



**Errington Community Park
– Sports Court
Geotechnical Assessment**

October 9, 2024

Submitted to: Regional District of Nanaimo
Prepared by McElhanney

Contact

Liesl Dykeman, P. Eng.
Project Manager
778-674-0463
ldykeman@mcelhanney.com

Address

1 – 1351 Estevan Road,
Nanaimo BC Canada
V9S 3Y3

Our file: 2231-12543-01

Your Challenge. Our Passion.



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1. Introduction

McElhanney Ltd. (McElhanney) has prepared this geotechnical assessment which summarizes our findings and recommendations for the proposed sports court project (the Project) at Errington Community Park, located at 1550 Veterans Road, Errington, BC. The proposed sports court will be approximately 70 m by 27 m in dimension and will comprise of granular base underlying an asphalt surface. McElhanney has been retained to complete a subsurface investigation, and provide geotechnical recommendations and comments to support the design and construction of the sports court.

This report was completed in accordance with the McElhanney proposal titled *Errington Community Park – Sports Court Geotechnical Design Services* dated May 1, 2024. Written approval to proceed was provided by the Regional District of Nanaimo (the RDN) via email on May 9, 2024.

2. Background

The Project site is currently owned and operated by the RDN and is in use as a developed community park with a playground, grass field, small stage, shed, and farmers market stand area. The RDN has proposed to construct a paved sports court at the park on the existing grassed field.

The grass field is relatively level in topography and is approximately 80 m by 80 m in size. During the construction of the existing playground, soft clayey/silty soils were encountered between 0.2 m to 1.0 m depths, as documented by RDN staff.

2.1. DESKTOP REVIEW

The following background information was reviewed when preparing this report:

- British Columbia Groundwater Wells and Aquifers records.¹
- Bednarski J. M. (2015). 'Surficial geology, Horne Lake - Parksville, British Columbia,' Geological Survey of Canada, Open File 7681.

Local well data indicated shallow shale bedrock at 2.7 to 3.5 m depth overlain by either sands and gravels or silts and clays.

¹ URL: https://apps.nrs.gov.bc.ca/gwells/?map_centre=49.287191,-124.370217&map_zoom=15 Well IDs: 52580, 96317

2.2. GEOLOGICAL SETTING

Geological mapping indicated that the site consists of Marine Veneer (variously bouldery gravel, sand, silt and clay; usually derived by underlying Vashon drift; generally less than 1 m thick and discontinuous) underlain by Till Blanket (>2 m thick continuous diamicton cover, locally obscures underlying bedrock relief) (Bednarski, 2015).

3. Field Investigation

3.1. GEOTECHNICAL SUBSURFACE INVESTIGATION

The geotechnical field investigation was conducted on June 4, 2024, and involved the advancement of four (4) boreholes (BH24-01 to BH24-04).

A BC 1 Call was submitted before any field work took place to determine the general presence of buried utilities at the project site. Following the BC 1 Call and prior to drilling activities, a private utility locator was contracted to confirm locations of buried utilities and to clear the proposed borehole locations.

McElhanney personnel logged and photographed subsurface and groundwater conditions observed in the field throughout the drilling process. These boreholes were advanced to a maximum depth of 2.6 meters below ground surface (mbgs) using a 11 cm diameter solid stem auger. Standard Penetration Testing (SPT) was conducted in each borehole location. Detailed borehole logs can be found in **Appendix A**, and the borehole location plan **Appendix B**.

Table 1: Summary of Borehole Conditions

SOIL GROUP	DEPTH (mbgs)	OBSERVED THICKNESS (m)	DESCRIPTION
Topsoil	0	0.2 to 0.5	Topsoil
Loose Sand	0.1 to 0.2	0 to 1.0	Sand (SM-SW), silty, loose
Soft Silt / Clay	0.2 to 0.5	0 to 1.7	SILT (ML) or CLAY (CL), soft to firm, brown
Hard Silt	1.0	0.6	SILT (ML), trace fine gravel, hard, brown [inferred till]
Compact Sand	0.6 to 2.0	0.3 to 1.0	SAND (SW/SM), silty or gravelly, compact to very dense, light brown
Inferred Bedrock	1.1 to 2.6	Unknown Thickness	Inferred Sandstone Bedrock

Notes:

1. Refer to the attached borehole logs for a detailed description of subsurface soil and groundwater conditions.
2. The depth of the boreholes and groundwater levels below ground surface measurements are approximate.



