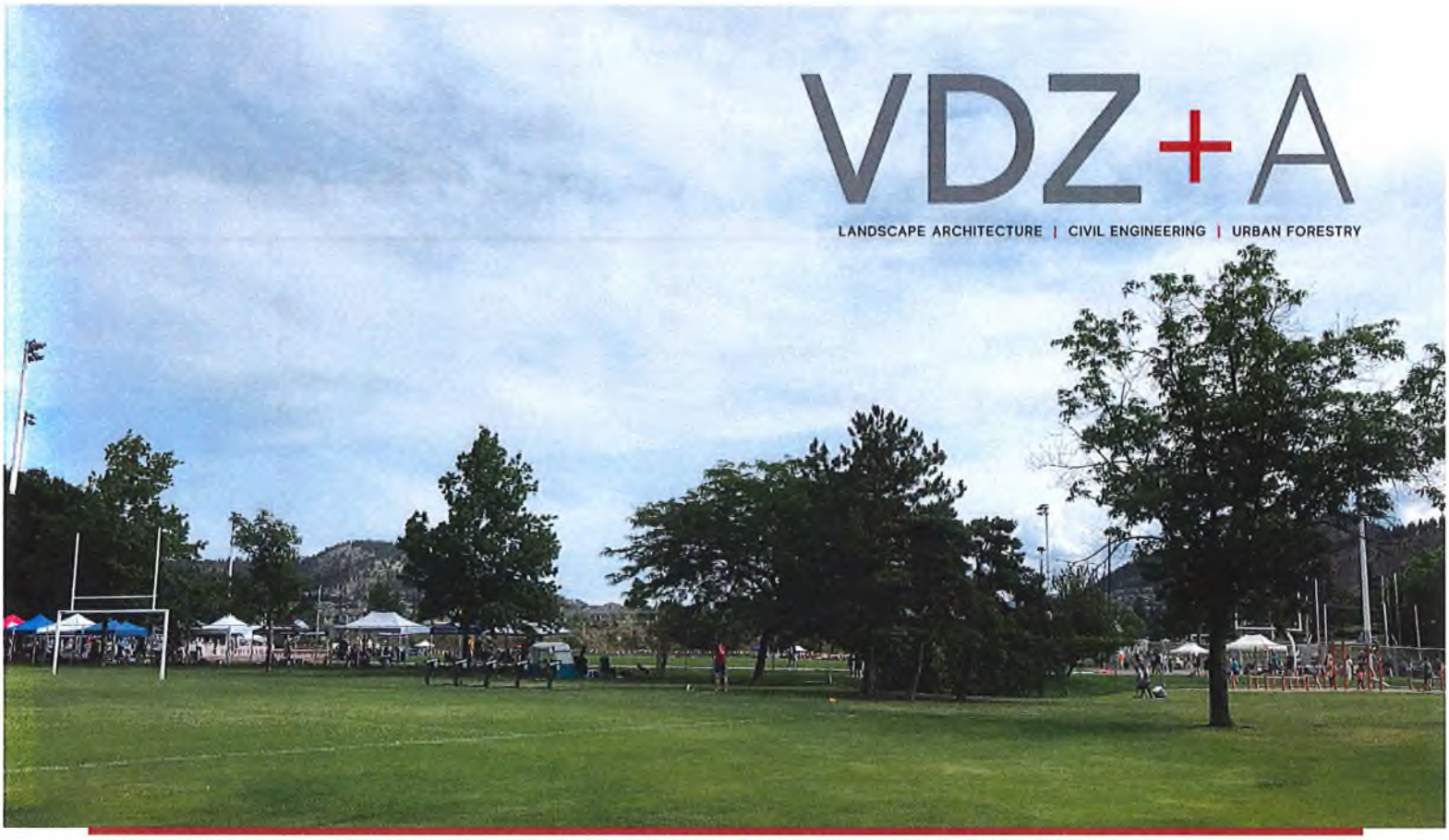

VDZ+A

LANDSCAPE ARCHITECTURE | CIVIL ENGINEERING | URBAN FORESTRY

KELOWNA IPD: REDEVELOPMENT OF PARKINSON RECREATION CENTRE (Phase 1)

Arborist Report

Site Address:
1700-1800 Parkinson Way,
Kelowna, BC V1Y 4P9

Submission Date: February 21, 2025
VDZ+A Project #: PR2024-13
Client/Municipal Project #: n/a

PREPARED FOR:

CITY OF KELOWNA
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Revision #	Revision Date	Revision Author	Comments
0	21-02-2025	A.L.	Original Report

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ARBORIST REPORT

ASSIGNMENT

Van der Zalm and Associates (VDZ+A) have been retained by the City of Kelowna to prepare an arborist report to assess trees located at 1700-1800 Parkinson Way, Kelowna, BC. VDZ+A prepared an arborist report based on the documents provided by the client.

This report will provide recommendations for the retention or removal of trees on this site based on existing site conditions and proposed site use. Mitigation of development impact on the trees has been considered as part of the tree assessment process.

LIMITS OF THE ASSIGNMENT

VDZ+A's observations are limited to 2 of site visits on February 14 & 18, 2025. VDZ+A's observations and notes are based on the tree inventory data provided by the City of Kelowna and arborist's own observations. VDZ+A located the trees using a survey map provided by Runnalls Denby B.C. Land Surveyors, dated June 11, 2024. On site measurements and navigation was used to locate trees that were not included in the survey.

No laboratory analysis was conducted on tissue or soil samples, and no site inspection was performed by VDZ+A's Arborist.

All trees recommended for retention are based on an inventory data from City, site review and proposed site use. Final recommendations are subject to review of finalized working drawings and additional assessments as necessary.

METHODOLOGY

VDZ+A Arborists, D. Glyn Romaine and Aaron Lee, prepared the arborist report based on the tree data provided by the City of Kelowna and the proposed development site plan. VDZ+A Arborist, D. Glyn Romaine completed a site review using visual observation and mallet sounding to validate the information provided by the City of Kelowna.

PURPOSE AND USE OF REPORT

Trees are an important part of the urban environment. They provide many benefits including provision of wildlife habitat, contribution to efficient water management, and a healthier microclimate.

This report provides an assessment of the tree resources present to help guide decision making, design and construction processes, and to avoid or mitigate development impacts to trees. The recommendations and requirements outlined herein are produced in accordance with the *City of Kelowna Tree Protection Bylaw No. 8041, 2022*, and the *City of Kelowna Municipal Properties Tree Bylaw No. 8042.*

OVERVIEW

The site is a recreation park located between Harvey and Clement Avenue, to the west of Spall Road. It is neighboured by single-family and multi-family lots, as well as commercial spaces and above ground parking. There is currently a recreation centre with concrete amenities, surface parking lots, and sports fields. Mill Creek flows southwest through a portion of the park.

FIG. 1 - **Site Outline (Kelowna, 2024)**

PROPOSED SITE DEVELOPMENT

The existing site is proposed to be redeveloped for the Parkinson Recreation Centre, with multiple outdoor recreational spaces and parking. Future phases include the flood mitigation and ecological enhancements to Mill Creek.

ENVIRONMENTAL DESCRIPTION

Vegetation

Canopy cover on site is low (20-30%), with 306 onsite trees and 220 SPEA trees. Vegetation is primarily along the perimeter of the site or centrally on the site and consists of mainly non native trees. Trees on site were in generally in fair to good condition.

Invasive Plants

Burdock (*Arctium* spp.), a provincially regulated noxious weeds was observed on site near Mill Creek during the assessment. There are also several Siberian elm (*Ulmus pumila*) are growing along the edge of the creek.

Riparian Areas/Watercourses)

Mill Creek flows southwest through the park.

Soils and Drainage

Approximately 70% of the site contains grass and permeable surfaces. No soil analysis was performed on site.

Birds and Wildlife

There is no evidence of raptors nests, osprey nests or heron colonies on the site. Removal of trees however between March 1 – August 31 (date subject to change depending on seasonal nesting behavior and therefore must be confirmed with the City) will require a bird nesting survey. This is as prescribed by the federal Migratory Birds Convention Act (MBCA), 1994 and Section 34 of the BC Wildlife Act. It is the responsibility of the owner/developer to ensure they are in compliance with the city's regulations governing nesting birds on sites where development is occurring.

SCHEDULING AND TIMING

Tree removal recommendations are suggested during the plants dormant season (from late fall to early spring), given the likelihood for minimizing stress on the surrounding vegetation and the potential spread of diseases. This also avoids sensitive bird nesting seasons (March 1 – August 31, or subject to change depending on seasonal nesting behavior - to be confirmed with the City, and require a bird nesting survey), and animals are less dependent on trees for shelter, which minimizes disturbances to local wildlife. Early Mornings on Weekdays, with attention to local traffic patterns and public use of the area, is ideal for urban settings. By aligning removal with these seasonal, environmental, and logistical factors, this can ensure a smooth, safe, and ecologically responsible process.

Tree removal should be avoided during the following:

- Spring and Early Summer, for breeding season
- Outside of daylight hours, to maximize safety and visibility for workers
- Peak traffic hours, to minimize disruptions to public infrastructure and community activities
- Wet weather conditions, to reduce the risk of slippage and damage, soil compaction, and post-removal site restoration
- High wind days, to reduce the risk of falling limbs and lack of control for fall direction

Immediate site cleanup will be required promptly after debris removal and stump grinding (if necessary), to avoid site hazards. Where replacement trees are planned, replanting should occur during spring and early summer or fall to ensure the best chances of survival for new trees.

TREE INVENTORY ASSESSMENT

Definition of tree conditions include:
Excellent = Well-balanced structure, full canopy, healthy foliage, no signs of disease/pests/structural issues.
Good = Healthy but have minor issue that do not significantly impact overall health or structure *(e.g. some deadwood, minor pest damage).*
Fair = Signs of stress/disease/structural concerns that are affecting the overall health or structure *(e.g. dieback, limited foliage, evidence of pest/disease, co-dominant or weak branch attachments).*
Poor = Significant health issues or structural defects that may compromise stability and structure *(e.g. extensive dieback, sparse canopy, large dead limbs, trunk decay).*

SUMMARY

- A total of 306 onsite trees, 220 SPEA trees, and 17 offsite trees were identified using data provided by the City of Kelowna and topographical survey data from Runnalls Denby B.C. Land Surveyors, validated through an onsite inspection by VDZ+A arborists.
- Of these, 97 onsite trees and 11 offsite trees are associated with the Phase 1 development. 35 onsite trees are recommended for removal while 60 onsite trees are recommended for retention. Additionally, 2 onsite trees will be transplanted to preserve them. All offsite trees, which are in proximity to the Phase 1 development, are also recommended for retention.
- Trees SPEA097-NT - SPEA161-NT are hand plotted.

Table 1 : Tree Inventory Data

All the trees identified on the Tree Management Plan and within the Tree Inventory Data Table have been given their Retention/Removal recommendations on a preliminary basis. Final recommendations will be based upon design/construction and grading details.
CRZ = Critical Root Zone - *see Tree Protection Barrier specification (Refer to Appendix B)* **LCR** = Live Crown Ratio **DBH** = Diameter at Breast Height (1.4m) **NT** = No tag **HP** = Hand plotted

Tree #	Common name	*Botanical name*	DBH (cm)	Crown Radius (m)	LCR (%)	Height (m)	Condi-tion	Comments	TPZ (m)	Retain/ Remove
The following trees are located within Phase 1 development area.										
16	Norway maple	*Acer platanoides*	50	6.0	70	15	Good	In conflict with proposed internal road.	4.0	Remove
17	Norway maple	*Acer platanoides*	45	6.0	60	15	Good		3.6	Retain
18	Norway maple	*Acer platanoides*	48	6.0	60	16	Good		3.8	Retain
19	Norway maple	*Acer platanoides*	50	8.0	60	15	Good		4.0	Retain
24	Oak	*Quercus sp.*	50	8.0	50	11	Good	Small hanger.	4.0	Retain
28	Norway maple	*Acer platanoides*	15	1.0	50	3	Poor	2 m vertical basal wound. Topped.	1.2	Remove
29	Norway maple	*Acer platanoides*	30				Fair	In conflict with proposed sidewalk. 1 m basal wound. Girdling root.	2.4	Remove
30	Norway maple	*Acer platanoides*	25				Good		2.0	Retain
31	Norway maple	*Acer platanoides*	21	4.0	50	8	Good		1.7	Retain

TREE INVENTORY ASSESSMENT

32	Norway maple	*Acer platanoides*	15	1.0	50	3	Poor	In conflict with proposed staging area. 2 m vertical basal wound. Topped.	1.2	Remove
33	London plane	*Platanus × acerifolia*	37						3.0	Retain
34	London plane	*Platanus × acerifolia*	39	7.0	70	15	Good		3.1	Retain
35	Katsura	*Cercidiphyllum japonicum*	27	4.0	60	10	Good		2.2	Retain
36	Katsura	*Cercidiphyllum japonicum*	24					In conflict with proposed sidewalk. 1 m basal scar.	1.9	Remove
37	Maple	*Acer sp.*	20	5.0	50	6	Fair	Missing leader.	1.6	Retain
38	Maple	*Acer sp.*	20	4.0	60	8	Good		1.6	Retain
39	Maple	*Acer sp.*	18	2.0	50	5	Fair	Trunk wound.	1.4	Remove
46	London plane	*Platanus × acerifolia*	29	5.0	60	13	Good		2.3	Retain
50	London plane	*Platanus × acerifolia*	40	7.0	70	14	Good		3.2	Retain
211	Poplar	*Populus sp.*	38	5.5	60	14	Good	Codominant at 2.5 m.	3.0	Retain
212	Poplar	*Populus sp.*	46	7.0	50	16	Good		3.7	Retain
213	Poplar	*Populus sp.*	46	7.0	50	16	Good		3.7	Retain
214	Poplar	*Populus sp.*	46	7.0	50	16	Good		3.7	Retain
215	Poplar	*Populus sp.*	40	5.5	70	15	Good	In conflict with proposed internal road. Girdling root.	3.2	Remove
216	Poplar	*Populus sp.*	37	6.0	60	15	Good	In conflict with proposed internal road. Canker on one branch.	3.0	Remove
217	Thornless honey-locust	*Gleditsia triacanthos*	60	10.0	60	18	Good	In conflict with proposed parking lot.	4.8	Remove
218	Thornless honey-locust	*Gleditsia triacanthos*	66	9.0	60	20	Good	In conflict with proposed sidewalk.	5.3	Remove
219	Poplar	*Populus sp.*	39	6.0	60	16	Good	In conflict with proposed parking lot. Small basal wound.	3.1	Remove
220	Poplar	*Populus sp.*	40	5.0	60	15	Good	In conflict with proposed parking lot. Codominant at 2 m.	3.2	Remove
221	London plane	*Platanus × acerifolia*	42	7.0	70	18	Good		3.4	Retain

TREE INVENTORY ASSESSMENT

222	London plane	*Platanus × acerifolia*	40	6.0	70	17	Good		3.2	Retain
223	London plane	*Platanus × acerifolia*	53	7.0	70	18	Good		4.2	Retain
224	Linden	*Tilia sp.*	36	5.0	70	16	Fair	Girdling root. Codominant at 2 m with weak attachment.	2.9	Retain
225	Linden	*Tilia sp.*	49	5.0	60	16	Good		3.9	Retain
226	European hornbeam	*Carpinus betulus*	50						4.0	Retain
227	European hornbeam	*Carpinus betulus*	50						4.0	Retain
228	European hornbeam	*Carpinus betulus*	50						4.0	Retain
229	European hornbeam	*Carpinus betulus*	50					In conflict with proposed sidewalk.	4.0	Remove
230	European hornbeam	*Carpinus betulus*	43						3.4	Retain
231	Linden	*Tilia sp.*	46	5.0	70	17	Good		3.7	Retain
232	Little-leaf linden	*Tilia cordata*	30	4.5	60	12	Good		2.4	Retain
233	Little-leaf linden	*Tilia cordata*	50	6.0	70	18	Good	Codominant at 3 m.	4.0	Retain
234	Horsechestnut	*Aesculus hippocastanum*	42	6.5	60	15	Good		3.4	Retain
235	Horsechestnut	*Aesculus hippocastanum*	63	6.0	60	18	Good	Codominant at 3 m.	5.0	Retain
236	Red oak	*Quercus rubra*	58	8.0	60	15	Good		4.6	Retain
237	Red oak	*Quercus rubra*	64	10.0	60	17	Fair	Some dead branches.	5.1	Retain
238	Douglas-fir	*Pseudotsuga menziesii*	30	3.5	70	15	Good	Some dead branches.	2.4	Retain
239	Little-leaf linden	*Tilia cordata*	67	7.0	70	18	Fair	In conflict with proposed soccer field. Codominant at 4 m.	5.4	Remove
240	Little-leaf linden	*Tilia cordata*	50	6.0	60	17	Good		4.0	Retain
241	Little-leaf linden	*Tilia cordata*	58	7.0	70	20	Good		4.6	Retain
242	Little-leaf linden	*Tilia cordata*	49	5.5	60	18	Fair	Epicormics at base.	3.9	Retain

TREE INVENTORY ASSESSMENT

243	Thornless honey-locust	*Gleditsia triacanthos*	75	9.0	70	16	Fair	Some dead branches.	6.0	Retain
244	Thornless honey-locust	*Gleditsia triacanthos*	66	9.0	60	16	Good		5.3	Retain
261	Norway maple	*Acer platanoides*	44	6.0	70	18	Good		3.5	Retain
262	Norway maple	*Acer platanoides*	43	5.5	50	15	Poor	In conflict with proposed soccer field. Large trunk wounds. Fungal fruiting bodies.	3.4	Remove
263	White willow	*Salix alba*	150	9.0	70	17	Fair	Deadwood in crown.	12.0	Retain
264	Willow	*Salix sp.*	175	10.0	70	20	Fair	Some dead wood in crown.	14.0	Retain
265	Spruce	*Picea sp.*	59	6.0	60	18	Good		4.7	Retain
266	Spruce	*Picea sp.*	50	4.5	70	16	Fair	Codominant at 5 m. Some dead branches.	4.0	Retain
267	Spruce	*Picea sp.*	57	5.0	80	18	Good	Damage to exposed roots.	4.6	Retain
268	Red spruce	*Picea rubens*	46	5.0	70	20	Good	Damage to exposed roots.	3.7	Retain
269	Red maple	*Acer rubrum*	44	6.5	60	15	Good	Codominant at 3 m. Damage to exposed roots.	3.5	Retain
270	Douglas-fir	*Pseudotsuga menziesii*	42	4.5	60	19	Good	In conflict with proposed soccer field. Hanger.	3.4	Remove
271	Douglas-fir	*Pseudotsuga menziesii*	22	1.0	20	10	Poor	In conflict with proposed soccer field. Few live branches. Dead top.	1.8	Remove
272	Englemann spruce	*Picea engelmannii*	37	4.0	70	14	Good	In conflict with proposed soccer field.	3.0	Remove
273	Englemann spruce	*Picea engelmannii*	47	4.5	70	17	Good	In conflict with proposed soccer field.	3.8	Remove
274	Plum	*Prunus sp.*	29	4.0	50	8	Fair	In conflict with proposed soccer field.	2.3	Remove
275	Douglas-fir	*Pseudotsuga menziesii*	37	4.0	70	15	Fair	In conflict with proposed pickle ball court. Some dead branches.	3.0	Remove
277	Thornless honey-locust	*Gleditsia triacanthos*	40	6.0	50	17	Good	In conflict with proposed soccer field.	3.2	Remove
278	Linden	*Tilia sp.*	39	5.0	60	14	Fair	In conflict with proposed sidewalk. Leans. Girdling root.	3.1	Remove
279	Thornless honey-locust	*Gleditsia triacanthos*	33	6.0	50	12	Good	In conflict with proposed sidewalk.	2.6	Remove
280	Linden	*Tilia sp.*	28	4.0	70	11	Fair	In conflict with proposed building. Codominant at 2.5 m with dieback on one leader.	2.2	Remove

TREE INVENTORY ASSESSMENT

293	Thornless honey-locust	*Gleditsia triacanthos*	44	5.0	60	15	Good	In conflict with proposed building. Codominant at 4 m.	3.5	Remove
294	Maple	*Acer sp.*	32	4.0	60	9	Fair	In conflict with proposed building. Some dieback.	2.6	Remove
295	Red oak	*Quercus rubra*	33	6.0	60	10	Good	In conflict with proposed building.	2.6	Remove
296	Scots pine	*Pinus sylvestris*	25	4.0	60	8	Good	In conflict with proposed building.	2.0	Remove
297	Scots pine	*Pinus sylvestris*	21	3.0	50	8	Good	In conflict with proposed building.	1.7	Remove
298	Austrian pine	*Pinus nigra*	35	4.0	70	12	Good	In conflict with proposed building.	2.8	Remove
299	Thornless honey-locust	*Gleditsia triacanthos*	37	7.0	60	12	Good	In conflict with proposed sidewalk.	3.0	Remove
300	Red maple	*Acer rubrum*	25	4.0	50	16	Good	In conflict with proposed PMT. Codominant at 4 m.	2.0	Remove
301	Red maple	*Acer rubrum*	18	3.0	40	10	Fair	In conflict with proposed PMT. Dead top.	1.4	Remove
302	Red maple	*Acer rubrum*	27	4.5	70	15	Good	In conflict with proposed internal road.	2.2	Remove
303	Maple	*Acer sp.*	16					Will be transplanted.	1.3	Retain
304	Maple	*Acer sp.*	18						1.4	Retain
305	Maple	*Acer sp.*	18						1.4	Retain
306	Norway maple	*Acer platanoides*	23						1.8	Retain
307	Norway maple	*Acer platanoides*	17						1.4	Retain
355	Magnolia	*Magnolia sp.*	14					In conflict with proposed parking lot. 2 m basal scar.	1.1	Remove
385	Norway maple	*Acer platanoides*	16	3.0	30	3	Poor	2 m frost crack.	1.3	Remove
386	London plane	*Platanus × acerifolia*	11	2.5	60	7	Good	Will be transplanted.	0.9	Retain
387	Norway maple	*Acer platanoides*	20	3.5	50	8	Fair	In conflict with proposed internal road. 1.2 m basal wound.	1.6	Remove
388	Norway maple	*Acer platanoides*	17	3.0	50	6	Fair	Dead top.	1.4	Retain
389	Norway maple	*Acer platanoides*	34	5.5	60	10	Good		2.7	Retain
390	Maple	*Acer sp.*	28	4.0	60	9	Good		2.2	Retain
396	London plane	*Platanus × acerifolia*	11	2.0	60	5	Good		0.9	Retain
397	London plane	*Platanus × acerifolia*	10	2.5	60	6	Good		0.8	Retain

TREE INVENTORY ASSESSMENT

NT04-HP	Black pine	Pinus nigra	35				Good		2.8	Retain
The following trees are located offsite and are in proximity to Phase 1 development area.										
OS-05-NT	Siberian elm	*Ulmus pumila*	15						1.2	Retain
OS-06-NT	Siberian elm	*Ulmus pumila*	60						4.8	Retain
OS-07-NT	Siberian elm	*Ulmus pumila*	60						4.8	Retain
OS-08-NT	Siberian elm	*Ulmus pumila*	30						2.4	Retain
OS-09-NT	Siberian elm	*Ulmus pumila*	60						4.8	Retain
OS-10-NT	Siberian elm	*Ulmus pumila*	60						4.8	Retain
OS-11-NT	Siberian elm	*Ulmus pumila*	30						2.4	Retain
OS-12-NT	Siberian elm	*Ulmus pumila*	60						4.8	Retain
OS-13-NT	Siberian elm	*Ulmus pumila*	60						4.8	Retain
OS-14-NT	Siberian elm	*Ulmus pumila*	30						2.4	Retain
OS-15-NT	Siberian elm	*Ulmus pumila*	30						2.4	Retain
The Following Trees are located onsite but are outside of the Phase 1 development area.										
20	Purple plum	*Prunus cerasifera*	20	3.0	50	7	Fair	Leans south.	1.6	Retain
21	Katsura	*Cercidiphyllum japonicum*	21						1.7	Retain
22	Katsura	*Cercidiphyllum japonicum*	25						2.0	Retain
23	Oak	*Quercus sp.*	53						4.2	Retain
25	Norway maple	*Acer platanoides*	25						2.0	Retain
26	Norway maple	*Acer platanoides*	24						1.9	Retain
27	Norway maple	*Acer platanoides*	20						1.6	Retain
40	Maple	*Acer sp.*	20						1.6	Retain
41	Norway maple	*Acer platanoides*	26						2.1	Retain
42	Norway maple	*Acer platanoides*	27						2.2	Retain
43	Norway maple	*Acer platanoides*	28	5.0	50	7	Fair	2 m frost crack. Girdling root.	2.2	Retain
44	London plane	*Platanus × acerifolia*	31						2.5	Retain

TREE INVENTORY ASSESSMENT

45	London plane	*Platanus × acerifolia*	29						2.3	Retain
47	Spruce	*Picea sp.*	18	3.0	90	8	Good		1.4	Retain
48	Austrian pine	*Pinus nigra*	33	4.5	70	13	Fair	Planting cage and twine embedded in root flare.	2.6	Retain
51	Austrian pine	*Pinus nigra*	32						2.6	Retain
52	Spruce	*Picea sp.*	22						1.8	Retain
53	Austrian pine	*Pinus nigra*	26						2.1	Retain
54	Spruce	*Picea sp.*	64						5.1	Retain
55	Pine	*Pinus sp.*	83						6.6	Retain
56	Austrian pine	*Pinus nigra*	27						2.2	Retain
57	Austrian pine	*Pinus nigra*	33						2.6	Retain
58	Austrian pine	*Pinus nigra*	28						2.2	Retain
59	Spruce	*Picea sp.*	30						2.4	Retain
60	Spruce	*Picea sp.*	20						1.6	Retain
61	Austrian pine	*Pinus nigra*	27						2.2	Retain
62	Austrian pine	*Pinus nigra*	33						2.6	Retain
63	Austrian pine	*Pinus nigra*	35						2.8	Retain
64	Spruce	*Picea sp.*	28						2.2	Retain
65	London plane	*Platanus × acerifolia*	43						3.4	Retain
66	London plane	*Platanus × acerifolia*	34						2.7	Retain
67	London plane	*Platanus × acerifolia*	20						1.6	Retain
68	Larch	*Larix sp.*	26						2.1	Retain
70	London plane	*Platanus × acerifolia*	34						2.7	Retain
71	London plane	*Platanus × acerifolia*	36						2.9	Retain
72	London plane	*Platanus × acerifolia*	48						3.8	Retain
73	London plane	*Platanus × acerifolia*	61						4.9	Retain
74	London plane	*Platanus × acerifolia*	33						2.6	Retain
75	London plane	*Platanus × acerifolia*	36						2.9	Retain

TREE INVENTORY ASSESSMENT

76	Katsura	*Cercidiphyllum japonicum*	24						1.9	Retain
77	Katsura	*Cercidiphyllum japonicum*	26						2.1	Retain
78	Katsura	*Cercidiphyllum japonicum*	22						1.8	Retain
79	Katsura	*Cercidiphyllum japonicum*	33						2.6	Retain
80	Katsura	*Cercidiphyllum japonicum*	25						2.0	Retain
81	Katsura	*Cercidiphyllum japonicum*	15						1.2	Retain
82	Austrian pine	*Pinus nigra*	41						3.3	Retain
83	London plane	*Platanus × acerifolia*	51						4.1	Retain
84	London plane	*Platanus × acerifolia*	42						3.4	Retain
85	London plane	*Platanus × acerifolia*	38						3.0	Retain
86	London plane	*Platanus × acerifolia*	34						2.7	Retain
87	London plane	*Platanus × acerifolia*	36						2.9	Retain
88	London plane	*Platanus × acerifolia*	40						3.2	Retain
89	London plane	*Platanus × acerifolia*	44						3.5	Retain
90	London plane	*Platanus × acerifolia*	42						3.4	Retain
91	London plane	*Platanus × acerifolia*	40						3.2	Retain
92	London plane	*Platanus × acerifolia*	40						3.2	Retain
93	Tulip tree	*Liriodendron sp.*	3						0.2	Retain
94	Dawn redwood	*Metasequoia glypto-stroboides*	8						0.6	Retain
95	Dawn redwood	*Metasequoia glypto-stroboides*	33						2.6	Retain
96	Austrian pine	*Pinus nigra*	40						3.2	Retain
97	Austrian pine	*Pinus nigra*	34						2.7	Retain

TREE INVENTORY ASSESSMENT

98	London plane	*Platanus × acerifolia*	43						3.4	Retain
99	London plane	*Platanus × acerifolia*	37						3.0	Retain
100	London plane	*Platanus × acerifolia*	53						4.2	Retain
101	London plane	*Platanus × acerifolia*	43						3.4	Retain
102	London plane	*Platanus × acerifolia*	35						2.8	Retain
103	London plane	*Platanus × acerifolia*	34						2.7	Retain
104	London plane	*Platanus × acerifolia*	32						2.6	Retain
105	London plane	*Platanus × acerifolia*	37						3.0	Retain
106	London plane	*Platanus × acerifolia*	32						2.6	Retain
107	Austrian pine	*Pinus nigra*	34						2.7	Retain
108	Austrian pine	*Pinus nigra*	37						3.0	Retain
109	Austrian pine	*Pinus nigra*	37						3.0	Retain
110	Austrian pine	*Pinus nigra*	36						2.9	Retain
111	Austrian pine	*Pinus nigra*	34						2.7	Retain
112	Austrian pine	*Pinus nigra*	40						3.2	Retain
113	Scots pine	*Pinus sylvestris*	43						3.4	Retain
114	Scots pine	*Pinus sylvestris*	52						4.2	Retain
115	Smoketree	*Cotinus sp.*	12					Shrub.	1.0	Retain
116	Ash	*Fraxinus sp.*	24						1.9	Retain
117	Amur maple	*Acer ginnala*	17						1.4	Retain
118	Red maple	*Acer rubrum*	31						2.5	Retain
119	Red maple	*Acer rubrum*	17						1.4	Retain
120	Maple	*Acer sp.*	25						2.0	Retain
121	Red maple	*Acer rubrum*	24						1.9	Retain
122	Red maple	*Acer rubrum*	40						3.2	Retain
123	Amur maple	*Acer ginnala*	24						1.9	Retain
124	Amur maple	*Acer ginnala*	23						1.8	Retain

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125	Linden	*Tilia sp.*	39						3.1	Retain
126	Maple	*Acer sp.*	27						2.2	Retain
127	Maple	*Acer sp.*	26						2.1	Retain
128	Spruce	*Picea sp.*	30						2.4	Retain
129	Spruce	*Picea sp.*	22						1.8	Retain
130	Spruce	*Picea sp.*	24						1.9	Retain
131	Spruce	*Picea sp.*	25						2.0	Retain
132	Spruce	*Picea sp.*	21						1.7	Retain
133	Spruce	*Picea sp.*	25						2.0	Retain
134	Amur maple	*Acer ginnala*	26						2.1	Retain
135	Maple	*Acer sp.*	44						3.5	Retain
136	Linden	*Tilia sp.*	30						2.4	Retain
137	London plane	*Platanus × acerifolia*	52						4.2	Retain
138	Norway maple	*Acer platanoides*	29						2.3	Retain
139	Norway maple	*Acer platanoides*	25						2.0	Retain
140	Mugo pine	*Pinus mugo*	13						1.0	Retain
141	Thornless honey-locust	*Gleditsia triacanthos*	55						4.4	Retain
142	Amur maple	*Acer ginnala*	0						0.0	Retain
143	Amur maple	*Acer ginnala*	8						0.6	Retain
144	Oak	*Quercus sp.*	32						2.6	Retain
145	Pin oak	*Quercus palustris*	53						4.2	Retain
146	Pin oak	*Quercus palustris*	33						2.6	Retain
147	Pin oak	*Quercus palustris*	34						2.7	Retain
148	Linden	*Tilia sp.*	37						3.0	Retain
149	Amur maple	*Acer ginnala*	32						2.6	Retain
150	Austrian pine	*Pinus nigra*	36						2.9	Retain

