEPTH (m)	DEPTH (ft)	WATER LEVEL			Remarks
49%			0			OH	BLACK/BROWN ORGANIC SILT with gravel (wet)(loose)(roots)[FILL]	
			1	5		GC	GREY SILTY SAND AND GRAVEL (very dense) (moist)	
7%			2					
			3	10				
			4	15				
			5					
			6	20				
			7	25				
			8					
			9	30				
			10	35				
			11					
				40				

NOTE:
- End of Drill Hole at 3m
-Groundwater was note observed
-Following completion of logging, the drill hole was backfilled with the extracted soils, and bentonite chips
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AUGER HOLE #4

MOISTURE CONTENT (%)	BLOWS (DCPT) PER FOOT	SAMPLE TYPE	DEPTH (m)	DEPTH (ft)	WATER LEVEL			Remarks
30%			0	0		OH	BLACK/BROWN ORGANIC SILT with gravel (wet)(loose)(roots)[FILL]	
			1	5		GC	GREY SILTY SAND AND GRAVEL (very dense) (moist)	
			2					
			3	10				
			4	15				
			5					
			6	20				
			7	25				
			8					
			9	30				
			10	35				
			11					
				40				

NOTE:
- End of Drill Hole at 3m
-Groundwater was note observed
-Following completion of logging, the drill hole was backfilled with the extracted soils, and bentonite chips
-Auger Hole 1 was completed on November 18, 2011 by track mounted drill rig provided by Uniwide Drilling

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AUGER HOLE #5

MOISTURE CONTENT (%)	BLOWS (DCPT) PER FOOT	SAMPLE TYPE	DEPTH (m)	DEPTH (ft)	WATER LEVEL			Remarks
14			0			OH	BLACK/BROWN ORGANIC SILT with gravel (wet)(loose)(roots)[FILL]	
15						GC	GREY SILTY SAND AND GRAVEL (very dense) (moist)	
100			1	5				
			2					
			3	10				
			4					
				15				
			5					
			6	20				
			7					
				25				
			8					
			9	30				
			10					
				35				
			11					
				40				

NOTE:
- End of Drill Hole at 2m
-Groundwater was note observed
-Following completion of logging, the drill hole was backfilled with the extracted soils, and bentonite chips
-Auger Hole 1 was completed on November 18, 2011 by track mounted drill rig provided by Uniwide Drilling

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AUGER HOLE #6

MOISTURE CONTENT (%)	BLOWS (DCPT) PER FOOT	SAMPLE TYPE	DEPTH (m)	DEPTH (ft) WATER LEVEL			Remarks
	5		0		OH	BLACK/BROWN ORGANIC SILT with gravel (wet)(loose)(roots)[FILL]	
	10						
	16						
12%	6	⊠	1	5			
	13						
	15		2				
	1						
53%	1	⊠					
	1						
	95		3	10	GC	GREY SILTY SAND AND GRAVEL (very dense) (moist)	
			4				
				15			
			5				
			6	20			
			7				
				25			
			8				
			9	30			
			10				
				35			
			11				
				40			

NOTE:
- End of Drill Hole at 3.2m
-Groundwater was note observed
-Following completion of logging, the drill hole was backfilled with the extracted soils, and bentonite chips
-Auger Hole 1 was completed on November 18, 2011 by track mounted drill rig provided by Uniwide Drilling

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AUGER HOLE #7

MOISTURE CONTENT (%)	BLOWS (DCPT) PER FOOT	SAMPLE TYPE	DEPTH (m)	DEPTH (ft)	WATER LEVEL			Remarks
5			0			OH	BLACK/BROWN ORGANIC SILT with gravel (wet)(loose)(roots)[FILL]	
6								
8								
21			1	5		GC	GREY SILTY SAND AND GRAVEL (very dense) (moist)	
98			2					
			3	10				
			4					
				15				
			5					
			6	20				
			7					
				25				
			8					
			9	30				
			10					
				35				
			11					
				40				

NOTE:
- End of Drill Hole at 1.5m
-Groundwater was note observed
-Following completion of logging, the drill hole was backfilled with the extracted soils, and bentonite chips
-Auger Hole 1 was completed on November 18, 2011 by track mounted drill rig provided by Uniwide Drilling

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AUGER HOLE #8

MOISTURE CONTENT (%)	BLOWS (DCPT) PER FOOT	SAMPLE TYPE	DEPTH (m)	DEPTH (ft) WATER LEVEL			Remarks
13%			0		OH	BLACK/BROWN ORGANIC SILT with gravel (wet)(loose)(roots)[FILL]	
			1	5	GC	BROWN SANDY SILT AND GRAVEL (wet)(loose)[FILL]	
			2				
11%			3	10	GC	GREY SILTY SAND AND GRAVEL (very dense) (moist)	
			4				
				15			
			5				
			6	20			
			7				
				25			
			8				
			9	30			
			10				
				35			
			11				
				40			

NOTE:
- End of Drill Hole at 3.5m
-Groundwater was note observed
-Following completion of logging, the drill hole was backfilled with the extracted soils, and bentonite chips
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