3.2. GROUNDWATER

Groundwater information was collected during the drilling investigation through soil observations and by using a water level meter in the borehole during and after drilling. Depths ranged from 1.1 to 2.6 mbgs which were encountered immediately following drilling.

Groundwater depths are displayed graphically on the borehole logs in **Appendix A**.

3.3. LABORATORY TESTING

Soil samples were collected, labelled, and sealed in appropriate containers during the drilling investigation. These samples were sent to McElhanney's materials testing laboratory for further to complete moisture testing (ASTM D 2216). Clays ranged from 34-37% moisture, silts were around 14-22%, and sands were in the range of 11-18%.

Detailed laboratory analysis results are provided in **Appendix C** of this report.

4. Discussion and Recommendations

4.1. GENERAL

The geotechnical recommendations provided in this report are based on our understanding of the proposed development concept provided by the client and the site conditions as described in preceding sections. It is recommended that once the development plan/design has been completed, McElhanney should be consulted to provide input into the detailed design.

Based on our project understanding and the findings of this geotechnical assessment, the subject site is considered suitable for the proposed new sports project from a geotechnical perspective with consideration of the recommendations and discussion provided in this report.

The following sections provide discussions and recommendations as input for planning and design based on the current project understanding.

4.2. EARTHWORKS

4.2.1. Subgrade Preparation

Approved subgrade materials include Compact Sand or Hard Silt as referenced in **Table 1**. If organic, loose or soft soils are encountered within the development area, it is recommended that these materials are sub-excavated and replaced with engineered fill. Removal depths are anticipated to be in the order of 0.6 to 1.0 m, however conditions may vary across the site.

Soft, fine-grained soils are not suitable for subgrade materials due to poor ability to conduct water and susceptibility to significant settlements. Materials containing organic matter are also not suitable due to the tendency of organics to breakdown overtime causing voids in the subgrade.



4.2.2. Engineered Fill Specifications

For base support placed below the underside of asphalt, a minimum of 150 mm thick free draining Granular Base with specifications meeting the gradation provided in **Table 2** should be provided. The base course should be compacted to 95% Modified Proctor Maximum Dry Density (MPMDD). The geotechnical engineer should be provided an opportunity to review the gravel specifications during the detailed design.

Upon review of *Bylaw No. 500. Regional District of Nanaimo. Land Use and Subdivision Bylaw No. 500, 1987*, no specification for granular base was found. The gradation specification for Granular Base from the Master Municipal Construction Documents (MMCD, 2019), is therefore considered appropriate in this application as displayed in **Table 2**.

Table 2: Granular Base Gradation (MMCD 2019, Section 31 05 17, Table 2.10)

SIEVE SIZE (MM)	GRANULAR BASE
19	100
12.5	75 – 100
9.5	60 – 90
4.75	40 – 70
2.36	27 – 55
1.18	16 – 42
0.600	8 – 30
0.300	5 – 20
0.075	2 – 8

An appropriate Sub-base to the Granular Base material may be used, given the material is compacted to 95% MPMDD and meets the gradation provided in **Table 3**.

Table 3: Crushed Granular Sub-Base Gradation (MMCD 2019, Section 31 05 17, Table 2.9.1)

SIEVE SIZE (MM)	CRUSHED GRANULAR SUB-BASE
75	100
38	60 – 100
19	35 – 80
9.5	26 – 60
4.75	20 – 40
2.36	15 – 30
1.18	10 – 20
0.600	5 – 15
0.300	3 – 10
0.075	0 – 5

4.3. DRAINAGE

The shallow natural soil conditions encountered during the investigation included silt and clay soils. These soil types typically have a low permeability. Drainage design should consider that infiltration into the natural subgrade adjacent to the court will be minimal. A civil engineer should be consulted to review the drainage design of the sports court.