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151	Austrian pine	*Pinus nigra*	39						3.1	Retain
152	Austrian pine	*Pinus nigra*	40						3.2	Retain
153	Scots pine	*Pinus sylvestris*	54						4.3	Retain
154	Pine	*Pinus sp.*	25						2.0	Retain
155	Amur maple	*Acer ginnala*	49	5.0	40	6	Good	Codominant from base.	3.9	Retain
156	Amur maple	*Acer ginnala*	57	4.5		6		3 stems from 0.3 m.	4.6	Retain
157	Maple	*Acer sp.*	28				Dead	8 m tall.	2.2	Retain
158	Maple	*Acer sp.*	35	5.0	60	10	Good		2.8	Retain
159	Amur maple	*Acer ginnala*	57	5.5	50	6	Good	Codominant at 1 m.	4.6	Retain
160	Norway spruce	*Picea abies*	70	5.5	60	16	Fair	Significant dieback on west side.	5.6	Retain
161	Norway maple	*Acer platanoides*	32	5.0	60	12	Good		2.6	Retain
162	Amur maple	*Acer ginnala*	40	4.0	40	5	Good	3 stems from 0.5 m.	3.2	Retain
163	Amur maple	*Acer ginnala*	72	5.0	50	7	Good	3 stems from 0.5 m.	5.8	Retain
164	Red maple	*Acer rubrum*	22						1.8	Retain
165	Red maple	*Acer rubrum*	44						3.5	Retain
166	Red maple	*Acer rubrum*	25						2.0	Retain
167	Red maple	*Acer rubrum*	43						3.4	Retain
168	Amur maple	*Acer ginnala*	20						1.6	Retain
169	Maple	*Acer sp.*	31						2.5	Retain
170	Austrian pine	*Pinus nigra*	25						2.0	Retain
171	Norway maple	*Acer platanoides*	38						3.0	Retain
172	Norway maple	*Acer platanoides*	34						2.7	Retain
173	Norway maple	*Acer platanoides*	36						2.9	Retain
174	Norway maple	*Acer platanoides*	27						2.2	Retain
176	Norway maple	*Acer platanoides*	36					Removed.	2.9	N.A.
177	Norway maple	*Acer platanoides*	34	6.0	60	12	Good	Nest.	2.7	Retain
178	Norway maple	*Acer platanoides*	44	5.5	60	10	Good		3.5	Retain

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179	Austrian pine	*Pinus nigra*	43						3.4	Retain
180	Austrian pine	*Pinus nigra*	43						3.4	Retain
193	Thornless honey-locust	*Gleditsia triacanthos*	48						3.8	Retain
194	Linden	*Tilia sp.*	53						4.2	Retain
195	Thornless honey-locust	*Gleditsia triacanthos*	40						3.2	Retain
196	London plane	*Platanus × acerifolia*	60						4.8	Retain
197	London plane	*Platanus × acerifolia*	61	8.0	70	18	Good		4.9	Retain
203	Thornless honey-locust	*Gleditsia triacanthos*	46	6.5	60	15	Good	Codominant at 3 m.	3.7	Retain
204	Thornless honey-locust	*Gleditsia triacanthos*	46	6.5	60	15	Good	Codominant at 3 m.	3.7	Retain
331	Golden rain tree	*Koelreuteria paniculata*	28	6.0	50	10	Good		2.2	Retain
332	Scots pine	*Pinus sylvestris*	28	7.0	50	7	Fair	Propped.	2.2	Retain
333	Scots pine	*Pinus sylvestris*	55	6.0	60	15	Good	Some damage to exposed roots.	4.4	Retain
334	Scots pine	*Pinus sylvestris*	20	3.5	50	4	Good		1.6	Retain
335	Thornless honey-locust	*Gleditsia triacanthos*	40	7.5	50	15	Good	Codominant at 2.5 m.	3.2	Retain
336	Thornless honey-locust	*Gleditsia triacanthos*	37	6.5	50	15	Good	Nest. Codominant at 2.5 m.	3.0	Retain
337	Thornless honey-locust	*Gleditsia triacanthos*	43	6.0	50	15	Good	Codominant at 3 m.	3.4	Retain
338	Amur maple	*Acer ginnala*	27	4.5	50	6	Good		2.2	Retain
339	Amur maple	*Acer ginnala*	50	6.0	50	7	Good		4.0	Retain
345	London plane	*Platanus × acerifolia*	36						2.9	Retain
346	London plane	*Platanus × acerifolia*	29						2.3	Retain
347	London plane	*Platanus × acerifolia*	23						1.8	Retain
348	London plane	*Platanus × acerifolia*	8						0.6	Retain

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349	London plane	*Platanus × acerifolia*	8						0.6	Retain
350	London plane	*Platanus × acerifolia*	8						0.6	Retain
351	Thornless honey-locust	*Gleditsia triacanthos*	8						0.6	Retain
357	Red maple	*Acer rubrum*	22						1.8	Retain
358	Red maple	*Acer rubrum*	20						1.6	Retain
359	Red maple	*Acer rubrum*	21						1.7	Retain
360	Red maple	*Acer rubrum*	19						1.5	Retain
361	Red maple	*Acer rubrum*	23						1.8	Retain
362	Red maple	*Acer rubrum*	21						1.7	Retain
363	Red maple	*Acer rubrum*	20						1.6	Retain
364	Red maple	*Acer rubrum*	22						1.8	Retain
365	Red maple	*Acer rubrum*	24						1.9	Retain
366	Red maple	*Acer rubrum*	24						1.9	Retain
367	Red maple	*Acer rubrum*	32						2.6	Retain
368	Red maple	*Acer rubrum*	27						2.2	Retain
369	Red maple	*Acer rubrum*	24						1.9	Retain
370	Maple	*Acer sp.*	10						0.8	Retain
371	Thornless honey-locust	*Gleditsia triacanthos*	12						1.0	Retain
372	Red maple	*Acer rubrum*	20						1.6	Retain
373	Thornless honey-locust	*Gleditsia triacanthos*	16						1.3	Retain
374	Thornless honey-locust	*Gleditsia triacanthos*	16						1.3	Retain
375	Red maple	*Acer rubrum*	18						1.4	Retain
376	London plane	*Platanus × acerifolia*	26						2.1	Retain
377	London plane	*Platanus × acerifolia*	21						1.7	Retain

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378	London plane	*Platanus × acerifolia*	18						1.4	Retain
379	London plane	*Platanus × acerifolia*	36						2.9	Retain
380	Thornless honey-locust	*Gleditsia triacanthos*	14						1.1	Retain
381	Thornless honey-locust	*Gleditsia triacanthos*	16	5.0	40	5	Good	Codominant at 2 m.	1.3	Retain
382	Thornless honey-locust	*Gleditsia triacanthos*	11						0.9	Retain
383	Thornless honey-locust	*Gleditsia triacanthos*	13						1.0	Retain
384	London plane	*Platanus × acerifolia*	12						1.0	Retain
391	Red maple	*Acer rubrum*	37						3.0	Retain
392	Red maple	*Acer rubrum*	33						2.6	Retain
393	London plane	*Platanus × acerifolia*	30						2.4	Retain
394	London plane	*Platanus × acerifolia*	23						1.8	Retain
395	London plane	*Platanus × acerifolia*	10						0.8	Retain
402	Spruce	*Picea sp.*	23						1.8	Retain
403	Spruce	*Picea sp.*	27						2.2	Retain
404	Austrian pine	*Pinus nigra*	51						4.1	Retain
405	Austrian pine	*Pinus nigra*	10						0.8	Retain
406	Austrian pine	*Pinus nigra*	24						1.9	Retain
407	Austrian pine	*Pinus nigra*	29						2.3	Retain
408	Pine	*Pinus sp.*	20						1.6	Retain
NT01	Oak	*Quercus sp.*	59	7.5	70	24	Good		4.7	Retain
NT02	Locust	*Gleditsia sp.*	25	5.0	50	9	Good		2.0	Retain
NT03	NI		20					Data is extracted from the survey file.	1.6	Retain
NT05-HP	London plane	*Platanus × acerifolia*	56	6.5	70	18	Good		4.5	Retain

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The following trees are located in the riparian area and are outside of the Phase 1 development area.										
49	Ponderosa pine	*Pinus ponderosa*	33	3.5	70	9	Poor		2.6	Retain
175	Norway maple	*Acer platanoides*	29	5.0	60	16	Good		2.3	Retain
181	Pine	*Pinus sp.*	39	4.5	60	12	Good		3.1	Retain
182	Maple	*Acer sp.*	16	3.0	70	7	Good		1.3	Retain
183	Maple	*Acer sp.*	16	3.0	70	7	Good		1.3	Retain
184	Linden	*Tilia sp.*	30	5.5	60	16	Good		2.4	Retain
185	Austrian pine	*Pinus nigra*	36	4.0	60	13	Good		2.9	Retain
186	Pine	*Pinus sp.*	30					Removed.	2.4	N.A.
187	Austrian pine	*Pinus nigra*	39	4.0	60	12	Good		3.1	Retain
188	Austrian pine	*Pinus nigra*	35	4.0	60	12	Good		2.8	Retain
189	Pine	*Pinus sp.*	30					Removed.	2.4	N.A.
190	Scots pine	*Pinus sylvestris*	47	5.0	70	14	Good		3.8	Retain
191	Pine	*Pinus sp.*	36					Removed.	2.9	N.A.
192	Austrian pine	*Pinus nigra*	45	4.0	60	10	Good		3.6	Retain
198	Thornless honey-locust	*Gleditsia triacanthos*	45	8.0	60	18	Good		3.6	Retain
199	Siberian elm	*Ulmus pumila*	50					Leans over creek. Codominant at 1.5 m.	4.0	Retain
200	Siberian elm	*Ulmus pumila*	78					2 stems. Dead branch.	6.2	Retain
201	Thornless honey-locust	Gleditsia triacanthos	45	6.5	60	16	Good		3.6	Retain
202	Thornless honey-locust	*Gleditsia triacanthos*	32	7.0	50	13	Good		2.6	Retain
205	Plum	*Prunus sp.*	24					Weeping.	1.9	Retain
207	Pine	*Pinus sp.*	49	7.0	70	18	Good	2 needles. Long needles.	3.9	Retain
208	Maple	*Acer sp.*	32						2.6	Retain
209	Red maple	*Acer rubrum*	41	6.0	70	17	Good	Frost crack. Dead branch.	3.3	Retain
210	Maple	*Acer sp.*	53	6.0	60	12	Good		4.2	Retain
245	Thornless honey-locust	*Gleditsia triacanthos*	37	8.0	50	12	Fair	Damage to exposed roots.	3.0	Retain

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246	Red oak	*Quercus rubra*	71					10. M crown.	5.7	Retain
247	Red oak	*Quercus rubra*	73	9.0	70	24	Fair	Many dead branches.	5.8	Retain
248	Mountain ash	*Sorbus aucuparia*	67	8.0	60	24	Good	Codominant at 6 m.	5.4	Retain
249	Mountain ash	*Sorbus aucuparia*	18				Dead		1.4	Retain
250	Maple	*Acer sp.*	43	7.0	70	19	Good		3.4	Retain
251	Willow	*Salix sp.*	112					Large deadwood in crown. Codominant at 3 m.	9.0	Retain
252	Maple	*Acer sp.*	34	7.0	60	18	Good	Codominant at 3 m.	2.7	Retain
253	Willow	*Salix sp.*	123					Codominant at 1.5 m. Large deadwood in crown.	9.8	Retain
254	Willow	*Salix sp.*	130					Dead branches.	10.4	Retain
255	London plane	*Platanus × acerifolia*	30	6.0	70	12	Good	Frost seam.	2.4	Retain
256	London plane	*Platanus × acerifolia*	33	6.5	70	16	Good	Small canker on lower trunk.	2.6	Retain
257	London plane	*Platanus × acerifolia*	73	8.0	70	18	Good	Codominant at 6 m.	5.8	Retain
258	London plane	*Platanus × acerifolia*	58	8.0	70	20	Good	Codominant at 3 m.	4.6	Retain
259	London plane	*Platanus × acerifolia*	56	8.0	70	20	Good	Codominant at 5 m.	4.5	Retain
260	Green ash	*Fraxinus pennsylva-nica*	52	7.0	50	20	Good		4.2	Retain
276	London plane	Gleditsia triacanthos	45	9.0	70	20	Fair	Basal wound.	3.6	Retain
281	London plane	*Platanus × acerifolia*	49	8.5	60	22	Good		3.9	Retain
282	London plane	*Platanus × acerifolia*	44	7.5	70	22	Good		3.5	Retain
283	London plane	*Platanus × acerifolia*	40	7.0	60	20	Good		3.2	Retain
284	Western redcedar	*Thuja plicata*	23	4.0	90	10	Good		1.8	Retain
285	London plane	*Platanus × acerifolia*	48	9.0	60	20	Good		3.8	Retain
286	London plane	*Platanus × acerifolia*	50	8.5	70	20	Good		4.0	Retain
287	Western redcedar	*Thuja plicata*	29	4.0	90	12	Good	Codominant at 0.5 m.	2.3	Retain
288	Western redcedar	*Thuja plicata*	25	4.5	90	11	Good		2.0	Retain
289	London plane	*Platanus × acerifolia*	37	8.5	70	18	Good		3.0	Retain
308	Cedar	*Cedrus sp.*	25	4.0	90	10	Good	Some flagging.	2.0	Retain
309	Cedar	*Cedrus sp.*	13	3.5	90	9	Fair	Some bronzing.	1.0	Retain

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310	Willow	*Salix sp.*	130					Large deadwoood. Fungal fruiting bodies on trunk.	10.4	Retain
311	Cedar	*Cedrus sp.*	9					Heavy bronzing.	0.7	Retain
312	Cedar	*Cedrus sp.*	9	2.0	80	6	Fair	Bronzing.	0.7	Retain
313	Cedar	*Cedrus sp.*	9				Dead		0.7	Retain
319	Weeping willow	*Salix babylonica*	160					9 m crown. Dead wood and cavities.	12.8	Retain
320	Willow	*Salix sp.*	187				Very Poor	Almost dead.	15.0	Retain
330	Catalpa	*Catalpa speciosa*	99	9.0	60	18	Good	Codominant at 1.5 m. Some damage to exposed roots.	7.9	Retain
340	Amur maple	*Acer ginnala*	44	7.5	60	8	Fair	Gnarly.	3.5	Retain
399	Ash	*Fraxinus sp.*	11						0.9	Retain
400	Ash	*Fraxinus sp.*	14	1.0	60	6	Good		1.1	Retain
SPEA01-NT	London plane	*Platanus × acerifolia*	20						1.6	Retain
SPEA02-1007	Siberian elm	*Ulmus pumila*	40					Basal wound.	3.2	Retain
SPEA03-NT	Siberian elm	*Ulmus pumila*	96					Multiple stems.	7.7	Retain
SPEA04-NT	Siberian elm	*Ulmus pumila*	80					Multiple stems.	6.4	Retain
SPEA05-NT	Siberian elm	*Ulmus pumila*	37					2 stems from base.	3.0	Retain
SPEA06-NT	Siberian elm	*Ulmus pumila*	40					Multiple stems.	3.2	Retain
SPEA07-NT	Western redcedar	*Thuja plicata*	35	4.0	90	15	Good		2.8	Retain
SPEA08-NT	Siberian elm	*Ulmus pumila*	150					Broken branches.	12.0	Retain
SPEA09-NT	Western redcedar	*Thuja plicata*	24	4.0	90	12	Good		1.9	Retain
SPEA10-NT	Siberian elm	*Ulmus pumila*	35						2.8	Retain
SPEA11-NT	Alder	*Alnus sp.*	92					1 stem dead.	7.4	Retain
SPEA12-NT	Siberian elm	*Ulmus pumila*	40						3.2	Retain
SPEA13-NT	Thornless honey-locust	*Gleditsia triacanthos*	24	4.0	50	8	Good		1.9	Retain
SPEA14-NT	Siberian elm	*Ulmus pumila*	20					Data is extracted from the survey file	1.6	Retain
SPEA15-NT	Siberian elm	*Ulmus pumila*	25					Data is extracted from the survey file	2.0	Retain

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SPEA16-NT	Siberian elm	*Ulmus pumila*	40					Data is extracted from the survey file	3.2	Retain
SPEA17-NT	Siberian elm	*Ulmus pumila*	40						3.2	Retain
SPEA18-NT	Alder	*Alnus sp.*	15					Multiple stems.	1.2	Retain
SPEA19-NT	Siberian elm	*Ulmus pumila*	15						1.2	Retain
SPEA20-NT	Birch	*Betula sp.*	24	4.0	70	11	Good	2 stems from base.	1.9	Retain
SPEA21-987	Paper birch	*Betula papyrifera*	71	5.0	70	9	Fair	Multi stemmed. Significant dieback.	5.7	Retain
SPEA22-NT	Black cottonwood	*Populus trichocarpa*	70	7.0	80	15	Fair		5.6	Retain
SPEA23-NT	Western redcedar	*Thuja plicata*	21	3.0	80	9	Good		1.7	Retain
SPEA24-NT	Black cottonwood	*Populus trichocarpa*	27	5.0	60	18	Good		2.2	Retain
SPEA25-NT	Black cottonwood	*Populus trichocarpa*	24	5.0	60	14	Good	Reaches north.	1.9	Retain
SPEA26-NT	Weeping willow	*Salix babylonica*	180					Massive. Large dead stem.	14.4	Retain
SPEA27-NT	Black cottonwood	*Populus trichocarpa*	59	7.0	50	18	Good	Subdominant stem from base. Corrected lean to east.	4.7	Retain
SPEA28-NT	Willow	*Salix sp.*	55						4.4	Retain
SPEA29-NT	Weeping willow	*Salix babylonica*	130					10 m crown. Dead wood in crown. Cavities.	10.4	Retain
SPEA30-NT	Black cottonwood	*Populus trichocarpa*	70	7.5	50	20	Fair	Basal damage. Previously broken top.	5.6	Retain
SPEA31-NT	Black cottonwood	*Populus trichocarpa*	48	5.0	50	22	Good	2 stems. Multiple smaller stems surrounding.	3.8	Retain
SPEA32-993	Willow	*Salix sp.*	120					Branch reaching over creek has crack with response.	9.6	Retain
SPEA33-NT	Black cottonwood	*Populus trichocarpa*	20	3.0	80	18	Good		1.6	Retain
SPEA34-956	Black cottonwood	*Populus trichocarpa*	20						1.6	Retain
SPEA35-NT	Weeping willow	*Salix babylonica*	130					10 m crown.	10.4	Retain
SPEA36-NT	Willow	*Salix sp.*	80					Reaches over creek.	6.4	Retain
SPEA37-NT	Weeping willow	*Salix babylonica*	150					Large deadwood in crown.	12.0	Retain
SPEA38-NT	London plane	*Platanus × acerifolia*	56	8.0	60	20	Good		4.5	Retain
SPEA39-NT	Willow	*Salix sp.*	170					Large dead wood in crown.	13.6	Retain
SPEA40-NT	Willow	*Salix sp.*	145					Very large dead wood in crown.	11.6	Retain
SPEA41-NT	Blue spruce	*Picea pungens*	40	4.0	80	14	Good		3.2	Retain
SPEA42-NT	Willow	*Salix sp.*	45	6.0	60	15	Fair		3.6	Retain

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SPEA43-NT	Willow	*Salix sp.*	110					Dead branches.	8.8	Retain
SPEA44-NT	Willow	*Salix sp.*	80					Large dead branches huge basal scar. Near exercise equipment Danger.	6.4	Retain
SPEA45-NT	Willow	*Salix sp.*	130					Large deadwood in crown.	10.4	Retain
SPEA46-NT	Western redcedar	*Thuja plicata*	15					Almost dead. Very brown.	1.2	Retain
SPEA47-NT	Willow	*Salix sp.*	30					In creek.	2.4	Retain
SPEA48-NT	Willow	*Salix sp.*	170					80cm limb weakly attached. Hazard. Dead wood in crown.	13.6	Retain
SPEA49-NT	Western redcedar	*Thuja plicata*	15				Fair	Flagging.	1.2	Retain
SPEA50-NT	Western redcedar	*Thuja plicata*	15				Very Poor	Almost dead.	1.2	Retain
SPEA51-NT	Willow	*Salix sp.*	35					near the creek.	2.8	Retain
SPEA52-NT	Western redcedar	*Thuja plicata*	15	3.5	70	8	Good		1.2	Retain
SPEA53-NT	Western redcedar	*Thuja plicata*	15	3.5	70	8	Good		1.2	Retain
SPEA54-NT	Willow	*Salix sp.*	150					Girdling root. Dead wood and cavities.	12.0	Retain
SPEA55-NT	Willow	*Salix sp.*	120						9.6	Retain
SPEA56-NT	Willow	*Salix sp.*	31					Codominant near base.	2.5	Retain
SPEA57-NT	Willow	*Salix sp.*	165					Multiple stems.	13.2	Retain
SPEA58-NT	Willow	*Salix sp.*	109					Multiple stems.	8.7	Retain
SPEA59-NT	Willow	*Salix sp.*	45					Codominant near base.	3.6	Retain
SPEA60-NT	Willow	*Salix sp.*	68					Multiple stems.	5.4	Retain
SPEA61-NT	Willow	*Salix sp.*	53					Codominant near base.	4.2	Retain
SPEA62-NT	Maple	*Acer sp.*	33	6.0	40	16	Good	Codominant at 4 m.	2.6	Retain
SPEA63-NT	Willow	*Salix sp.*	104					Codominant st 1 m.	8.3	Retain
SPEA64-921	Willow	*Salix sp.*	112					4 leaders from 1 m.	9.0	Retain
SPEA65-NT	Western redcedar	*Thuja plicata*	15	3.0	80	9	Fair	Some dead branches.	1.2	Retain
SPEA66-NT	Willow	*Salix sp.*	38					Leans south.	3.0	Retain
SPEA67-NT	Willow	*Salix sp.*	53					Codominant near base.	4.2	Retain
SPEA68-922	Willow	*Salix sp.*	80					Multiple stems.	6.4	Retain
SPEA69-NT	Willow	*Salix sp.*	30					Codominant near base.	2.4	Retain

TREE INVENTORY ASSESSMENT

SPEA70-NT	Walnut	*Juglans sp.*	16						1.3	Retain
SPEA71-NT	Willow	*Salix sp.*	48					Codominant near base.	3.8	Retain
SPEA72-NT	Willow	*Salix sp.*	28					Basal damage.	2.2	Retain
SPEA73-NT	Willow	*Salix sp.*	25						2.0	Retain
SPEA74-NT	Willow	*Salix sp.*	184					Multiple stems.	14.7	Retain
SPEA75-NT	Willow	*Salix sp.*	37						3.0	Retain
SPEA76-NT	Willow	*Salix sp.*	37						3.0	Retain
SPEA77-NT	Willow	*Salix sp.*	120					Large dead branches.	9.6	Retain
SPEA78-NT	Willow	*Salix sp.*	85					2 leaning stems.	6.8	Retain
SPEA79-NT	Willow	*Salix sp.*	104					Multiple stems.	8.3	Retain
SPEA80-883	Willow	*Salix sp.*	30					Codominant near base.	2.4	Retain
SPEA81-NT	Willow	*Salix sp.*	120					Leans heavily southeast over path.	9.6	Retain
SPEA82-NT	Willow	*Salix sp.*	20				Very Poor		1.6	Retain
SPEA83-NT	Willow	*Salix sp.*	25						2.0	Retain
SPEA84-NT	Willow	*Salix sp.*	104					Codominant at 0.3 m.	8.3	Retain
SPEA85-NT	Willow	*Salix sp.*	51					3 stems from base.	4.1	Retain
SPEA86-NT	Willow	*Salix sp.*	120					Codominant at base.	9.6	Retain
SPEA87-NT	Willow	*Salix sp.*	100					Codominant at 2 m with 40 cm dead stem.	8.0	Retain
SPEA88-NT	Willow	*Salix sp.*	100					Large deadwood in crown.	8.0	Retain
SPEA89-NT	Willow	*Salix sp.*	120					Large deadwood in crown.	9.6	Retain
SPEA90-NT	Willow	*Salix sp.*	100						8.0	Retain
SPEA91-NT	Willow	*Salix sp.*	120					Large deadwood in crown.	9.6	Retain
SPEA92-NT	Willow	*Salix sp.*	71					Codominant at base.	5.7	Retain
SPEA93-NT	Willow	*Salix sp.*	70					Codominant at base.	5.6	Retain
SPEA94-NT	Willow	*Salix sp.*	120					Large dead branches.	9.6	Retain
SPEA95-NT	Willow	*Salix sp.*	100					Large deadwood in crown.	8.0	Retain
SPEA96-NT	Black cottonwood	*Populus trichocarpa*	77	8.0	60	25	Fair	Codominant at 8 m. Some dead branches.	6.2	Retain
SPEA97-NT	Ash	*Fraxinus spp.*	9						0.7	Retain

TREE INVENTORY ASSESSMENT

SPEA98-NT	Ash	*Fraxinus spp.*	8						0.6	Retain
SPEA99-NT	Ash	*Fraxinus spp.*	7						0.6	Retain
SPEA100-NT	Ash	*Fraxinus spp.*	6						0.5	Retain
SPEA101-NT	Ash	*Fraxinus spp.*	6						0.5	Retain
SPEA102-NT	Ash	*Fraxinus spp.*	11						0.9	Retain
SPEA103-NT	Ash	*Fraxinus spp.*	7						0.6	Retain
SPEA104-NT	London plane	*Platanus × acerifolia*	3						0.2	Retain
SPEA105-NT	London plane	*Platanus × acerifolia*	3						0.2	Retain
SPEA106-NT	London plane	*Platanus × acerifolia*	3						0.2	Retain
SPEA107-NT	Linden	*Tilia spp.*	4						0.3	Retain
SPEA108-NT	Willow	*Salix spp.*	7						0.6	Retain
SPEA109-NT	Elm	*Ulmus spp.*	9						0.7	Retain
SPEA110-NT	London plane	*Platanus × acerifolia*	3						0.2	Retain
SPEA111-NT	Willow	*Salix spp.*	37						3.0	Retain
SPEA112-NT	Maple	*Acer spp.*	5						0.4	Retain
SPEA113-NT	Willow	*Salix spp.*	35						2.8	Retain
SPEA114-NT	Willow	*Salix spp.*	87						7.0	Retain
SPEA115-NT	Willow	*Salix spp.*	40						3.2	Retain
SPEA116-NT	Maple	*Acer spp.*	5						0.4	Retain
SPEA117-NT	Maple	*Acer spp.*	3						0.2	Retain
SPEA118-NT	Elm	*Ulmus spp.*	16						1.3	Retain
SPEA119-NT	Oak	*Quercus spp.*	5						0.4	Retain
SPEA120-NT	Oak	*Quercus spp.*	5						0.4	Retain
SPEA121-NT	Hornbeam	*Carpinus spp.*	3						0.2	Retain
SPEA122-NT	Oak	*Quercus spp.*	5						0.4	Retain
SPEA123-NT	Oak	*Quercus spp.*	6						0.5	Retain
SPEA124-NT	Oak	*Quercus spp.*	6						0.5	Retain
SPEA125-NT	Hornbeam	*Carpinus spp.*	2					Dead top.	0.2	Retain

TREE INVENTORY ASSESSMENT

SPEA126-NT	Horsechestnut	*Aesculus hippocas-tanum*	3						0.2	Retain
SPEA127-NT	Elm	*Ulmus spp.*	6						0.5	Retain
SPEA128-NT	Horsechestnut	*Aesculus hippocas-tanum*	3						0.2	Retain
SPEA129-NT	Horsechestnut	*Aesculus hippocas-tanum*	5						0.4	Retain
SPEA130-NT	Hornbeam	*Carpinus spp.*	4						0.3	Retain
SPEA131-NT	Willow	*Salix spp.*	27						2.2	Retain
SPEA132-NT	Ash	*Fraxinus spp.*	4						0.3	Retain
SPEA133-NT	Ash	*Fraxinus spp.*	4						0.3	Retain
SPEA134-NT	Oak	*Quercus spp.*	4						0.3	Retain
SPEA135-NT	Ash	*Fraxinus spp.*	4						0.3	Retain
SPEA136-NT	Elm	*Ulmus spp.*	0				Dead	Dead standing.	0.0	Retain
SPEA137-NT	Western redcedar	*Thuja plicata*	0				Dead	Dead standing.	0.0	Retain
SPEA138-NT	Western redcedar	*Thuja plicata*	7						0.6	Retain
SPEA139-NT	Western redcedar	*Thuja plicata*	8						0.6	Retain
SPEA140-NT	Western redcedar	*Thuja plicata*	6					Almost dead.	0.5	Retain
SPEA141-NT	London plane	*Platanus × acerifolia*	52	8.5	60	20	Good		4.2	Retain
SPEA142-NT	Western redcedar	*Thuja plicata*	4						0.3	Retain
SPEA143-NT	Birch	*Betula spp.*	15						1.2	Retain
SPEA144-NT	Western redcedar	*Thuja plicata*	11	3.0	50	9	Poor	Dead top.	0.9	Retain
SPEA145-NT	Black cottonwood	*Populus trichocarpa*	15	1.0	30	15	Poor	Dead top.	1.2	Retain
SPEA146-NT	Maple	*Acer spp.*	4						0.3	Retain
SPEA147-NT	Alder	*Alnus spp.*	30						2.4	Retain
SPEA148-NT	Mountain ash	*Sorbus aucuparia*	4						0.3	Retain
SPEA149-NT	Maple	*Acer spp.*	5						0.4	Retain
SPEA150-NT	Western redcedar	*Thuja plicata*	10						0.8	Retain
SPEA151-NT	Western redcedar	*Thuja plicata*	8						0.6	Retain
SPEA152-NT	Maple	*Acer spp.*	3						0.2	Retain

TREE INVENTORY ASSESSMENT

SPEA153-NT	Crabapple	*Malus spp.*	20						1.6	Retain
SPEA154-NT	Hawthorn	*Crataegus spp.*	15						1.2	Retain
SPEA155-NT	Birch	*Betula spp.*	18						1.4	Retain
SPEA156-NT	Western redcedar	*Thuja plicata*	7						0.6	Retain
SPEA157-NT	NI		15						1.2	Retain
SPEA158-NT	Hawthorn	*Crataegus spp.*	9						0.7	Retain
SPEA159-NT	Western redcedar	*Thuja plicata*	6				Good		0.5	Retain
SPEA160-NT	Magnolia	*Magnolia spp.*	17	4.0	70	10	Good		1.4	Retain
SPEA161-NT	Elm	*Ulmus spp.*	20						1.6	Retain
The Following Trees are Located offsite.										
OS-01-NT	Siberian elm	*Ulmus pumila*	30						2.4	Retain
OS-02-NT	Siberian elm	*Ulmus pumila*	30						2.4	Retain
OS-03-NT	Siberian elm	*Ulmus pumila*	20						1.6	Retain
OS-04-NT	Siberian elm	*Ulmus pumila*	30						2.4	Retain
OS-16-NT	NI		35					Removed.	2.8	N.A.
OS17-1004-HP	Norway maple	*Acer platanoides*	46				Poor		3.7	Retain
OS18-NT-HP	NI		45				Dead		3.6	Retain

Table 2 : Summary of Tree Preservation by Tree Species

All onsite, offsite and city trees associated with the project

Tree Species	Existing	Remove	Retain
Deciduous Trees			
Ash (Green/Mountain/*spp.*)	17 (1/3/13)	0 (0/0/0)	17 (1/3/13)
Alder *spp.*	3	0	3
Birch (Paper/*spp.*)	4 (3/1)	0	4 (3/1)
Black cottonwood	10	0	10
Catalpa	1	0	1
Crabapple	1	0	1
Elm (Siberian / *spp.)*	35 (30/5)	0	35 (30/5)
Goldenrain tree	1	0	1
Hawthorn	2	0	2
Horsechestnut	5	0	5
Hornbeam (European/ *spp.)*	8 (5/3)	1 (1/0)	7 (4/3)
Katsura	10	1	9
Linden (Littleleaf/*spp.*)	17 (6/11)	3 (1/2)	14 (5/9)
Locust (Honey/*spp.*)	30 (29/1)	6 (6/0)	24 (23/1)
London plane	77	0	77
Magnolia	2	1	1
Maple (Amur/Norway/Red/*spp.*)	110 (16/34/30/30)	9 (0/5/3/1)	101 (16/29/27/29)
Oak (Pin/Red/*spp.*)	18 (3/5/10)	1 (0/1/0)	17 (3/4/10)
Plum (Purple/*spp.*)	3 (1/2)	1 (0/1)	2 (1/1)
Poplar	8	4	4
Smoketree	1	0	1
Tulip tree	1	0	1
Walnut	1	0	1
Willow (Weeping/White/*spp.*)	69 (5/1/63)	0 (0/0/0)	69 (5/1/63)
Un-defined	3	0	3

Coniferous Trees			
Cedar	5	0	5
Dawn redwood	2	0	2
Douglas fir	4	3	1
Larch	1	0	1
Pine (Austrian/Blacl/Mugo/Scots/ Ponderosa/*spp.*)	50 (33/1/1/9/1/5)	3 (1/0/0/2/0/0)	47 (32/1/1/7/1/5)
Spruce (Blue/ Englemann/ Red/ Norway/*spp.*)	22 (1/2/1/1/17)	2 (0/2/0/0/0)	20 (1/0/1/1/17)
Western redcedar	22	0	22
Total Trees	543	35	508

Table 3 : Summary of Tree Preservation by Class

Tree Diameter Class	Onsite		Offsite		SPEA	
	Retain	Remove	Retain	Remove	Retain	Remove
0 - 15	23	2	1	0	67	0
>15 - 30	104	11	8	0	37	0
>30 - 45	89	16	1	0	40	0
>45 - 60	43	4	7	0	19	0
> 60	12	2	0	0	57	0

Replacement Trees Requirement

Unless this provision is waived or modified by Council or the Director of Planning & Development Services, replacement tree requirements for protected trees within a Riparian Management Area are determined by the Kelowna Tree Protection Bylaw, No. 8041, 2022, and are based on the size of tree being removed. At least one of the trees must by of the same type (either coniferous or deciduous). The minimum size must be 6 cm DBH for deciduous trees or a minimum height of 2 m for coniferous trees. The replacement shall be conducted within one growing season.