Groundwater depths can vary seasonally. If groundwater is encountered during excavation, effort to remove water should be made prior to the placement of any fills. The geotechnical engineer should be retained to review the subgrade conditions prior to fill placement.

4.4. CONSTRUCTION REVIEWS

The Geotechnical Engineer should be retained to carry out sufficient field reviews during construction to ensure that the recommendations contained within this report have been adequately communicated to the design team and the construction contractors undertaking the work.

It is the contractor's responsibility to advise the geotechnical engineer (a minimum of 48 hours in advance) that a field review is required. Geotechnical field reviews are typically required at the time of the following:

1. Stripping – Review of subgrade prior to any fill placement.
2. Excavation – Review of excavation.



3. Engineered fill – Review of any engineered fill and fill slopes to raise grades.
4. Backfill – Review of any backfill.

The RDN should provide this document to the construction contractor in advance of any work being carried out, so they become familiarized with the sensitive aspects of the works proposed. It is the responsibility for the developer to notify the geotechnical engineer when conditions or situations not outlined in this document are encountered.



5. Closure

The attached Statement of Limitations for Geotechnical Services is provided in **Appendix D**, apply to this report, and are hereby incorporated herein.

We trust this geotechnical assessment information is sufficient for your present needs. Should you have any questions or require additional information, please do not hesitate to contact the undersigned.

Sincerely,
McElhanney Ltd.

Prepared by:

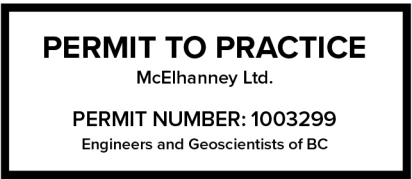
Reviewed by:



Liesl Dykeman, P.Eng.
Geotechnical Engineer
ldykeman@mcelhanney.com

Tim Schaap, P.Eng.
Geotechnical Engineer
tschaap@mcelhanney.com

Date	Status	Revision	Author/ Reviewer
July 4, 2024	DRAFT	0	L. Dykeman T. Schaap
October 9, 2024	FINAL	1	L. Dykeman T. Schaap



APPENDIX A

Borehole Logs


CLIENT:	Regional District of Nanaimo	PROJECT:	Errington Community Park	BOREHOLE No.	BH24-01
CONTRACTOR:	WestSoil Sampling Ltd.	CO-ORDS N/E:	5460185.97 400379.02	PROJECT No.	2231-12543-01
METHOD:	Solid Stem Auger/Big Beaver XL	LOCATION:	Errington, BC	ELEVATION:	128.00 m

DEPTH (m)	ELEVATION (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY (%)	BLOW COUNTS (N VALUE)	<div>▲ N Value</div> <div>● Moisture Content (%)</div> <div> Plastic/Liquid Limit (%)</div> <div>□ Fines Content (%)</div> <div>20 40 60 80</div>	WATER	REMARKS
			<div>TOPSOIL, sand and gravel, rootlets, organics</div> <div>CLAY (CL), silty, low plasticity, firm, light brown, moist</div> <div>SILT (ML), trace fine gravel, trace fine sand, stiff to very stiff, moist, brown</div> <div>- At 1.5 m - sandy, trace fine sub-rounded gravel, blocky, dry to moist</div> <div>SAND (SW), gravelly, silty, very dense, well graded, light brown, saturated</div> <div>Terminated at 2.57 m. Auger refusal on inferred bedrock. Groundwater encountered at 1.5m. Backfilled with bentonite and drill cuttings.</div>	<div>SPT</div> <div>G</div> <div>SPT</div> <div>G</div>	<div>100</div> <div>100</div>	<div>4-3-4-10 (7)</div> <div>5-22-37-41 (59)</div>	<div>▲ at 1.0m, ● at 1.1m</div> <div>● at 1.5m, ▲ at 1.8m, ● at 2.1m</div>	<div>Water level symbol at 1.5m</div>	

	LOGGED BY:	Liesl Dykeman/Julia Moragas	START DATE:	June 04, 2024
	REVIEWED BY:	Tim Schaap	COMPLETION DATE:	June 04, 2024
	COMPLETION DEPTH:	2.57 m		Sheet 1 of 1


CLIENT:	Regional District of Nanaimo	PROJECT:	Errington Community Park	BOREHOLE No.	BH24-02
CONTRACTOR:	WestSoil Sampling Ltd.	CO-ORDS N/E:	5460196.80 400370.19	PROJECT No.	2231-12543-01
METHOD:	Solid Stem Auger/Big Beaver XL	LOCATION:	Errington, BC	ELEVATION:	128.00 m

DEPTH (m)	ELEVATION (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY (%)	BLOW COUNTS (N VALUE)	▲ N Value ● Moisture Content (%) Plastic/Liquid Limit (%) □ Fines Content (%)	WATER	REMARKS
			<div> <div> <div>0.10</div> <div>127.90</div> </div> <div> <div>127</div> <div>126</div> <div>125</div> <div>124</div> </div> <div> <div>1.14</div> <div>126.86</div> </div> </div> <div> <div>TOPSOIL, sand and gravel, rootlets, organics</div> <div>SAND (SM), silty, trace fine gravel, poorly graded, loose to compact, brown, angular, wet to moist</div> <div>Terminated at 1.14 m. Auger refusal on inferred bedrock. Groundwater encountered at 1.14m. Backfilled with bentonite and drill cuttings.</div> </div>	<div> <div>SPT</div> <div>G</div> </div>	100	5-5-6-14 (11)	<div> <div>20</div> <div>40</div> <div>60</div> <div>80</div> </div> <div> <div>▲</div> <div>●</div> <div> </div> <div>□</div> </div>	<div> <div>▽</div> </div>	

 McElhanney	LOGGED BY:	Liesl Dykeman/Julia Moragas	START DATE:	June 04, 2024
	REVIEWED BY:	Tim Schaap	COMPLETION DATE:	June 04, 2024
	COMPLETION DEPTH:	1.14 m		Sheet 1 of 1


CLIENT:	Regional District of Nanaimo	PROJECT:	Errington Community Park	BOREHOLE No.	BH24-03
CONTRACTOR:	WestSoil Sampling Ltd.	CO-ORDS N/E:	5460208.20 400379.42	PROJECT No.	2231-12543-01
METHOD:	Solid Stem Auger/Big Beaver XL	LOCATION:	Errington, BC	ELEVATION:	128.00 m

DEPTH (m)	ELEVATION (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY (%)	BLOW COUNTS (N VALUE)	<div> ▲ N Value ● Moisture Content (%) Plastic/Liquid Limit (%) □ Fines Content (%) </div> <div> 20 40 60 80 </div>	WATER	REMARKS
			TOPSOIL, sand and gravel, rootlets, organics						
	0.20		SAND (SW), gravelly, some to trace silt, loose sub-angular, moist, dark brown	127.80					
	0.38		CLAY (CL), silty, low plasticity, brown to black, saturated, very soft	127.62					
	0.61		SAND (SM), fine sand, silty trace fine gravel, poorly graded, compact, light brown, moist	127.39					
1	127			SPT	100	2-1-1-4 (2)	▲		
				G			●		
				SPT	100	25-50/54 mm (R)	●		
	1.73		Terminated at 1.73 m. Auger refusal on inferred bedrock. Groundwater encountered at 1.5m. Backfilled with bentonite and drill cuttings.	126.27					
2	126								
3	125								
4	124								


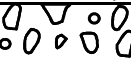


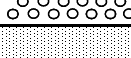










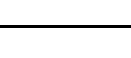
 McElhanney	LOGGED BY:	Liesl Dykeman/Julia Moragas	START DATE:	June 04, 2024
	REVIEWED BY:	Tim Schaap	COMPLETION DATE:	June 04, 2024
	COMPLETION DEPTH:	1.73 m		Sheet 1 of 1

CLIENT:	Regional District of Nanaimo	PROJECT:	Errington Community Park	BOREHOLE No.	BH24-04
CONTRACTOR:	WestSoil Sampling Ltd.	CO-ORDS N/E:	5460219.45 400372.35	PROJECT No.	2231-12543-01
METHOD:	Solid Stem Auger/Big Beaver XL	LOCATION:	Errington, BC	ELEVATION:	128.00 m