Table 4 : Tree Protection Bylaw replacement requirements

Size of Tree Removed (mm)	Replacement: Removal Ratio	Replacement Securities
0 - 151	2	125% of the value of all replacement trees and site restoration and clean-up measures required by the City *(at the discretion of Director of Planning & Development Services)*
152 - 304	3	
305 - 456	4	
457 - 609	6	
> 610	8	

Replacement tree requirements for trees on municipal property are determined by the City of Kelowna Municipal Tree Bylaw No. 8042, 2021, are based on equitable compensation. The equitable compensation is paid for the value of the tree as determined a tree appraisal, as well as all removal costs. Replacement costs may also be required. Compensation and replacement costs are at the discretion of the Urban Forestry Supervisor. 2:1 replacement ratio will be used in this report.

Table 5 : Summary of Tree Preservation

Kelowna Project No.:

Address: 1700-1800 Parkinson Way, Kelowna, B.C. V1Y 4P9

Arborist: D. Glyn Romaine

Date of Report/ Revision: February 21, 2025

Arborist Signature

*All trees identified for removal, retention and/or replacement are subject to change prior to final approval of the arborist report.

Onsite & Shared Trees		# of Trees
Existing Bylaw Trees		306
Proposed Removed Bylaw Trees		35
Proposed Retained Bylaw Trees		271
Total Replacement Trees Required		
Bylaw Trees Requiring 2 to 1 Replacement Ratio		
35	x2	70
Required Replacement Trees		**70**
Proposed Replacement Trees		TBD
Deficit of Replacement Trees		70
Total Onsite Retained and Replacement Trees		TBD

Trees within riparian area		# of Trees
Existing Protected Trees		220
Proposed Removed Bylaw Trees		0
Proposed Retained Bylaw Trees		220
Total Replacement Trees Required		
Tree Diameter Class (10 cm - 15.1 cm) Requiring 2 to 1 Replacement Ratio		
0	x2	0
Tree Diameter Class (15.2 cm - 30.4 cm) Requiring 3 to 1 Replacement Ratio		
0	x3	0
Tree Diameter Class (30.5 cm - 45.6 cm) Requiring 4 to 1 Replacement Ratio		
0	x4	0
Tree Diameter Class (45.7 cm - 60.9 cm) Requiring 6 to 1 Replacement Ratio		
0	x6	0
Tree Diameter Class (61 cm or greater) Requiring 8 to 1 Replacement Ratio		
0	x8	0
Required Replacement Trees		**0**
Proposed Replacement Trees		0
Deficit of Replacement Trees		0
Total Trees within Riparian Area Retained and Replacement Trees		220

SPECIES RECOMMENDATION FOR REPLACEMENT TREES

As advised by Kelowna's Urban trees web page, some of the recommended replacement trees based on size and shape are listed below.

Table 6 : Recommended Replacement Tree Species

Large Trees	Medium Trees	Small Trees
• *Celtis occidentalis* (common hackberry) • *Acer saccharum* (sugar maple) • *Cercidiphyllum japonicum* (Katsura) • *Eucommia ulmoides* (hardy rubber tree) • *Fagus sylvatica* (European beech) • *Fraxinus americana* (white ash) • *Fraxinus pennsylvanica* (green ash) • *Gingko biloba* (maidenhair tree) • *Gymnocladus dioica* (Kentucky coffeetree) • *Liquidambar tulipifera* (tulip tree) • *Platanus acerifolia* (London plane) • *Quercus alba* (white oak) • *Quercus robur* (English oak) • *Quercus* x *bimundorum* (Prairie stature oak) • *Tilia americana* (American linden) • *Tilia cordata* (littleleaf linden) • *Ulmus americana* (Patmore elm) • *Zelkova serrata* (Japanese zelkova) • *Quercus coccinea* (scarlet oak) • *Quercus macrocarpa* (bur oak) • *Quercus rubra* (red oak)	• *Acer pseudoplatanus* (Sycamore maple) • *Nyssa sylvatica* (black gum) • *Acer platanoides* (Norway maple) • *Acer rubrum* (red maple) • *Carpinus carolinianas* (American hornbeam) • *Morus alba* (white mulberry) • *Ostrya virginiana* (American hop-hornbeam) • *Aesculus* x *carnea* (horsechestnut) • *Gleditsia triacanthos* (thornless honeylocust)	• *Acer campestre* (hedge maple) • *Acer tataricum* (Tatarian maple) • *Acer ginnala* (Amur maple) • *Amelanchier grandiflora* (serviceberry) • *Cercis canadensis* (Eastern redbud) • *Maackia amurensis* (Amur maackia) • *Magnolia soulangiana* (saucer magnolia) • *Stewartia pseudocamillia* (Japanese stewartia) • *Syringa reticulata* (Japanese tree lilac) • *Crataegus* x *mordenensis* (hawthorn)
	Columnar Trees	**Conifers**
	• *Acer rubrum* 'Armstrong' (Armstrong red maple) • *Acer platanoides* (columnar Norway maple) • *Carpinus betulus* 'Fastigiata' (European hornbeam) • *Fagus sylvatica* 'Fastigiata' (fastigiate beech) • *Populus tremula* 'Erecta' (Swedish columnar poplar) • *Tilia americana* 'Fastigiata' (pyramidal American linden)	• *Thuja plicata* (Western redcedar) • *Abies concolor* (white fir) • *Picea abies* (Norway spruce) • *Picea pungens* (blue spruce) • *Pinus monticola* (Western white pine) • *Pinus nigra* (Austrian pine) • *Pinus ponderosa* (Ponderosa pine) • *Pinus strobus* (Eastern white pine) • *Pinus sylvestris (*Scotch pine) • *Pseudotsuga menziesii* (Interior Douglas-for)

A list of trees to avoid have also been included, due to their undesirable attributes or their poor ability to thrive in the climate:

Table 7 : Tree species to avoid for replacement trees.

Tree Species	Attribute
Ailanthus altissima (tree of heaven)	*Invasive*
Betula spp. (birches)	Vulnerable to several insect and disease problems.
Catalpa spp. (catalpas)	Large seedpods require significant maintenance.
Elaeagnus angustifolia (Russian olive)	*Invasive*
Populus spp. (Poplars, except columnar varieties)	Extensive, shallow root systems and weak wood prone to branch breakage.
Ulmus pumila (Siberian elm)	*Invasive*
Prunus spp. (Plums)	Requires mandatory ongoing codling moth control.
Malus spp. (Apples)	
Robinia pseudoacacia (black locust)	Large thorns present on stems and branches.
Salix spp. (willows)	Weak branching, messy, and, vulnerable to several insect and pest problems.

FIG. 2

FIG. 3

FIG. 4

FIG. 5

FIG. 6

FIG. 7

FIG.8

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FIG. 11

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FIG. 63

FIG. 64

FIG. 65

FIG. 66

FIG. 67

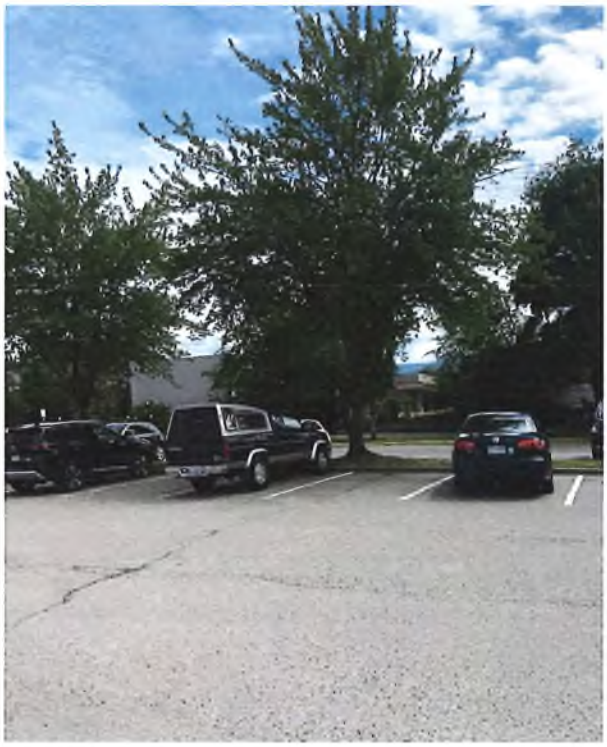
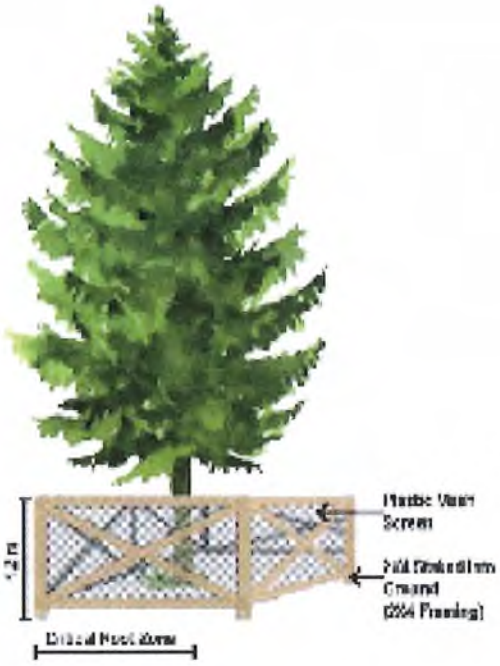
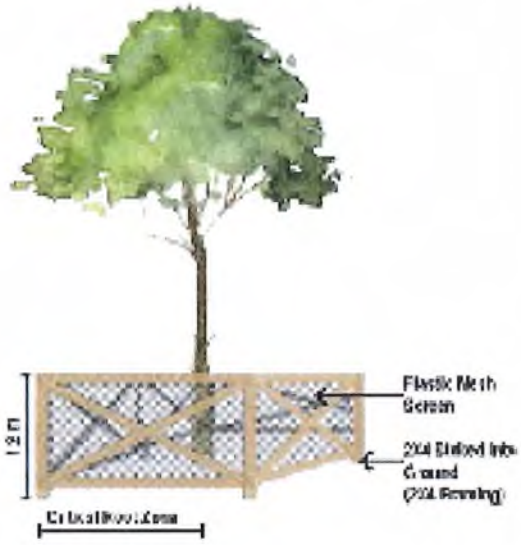


FIG. 68

Specifications for Tree Protection Barriers



Elevation View



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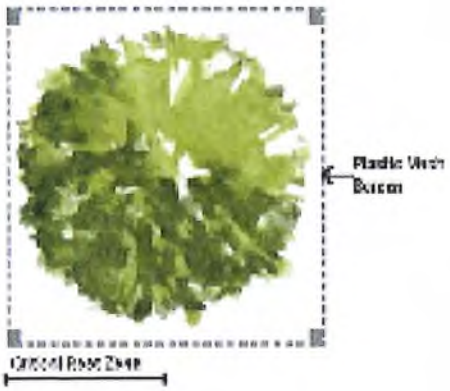
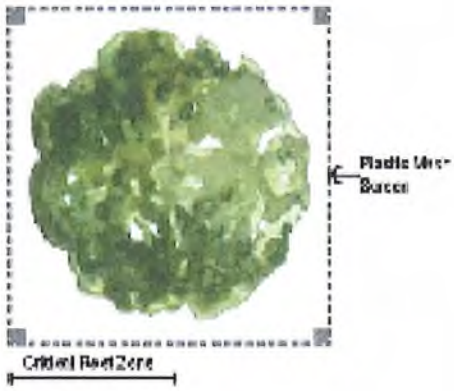


Plan View



Plan View

General Requirements and Limitations for Operations Within the Tree Protection Zone

- The Contractor shall not engage in any construction activity within the Tree Protection Zone (TPZ) without the approval of the Project Arborist including: operating, moving or storing equipment; storing supplies or materials; locating temporary facilities including trailers or portable toilets and shall not permit employees to traverse the area to access adjacent areas of the project or use the area for lunch or any other work breaks. Permitted activity, if any, within the Tree Protection Zone maybe indicated on the drawings along with any required remedial activity as listed below.
- In the event that construction activity is unavoidable within the Tree Protection Zone, notify the Project Arborist and submit a detailed written plan of action for approval. The plan shall include: a statement detailing the reason for the activity including why other areas are not suited; a description of the proposed activity; the time period for the activity, and a list of remedial actions that will reduce the impact on the Tree Protection Zone from the activity. Remedial actions shall include but shall not be limited to the following:
- In general, demolition and excavation within the drip line of trees and shrubs shall proceed with extreme care either by the use of hand tools, directional boring and/or Air Spade. If any excavation work is required within the Tree Protection Zone (TPZ), the Project Arborist must be present during excavation, and a trench should be 'hand dug' to a depth of 60 cm outside the Drip Line, to uncover any potential roots. The Project Arborist should cleanly prune roots and recommend the appropriate treatment for any structural roots encountered.
- Knife excavation where indicated or with other low impact equipment that will not cause damage to the tree, roots soil.
- When encountered, exposed roots, 1 inches and larger in diameter shall be worked around in a manner that does not break the outer layer of the root surface (bark). These roots shall be covered in Wood Chips and shall be maintained above permanent wilt point at all times. Roots one inch and larger in diameter shall not be cut without the approval of the Project Arborist. Excavation shall be tunnelled under these roots without cutting them. In the areas where roots are encountered, work shall be performed and scheduled to close excavations as quickly as possible over exposed roots.
- Tree branches that interfere with the construction may be tied back or pruned to clear only to the point necessary to complete the work. Other branches shall only be RETAINED when specifically indicated by the Project Arborist. Tying back or trimming of all branches and the cutting of roots shall be in accordance with accepted arboriculture practices (ANSI A300, part 8) and be performed under supervision of the Project Arborist.
- Do not permit foot traffic, scaffolding or the storage of materials within the Tree Protection Zone.
- Protect the Tree Protection Zone at all times from compaction of the soil; damage of any kind to trunks, bark, branches, leaves and roots of all plants; and contamination of the soil, bark or leaves with construction materials, debris, silt, fuels, oils, and any chemicals substance. Notify the Project Arborist of any spills, compaction or damage and take corrective action immediately using methods approved by the Project Arborist

GLOSSARY OF KEY TERMS *(As Written in the Kelowna Tree Protection Bylaw)*

Certified Arborist: a person accredited as such by the International Society of Arboriculture;

City: the City of Kelowna;

Council: the Municipal Council of the City of Kelowna;

Cut down: to cut down, remove or kill a tree by any means;

DBH: a tree trunk diameter measured at breast height (1 m above grade). For multi-stemmed trees this measurement is equal to the cumulative total of the DBH of the three largest stems;

Damage: any action which will cause a tree to decline in health or die, including, but not limited to: ringing or removing bark, poisoning, burning, topping (unless branches are weak/diseased), raising/lowering the grade withing a Tree Protection Zone, stockpiling material or driving within a Tree Protection Zone, cutting roots, excavation impacting roots, or excessive pruning (exceeding 25% of live branches within a 12 month period;

Dangerous or hazardous tree or limb: a tree or limb identified by a qualified person as being, or likely to become in the immediate future, a danger to people or property;

Dead, diseased or damaged trees or limbs: a tree or limb identified by a qualified person as being, or likely to become in the immediate future, a danger to people or property;

Director of Planning & Development Services: the person appointed by The City as such and includes the person's lawful designate;

Drip line: a circle in the ground around a tree trunk that corresponds to and is directly below the tips of the tree's outermost branches;

Fruit tree: any tree, fruiting or flowering, of the Genus Malus, Prunus, Pyrus or Cydonia;

Invasive tree: Siberian Elm (*Ulmus pumila*), Russian olive (*Elaeagnus angustifolia*), and Tree of Heaven (*Ailanthus altisssima*) in addition to any other species identified by the Provincial invasive species authority;

Landscape architect: a person registered with the British Columbia Society of Landscape Architects;

Owner: the registered owner of an estate in fee simple, and includes:

(a) the tenant for life under a registered life estate;

(b) the registered holder of the last registered agreement for sale; and

(c) the holder or occupier of land held in the manner mentioned in Sections 356 and 357 of the Municipal Act;

Permit: a Tree Cutting Permit issued pursuant to this bylaw;

Person: a natural person, his heirs, executors, administrators, or assigns, a firm, corporation, municipal or quasi-municipal corporation, society or party school board, hospital board, or other government or government agency;

Protected tree: any tree within the lands to which this bylaw applies with a diameter of 100 mm or more measured 1 m above grade (100 mm DBH).

Qualified person: a registered professional forester, landscape architect or a certified arborist;

Replacement tree: a tree required to replace a tree which has been removed or damaged;

Retained tree: a tree that is shown on a site plan attached to a Tree Cutting Permit as a tree that will be retained;

Riparian Management Area: an area of sufficient width to include any significant natural attribute and adjacent ecosystem (e.g. vegetation, water features, fish and wildlife habitat, escarpments, terraces, steep valley sides and cliffs) adjacent to a water course, linking aquatic to terrestrial ecosystems and includes both existing and potential riparian vegetation and existing and potential adjacent upland vegetation that exerts an influence on the stream and the size of which is determined based on the water course location as identified in the Official Community Plan.

Stream: a natural watercourse or source of water supply, whether usually containing water or not, ground water, lake, river, creek, spring, ravine, swamp and gulch, as defined by the Water Act;

Tree: a self-supporting woody plant that is a species of coniferous or deciduous genus which normally grows to a height of five (5) metres or greater, notwithstanding its current size.

Tree Protection Zone: the area of land around a tree that must be protected to prevent damage to roots defined by an arborist, which should include the area below the dripline (see Schedule A for details and drawing).

STATEMENT OF LIMITATIONS

This report is valid for the day the trees were reviewed. Trees are living things and as such are subject to change time. This report is not to be re-printed, copied, published, or distributed without prior approval by VDZ + A Consulting Inc.

Sketches, diagrams, and photographs contained in this report being intended as visual aids, should not be constructed as engineering reports or legal surveys. Only the subject tree(s) was inspected and no others, under the standards and parameters of the City of Kelowna Tree Protection Bylaw No. 8041, 2022. This report does not imply or in any other way infer that other trees on this site or near this site are sound and healthy.

The tendency of trees or parts of trees to fall due to environmental conditions and internal problems are unpredictable. Defects are often hidden within the tree or underground. The project arborist has endeavored to use their skill, education, and judgement to assess the potential for failure, with reasonable methods and detail. It is the owner's responsibility to maintain the trees and inspect the trees to reasonable standards and to carry out recommendations for mitigation suggested in this report.

If you have any further questions or concerns regarding this report, please contact the undersigned.

Sincerely,

D. Glyn Romaine, VDZ+A Consulting Inc.

ISA Certified Arborist PN-7929A

ISA Tree Risk Assessment Qualification

(604) 841-9977

TREE MANAGEMENT PLAN

See attached Tree Management Plan

Original size: 24x36

Print as 11x17 for foldout

BSK - Parkinson Recreation Center

Issued for Development Permit

2025.02.28

Legal Description :
Plan : KAP32159, Lot : 2 & lot 18; Property Type : P - Typical Property
Plan : KAP37596, Lot: A, Property Type : P - Typical Property

Civic Address :
1700-1800 Parkinson Way
1456 Spall Road

Project Description

This facility will reside on a 19.4 hectare site, easily accessible to pedestrians, cyclists, and transit users, with multiple amenities, including the Apple Bowl, the Parkinson Activity Centre, sports fields, athletics, sports courts, Mill Creek, and access points to the Okanagan Rail Trail.

The new Parkinson Recreation Center facility is envisioned as a multi-purpose campus that capitalizes on the synergies of these elements, embodying the forward-thinking spirit of the City.

The facility components will include a natatorium, gymnasium, fitness and training rooms, multiple convertible program and activities rooms, and general administration spaces. Outdoor amenities include sports field facilities, courts, plazas, playgrounds, and walking and cycling trails.

Sheet List - Architectural - DP

Sheet Number	Sheet Name
DP-A000	Cover Page
DP-A001	Perspectives
DP-A002	Survey & Phasing Plan
DP-A010	Park Plan
DP-A011	Site Plan
DP-A012	Parking Area 'A' - Enlarged
DP-A013	Parking Area 'B' - Enlarged
DP-A014	Parking Area 'C' - Enlarged
DP-A100	Basement - Floor Plan
DP-A101	Level 1 - Floor Plan
DP-A102	Level 2 - Floor Plan
DP-A103	Roof Plan
DP-A300	Elevations
DP-A400	Building Sections
DP-A500	FAR Plan - Level 1
DP-A501	FAR Plan - Level 2

Sheet List - Landscape - DP

Sheet Number	Sheet Name
DPL-1	General Arrangement Plan
DPL-1.1	Mobility Plan - Pathway Hierarchy
DPL-1.1B	Soil Volume Plan
DPL-1.2A	Detail Area Plan A - PRC Building
DPL-1.2B	Detail Area Plan B - Burch Entrance
DPL-1.2C	Detail Area Plan C - Spall Parking
DPL-1.2D	Detail Area Plan D - South East
DPL-1.3	Tree Management Plan
DPL-1.3B	Tree Palette
DPL-1.4	Planting Palette and Prototype
DPL-1.4A	Planting Plan A - PRC Building
DPL-1.5	Hardscape and Furniture Palette

Sheet List - Civil - DP

Sheet Number	Sheet Name
DP-C010	Site Subgrade, Erosion / Sediment Control and Logistics Plan
DP-C011	Site Subgrade Excavation and Grading Plan
DP-C012	Building Excavation / Subgrade Plan
DP-C050	Erosion and Sediment Control Notes and Details
DP-C105	Civil Site Grading Plan DP-A (1 of 3)
DP-C106	Civil Site Grading Plan DP-A (2 of 3)
DP-C107	Civil Site Grading Plan DP-A (3 of 3)
DP-C115	Civil Site Utility Plan DP-A (1 of 3)
DP-C116	Civil Site Utility Plan DP-A (2 of 3)
DP-C117	Civil Site Utility Plan DP-A (3 of 3)

Site Information

	Site 1	Site 2	Site 3
Legal Description:	Plan#: KAP32159, Lot 2	Plan#: KAP37596, Lot A	Plan#: KAP32159, Lot 18
Civic Address	1700-1800 Parkinson Way	1456 Spall Rd	1800 Parkinson Way

	Current	Proposed
Zoning	P1/P2	P1/P2
Land Use	Major Institutional; Cocasion & Minor Institutional	Participant Recreation Services, Indoor & Outdoor; Child Care Center, Major
Density:	2.0 FAR	0.96
Site Coverage:		
Buildings	50%	5%
Buildings & Impermeable Surfaces	70%	N/A
Setbacks		
Front	3.0 m	N/A
Side (East)	4.5 m	N/A
Side (West)	4.5 m	N/A
Rear	6.0 m	N/A
Height:	22.0 m/ 6 Storeys	15.33 m/ 3...

Site Area & FAR

	Site Area		FAR Rights		Proposed FAR	
	acres	m2	FAR	(MFA) m2	FAR	(MFA) m2
Site 1	37.41	151,393.02				
Site 2	7.39	30,697.34				
Site 3	1.81	6,110.78				
Total Gross Lot Area	46.60	188,191.13	2.00	376,382.26	0.09	11,289.67

Building

Level	Number of Floors	Participant Recreation Services	Child Care Centre	Common Area	Storage&Service	Gross Floor Area	FAR Area	Proposed FAR
		m2	m2	m2	m2	m2	m2	
Basement	1			31.72	1,230.93	1,708.57		
L1	1	6,844.63	662.70	1,204.59	428.97	9,225.89	[illegible]	
L2	1	3,422.34	0.00	516.90	697.30	4,948.54	3,422.34	
Sub Total	2	10,379.97	662.70	1,808.21	2,583.12	15,441.00	11,068.97	0.96

Parking Breakdown

Level	FAR Inclusions (MFA)		FAR Exclusions		Total GFA
	Recreation Centre	Child Care Centre	Common Area	Storage&Service	
	m2	m2	m2	m2	m2
Basement			31.72	1,230.93	1,262.57
Level 1	6,844.63	662.70	1,204.59	428.97	9,225.89
Level 2	3,422.34		516.90	697.30	4,948.54
Total	10,379.97	662.70	1,808.21	2,583.12	15,441.00

Parking

	Quantity	Bylaw Requirement	Parking Required	Parking Provided
Recreation Centre	12,844.62 m2 total GFA**	2 per 100m2 GFA	256	702
Child Care Centre, Major	81 Children	1 per 11 children or 2.5 per 100m2 whichever is more	17	23
	662.70 m2 total GFA			
Total Parking			274	725

Notes: **GFA for calculation of required parking spaces excluding all secure bicycle parking areas, common stairways and mechanical rooms within the building

Provided Parking Breakdown

	Regular Parking Stalls	Accessible Parking Stalls	Accessible Van Parking Stalls	Green Parking Stalls as per LEED requirements	EV Parking Stalls as per LEED requirements	Short-term Stalls (Childcare)	Lay-by Stalls	SubTotal
Parking Area A	157	2	1	12	4	6	5	187
Parking Area B	207	5	1	12	6		2	234
Parking Area C	275	6	1	13	6		3	304
Total	639	14	3	37	16	6	10	725

Loading

	Quantity	Bylaw Requirement	Loading Required	Loading Provided
Institutional Uses	12,844.62 m2 total GFA**	1 per 2,000m2 GFA, max. 3 spaces	3	3
waste / recycling				1
Total Loading			3	4

Notes: **GFA for calculation of required loading spaces excluding all secure bicycle parking areas, common stairways and mechanical rooms within the building

Bicycle Parking

	Quantity	Bylaw Requirement	Bicycle Parking Required	Total Bicycle Parking Provided
Required Long-term	14,177.42 m2 total GFA**	0.35 per 100 m2 GFA	28	62
Short-term	2 entrances	4 per entrance	8	16
Total Bicycle Parking			36	68

Notes: **GFA for calculation of required bicycle parking spaces excluding basements mechanical rooms

Bicycle Parking Breakdown

Vertical Stalls	30
Horizontal Stalls	32
Total	62

Owner
City of Kelowna

Project Manager
Colliers Project Leaders

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Stantec
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T: (604) 484-7474

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Electrical
AES Engineering
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Scatliff + Miller + Murray
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Calgary, AB T2P 1N3
403-242-4144

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Mill Creek
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General Contractor
Bird Construction

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237 4th Ave SW, Suite 2300
Calgary, AB T2P 4K3
T: (587) 390-8211

Electrical Contractor
Wedmanfire
250-469-1147

Mechanical Contractor
Aldo North
780-482-1147

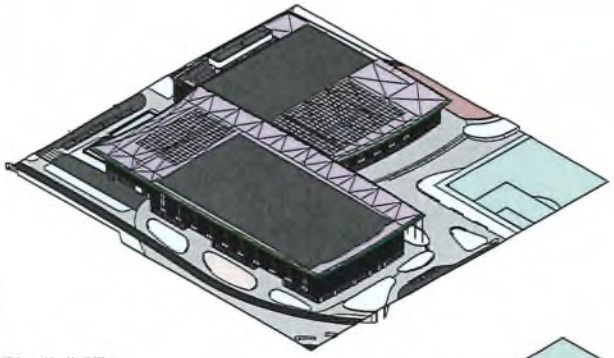
diamond schmitt
Stantec
City of Kelowna

REGISTERED ARCHITECT
ANA MARIA LANDO
BRITISH COLUMBIA

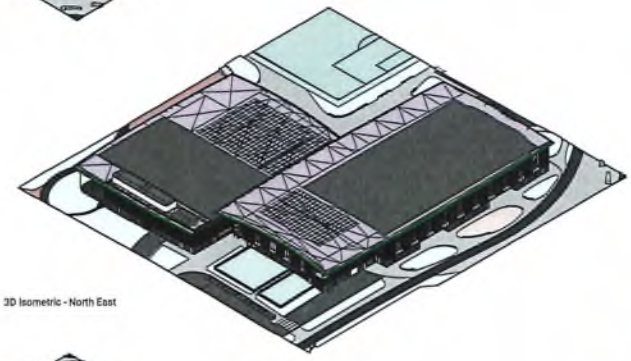
BSK - Parkinson Recreation Center

Cover Page

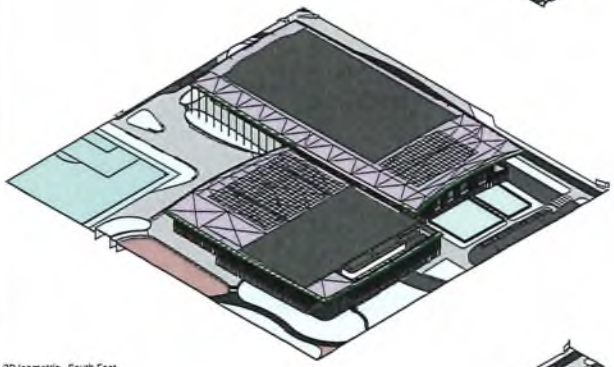
DP-A000



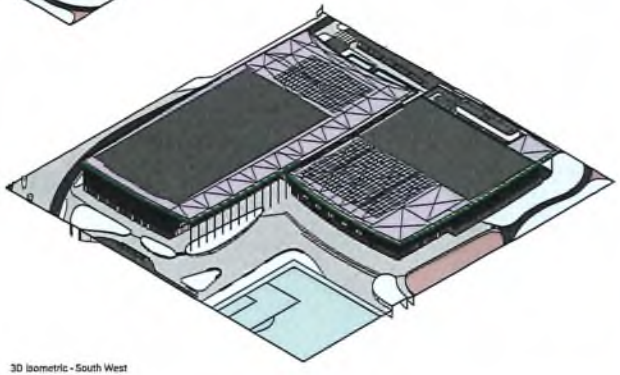
3D Isometric - North West



3D Isometric - North East



3D Isometric - South East



3D Isometric - South West

South Perspective

West Entrance Perspective

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City of Kelowna

No.	Date	Description
1	03/08/2023	Issued for Development Permit

REGISTERED ARCHITECT
ANNA-MARIA LAZARIS
BRITISH COLUMBIA

NOT FOR CONSTRUCTION

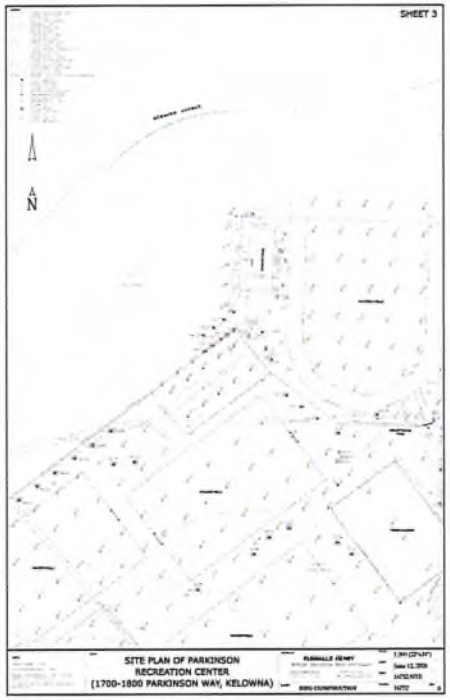
BSK - Parkinson Recreation Center

Perspectives

DP-A001

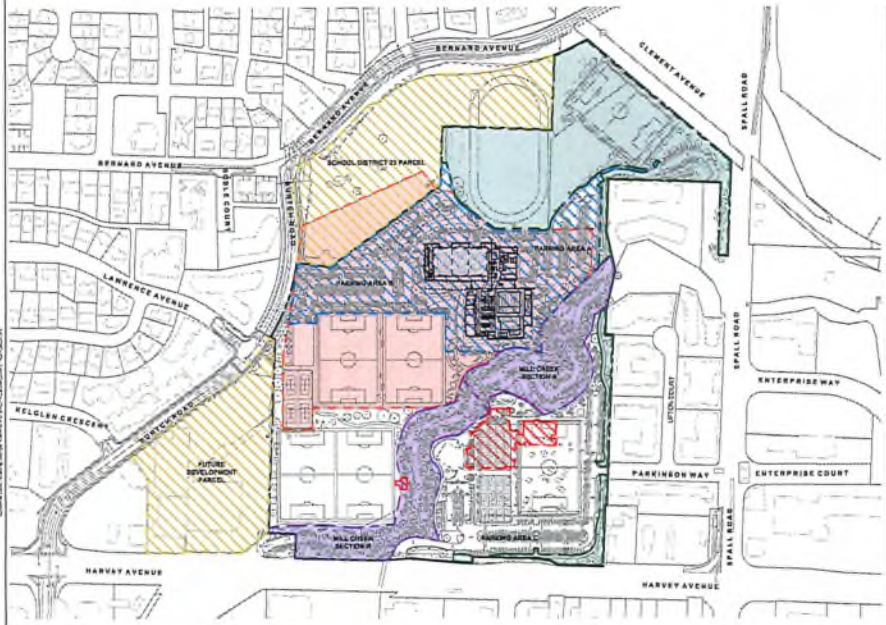
Phasing Plan Legend

Survey - Key Plan (Not to Scale - Refer to Original Survey Drawing for Scale)

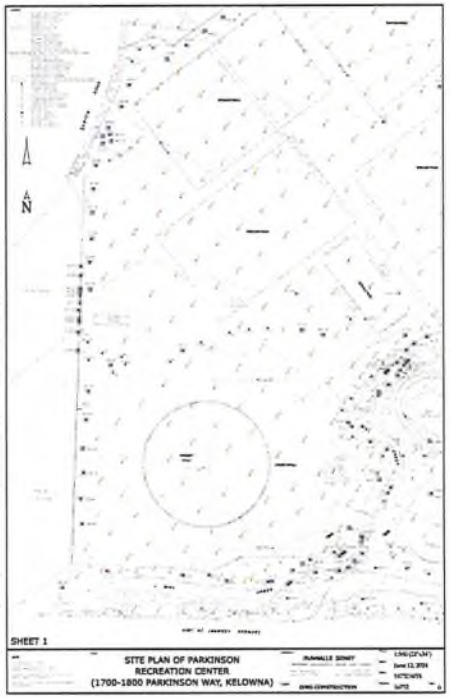


Survey - Sheet 3 (Not to Scale - Refer to Original Survey Drawing for Scale)

Survey - Sheet 4 (Not to Scale - Refer to Original Survey Drawing for Scale)



Development Permit Phasing Plan



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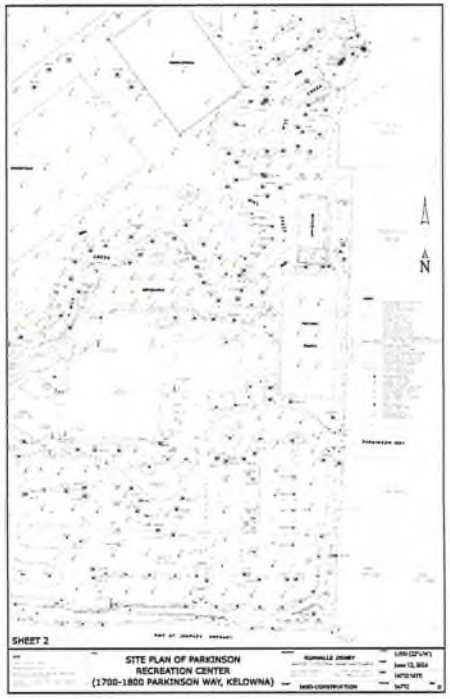

Survey - Sheet 2 (Not to Scale - Refer to Original Survey Drawing for Scale)

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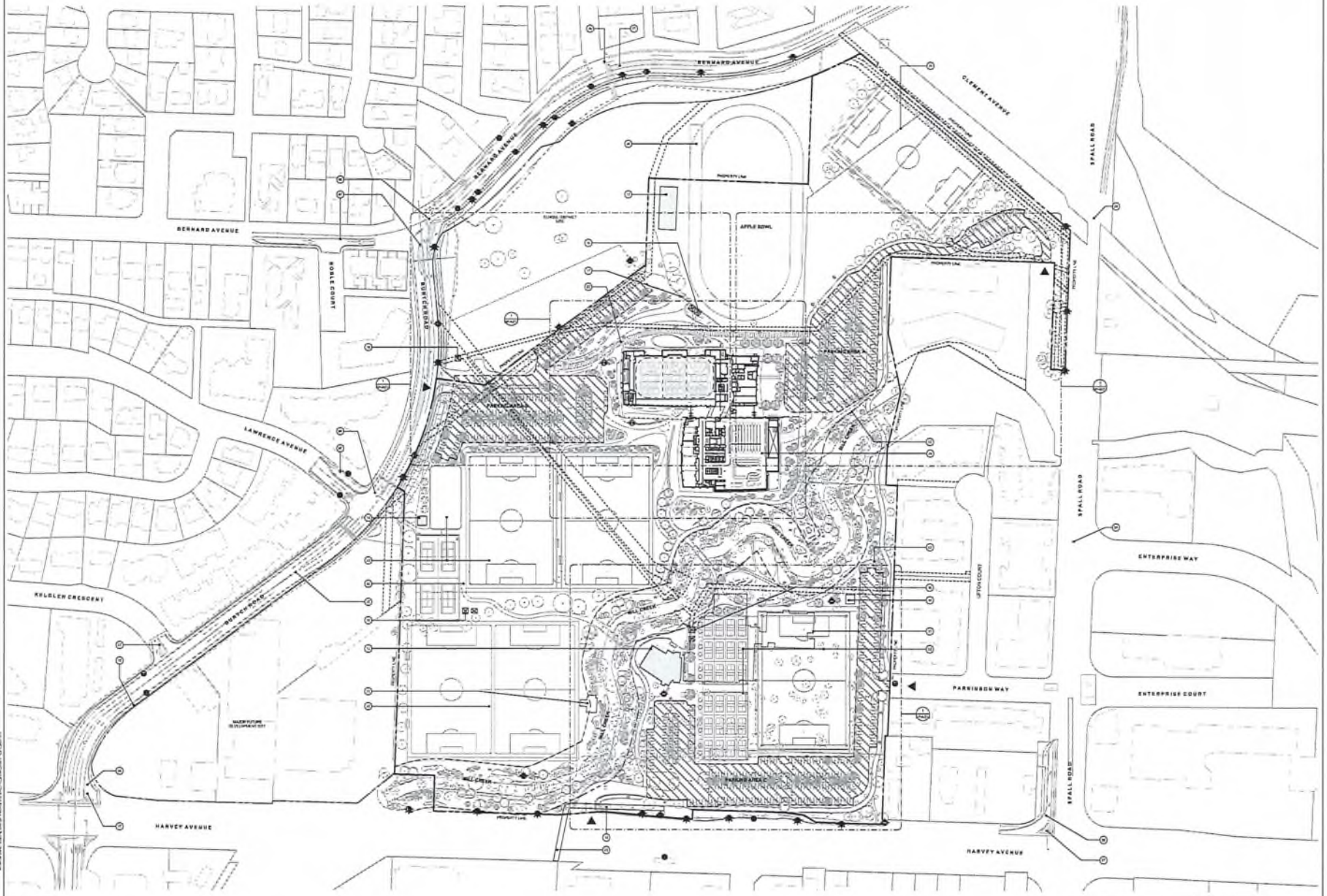
City of Kelowna

NOT FOR CONSTRUCTION

BSK - Parkinson Recreation Center

Survey & Phasing Plan

DP-A002



DP Park Plan

1 : 1000

Park Plan Notes

01 EXISTING PK DECIDUOUS SHRUBS
02 PROPOSED SOFT PK PLANTING (SEE LANDSCAPE DWGS)
03 PROPOSED SPORTS FIELD (DEPLAYING SURFACE)
04 PROPOSED RECREATION FACILITY
05 EXISTING SPORTS FIELD
06 EXISTING RUNNING TRACK
07 EXISTING PK-WIDE HOUSEKEEPING (REF CIVIL DWGS)
08 EXISTING PK-WIDE CROSSWALKS
09 PROPOSED PK-WIDE CROSSWALKS
10 EXISTING CITY SIDEWALK
11 OUTLINE OF BUILDING TO BE DEMOLISHED
12 OUTLINE OF BUILDING TO REMAIN
13 APPLE BOWL GRANDSTAND TO REMAIN
14 STORAGE HUT BUILDING
15 PROPOSED ELECTRICAL SERVICE VAULT (SEE CIVIL DWGS)
17 VEHICLE ACCESS TO THE APPLE BOWL

Park Plan Legend

1 : 1000

PROPERTY LINE
EASEMENT BOUNDARY
TRANSMISSION LATTICE
VEHICLE GATE ACCESS
EXISTING FIRE HYDRANT (SEE CIVIL DWGS)
PROPOSED FIRE HYDRANT (SEE CIVIL DWGS)
TOT-LOT (THEMED LOCATION)
LAMP STANDARD (SEE CIVIL DWGS)
UTILITY POLE (SEE CIVIL DWGS)

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City of Kelowna

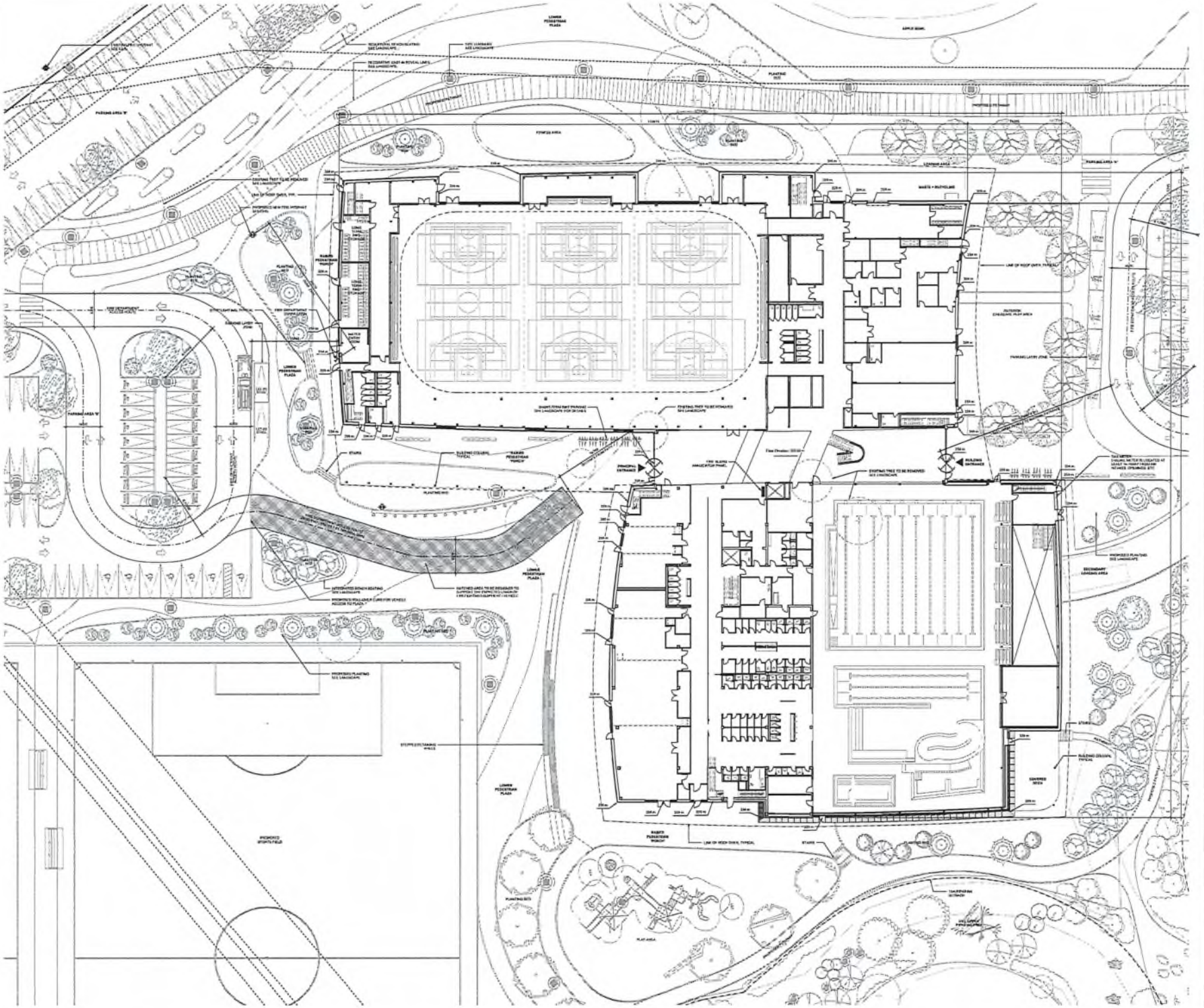
REGISTERED ARCHITECT
ANA MARIA CLARKE
BRITISH COLUMBIA

NOT FOR CONSTRUCTION

BSK - Parkinson Recreation Center

Park Plan

DP-A010



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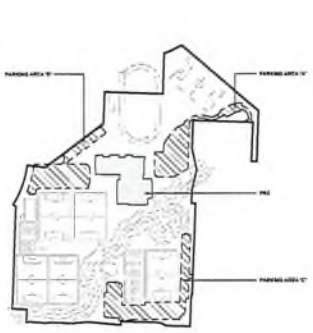
BSK - Parkinson Recreation Center

Site Plan

1 : 250

DP-A011



Parking Area Key Plan

Wayne Titan

	mm
Width	2525
Track	2439
Lock to Lock Time	6.0
Steering Angle	45.0

Waste Collection Vehicle

SU-9M

	mm
Width	2438
Track	2438
Lock to Lock Time	9.0
Steering Angle	31.0

Loading Vehicle

Parking Schedule

Parking Area A Notes

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City of Kelowna

NOT FOR CONSTRUCTION

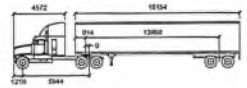
BSK - Parkinson Recreation Center

Parking Area 'A' - Enlarged

as indicated

DP-A012

Parking Area Key Plan

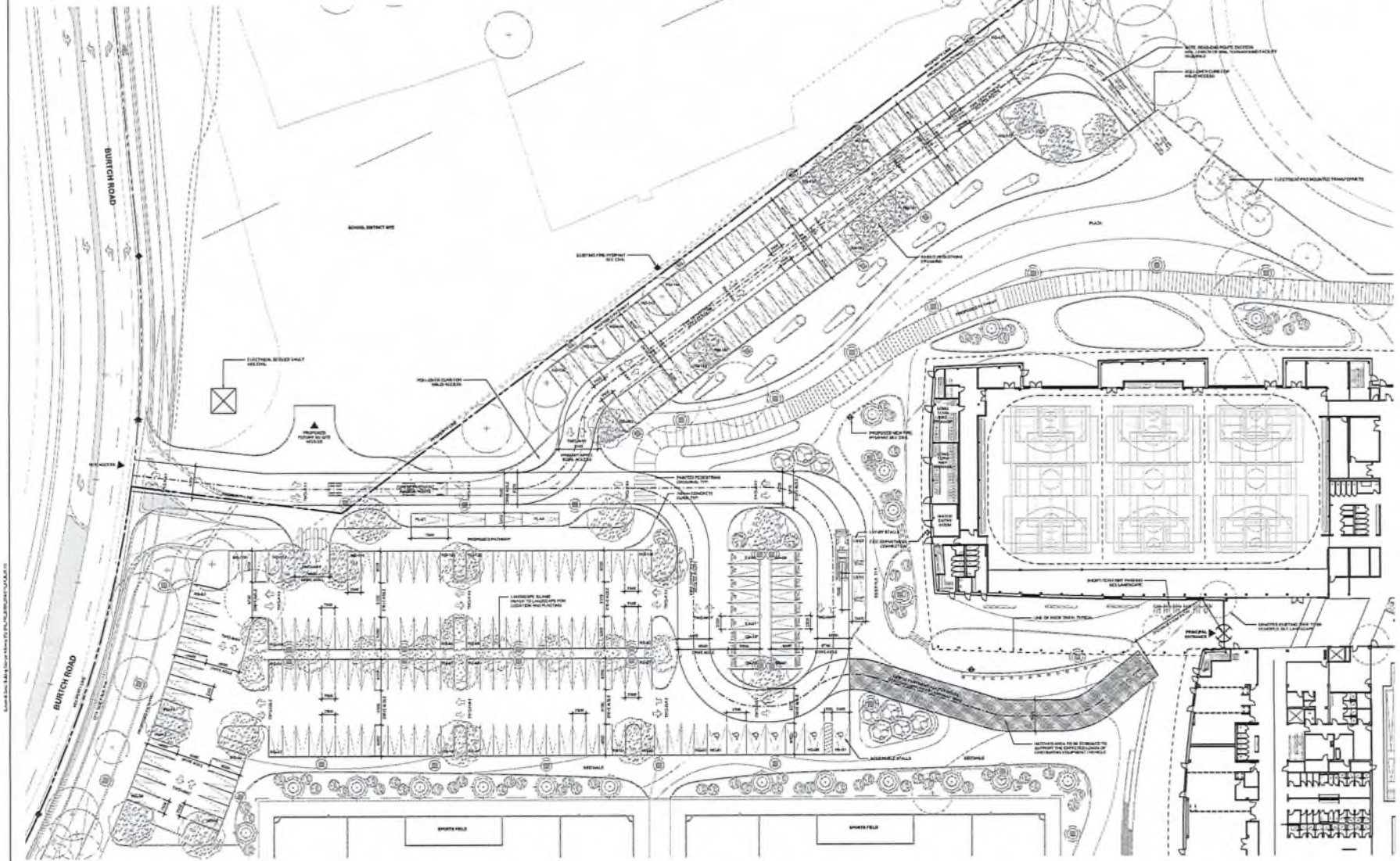


WB-20M

Tractor Width	: 2438	Lock to Lock Time	: 8.0
Trailer Width	: 2591	Steering Angle	: 28.4
Tractor Track	: 2438	Articulating Angle	: 73.0
Trailer Track	: 2591		

WB-20

Parking Schedule



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City of Kelowna

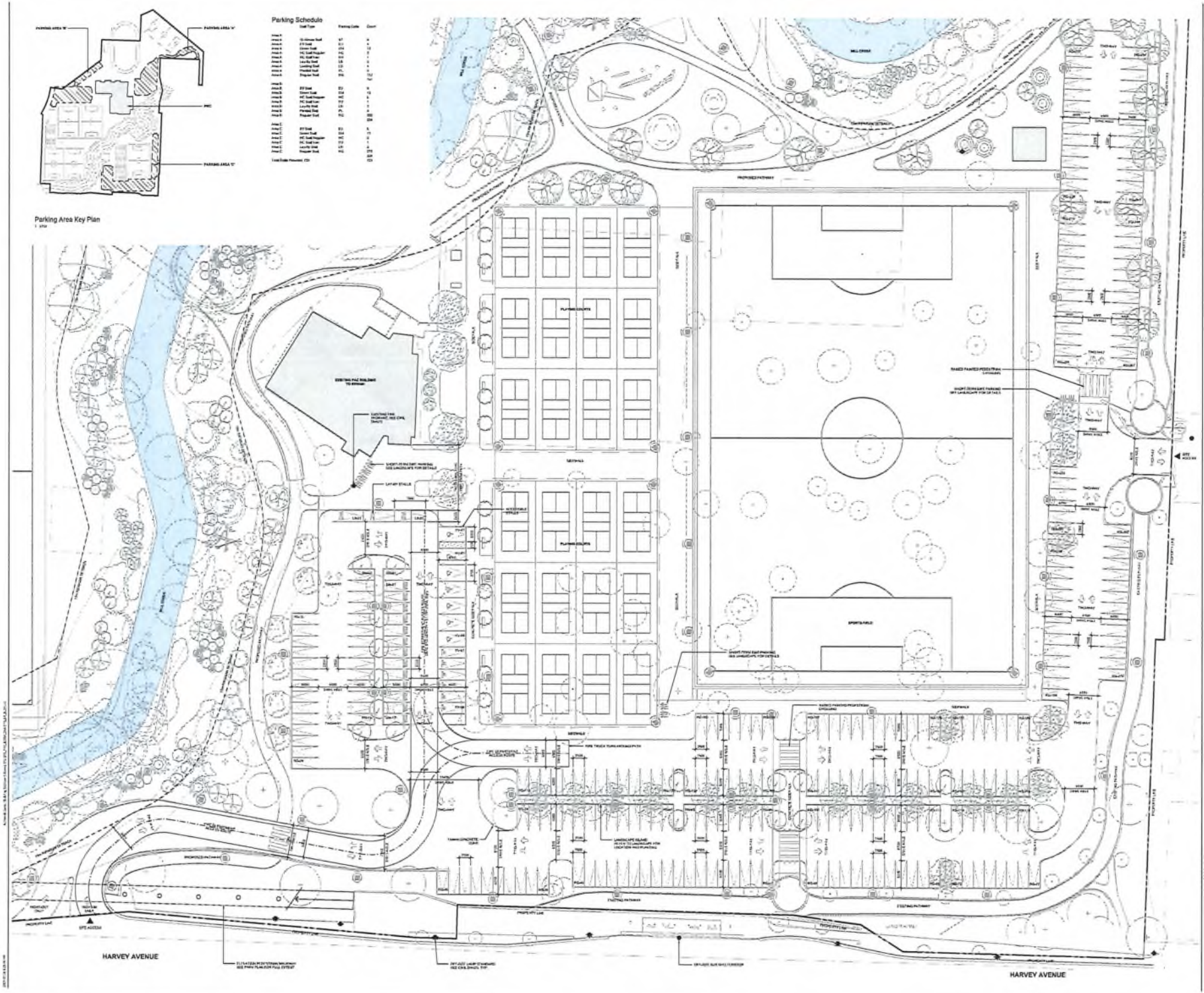
REGISTERED ARCHITECT MARIA LEANZA BRITISH COLUMBIA

NOT FOR CONSTRUCTION

BSK - Parkinson Recreation Center

Parking Area 'B' - Enlarged

DP-A013



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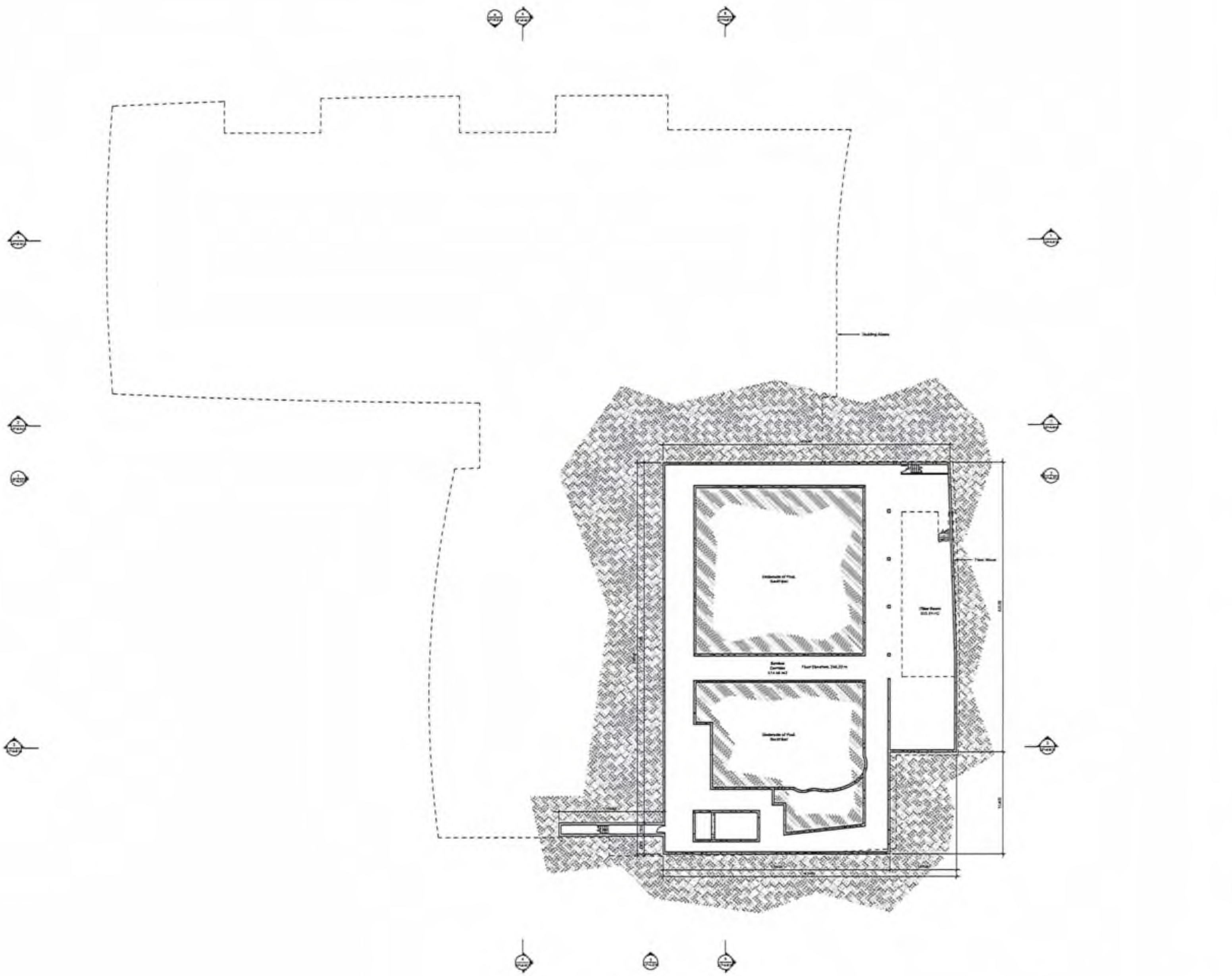
City of Kelowna