DEPTH (m)	ELEVATION (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY (%)	BLOW COUNTS (N VALUE)	▲ N Value ● Moisture Content (%) Plastic/Liquid Limit (%) □ Fines Content (%)	REMARKS
			TOPSOIL, sand and gravel, rootlets, organics				20 40 60 80	
	0.20		127.80 SAND (SM), silty, fine sand, trace fine gravel, poorly graded, loose, brown, wet	SPT	100	3-4-4-12 (8)	▲ ●	
	0.61		127.39 SILT (ML), sandy, trace fine gravel, low to medium plasticity, brown, moist to wet, very soft	G			●	
1	127		- At 1.1 m - boulder	SPT			●	
	1.52		126.48 SAND (SM), silty, trace fine gravel, angular, poorly graded, dense to very dense, moist		100	37 (R)		
	1.68		126.32 Terminated at 1.68 m. Auger refusal on inferred bedrock. Backfilled with bentonite and drill cuttings.					
2	126							
3	125							
4	124							

 McElhanney	LOGGED BY:	Liesl Dykeman/Julia Moragas	START DATE:	June 04, 2024
	REVIEWED BY:	Tim Schaap	COMPLETION DATE:	June 04, 2024
	COMPLETION DEPTH:	1.68 m		Sheet 1 of 1

MODIFIED UNIFIED CLASSIFICATION SYSTEMS FOR SOILS

MAJOR DIVISION			GROUP SYMBOL		TYPICAL SOIL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA
COARSE GRAINED SOILS (more than 50% larger than 75 µm)	GRAVELS	Clean Gravels (< 5% Fines)	GW		Well graded gravels, sandy gravels, trace or no fines	$C_u = D_{60}/D_{10} > 4$, $C_c = (D_{30})^2 / D_{10} D_{60} = 1 \text{ to } 3$
			GP		Poorly graded gravels, sandy gravels, trace or no fines	Not meeting the GW requirements.
		Dirty Gravels (> 12% Fines)	GM		Silty gravels, silty sandy gravels	Plasticity below A-Line or $I_p < 4$
			GC		Clayey gravels, clayey sandy gravels	Plasticity above A-Line or $I_p > 7$
	SANDS	Clean Sands (< 5% Fines)	SW		Well graded sands, gravelly sand, trace or no fines	$C_u = D_{60}/D_{10} > 4$, $C_c = (D_{30})^2 / D_{10} D_{60} = 1 \text{ to } 3$
			SP		Poorly graded sands, gravelly sand, trace or no fines	Not meeting the SW requirements.
		Dirty Sands (> 12% Fines)	SM		Silty sands, sand and silt mixtures	Plasticity below A-Line or $I_p < 4$
			SC		Clayey sands, sand and clay mixtures	Plasticity above A-Line or $I_p > 7$
FINE GRAINED SOILS (more than 50% smaller than 75 µm)	SILTS	$W_L < 50\%$	ML		Inorganic silts, sandy silts with slight plasticity	Classifications are based upon Plasticity Chart.
		$W_L > 50\%$	MH		Inorganic silts of high plasticity	
	CLAYS	$W_L < 30\%$	CL		Inorganic clay, silty clays of low plasticity	
		$30\% < W_L < 50\%$	CI		Inorganic clay, silty clays of intermediate plasticity	
		$W_L > 50\%$	CH		Inorganic clay, silty clays of high plasticity	
	ORGANIC SILTS AND CLAYS	$W_L < 50\%$	OL		Organic silts and silty clays of low plasticity	
		$W_L > 50\%$	OH		Organic silts and silty clays of high plasticity	
	HIGHLY ORGANIC		PT		Peat and other highly organic soils	