NOT FOR CONSTRUCTION

BSK - Parkinson Recreation Center

Parking Area 'C' - Enlarged

DP-A014



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City of Kelowna

Issued

Issued for Development Permit

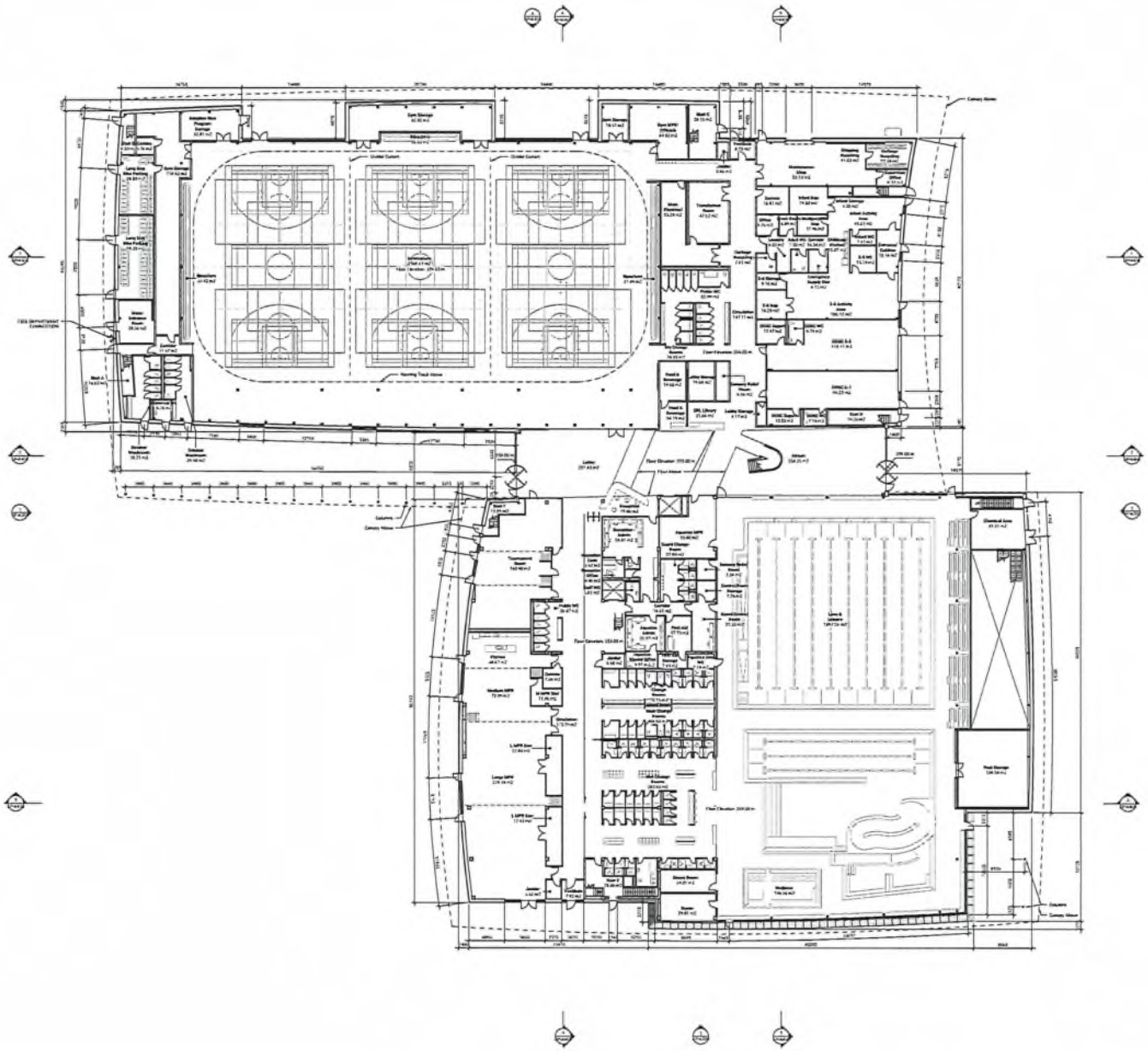
REGISTERED ARCHITECT
BRITISH COLUMBIA

NOT FOR CONSTRUCTION

BSK - Parkinson Recreation Center

Basement - Floor Plan

DP-A100



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City of Kelowna

Issued		
No	Date	Description
1	03/28/2025	Issued for Development Permit

REGISTERED ARCHITECT
ANA MARIA LLANOS
BRITISH COLUMBIA

NOT FOR CONSTRUCTION

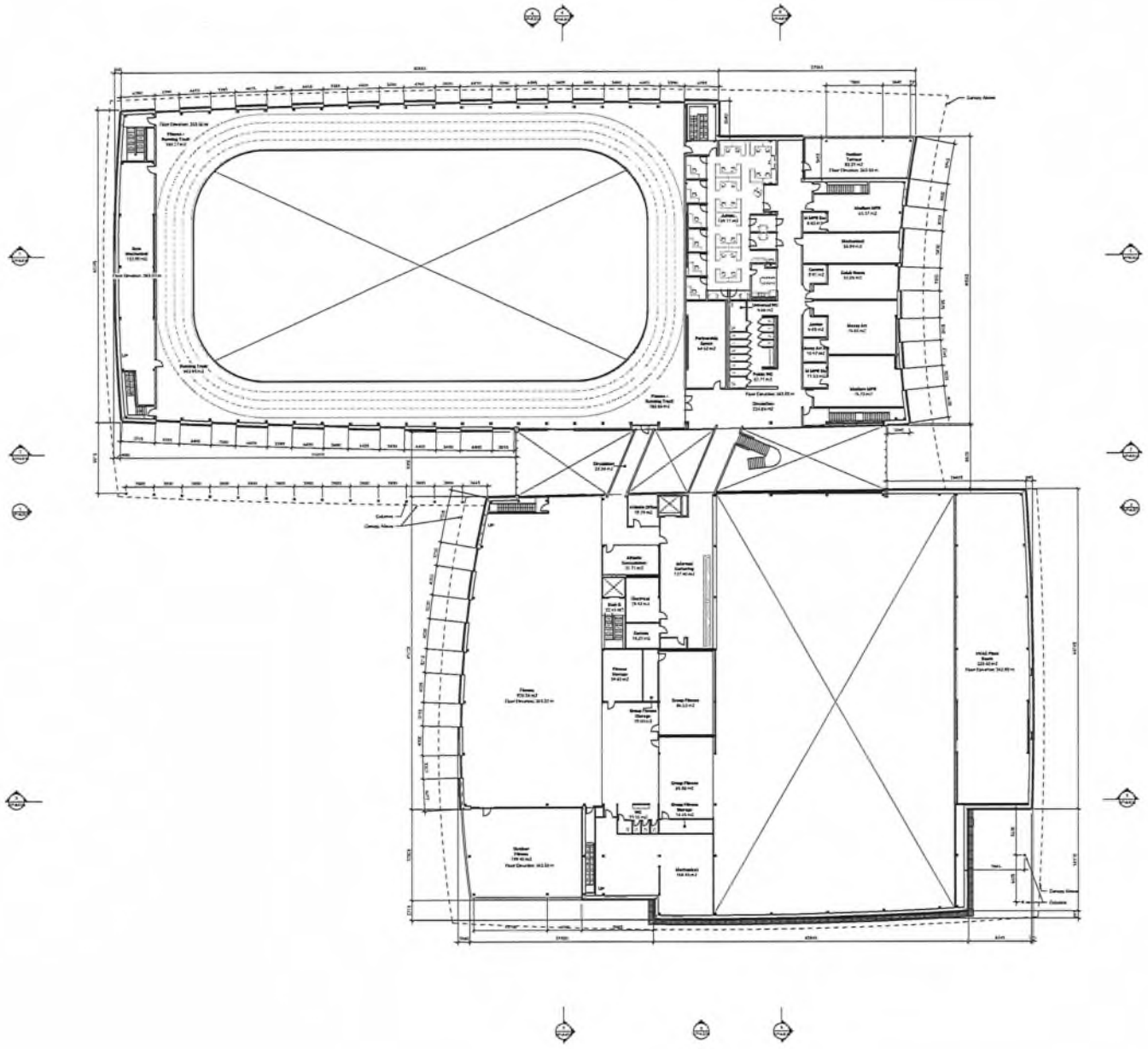
BSK - Parkinson Recreation Center

22154

Level 1 - Floor Plan

1 : 200

DP-A101



diamond schmitt

Stantec

City of Kelowna

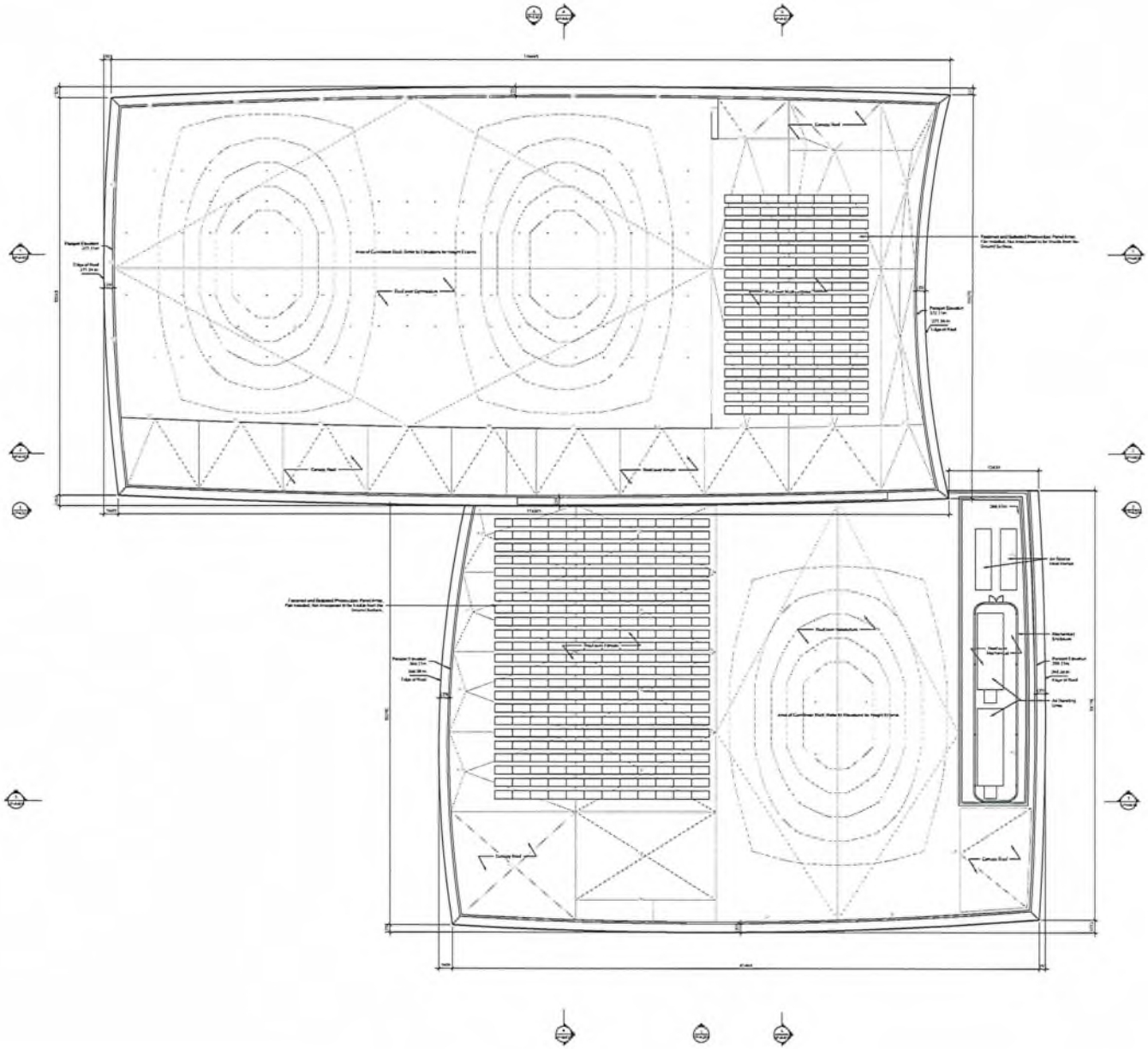
NOT FOR CONSTRUCTION

BSK - Parkinson Recreation Center

Level 2 - Floor Plan

1 : 150

DP-A102



diamond schmitt

Stantec

City of Kelowna

No.	Date	Description
1	03/18/2021	Issued for Development Permit

REGISTERED ARCHITECT
ANA MARIA LLANOS
BRITISH COLUMBIA
2009-03-06

NOT FOR CONSTRUCTION

BSK - Parkinson Recreation Center

Roof Plan
1 : 200

DP-A103

Exterior Material Tags

1. Exterior Cladding Panel 1 (Lower) - Cement Panel
2. Exterior Cladding Panel 2 (Upper) -
   3A. Coloured Metal Breakshape Panel
   3B. Coloured Metal Breakshape Panel - Perforated
3. Exterior Cladding Panel 3 (Base) - Concrete Precast Panel
4. Glazing Type 1 - Coloured Metal Frame and Clear Glass
   4V. Vision Glass Panel
   4S. Spandrel Panel
5. Glazing Type 2 - Deep Coloured Metal Frame to match Exterior Cladding Panel 1 (Lower) and Clear Glass (Natatorium)
6. Mechanical Equipment Screen - Coloured Perforated Metal Panel
7. Picket Guard - Coloured Metal Extrusion
8. Canopy Fascia Cladding - Coloured Metal Cladding
9. Parapet Cladding Type 1 - Metal Cladding to match Exterior Panel 3 (Upper)
10. Fascia Cladding - Metal Cladding to match Exterior Panel 2 (Upper)
11. Painted Steel Columns
12. Exposed Roof Membrane to match Exterior Panel 2 (Upper)
13. PV Array Roof Beyond
14. Exterior Railing - Coloured Metal Railing to match Glazing Type 2
15. Loading Door to match Exterior Cladding Panel 1 (Lower)
16. Wood and Painted Metal Structural Canopy Framing
17. Soffit Cladding - Coloured Metal Panel
18. Exterior Doors
   18A. HM Door Clad with Exterior Cladding 1 Veneer Panel
   18B. Glass Door to match Glazing Type 1 (MV)

1 Elevation - North
1 : 200

1 Elevation - South
1 : 200

1 Elevation - East
1 : 200

1 Elevation - West
1 : 200

diamond schmitt

Stantec

City of Kelowna

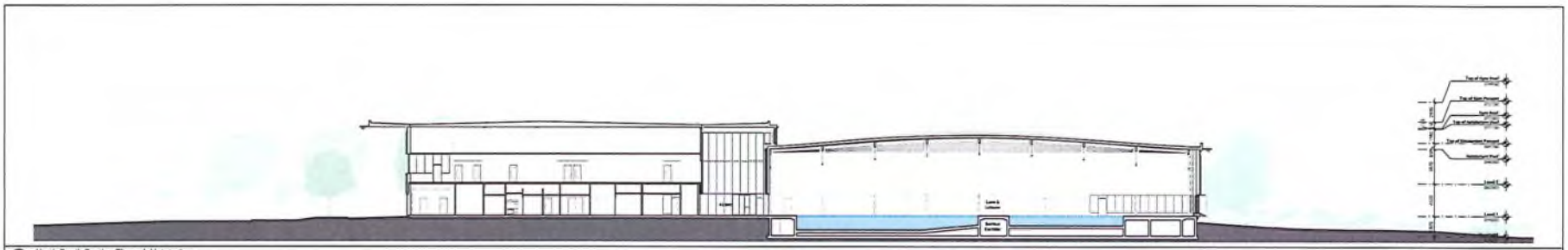
No.	Date	Description
1	2024.12.20	Issued for Development Permit

NOT FOR CONSTRUCTION

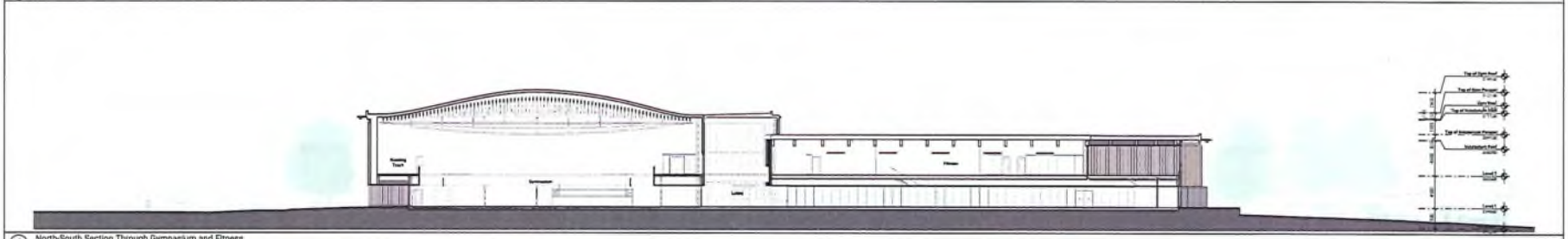
BSK - Parkinson Recreation Center

Elevations

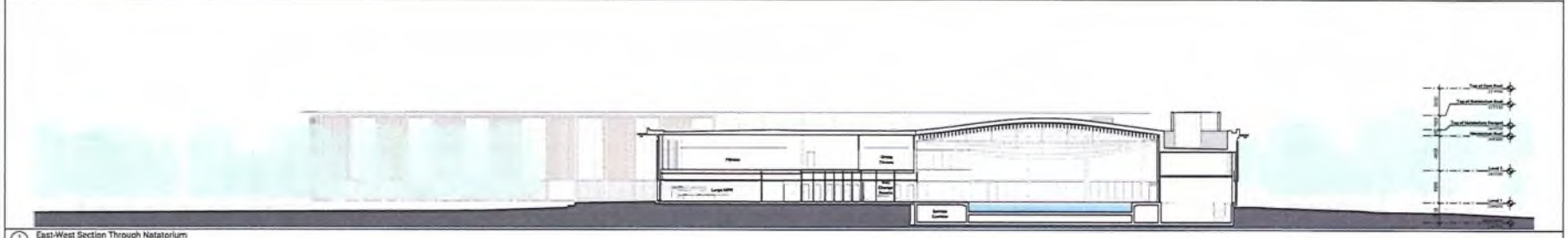
DP-A300



North-South Section Through Natatorium
1 : 200

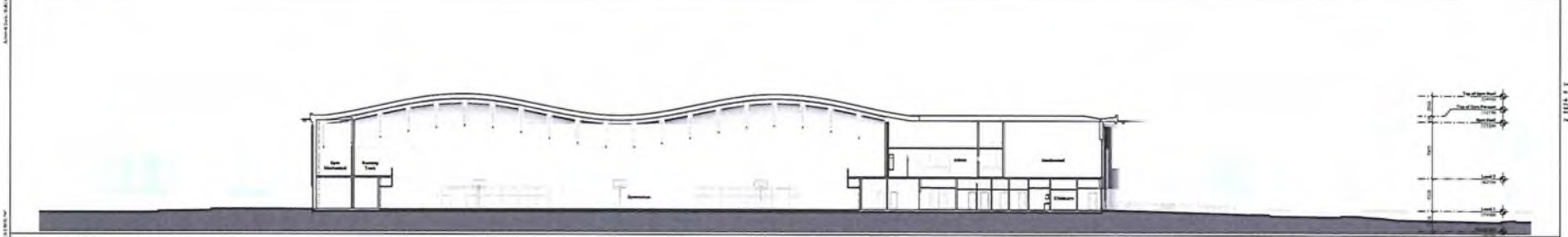


North-South Section Through Gymnasium and Fitness
1 : 200



East-West Section Through Natatorium
1 : 200

East-West Section Through Atrium
1 : 200



East-West Section Through Gymnasium
1 : 200

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Stantec

City of Kelowna

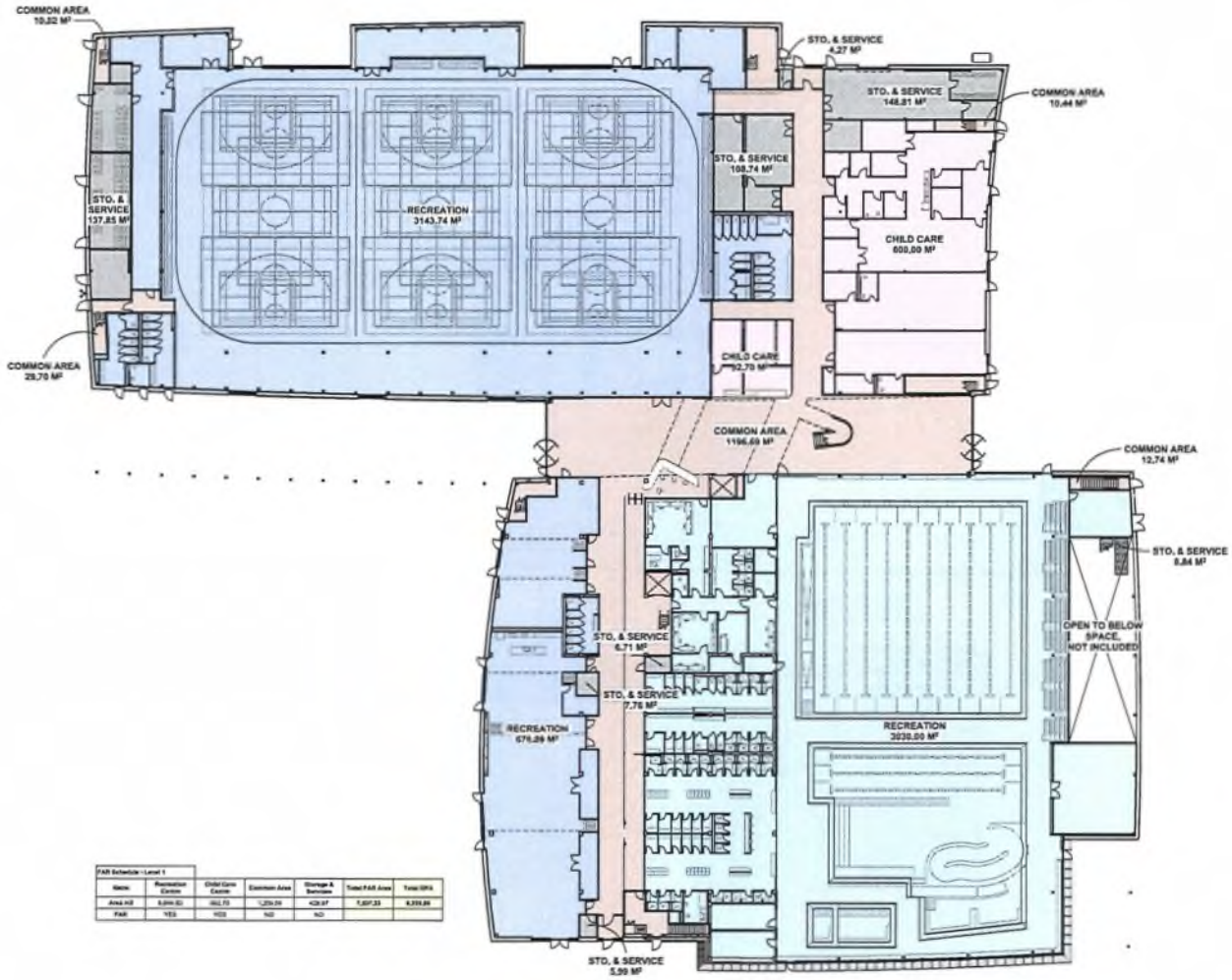
REGISTERED ARCHITECT
ANA MARIA LLANOS
BRITISH COLUMBIA

NOT FOR CONSTRUCTION

BSK - Parkinson Recreation Center

Building Sections
1 : 200

DP-A400



FAR Schedule - Level 1						
Name	Recreation Centre	Child Care Centre	Common Area	Storage & Services	Total FAR Area	Total GFA
Area m2	3,899.83	652.70	1,229.04	426.87	7,207.33	8,359.84
FAR	YES	YES	NO	NO		

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City of Kelowna

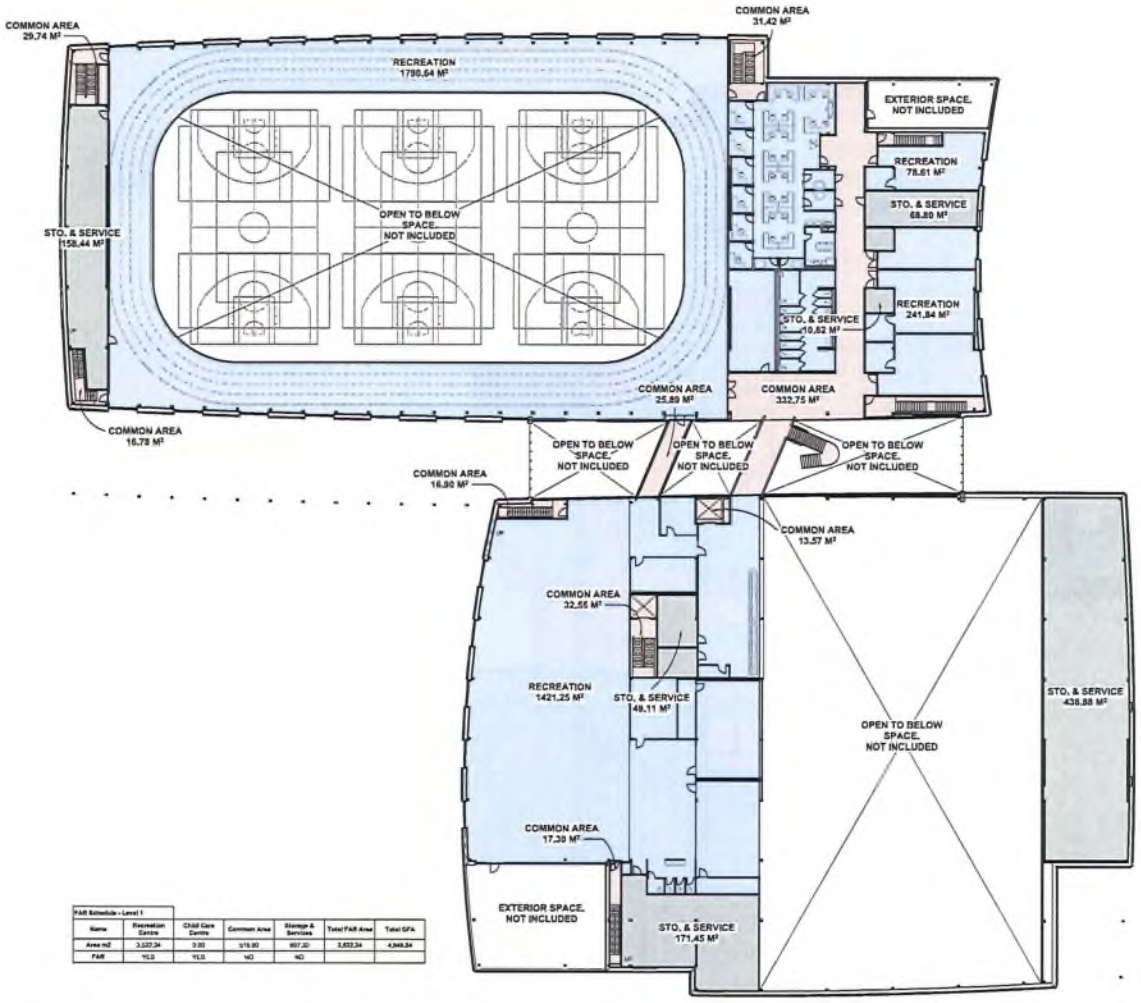
NOT FOR CONSTRUCTION

BSK - Parkinson Recreation Center

FAR Plan - Level 1

1 : 150

DP-A500



FAR Schedule - Level 1

Name	Recreation Centre	Child Care Centre	Common Area	Storage & Services	Total FAR Area	Total GFA
Area m2	3,537.34	0.00	979.80	997.20	3,537.34	4,949.24
FAR	YES	YES	NO	NO		

diamond schmitt

Stantec

City of Kelowna

Issued		
No.	Date	Description
1	03/26/2025	Issued for Development Permit

REGISTERED ARCHITECT
ANA MARIA LLANOS
BRITISH COLUMBIA

NOT FOR CONSTRUCTION

BSK - Parkinson Recreation Center

FAR Plan - Level 2

1 : 200

DP-A501

Stantec

Memo

To:	Jim Hager - City of Kelowna Kelowna, BC	From:	Luke Viljakainen Kelowna
Project/File:	Redevelopment of Parkinson Recreation Centre	Date:	February 20, 2025

Reference: Parkinson Recreation Centre - Stormwater Management Plan

1 Introduction

A Stormwater Management Plan (SWMP) is essential for assessing the hydrology, drainage, and stormwater quality of the subject site under existing conditions and to evaluate the impacts of the proposed development on these items and recommend solutions to mitigate these impacts. The SWMP will aim to control potential erosion and flooding through a comprehensive stormwater management system.

This report outlines our approach to stormwater management, establishing clear performance targets and objectives to ensure effective and sustainable outcomes. This work is being completed concurrently with the Mill Creek flooding improvements.

2 Background Review

We've completed a thorough background review of City Bylaws, several agency and government guidelines, and stormwater management practices in British Columbia. The following documents were reviewed:

- City of Kelowna. (n.d.). *Subdivision, development and servicing bylaw no. 7900: Schedule 4 - Design standards*. Retrieved from https://apps.kelowna.ca/CityPage/Docs/PDFs/Bylaws/Subdivision,%20Development%20and%20Servicing%20Bylaw%20No.%207900/Schedule%204%20-%20Design%20Standards.pdf
- City of Kelowna. (n.d.). *Sanitary sewer storm drain regulation bylaw no. 6618*. Retrieved from https://www.kelowna.ca/sites/files/1/docs/city-services/sanitary_sewer_storm_drain_regulation_bylaw_no._6618.pdf
- British Columbia Ministry of Water, Land and Air Protection. (2002). *Stormwater planning: A guidebook for British Columbia*. Retrieved from https://www2.gov.bc.ca/assets/gov/environment/waste-management/sewage/stormwater_planning_guidebook_for_bc.pdf
- City of Kelowna. (n.d.). *Stormwater management reports: Terms of reference*. Retrieved from https://www.kelowna.ca/sites/files/1/docs/homes-building/app_3_stormwater_tor_new.pdf

- Salmon-Safe. (n.d.). Salmon-Safe certification standards for urban development. Retrieved from https://www.salmonsafe.ca/_files/ugd/59f3c3_6ddecf8be22041a38f03bace7217e4bc.pdf

The City of Kelowna currently implements the following stormwater management criteria.

- **Minor System** – includes all drainage works that collect, convey, detain, divert and intercept design storm runoff. The minor design event must be the 5-year design storm.
- **Major System** – includes all drainage pathways that convey, detain and/or intercept flows in excess of the capacity of the minor system. Its primary purpose is to provide flood protection for the 1:100-year design storm. The major system generally includes surface flow paths such as ditches, swales, sewers, roadways, plus roadway culverts and watercourses.
- **Detention Systems** – are used to capture and store water on site to assure that storm releases are limited to the pre-development release rate for a 5-year design storm.
- **Quality Control** – minor system flow (50% of the 1 in 2-year) must meet minimum BC Ministry of Environment Recreational Water Quality Guidelines and as per Sanitary Sewer/Storm Drain Regulation Bylaw 6618.

3 Approach and Objectives

3.1 Quality

- Capture at the source frequent storm events for infiltration and/or reuse. This is equivalent to 50% of the 2-year rainfall event.
- Oil/grit separators will be deployed to treat stormwater runoff.
- Subsurface disposal systems will be utilized where existing systems are already in place. Catch basin inserts will be installed to treat stormwater runoff.

3.2 Minor System

- **Rate Reduction:** store the runoff generated by the 5-year post-development 1-hour AES design storm and release it at a pre-development condition.
- **Conveyance Level of Service:** The minor system is designed to convey the 5-year post-development 1-hour AES design storm.
- Underground storage systems can be integrated with parking lots and sports fields, while above-ground systems can include parking lot ponding (up to 150mm).

3.3 Major System

- **Volume Reduction:** Underground stormwater management facilities will be designed to detain 100-year post-development flows to match the 5-year pre-development levels for the 24-hour SCS Type IA design storm.
- Safely convey rainfall events that exceed the capacity of the minor system. This system consists of surface flood paths, roadways, culverts, channels, and stormwater management facilities designed to capture and modify the release rate.

4 Existing Stormwater Drainage Conditions

The study area is currently used as a recreational park, with the majority of the space being green areas. On the north side, there are six tennis courts and the Apple Bowl Stadium, while the south side features a recreation center facility and parking lot.

The north side generally drains southward to Mill Creek, with a storm pipe system conveying flows from the Apple Bowl Stadium and the tennis courts. The south side is serviced by a storm pipe system that collects runoff from the building and the existing parking lot.

To effectively design a stormwater management plan, it is essential to determine the allowable discharge rates from the study area. This process involves assessing the peak runoff and volume from the site based on its pre-development condition. For the PRC site that will be disturbed, the pre-development condition is assumed to be a state with no development or 5% imperviousness. For catchments that will remain undisturbed, the pre-development condition is assigned an imperviousness that reflects current state.

4.1 Parkison Park Storm System

There are two separate storm systems within the park. A 200mm diameter storm system services the football/track field and the six tennis courts on the north side. It is believed that the piping within the track field (not included in the model) is perforated to allow infiltration. On the south side, a 375/300 mm diameter storm system services the existing Parkinson Recreation Centre and the adjacent parking lot area.

4.2 Burtch Road Storm System

The Burtch Road storm system was checked and updated based on online as-built drawing records to obtain the most accurate information possible for system capacity assessment. The as-built drawings were useful for verifying pipe invert elevations, manhole rim elevations, and pipe sizes.

An oil interceptor structure with low-flow bypass system is located immediately upstream of the outfall south of Harvey Avenue. During normal dry days, flow will be diverted to the interceptor by a low barrier on the existing 600mm diameter storm main. Any excess flow during rainy days will overflow directly to the existing 600mm diameter outfall.

Upstream of the oil interceptor, on the 600mm storm sewer, a section is 0.12m lower than the downstream section, as illustrated in **Figure 1** and documented in record drawing A-1620-1. This condition, reflected in the model, reduces the capacity of the storm sewer through this section.

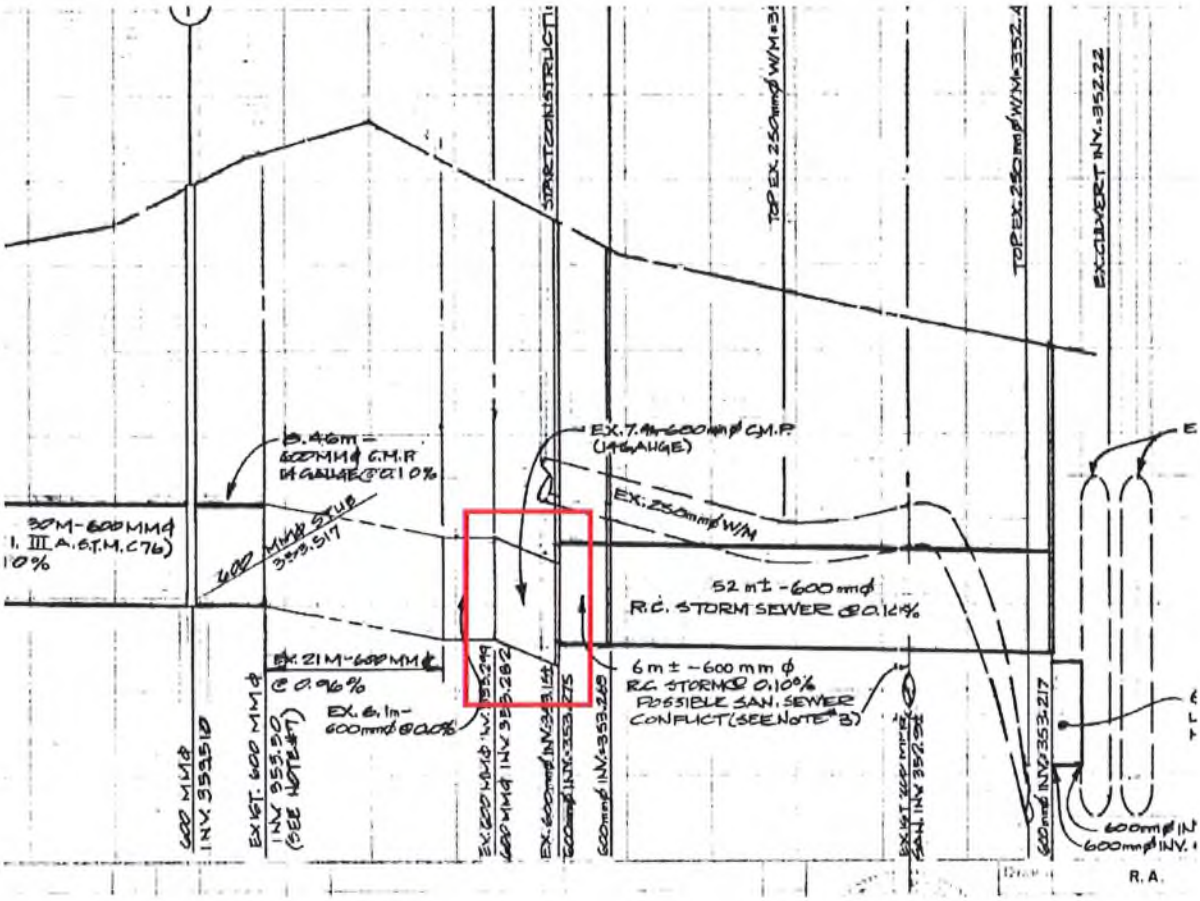


Figure 1 – Extract from A-1620-1

4.3 Parkinson Way Storm System

The 600mm diameter storm system along Parkinson Way/Enterprise Court was updated to correct all inconsistent pipe invert elevations, ensuring a smooth profile based on upstream and downstream inverts. It was assumed that the GIS data is generally accurate, and no as-built drawings were used in the update process. Two separators are indicated in the GIS data, but they were not included in the update due to the apparent lack of as-built records for these structures.

5 Model Build/Parameterization

A comprehensive stormwater drainage model was developed using PCSWMM version 7.6.3695, incorporating SWMM engine 5.2.4, to assess pre-development runoff responses from both on-site and off-site areas. The pre-condition sub-catchments were delineated using the PCSWMM watershed delineation tool with a survey DEM surface for the Parkinson Recreation Park area. The delineation for off-site areas,

including Burtch Road and Parkinson Way drainage systems, was completed using 1.0-m interval contour maps.

To enhance accuracy, curbside catch basin locations and multi-family servicing connections were verified using the City's public online mapping database. Additionally, Google Maps Street View was utilized to cross-check for inconsistencies or missing catch basins.

5.1 Hydrological and Hydraulic Parameters

Key sub-catchment hydrological parameters and pipe/node hydraulic parameters are summarized in **Table 1**. Site-specific parameters, such as size, slope, and percentage of impervious area, were determined using a combination of land surface maps, 1m interval contour maps, and aerial imagery.

The Green-Ampt method was selected for runoff infiltration based on its application in the Brandt's Creek model. The Brandt's Creek model encompasses a large area along Glenmore Drive north of Highway 97, with a portion adjacent to the Burtch Road drainage area. The parameters for this region, characterized by sandy loam soil, are outlined in **Table 1.**

Parameter	Model Item	Value
Sub-catchment Hydrological Parameters		
Manning's n Number for Impervious Surface	N Imperv	0.013
Manning's n Number for Pervious Surface	N Perv	0.15
Depression Storage on Impervious Surface (mm)	Dstore Imperv	2
Depression Storage on Pervious Surface (mm)	Dstore Perv	5
Area with No Depression on Impervious Surface (%)	Zero Imperv	25
Soil Suction Heading for Green-Ampt Method (mm)	Suction Head	109.98
Soil Hydraulic Conductivity for Green-Ampt Method (mm/hr)	Conductivity	10.92
Initial Deficit for Green-Ampt Method (fraction)	Initial Deficit	0.369
Network Hydraulic Parameters		
Node Allowable Surface Ponding Area (m2)	Ponded Area	1000
Pipe Manning's n Number	Roughness	0.013
Natural Channel Manning's n Number	Roughness	0.05
Weir Discharge Coefficient	Discharge Coeff.	1.8
Orifice Discharge Coefficient	Discharge Coeff.	0.63

Table 1 – Hydrologic & Hydraulic Parameters

A geotechnical study conducted in Parkinson Park confirmed that the soil composition consists primarily of sand, gravel, and trace silt in the topsoil, with underlying layers primarily composed of sand, gravel, and silt. These findings, based on the *Preliminary Geotechnical Investigation and Report* by Fletcher Paine

Associates Ltd. (2024), support the use of sandy loam soil parameters from the Brandt's Creek model in the Parkinson Recreation Park model.

It is assumed that groundwater will not influence the sub-catchments, and that Mill Creek water levels will not impact outfall systems.

5.2 Hydraulic System Construction

The hydraulic system in the model was constructed using the City's GIS data. The primary stormwater systems modeled include two storm drainage systems on both sides of Mill Creek within Parkinson Recreation Park. Additionally, two overland flow paths generated by the PCSWMM watershed delineation tool were included to convey the majority of runoff on the north side of the park. The existing condition model layout is illustrated in **Figure 2**.

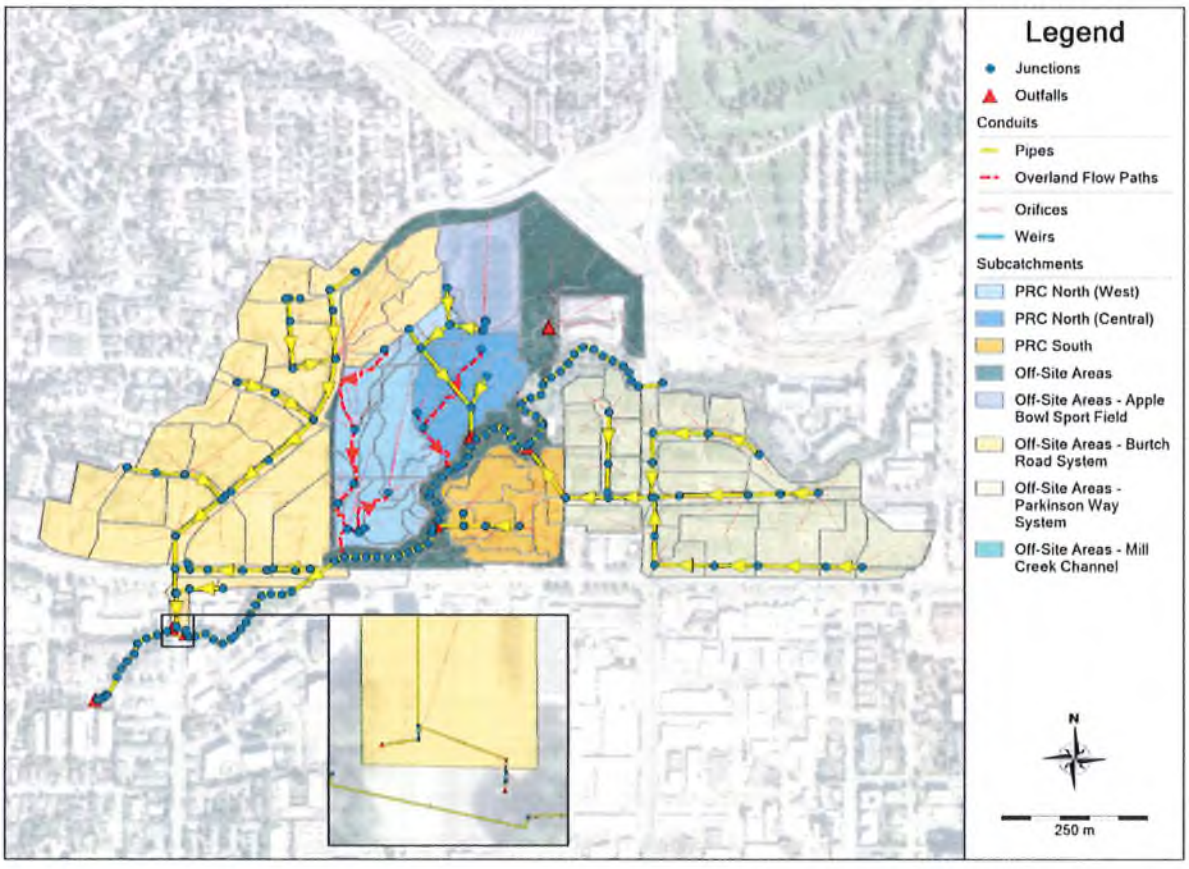


Figure 2 – Existing Condition Model

The model also includes the complete Burtch Road storm drainage system, which discharges to Mill Creek south of Harvey Avenue, and the Parkinson Way storm drainage system located to the east of the park.

Manning's n values for pipes and overland flow paths are presented in **Table 1**. The model allows excess water to pond above node rims to prevent water loss during simulations. A ponding surface area of 1,000 m^2 is assumed at each node. Once system capacity is available, ponded water will re-enter the drainage system.

5.3 Sub-Catchment Breakdown

The north side of the park is divided into two sub-catchment tributaries: PRC north-west and PRC north central. The PRC north-central sub-catchment includes a 200mm diameter storm pipe system that collects runoff from Apple Bowl Stadium and the tennis courts. The northern parking lot drains into the Burtch Road storm drainage system. On the south side of the park, a 375/300mm storm drainage system serves the existing recreational facility.

The study assumes that PRC north-west, PRC north-central, and PRC south exist in a pre-development state with only 5% imperviousness. Imperviousness for off-site areas is based on current land use.

Apple Bowl Stadium has depressions that provide on-site detention capacity, and the surrounding track field pipe system is perforated to promote infiltration. However, due to limited data, the effects of Apple Bowl's storage and perforation were not included in the model. A more detailed review of the storage and perforated pipe system is needed to accurately incorporate them into the model. At this level of detail, it is difficult to validate the accuracy of the storage and perforated pipe system

5.4 Design Rainfall Event Selection

The City's design standard rainfall intensity-duration-frequency (IDF) curves (Drawing SS-S56) were developed using data from the Kelowna International Airport AES station. To account for climate change, a 15% increase was applied. Rainfall depths for the 5-year and 100-year return periods are summarized in **Table 2**.

Return Period and Duration	Kelowna Airport (mm)		Kelowna Airport with Climate Change (mm)		Burnetts Nursery (mm)		Burnetts Nursery with Climate Change (mm)	
	5-Year	100-Year	5-Year	100-Year	5-Year	100-Year	5-Year	100-Year
5 min	5.4	10.1	6.3	11.6	5.9	12.0	6.8	13.9
10 min	7.3	13.3	8.4	15.3	8.1	17.1	9.5	19.7
15 min	8.9	17.0	10.3	19.5	9.4	20.0	11.1	23.1
30 min	11.1	21.1	12.7	24.2	10.4	21.1	12.1	24.5
1 h	12.7	22.9	14.6	26.3	11.6	21.7	13.4	25.3
2 h	15.3	26.2	17.6	30.2	13.6	24.0	15.7	28.0
6 h	19.9	31.6	22.8	36.4	18.0	30.6	20.8	35.7
12 h	24.2	37.2	27.7	43.5	21.8	36.2	25.2	42.2
24 h	28.0	41.9	32.1	49.1	28.1	49.9	32.5	58.2

Table 2 - IDF Curve Data

The Kelowna PC Burnetts Nursery rain gauge station, approximately 2 km south of the study area, was considered. However, its data span (1969-1991) is shorter than that of the Airport station (1969-2004). Although the two datasets show similar 5-year rainfall values, the Nursery station reports 20% higher 100-year rainfall depths. Given its longer and more recent dataset, the Airport station data was deemed more representative.

Stormwater storage requirements and sizing were based on 5-year and 100-year 24-hour SCS Type IA design storm plus a 15% climate change impact. The 24-hour duration produces the largest runoff volume, critical for storage volume determination. Pipe sizing was based on the 5-year 1-hour AES design storm plus a 15% climate change factor, as this event produces the sharp peak flows required for pipe sizing.

6 Existing Condition Model Results

6.1 Existing Site (North and South)

The pre-condition model was simulated for the north and south catchments using the 5-year 24-hour SCS Type IA and 5-year 1-hour AES BC Interior design storm. Maximum simulated flow rates are presented in **Table 3**. Overland flow paths and pipe flows from Apple Bowl Stadium in PRC north-west and PRC north-central were combined for analysis.

Outlet Location	Allowable Discharge Rate (m^3/s)	
	5-year SCS Type IA 24-hour	5-year AES 1-hour
North (West and Central)	0.016	0.037
South	0.007	0.058

Table 3 - Allowable Discharge Rates

6.2 Burtch Road Storm System

The model in the existing condition was simulated with 5-year 1-hour AES BC Interior design storm including climate change. No boundary conditions were applied to the outfalls, and they are free outlets. The 600mm diameter section at Harvey Avenue is not under capacity due to the steeper slope of the pipe. Generally, the topography along Burtch Road and the lateral streets features mild slopes with no apparent depressions. In reality, surface flooding will cascade as overland flow traveling down to Harvey Avenue and possibly continue to the west. The results shows that the Burtch Road system is under capacity with surcharging above pipe crown starting from the downstream 600mm diameter and extending beyond Lawrence Avenue as shown in **Figure 3**.

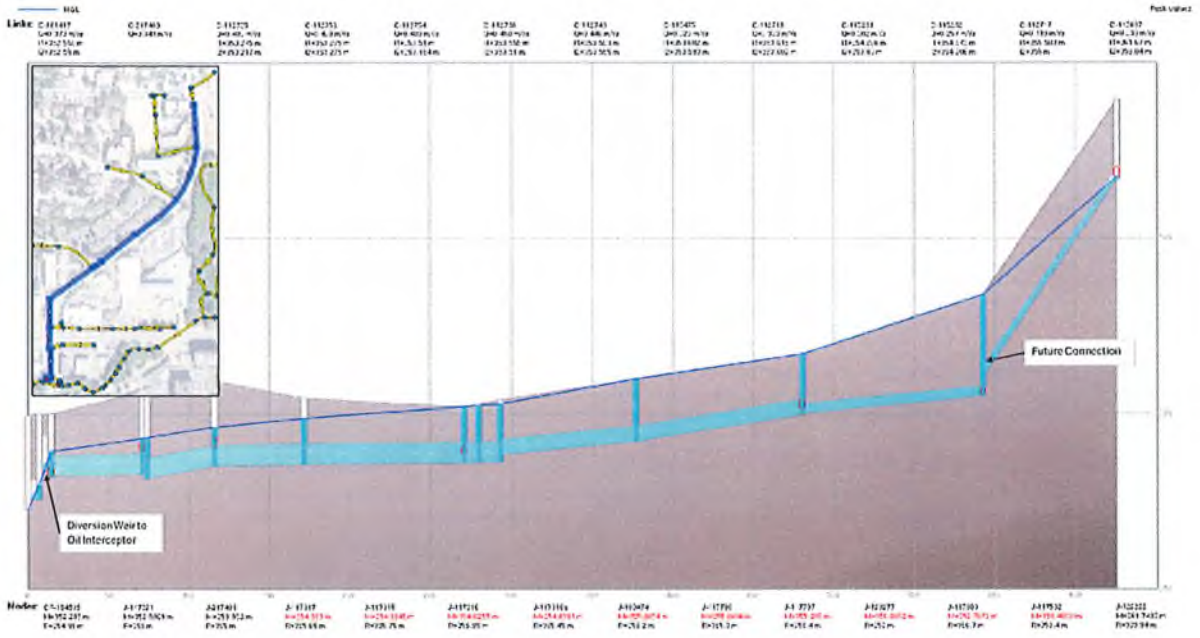


Figure 3 - Burtch Road Profile

6.3 Parkinson Way Storm System

The model in the existing condition was simulated with 5-year 1-hour AES BC Interior design storm including climate change. No boundary conditions were applied to the outfalls, and they are free outlets. The results show sections of this storm system under capacity with surcharging above pipe crown for Parkinson Way, Enterprise Court, Enterprise Way, Spall Road, and Harvey Avenue. **Figure 4** illustrates the profile along Enterprise Court to Parkison Way.

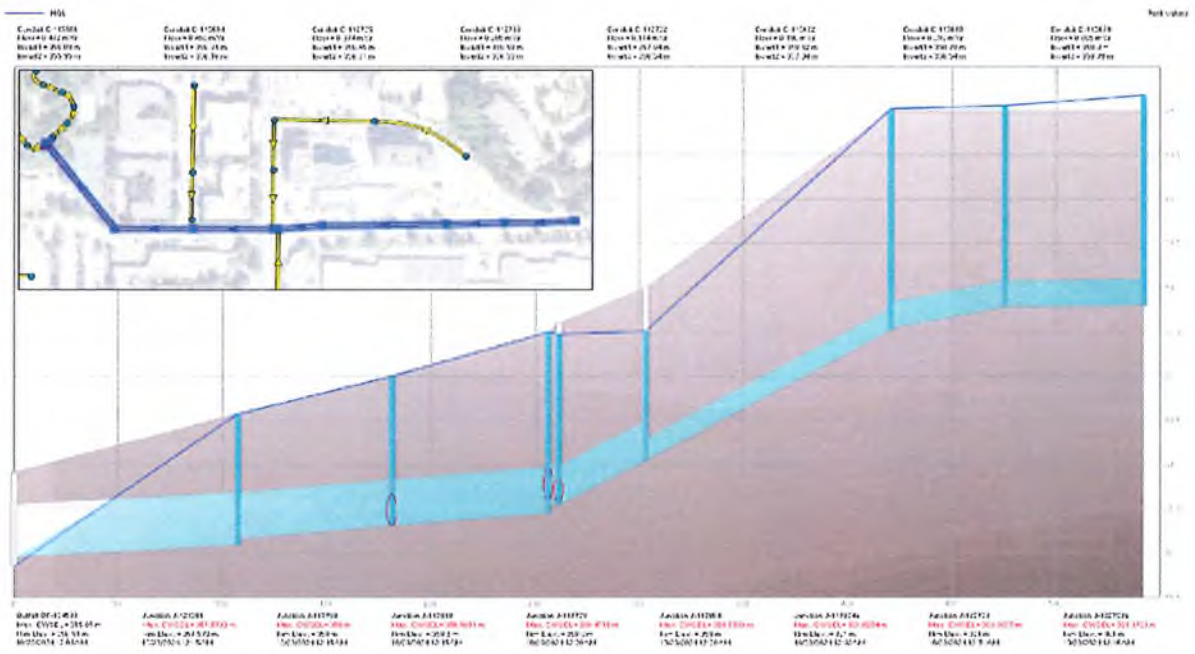


Figure 4 - Parkinson Way Profile

7 Proposed Stormwater Management System

Stormwater from the site will be collected in a new storm pipe systems and discharged into Mill Creek. The north stormwater system will serve the new recreational facility, parking lots, and sports fields. Apple Bowl Stadium will be connected to this system, and its existing outfall will be decommissioned. The proposed storm system includes pipe sizes ranging from 200mm for catch basin leads to 525mm for storm pipes, with a 525mm outfall.

A separate short pipe system will be installed to drain portions of the northern parking lot and vacant land, where a future school will be constructed. This system will connect to the Burtch Road drainage system. The future school site will include its own on-site stormwater storage, which is excluded from this model. Notably, the Burtch Road system does not have adequate capacity to accommodate the additional flow. Downstream capacity improvements should be reviewed.

The south stormwater system will replace the existing system, servicing the building, parking lot, and new sports field and courts. A new outfall will be constructed east of the parking lot. The proposed storm system includes pipe sizes ranging from 200mm for catch basin leads to 525mm for storm pipes, with a 525mm outfall.

The post-development model, shown in **Figure 5**, is based on the pre-development model but incorporates new sub-catchments and stormwater systems. The north-west catchments just north of Harvey Avenue overland flow path mimics existing conditions and conveys runoff from the sports fields to Mill Creek.

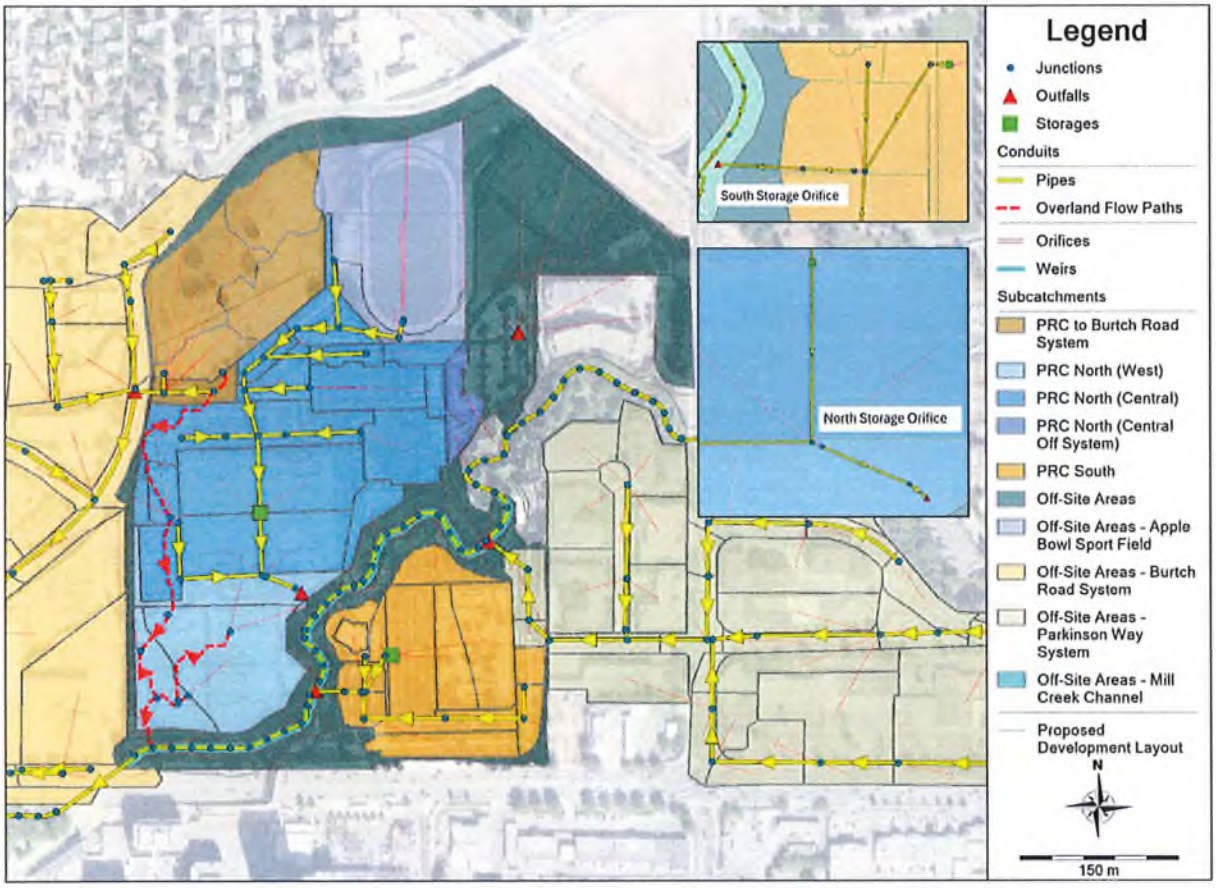


Figure 5 - Post-development Condition Model

7.1 Model Results

Post-development pipe sizing was determined using the 5-year 1-hour AES BC Interior design storm. Pipe sizes range from 200mm to 525mm in the north system, with a 525mm outfall to Mill Creek. The south system features pipe sizes from 200mm to 525mm, also with a 525mm outfall.

A minimum pipe cover of 1.2m is provided for the main sewer line in the north system, while lateral pipes have a minimum cover of 0.9m. Exceptions include lateral pipes near the new tennis courts and the final 525mm outfall section. The north and south storm pipe profiles are shown in **Figure 6** & **Figure 7**.

Reference: **Parkinson Recreation Centre - Stormwater Management Plan**

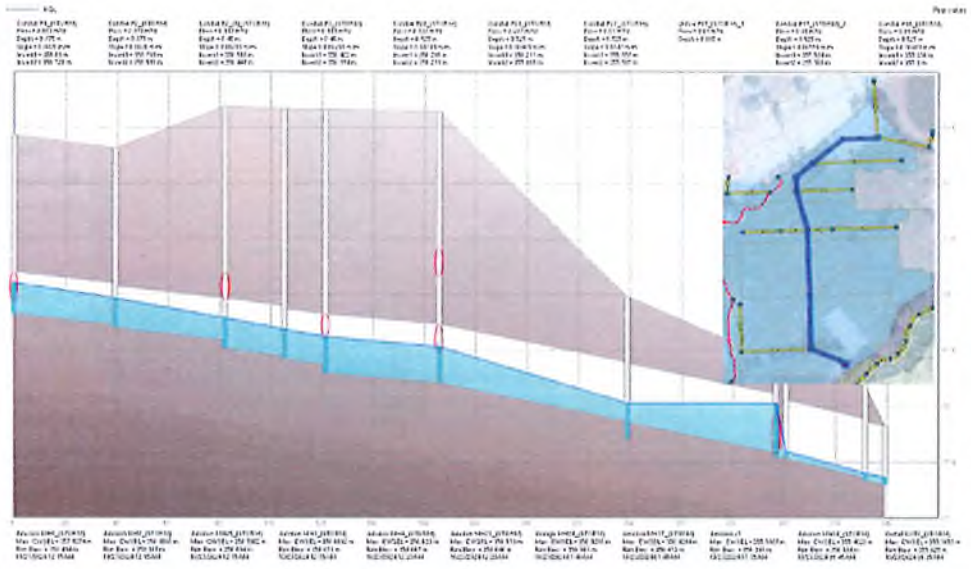


Figure 6 - North Storm Profile

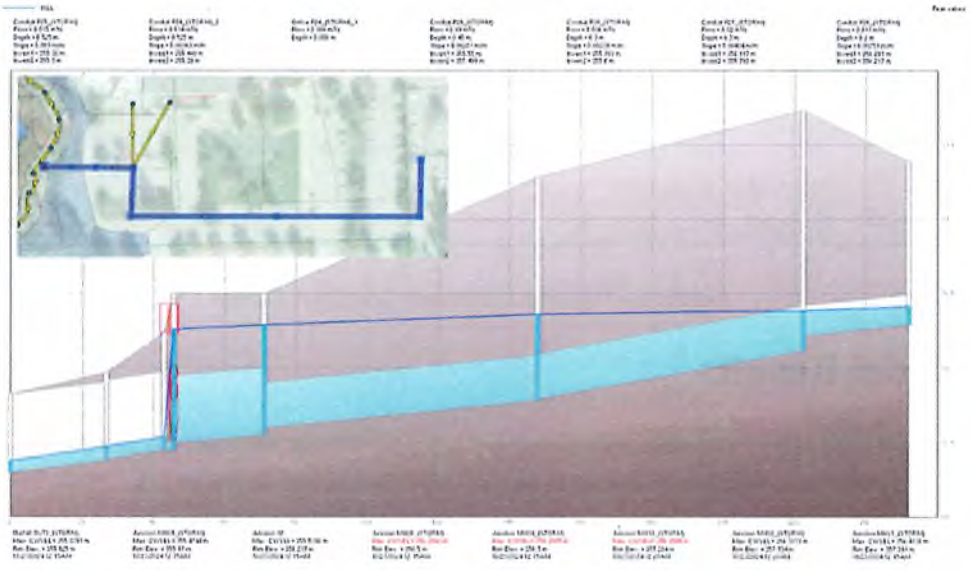


Figure 7 - South Storm Profile

Detention storage will regulate outfall discharges to match pre-condition rates. StormTech SC-310 chamber systems will be installed underground at both sports field locations. The maximum discharge flows at the new outfalls are summarized in **Table 4** and compared to pre-development flow rates.