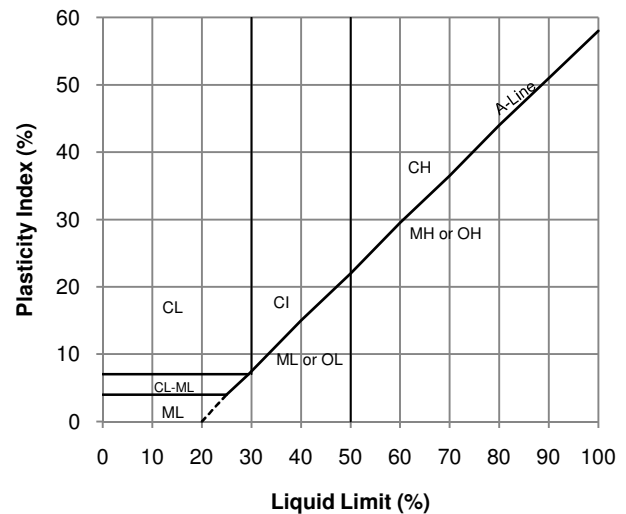
SOIL COMPONENTS

Fraction	U.S. Standard Sieve Size		Percentage (by weight)	Description
	Passing	Retained		
Gravel				
Coarse	76 mm	19 mm	35-50	AND
Fine	19 mm	4.75 mm		
Sand				
Coarse	4.75 mm	2.00 mm	20-35	Y/EY
Medium	2.00 mm	425 µm		
Fine	425 µm	75 µm	10-20	SOME
Fines (Silt or Clay)	75 µm			
Trace			1-10	TRACE
Over Size Material	Cobbles	76 mm to 200 mm		
	Boulders	> 200 mm		

RELATIVE DENSITY AND CONSISTENCY

Cohesionless Soils		Cohesive Soils	
Relative Density	SPT (N) Value	Consistency	Undrained Shear Strength (kPa)
Very Loose	0-4	Very Soft	0-10
Loose	4-10	Soft	10-25
Compact	10-30	Firm	25-50
Dense	30-50	Stiff	50-100
Very Dense	>50	Very Stiff	100-200
		Hard	>200

Plasticity Chart



Notes:

1. Use dual symbols for coarse grained soils with 5 to 12% fines (i.e. GP-GM)
2. All sieves are U.S. Standard ASTM E11



McElhanney

McElhanney Consulting Services Limited

APPENDIX B

Borehole Location Plan



CLIENT Regional District of Nanaimo

PROJECT NAME Errington Community Park

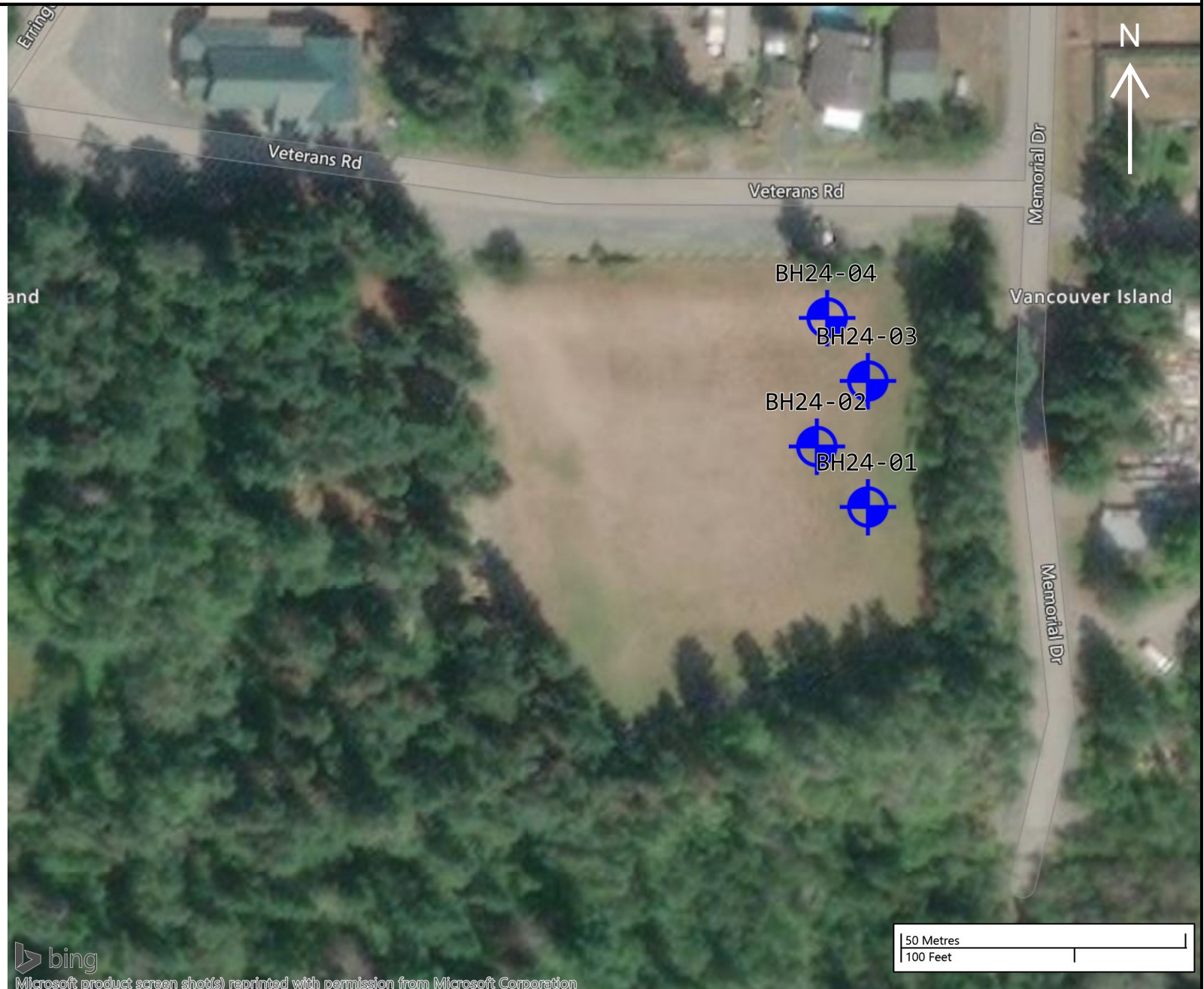
HORIZONTAL SCALE 1:1000

PROJECT NUMBER 2231-12543-01

PROJECT LOCATION Errington, BC

Legend Key

◆ Geotechnical Borehole



Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation

APPENDIX C

Laboratory Testing

Soil Moisture Content**Report**

Client: Regional District of Nanaimo Lab ID: 2231
 Project Name: Errington Community Park - Sports Court Project Number: 2231-12543-01
 Report Number: 1
 Report Date: 26 - Jun - 2024

Material Type: Native Soil Sample Date: 6-June-24
 Source: Boreholes Sampled by: L. Dykeman
 Other: _____ Test Date: 6-Jun-24
 Tested by: McElhanney

Bore Hole Number	Sample Depth (m)	Tare (g)	Tare + Wet (g)	Tare + Dry (g)	Moisture (%)
BH24-01 S1	0.0-1.0	255.2	555.8	478.5	34.6
BH24-01 G1	1.5	254.6	761.7	671.3	21.7
BH24-01 S2	1.5-2.1	255	688.5	634.6	14.2
BH24-01 G2	2.1-2.6	251.1	842.7	748.9	18.8
BH24-02 S1	0.0-0.9	254	548.3	506.5	16.6
BH24-02 G2	1.1	256.7	574.3	530	16.2
BH24-03 S1	0.4-0.6	254.3	500.7	433.4	37.6
BH24-03 G1	1.5	255	675.7	611.5	18.0
BH24-03 S2	1.5-1.7	255	644.7	605.8	11.1
BH24-04 S1	0.0-0.7	251.1	616.4	565.2	16.3
BH24-04 S1	0.0-0.7	15.2	301.7	270.5	12.2

Reviewed by: Liesl Dykeman

<i>Bore Hole Number</i>	<i>Sample Depth (m)</i>	<i>Tare (g)</i>	<i>Tare + Wet (g)</i>	<i>Tare + Dry (g)</i>	<i>Moisture (%)</i>
<i>BH24-04 G1</i>	<i>0.9</i>	256.1	686.7	621.5	17.8
<i>BH24-04 S2</i>	<i>1.5-1.7</i>	253.6	609.1	568.6	12.9