Location		100-year Post- to 5-year Pre-Development 24-hour	
		1:5 Year Allowable Discharge Rate (m^3/s)	Peak Controlled Discharge (m^3/s)
North (West and Central)	Flow (m^3/s)	0.0157	0.0155
	Volume (m^3)	923	
	Depth (m)	0.41	
	Control Size (mm)	98	
South	Flow (m^3/s)	0.0066	0.0064
	Volume (m^3)	891	
	Depth (m)	0.58	
	Control Size (mm)	56	

Table 4 - Peak Flow Rates and Require Storage

It is assumed that the future artificial turf sports fields on the south side will be paved with highly impervious materials. This evaluation aims to determine the potential extent of storage requirements for the south side at an extreme post-development stage.

The 5-year post-development peak flow rates were compared to the 5-year pre-development peak flow rates for the 1-hour AES BC Interior design storm. This rate reduction target manages infrequent large storms and releases at a rate similar to undeveloped conditions. Since the 100-year post-development to 5-year pre-development 24-hour SCS Type IA design storm governs the volume reduction and storage sizing, storage volumes were not computed for this simulation. The rate reduction target used the same orifice sizing for the north side and required a second weir at 365.20m for the south side to prevent flooding. **Table 5** summarizes the rate reduction for the 5-year rainfall event.

Location	5-year Pre-Development Flow (m^3/s)	5-year Post Development Flow (m^3/s)
North (West and Central)	0.037	0.020
South	0.058	0.035

Table 5 - 5-year Pre- and Post-development Flow Rates

7.2 Quality Control

The stormwater design must meet or exceed the minimum water quality guidelines before entering the City storm system. Specifically, water quality target flow is equal to 50% of the 1 in 2-year design storm and must comply with the BC Ministry of Environment Recreational Water Quality Guidelines and the Sanitary Sewer/Storm Drain Regulation Bylaw 6618. For the north side, the quality control flow rate is designed to handle runoff from the new recreational facility, parking lots, sports fields, and Apple Bowl Stadium, while the south side's flow rate manages runoff from existing building, parking lot, and new sports field and courts. Effluent targets are set to ensure that the stormwater discharged meets the required standards,

maintaining the integrity of the City's storm system and protecting local water bodies. **Table 6** summarizes the quality minor system flow and effluent targets.

Parameter	North (West and Central)	South
Peak Flow Target (m^3/s)	0.017	0.0059
Total Suspended Solids (mg/L)	25	
Oil and Grease	15	

Table 6 - Quality Control Requirements

8 Summary

- The model was not calibrated with recorded flow monitoring data as it appears not available. The level of accuracy of the model is therefore not verified; it will be beneficial if any records of surface flooding reports in the areas can be provided for comparison. However, it is believed the model should represent a good extent of the reality in which the storm pipe system was checked, and sub catchments imperviousness agree within the typical range of the land uses.
- Pipe sizes for both the north and south areas range from 200mm to 525mm, with outfalls to Mill Creek.
- The detention systems for both the north and south sides will use SC-310 chambers. A 150mm clear stone layer is included in the detention storage sizing.
- The minor system is design to convey the 5-year 1-hour AES post-development peak flow rate.
- The major system is designed to safely convey short duration rainfall events that exceed the 5-year design storm and surcharge the minor system to the 100-year design storm.
- The underground stormwater management facilities are sized to attenuate the 100-year post-development design storm to 5-year pre-development levels for the 24-hour SCS Type IA.
- Runoff rate reduction is provided for the 5-year post-development design storm to 5-year pre-development levels for the 1-hour AES BC Interior design storm.
- OGS systems will be deployed to treat stormwater runoff for design storm events equivalent to 50% of the 2-year. Effluent targets will comply with the BC Ministry of Environment Recreational Water Quality Guidelines and the Sanitary Sewer/Storm Drain Regulation Bylaw 6618.
- The Burtch Road system lacks the capacity to handle additional flow, requiring the future school to provide on-site stormwater storage. It is recommended to review downstream capacity improvements.
- The realignment of the Parkinson Way storm sewer within the park presents an opportunity to consider upsizing this pipe section. Preliminary assessments suggest that a 900mm storm sewer would resolve current capacity issues. However, this recommendation takes into account existing upstream capacity constraints. If upstream improvements are made, the downstream section will experience increased minor system flow.

9 Closing

The SWMP outlined in this report sets a clear path forward for managing stormwater effectively and sustainably at the subject site. This plan, developed in tandem with the Mill Creek flooding improvements, will ensure that our stormwater management efforts contribute to a resilient and environmentally responsible development. Consequently, it may be necessary to periodically revisit and adjust the performance targets to ensure they continue to benefit the project, the community, and the environment.

Regards,

Stantec Consulting Ltd.

Stantec Permit #1002862

Luke Viljakainen Associate, P. Eng.
Civil Engineer
Phone: 250-212-5521
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Feb 24th, 2025

Derreck Travis
Stantec
1100-111 Dunsmuir Street
Vancouver BC V6B 6A3

Dear Derreck,

Re: Redevelopment of Parkinson Recreational Center - Groundwater and foundation strategy

The purpose of this memo is to describe the structural strategy used to resist buoyancy forces experienced by the structure of the proposed Parkinson Recreational Center (PRC).

Site conditions and groundwater assessment

The proposed location for the new Parkinson Recreation Centre (PRC) is immediately north of the existing Mill Creek. Due to the proximity of the creek, the project team acquired the hydrogeology services of Western Water in addition to the geotechnical services of Fletcher Paine Associated Ltd. (FPA) to assist with the project.

FPA completed their site investigation in August 2024, which is when the first groundwater measurements for the site were taken. Continuous groundwater monitoring was installed by Western Water in November 2024. The groundwater measurements taken in August 2024 match those taken in November 2024 through January 2025 (when the most recent data was downloaded from the monitoring wells). The water table has been consistent at the site since August 2024, though it is anticipated to rise during the spring of 2025.

Groundwater and foundation impact

The elevation of the existing grade on site at the proposed location for the PRC is approximately 358m. The ground elevation below the PRC is intended to be raised approximately 1m for a final floor elevation of 359m.

Based on the investigation completed by Western Water, the groundwater elevations and the creek water elevations are tied together; when one rises or falls, so does the other. The 1:200 year flood elevation for the creek is 357.1m, which is expected to be mirrored in the groundwater table below PRC, and is the groundwater elevation used for buoyancy calculations.

The foundations below most of the building are to be a maximum of 1.5m below finished floor elevation (357.5m). This depth is above the 1:200 year floor elevation. These foundations, therefore, do not need to be designed to resist buoyancy forces.

The natatorium foundations are deeper, due to the pools and the mechanical requirements. The depth to the underside of the foundations in the natatorium is 3.33m below the finished floor elevation (355.67m), which results in an unfactored buoyancy uplift force of 14kPa. These foundations, therefore, do need to be designed to resist the buoyancy forces.

Buoyance force calculation used in design

The design elevation of the 1:200 year flood is 357.1m, which was advised by the Mill Creek flood analysis. This analysis also shows that the difference between a 1:100 year flood event and the 1:200 year flood event is approximately 0.1m.

The British Columbia Building Code prescribes a load factor of 1.5 to be applied to lateral groundwater pressure, which is interpreted also as applying to the upward buoyancy force. Since the buoyancy force depends on the difference in elevation between the flood level and the foundation, the effect of this load factor can be dramatic and unreasonable where there is a substantial difference in these levels. For example: whereas for a building with a 200mm difference between flood level and foundation this load factor would represent a 0.1m rise in buoyancy force, for a building at the same site founded 800mm lower, the load factor would represent a 0.5m rise in buoyancy force.

In the case of the PRC, the factored buoyancy force would represent an additional 0.7m rise in flood level, which is considered by the project team to represent an event which is unnecessarily rare and at the limits of what is physically conceivable, being equal to 7 times the difference between a 1:100 and the 1:200 year flood events.

An upper cap is therefore applied to the factored flood level, to limit the rise above the 1:200 flood level when factoring the buoyancy force to 0.35m, still representing an event significantly rarer than the 1:200 year flood event.

Buoyancy resistance strategy

The buoyancy forces are to be counteracted in the natatorium using a combination of the weight of the structure and a grid of helical piles or soil anchors (referred to hereafter as piles).

The foundation below the natatorium and adjacent mechanical room is a 300mm thick raft slab, that will extend across the entire area experiencing the buoyancy forces. The perimeter of the natatorium and mechanical room will have 300mm thick concrete walls. Between the underside of each pool base slab and the top of the raft slab will be granular fill, whose weight will also counteract the buoyancy. The concrete pool walls and the suspended concrete slab pool deck are also considered permanent structure used to counteract the buoyancy forces.

The weights of mechanical and electrical services and the weight of water in the pools are not considered as counteracting forces, as they could vary in the future and it is not considered practical to take measures to guarantee they are present at the time of a flood.

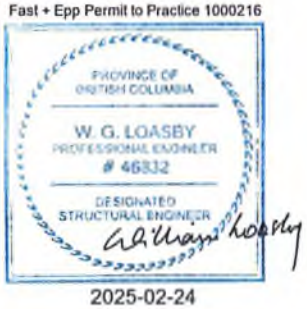
Where the weight of the structure alone is insufficient to counteract the buoyancy forces, the foundations are anchored using piles. The current spacing of piles below the natatorium raft slab is 5.9m on centre in both directions, and 4.2m on centre below the mechanical room raft slab. These spacings may vary as the detailed design of the piles continues in the next phase of the project.

Conclusion

For the PRC project, groundwater analysis has been undertaken and the project team has developed the foundation structural solution to respond to the groundwater conditions accordingly.

Should you have any questions, please do not hesitate to contact us.

Fast + Epp Permit to Practice 1000216



2025-02-24

William Loasby

P.Eng., Struct.Eng.
Associate Principal

western water
ASSOCIATES LTD
Consultants in Hydrogeology and Water Resources Management

December 19, 2024 File: 24-093-01VR

Ministry of Water, Land and Resource Stewardship
2501 14th Avenue
Vernon, BC V1T 8Z1

Attention: Ms. Kirsten Bevandick, M.Sc., P.Ag., Authorizations Specialist - Water

Re: Supporting Documentation for Short Term Water Use Authorization Application(s) under the Water Sustainability Act – Redevelopment of Parkinson Recreation Centre, Kelowna, BC

Dear Ms. Bevandick,

This letter provides supporting documentation for a short-term water use application for the City of Kelowna. The dewatering water use application will be for planned excavation dewatering for construction of a new Parkinson Recreation Centre, to be located in Parkinson Recreational Park, Kelowna, BC.

Project Description

The existing Parkinson Recreational Centre is located at 1800 Parkinson Way, to the south of Parkinson Recreation Park in Kelowna, BC. It is also south of and directly adjacent to Mill Creek, a watercourse that winds its way east to west through the downtown core. To maintain service to the public, the facility is planned to remain open during the construction of the new facility, planned to be completed over the next 2 to 3 years.

The City of Kelowna is using the Integrated Project Delivery (IPD) model to deliver the project which is a poly-party contract agreement including various contractors and consultants in addition to the City. The redevelopment of the Parkinson Recreation Centre is planned to be located on the north side of Mill Creek in Parkinson Recreational Park, in an area currently occupied by sports fields and tennis courts. The Building Excavation and Subgrade Plan is provided as Figure 1 and depicts the proposed construction excavation in both plan view and a series of conceptual cross sections. The excavation is expected to be 153 m by 123 m in area and completed to varying depths below grade.

The plan is for building excavation, ground preparation and foundation creation to be completed in phases (Phase 1-4) as illustrated. The first phase (Phase 1) focuses on the southeast corner of the excavation, which presents the most technically challenging work as that portion of the excavation is closest to Mill Creek and is planned to be the deepest to accommodate the subgrade and mechanical for the proposed pool. Based on preliminary drawings, the depth of excavation in the Phase 1 area is on the order of 3.2 m below current grade. Subsequent phases (Phases 2-4) will also require excavation to this depth for the foundation to meet structural fill requirements.

Several geotechnical boreholes and standpipe monitoring wells were installed by Fletcher Paine Associates in 2022 and 2024 to characterize site soils, identify hydrostratigraphic units and delineate lateral extents. Grain size analyses of select soil samples and hydraulic upset testing of a subset of the monitoring wells provided hydraulic characteristics of onsite soils for use in groundwater dewatering estimates.

Dewatering Plan

The current dewatering plan (Figure 1) calls for an array of well points to be installed around the perimeter of the proposed excavation (red solid line) as well as several internal transects (blue dotted line) designed to mitigate any upwelling that may occur due to the size of the open excavation base. These wellpoints will be connected to a common header to collect and convey water away from the excavation.

Based on the proposed excavation size and depths, and the on-site hydraulic parameters calculated from previous testing, we estimate the flows required to dewater the excavation will be on the order of up to 4,600 to 5,000 m^3/day, dependent on the groundwater table elevation at the time of pumping. Based on this anticipated maximum flow rate, an annual flow rate of **1,825,000 m^3/year for up to 24 months** is used in our short-term water use approval (dewatering water use) application. However, while excavation dewatering is expected to continue continuously, there will be some reduction in flow expected once the water from aquifer storage has been removed and flows reduce to "ongoing maintenance" of the dewatered condition. There will also be a reduction of flows at low groundwater times of the year (anticipated September through February), but the exact timing and amount of reduction are difficult to quantify. Therefore this volume is considered the maximum that will be extracted annually, within the uncertainty of the parameters used for estimation.

To mitigate groundwater flow to the excavation, a sheet pile wall (green solid line in Figure 1) is proposed to be set just outside the wellpoint field along the eastern and southern extents of the Phase 1 excavation that will limit the amount of inflow expected from Mill Creek. This structure will be keyed into the underlying silty clays at a depth of approximately 10 m, and act as a cutoff wall for this corner of the excavation. This will allow the groundwater table within the sheet pile wall to be depressed relative to the static water table on the creek-side behind the wall.

Groundwater Discharge Plan

The current groundwater discharge plan is provided on Figure 2. During dewatering system startup, the pumped discharge water has the potential to have a high turbidity as a result of high concentrations of suspended sediment. This pumped groundwater is to be discharged to grassy fields located southwest of the planned excavation area (labelled general soak-away area) until such time that the water quality meets stormwater discharge criteria to Mill Creek. Based on previous wellpoint dewatering programs in the Kelowna area, and in similar soils, this startup period is anticipated to last between 24 and 48 hours at the initiation of each phase of excavation (Figure 1). Pumped water quality will be monitored in the field for both turbidity and total suspended solids (TSS) until such time as it is suitable for discharge to the storm sewer main.

Once the turbidity has subsided, dewatering flows will be directed to the storm sewer system for conveyance and discharge to Mill Creek via existing outfalls. As the primary method under high flows (high groundwater table), groundwater of suitable quality will be pumped to a temporary manhole and sediment trap on a 600 mm diameter main located south of the pedestrian bridge across Mill Creek. The outfall from this line is located on the southern bank of Mill Creek, north of the existing recreation centre. As the secondary method under lower flows (low groundwater table, maintenance flows), groundwater will be pumped to a new manhole installed on the 200 mm diameter storm main located south of the Phase 2 excavation. This main also discharges to Mill Creek, but from an existing outfall on the north bank of Mill Creek.

An emergency spillway is proposed to be constructed on the north bank of Mill Creek, south of the parking lot and upstream of the proposed works. This spillway is to be constructed and used only in the event of seasonal low flows in Mill Creek to reintroduce flows upstream of the dewatering works (flow augmentation) if required. The spillway would be designed and sized with rip rap of sufficient size to dissipate the energy from the expected flows and minimize scour of the natural channel banks. With the incorporation of the sheet pile cutoff wall as a mitigative strategy, the need for this spillway is not expected but is considered as an alternative to the proposed works for the short-term water use approval application if needed.

Sediment and Erosion Control Plan

The general soak away area is to be used if the pumped water quality does not meet criteria for direct discharge to Mill Creek via the stormwater system. Upon use, this area will be preferentially flooded for a short time duration (expected to be approximately 24 to 48 hours) during startup of each phase of dewatering (Figure 1).

The perimeter of this area will be delineated with silt fencing to inhibit any overland flow of turbid water back into Mill Creek by capturing suspended sediment but allowing water to pass. The intent of the soak away area is for the ponded water to infiltrate slowly over time through the vegetation (grass turf) present and into the surficial sediments below. The silty sediment retained at surface will be stripped and disposed of off-site, and any remaining residuals will be raked into the grass upon completion of the program.

If the emergency upstream spillway is put into service, the riprap will be placed to inhibit scour and sediment entrainment at the point of discharge and re-entry into Mill Creek. Turbidity and TSS will be monitored at the point of discharge and in Mill Creek at monitoring stations located both upstream and downstream of the point(s) of discharge.

Closure

We trust this letter provides sufficient context and explanation of the dewatering plan proposed and is sufficient for your needs for the application. Please contact the undersigned if you have any questions or comments pertaining to the proposed dewatering plan and short-term water use application.

Sincerely,

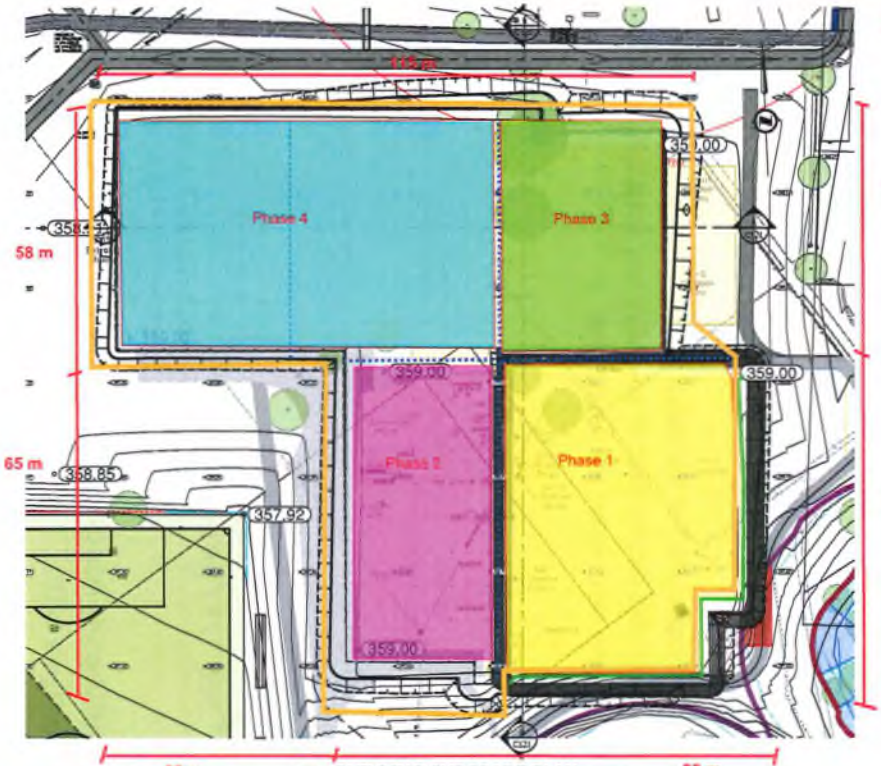
Western Water Associates Ltd.
(EGBC Permit to Practice #1001419)

PROFESSIONAL GEOSCIENTIST PROVINCE OF BRITISH COLUMBIA CHR. HOMES # 37961

Christopher Homes, P.Geo.
Senior Hydrogeologist

DEC. 19/2024

Attachments: Figure 1 – Building Excavation/Subgrade Plan C-121
Figure 2 – Dewatering Options Figure C-110

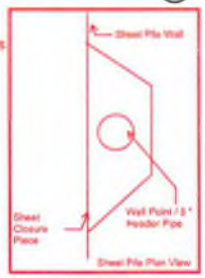


1 BUILDING SUBGRADE PLAN
Scale: 1:500

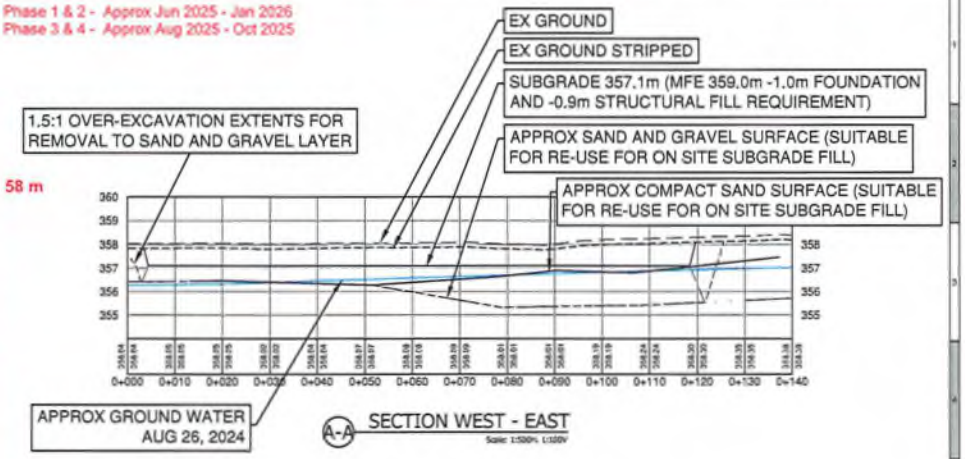
Perimeter Well Points

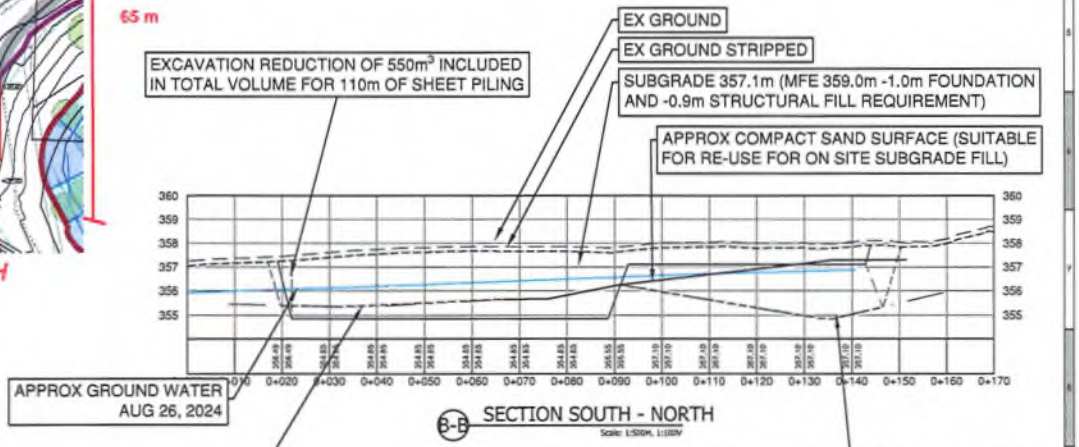
Optional Interior Well Points

Sheet Pile Wall



Phase 1 & 2 - Approx Jun 2025 - Jan 2026
Phase 3 & 4 - Approx Aug 2025 - Oct 2025





MECHANICAL AND 25m POOL SUBGRADE 354.85m(2.6m CLEAR IN MECH ROOM)
(MFE 359.0m -3.25m FOUNDATION AND -0.9m STRUCTURAL FILL REQUIREMENT)

CONSULTANT
Stantec
405-1626 Dickson Avenue,
Kelowna, B.C. V1Y 9P2
Tel. (250) 869-3270
Fax. (250) 869-3267

STAMPS

NO.	DATE	ISSUE/REVISION	BY	APPROVED	CHECKED
1					

SEAL

SURVEY
BASE: J. IRWIN
DESIGN: C.KILCHER
ENG. OF RECORD: J.PETERSON
SCALE

CITY OF KELOWNA

REDEVELOPMENT OF PARKINSON RECREATION CENTER

BUILDING EXCAVATION/SUBGRADE PLAN

CITY DEPT.: INFRASTRUCTURE
CITY FILE NO.: -
PROJECT DRAWING NO.: C-121
REV NO.: 1
CITY RECORD NO.: -
SHEET NUMBER: SHEET - OF -

DEWATERING METHODOLOGY:

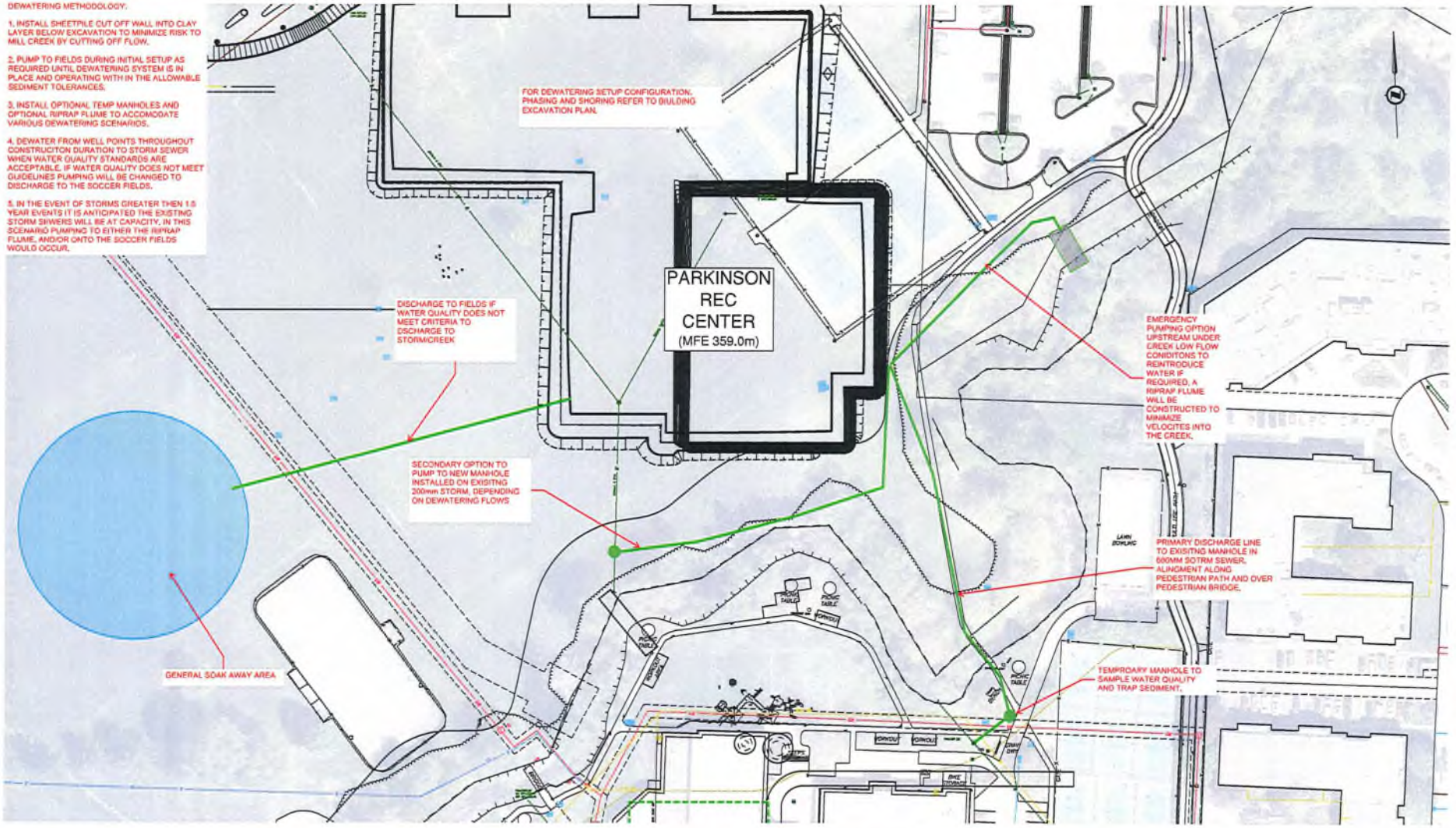
1. INSTALL SHEETPILE CUT OFF WALL INTO CLAY LAYER BELOW EXCAVATION TO MINIMIZE RISK TO MILL CREEK BY CUTTING OFF FLOW.

2. PUMP TO FIELDS DURING INITIAL SETUP AS REQUIRED UNTIL DEWATERING SYSTEM IS IN PLACE AND OPERATING WITH IN THE ALLOWABLE SEDIMENT TOLERANCES.

3. INSTALL OPTIONAL TEMP MANHOLES AND OPTIONAL RIPRAP FLUME TO ACCOMODATE VARIOUS DEWATERING SCENARIOS.

4. DEWATER FROM WELL POINTS THROUGHOUT CONSTRUCITON DURATION TO STORM SEWER WHEN WATER QUALITY STANDARDS ARE ACCEPTABLE. IF WATER QUALITY DOES NOT MEET GUIDELINES PUMPING WILL BE CHANGED TO DISCHARGE TO THE SOCCER FIELDS.

5. IN THE EVENT OF STORMS GREATER THEN 1:5 YEAR EVENTS IT IS ANTICIPATED THE EXISTING STORM SEWERS WILL BE AT CAPACITY. IN THIS SCENARIO PUMPING TO EITHER THE RIPRAP FLUME, AND/OR ONTO THE SOCCER FIELDS WOULD OCCUR.



CONSULTANT	STAMPS	NO	DATE	ISSUE/REVISION	BY	APPROVED	CHECKED	SEAL	SURVEY	BASE: J. IRWIN	CITY OF KELOWNA
Stantec 400-1620 Dickson Avenue, Kelowna, B.C. V1Y 9Y2 Tel. (250) 860-3225 Fax. (250) 860-3267		1							DESIGN: C.KILCHER	ENG. OF RECORD: J.PETERSON	REDEVELOPMENT OF PARKINSON RECREATION CENTER
									SCALE: H 1:750 0 7.5 15 37.5		DEWATERING OPTIONS FIGURE

CITY DEPT.	INFRASTRUCTURE
CITY FILE NO.	-
PROJECT DRAWING NO.	C-110
REV NO.	1
CITY RECORD NO.	-
SHEET NUMBER	SHEET - OF -

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Feb 24th, 2025

Derreck Travis
Stantec
1100-111 Dunsmuir Street
Vancouver BC V6B 6A3

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Should you have any questions, please do not hesitate to contact us.

Fast + Epp Permit to Practice 1000216

PROVINCE OF BRITISH COLUMBIA
W. G. LOASBY
PROFESSIONAL ENGINEER
46832
DESIGNATED STRUCTURAL ENGINEER

2025-02-24

William Loasby

P.Eng., Struct.Eng.
Associate Principal

Bird Construction Inc.
Suite 200, 1626 Richter Street, Kelowna, BC V1Y 2M3
Tel 236.361.0477
www.bird.ca

To whom it may concern,

The following document describes a high level procedure that Sheet Piling Contractor will follow for the installation of the sheet piles for the ***Kelowna – Redevelopment of the Parkinson Recreation Centre***.