APPENDIX D

Statement of Limitations – Geotechnical Services



Statement of Limitations – Geotechnical Services

Use of this Report. This report was prepared by McElhanney Ltd. ("McElhanney") for the particular site, design objective, development and purpose (the "Project") described in this report and for the exclusive use of the client identified in this report (the "Client"). The data, interpretations and recommendations pertain to the Project and are not applicable to any other project or site location and this report may not be reproduced, used or relied upon, in whole or in part, by a party other than the Client and Building Authority, without the prior written consent of McElhanney. The Client may provide copies of this report to its affiliates, contractors, subcontractors and regulatory authorities for use in relation to and in connection with the Project provided that any reliance, unauthorized use, and/or decisions made based on the information contained within this report are at the sole risk of such parties. McElhanney will not be responsible for the use of this report on projects other than the Project, where this report or the contents hereof have been modified without McElhanney's consent, to the extent that the content is in the nature of an opinion, and if the report is preliminary or draft. This is a technical report and is not a legal representation or interpretation of laws, rules, regulations, or policies of governmental agencies. The professional services retained for this Project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in this report. In particular, environmental conditions such as surface and subsurface contamination are outside the scope of this report.

Standard of Care and Disclaimer of Warranties. This study and report have been prepared in accordance with generally accepted engineering and scientific judgments, principles and practices. McElhanney expressly disclaims any and all warranties in connection with this report including, without limitation, any warranty that this report and the associated site review work has uncovered all potential geotechnical liabilities associated with the subject property.

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Subsurface Risks. Soil, rock and groundwater data were collected in general accordance with the standards and methods described in the document. The classification and identification of soils, rocks and geologic formations was based on commonly accepted methods employed in the practice of geotechnical engineering and related disciplines. Interpretations of groundwater levels and flow direction are based on water level observations at selected test hole locations and are expected to fluctuate. Observations at test holes indicate the approximate subsurface conditions at those locations only. Subsurface conditions between test holes were based, by necessity, on judgement and assumptions of what exists between the actual locations sampled, and may vary significantly from actual site conditions and all persons making use of this report should be aware of, and accept, this risk. Even a comprehensive sampling and testing program, implemented in accordance with appropriate equipment by experienced personnel, may fail to detect all or certain conditions.

Information from Client and Third Parties. McElhanney has relied in good faith on information provided by the Client and third parties noted in this report and has assumed such information to be accurate, complete, reliable, non-fringing, and fit for the intended purpose without independent verification. McElhanney accepts no responsibility for any deficiency, misstatements or inaccuracy contained in this report as a result of omissions or errors in information provided by third parties or for omissions, misstatements or fraudulent acts of persons interviewed.

Underground Utilities and Damages. In the performance of the services, McElhanney has taken reasonable precautions to avoid damage or injury to subterranean structures or utilities. Subsurface sampling may result in unavoidable contamination of certain subsurface areas not known to be previously contaminated such as, but not limited to, a geologic formation, the groundwater or other hydrous body. McElhanney will adhere to an appropriate standard of care during the conduct of any subsurface sampling.

Independent Judgments. McElhanney will not be responsible for the independent conclusions, interpretations, interpolations and/or decisions of the Client, or others, who may come into possession of this report, or any part thereof. This restriction of liability includes decisions made to purchase, finance or sell land or with respect to public offerings for the sale of securities.

Construction. The subsurface information contained in this report were obtained for the owner's information and design. The extent and detail of assessments necessary to determine all relevant conditions that may affect construction costs would normally be greater than the assessments carried out for this report. Accordingly, a contingency fund to allow for the possibility of variations of subsurface conditions should be included in the construction budget to cover costs associated with modifications of the design and construction procedures resulting from conditions that vary from the assumptions in this report. If during construction, subsurface conditions are found to be other than those described in this report, McElhanney is to be notified and may alter or modify the geotechnical report recommendations. If McElhanney is not retained to provide services during construction, then McElhanney is not responsible for confirming or recording that subsurface conditions do not materially differ from those interpreted conditions contained in this report or for confirming or recording that construction activities have not adversely affected subsurface conditions or the recommendations contained in this report.

Contact

Liesl Dykeman, P. Eng.

778-674-0463

ldykeman@mcelhanney.com