Due to the high groundwater levels and the site's proximity to the creek, shoring protection for the excavation is anticipated. The most efficient way to do this wall is using sheet piles. This approach ensures stability and minimizes the high groundwater levels in the place of excavation/works.

PRELIMINARY PREPARATIONS

- Construction of temporary sheet pile walls will be conducted safely and in strict accordance with the approved Job Safety Analysis.
- If not already provided by the supplier, lifting holes will be prepared on the sheet piles.

STAGING AND SURVEYING

- A loader will stage falsework and sheet pile materials near the designated starting point of the installation, adjacent to the piling rig.
- Using Benchmarks and reference points provided by the project's survey team, pile layout for sheet pile installation will be completed. This ensures alignment is in accordance with design specifications.

PILE GUIDE INSTALLATION

- The pile guide will be installed and fixed in position to ensure accurate driving of the sheet piles. This framework is critical for maintaining alignment and stability during the driving process.
- Horizontal guides spanning from soldier pile to soldier pile will be hoisted and securely in place.
- The position and alignment of the pile guide will be re-checked and verified before commencing sheet pile installation.

Bird Construction Inc.
Suite 200, 1626 Richter Street, Kelowna, BC V1Y 2M3
Tel 236.361.0477
www.bird.ca

DRIVING OF SHEET PILES

- Each sheet pile will be hoisted to a vertical position using an auxiliary hook and secured to a vibro hammer.
- After centering the sheet pile in the guide frame and ensuring a firm grip by the vibro hammer, driving will commence using a power pack to provide the required force.
- Sheet piles will be driven incrementally to an embedment depth sufficient to allow release from the piling rig. Vertical alignment will be monitored and adjusted as needed throughout the driving process. No excavation occurs during this process.

SEQUENTIAL INSTALLATION

- Each subsequent sheet pile will be threaded into the previously driven pile to ensure interlocking and continuity of the wall. These steps will be repeated for each sheet pile until all have been driven near their final embedment depths.
- Alignment and verticality will be checked at each stage to maintain precision and structural integrity

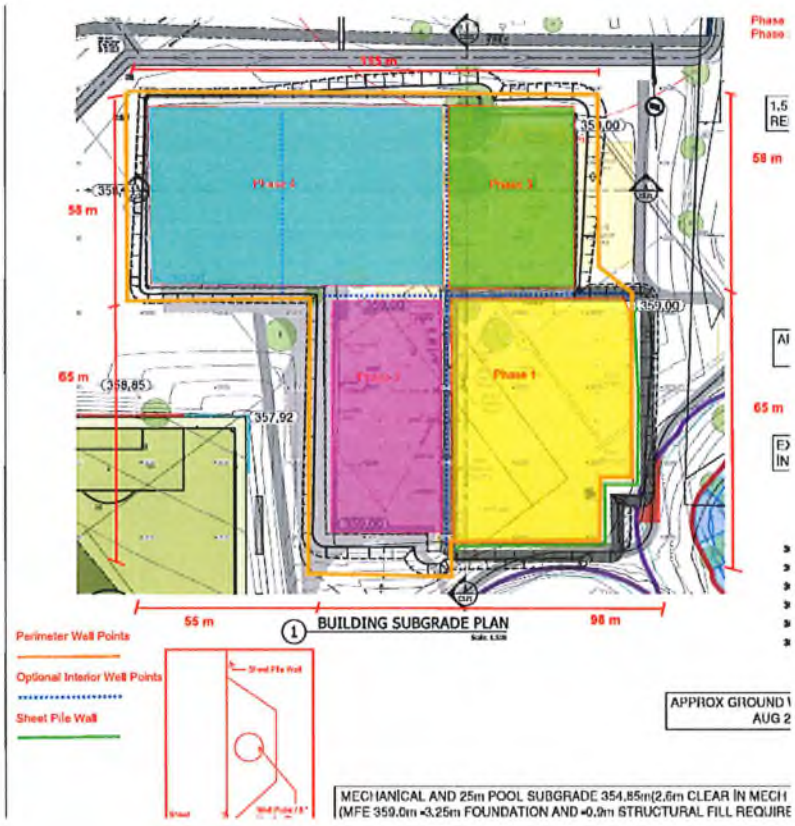
FINAL EMBEDMENT AND ADJUSTMENTS

- Each pile will be driven to the design-specified embedment depth or until practical refusal is encountered. In cases of refusal, the engineer of record will be consulted for further analysis and instructions.
- Upon completion of one phase, the installation process will be repeated for subsequent phases as per the project's work schedule.

PROMIXITY TO RIPARIAN ZONE

- The sheet pile installation will take place well outside the designated riparian zone of Mill Creek, ensuring no impact on the creek or its surrounding environment. The work has been carefully planned to maintain a safe buffer from the watercourse, fully complying with all environmental regulations and setback requirements.
- Given the sensitivity of the area, all work will adhere to regulatory requirements, including any permits and setback restrictions. Protective measures, such as sediment and erosion controls, will be in place at the site boundary fences (as per the ESC plan) to prevent disturbances to the creek and surrounding vegetation.
- Below excerpt from the Section 10 dewatering submission outlines the location of the sheet pile wall(green) and the riparian zone(purple). The work will remain outside of the riparian zone.

Bird Construction Inc.
Suite 200, 1626 Richter Street, Kelowna, BC V1Y 2M3
Tel 236.361.0477
www.bird.ca



SCHEDULE OF WORK

- The sheet pile installation is scheduled to take place in Q2 2025 (Expectation is late June/early July 2025) to align with site preparation activities and seasonal constraints. This work must be sequenced to accommodate dewatering operations, adjacent foundation activities, and regulatory windows. Efforts will be made to complete the installation efficiently to minimize disruption to other site operations and environmental considerations.

SAFETY AND QUALITY CONTROL

- Throughout the installation process, care will be taken to ensure adherence to safety protocols and quality standards. The alignment and embedment of the sheet piles will be monitored by qualified personnel to meet all design and engineering requirements.

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Tel 236.361.0477
www.bird.ca

EQUIPMENT

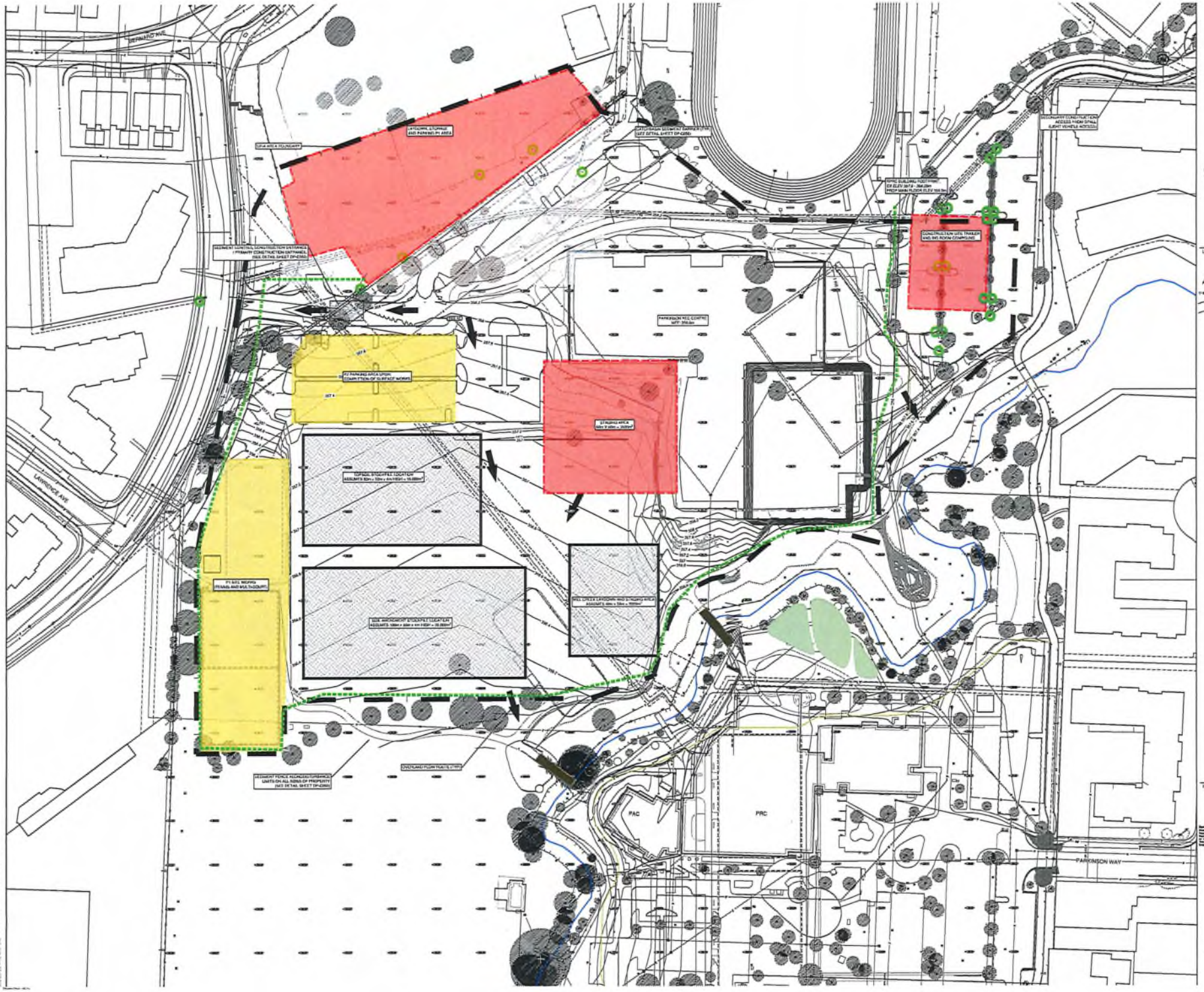
- Crawler Crane
- Vibratory Hammer and Powerpack
- Loader with forks and grapples
- Vehicles

MATERIALS

- Sheet piles (Specification TBC)
- Sheet piling corners
- Shackles
- Redrope and pylons
- Hand tools.
- Cutting Torches.
- Grinders
- Beveller
- Slings.

Regards,

Mike Tennis, Project Manager, EIT


BERNARD AVE
LAWRENCE AVE
PARKINSON WAY
PAC
PRC
Stantec
City of Kelowna
Legend
OVERLAND FLOW ROUTE
EXISTING GROUND ELEVATION
SUBGRADE SURFACE MAJOR CONTOUR
SUBGRADE SURFACE MINOR CONTOUR
Permit Seal
RSK - PARKINSON RECREATION CENTRE
SITE SUBGRADE, EROSION/SEDIMENT CONTROL, AND LOGISTICS PLAN
DP-C010

Stantec

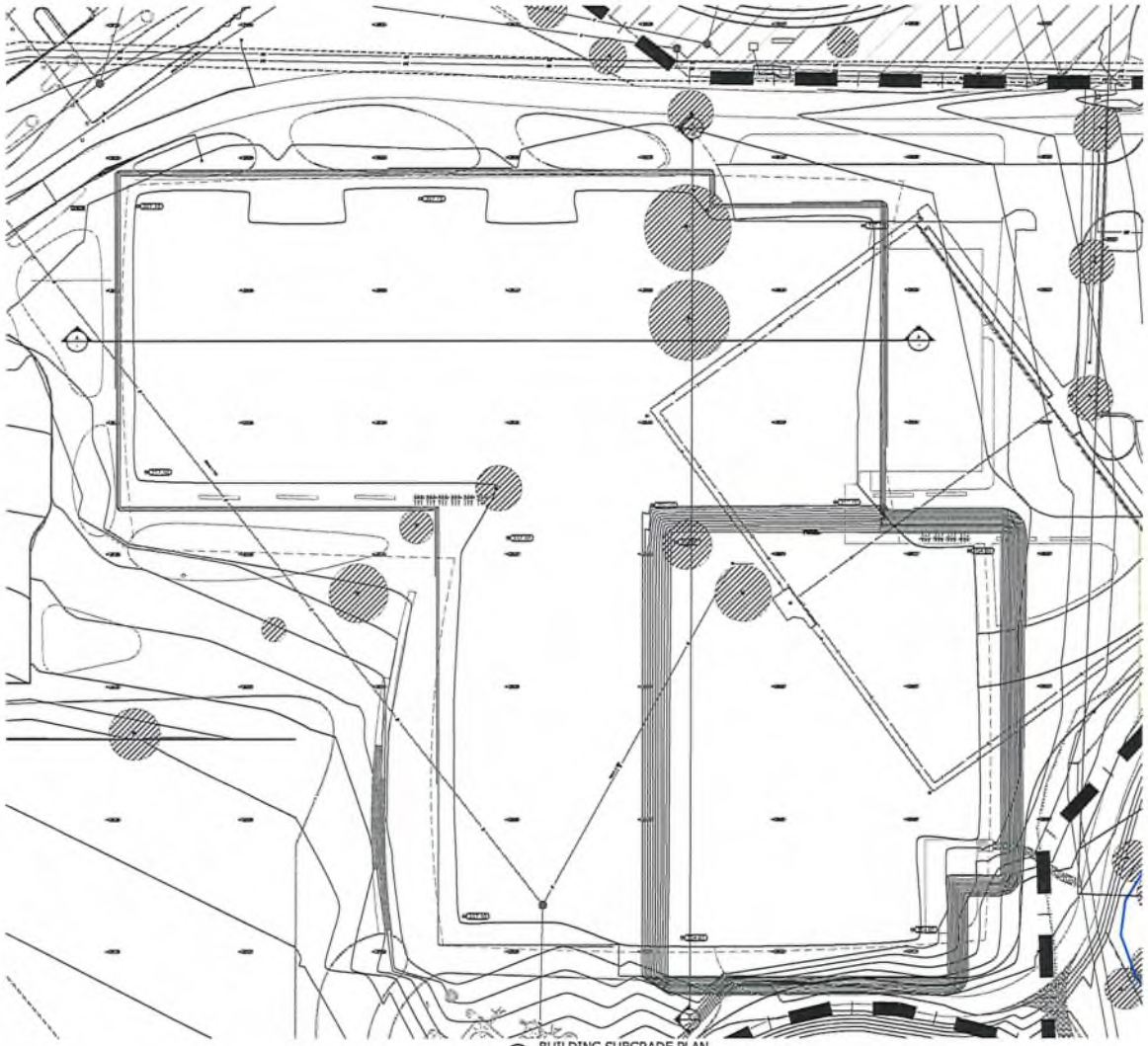
City of Kelowna

Legend

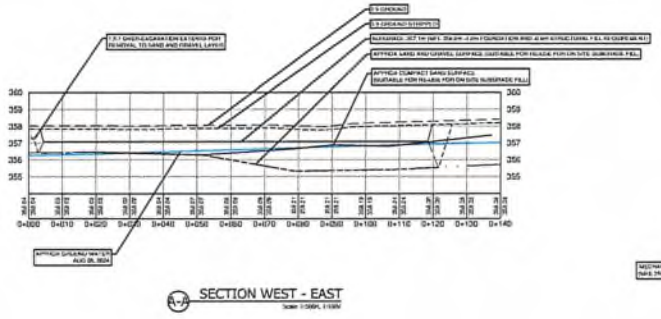
BSX - PARKINSON RECREATION CENTRE

SITE SUBGRADE EXCAVATION AND GRADING PLAN

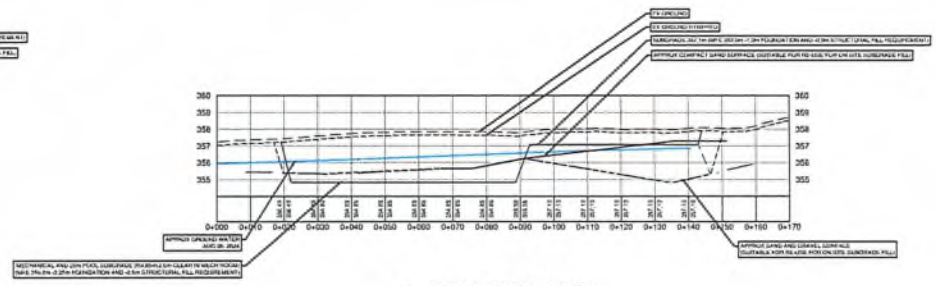
DP-C011



1 BUILDING SUBGRADE PLAN



A-A SECTION WEST - EAST



B-B SECTION SOUTH - NORTH

Stantec

City of Kelowna

Legend

BSK - PARKINSON RECREATION CENTRE

BUILDING EXCAVATION / SUBGRADE PLAN

AS SHOWN

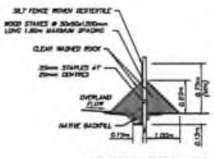
DP-C012

GENERAL NOTES - EROSION AND SEDIMENT CONTROL

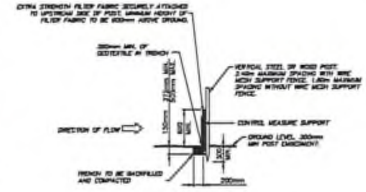
[illegible]

SEDIMENT FENCE NOTES:

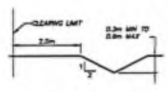
1. SEDIMENT FENCE TO BE IN ACCORDANCE WITH DFO PUBLICATION "LAND DEVELOPMENT GUIDELINES FOR THE PROTECTION OF AQUATIC HABITAT".
2. SEDIMENT FENCE TO BE PLACED AT THE TOE OF ALL SLOPES CONSTRUCTED WITH A SLOPE GREATER THAN 3:1.
3. LIMIT LENGTH OF ANY SINGLE RUN OF FENCE TO 100m.
4. IN TOE OF SLOPE APPLICATIONS TURN THE LAST 2m OF FENCE UP SLOPE IN A 'J' OR 'L' SHAPE.
5. FENCE TO HAVE SPILLWAY AT LOW POINT OF FENCE TO ALLOW WATER TO SPILL OVER TOP OF FABRIC RATHER THAN WATER RUNNING BELOW OR AROUND THE SIDES.
6. SEDIMENT TO BE REMOVED WHEN IT REACHES 1/3 THE HEIGHT OF FENCE.



SILT FENCE CHECK DAM



SEDIMENT FENCE



TYPICAL CUT-OFF DITCH

EROSION CONTROL SEED MIX		
SEED	% BY SEED WEIGHT	% BY SEED COUNT
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
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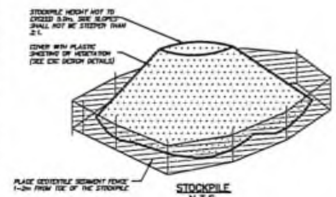
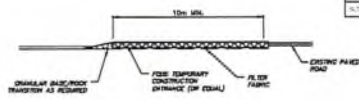
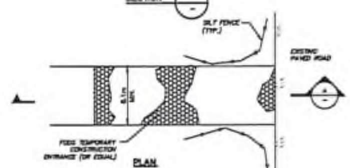


STOCKPILE
N.T.S.

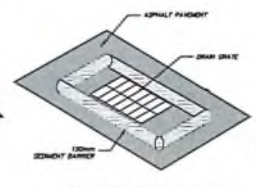


SECTION A

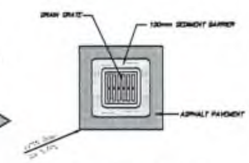


PLAN

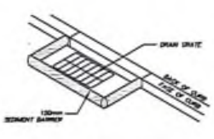
TEMPORARY STABILIZED CONSTRUCTION ENTRANCE



EXPOSED INLET PLACEMENT DETAIL



CATCH BASIN INLET SEDIMENT BARRIER DETAIL



CURB AND GUTTER INLET PLACEMENT DETAIL

TYPICAL SEDIMENT BARRIERS

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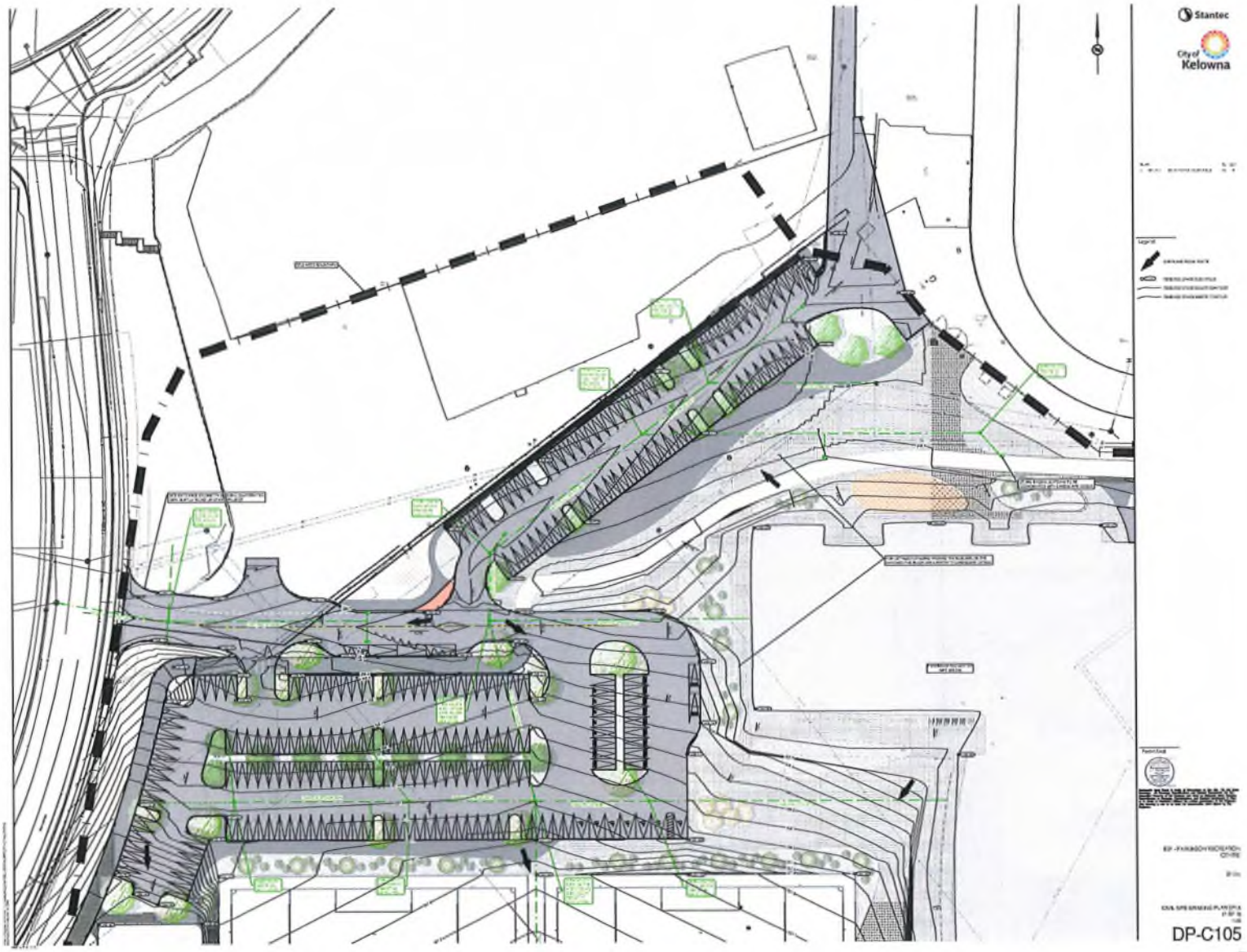
BSK - PARKINSON RECREATION CENTRE

231024

EROSION & SEDIMENT CONTROL NOTES AND DETAILS

AS SHOWN

DP-C050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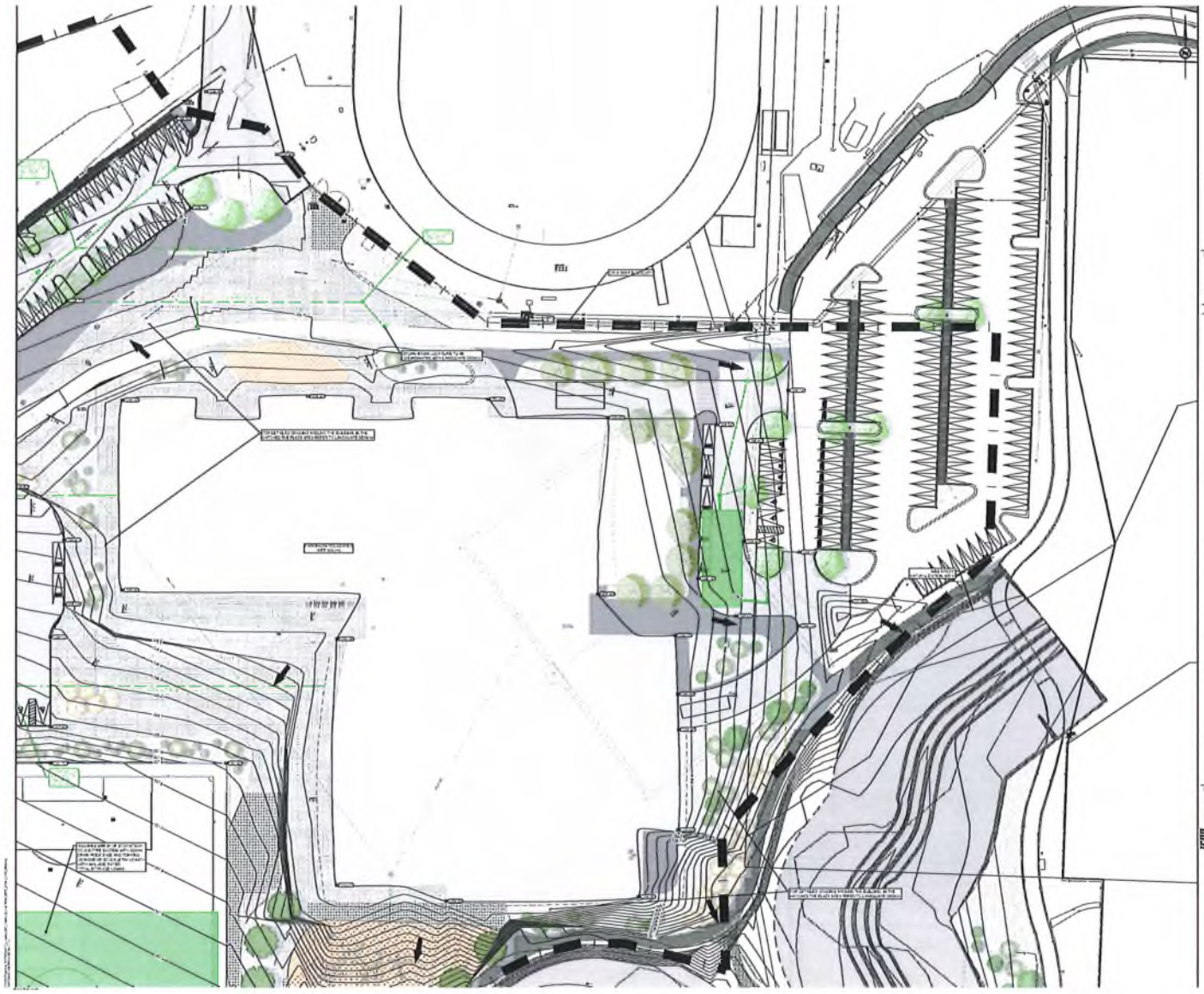
DP-C105



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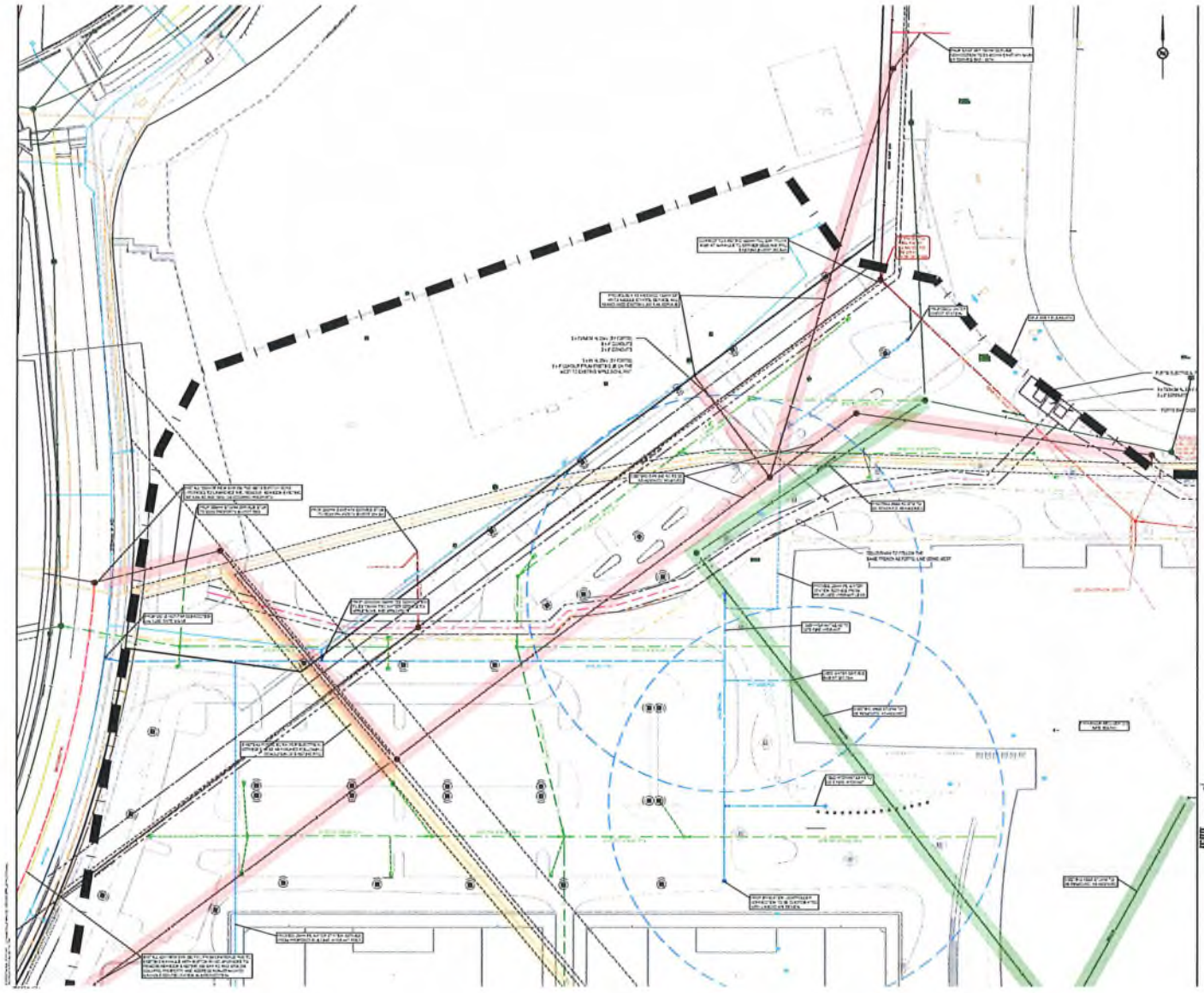
City of Kelowna

DP-C106


MULTI-USE COURT
SIZE: 51mX25m
CHAMPIONSHIP NATURAL TURF FIELD
c/w 3.0m BUFFER
FIELD SIZE: 105mX65m
TOTAL INCL. BUFFER: 111mX74m
CHAMPIONSHIP NATURAL TURF FIELD
c/w 3.0m BUFFER
FIELD SIZE: 105mX65m
TOTAL INCL. BUFFER: 111mX74m
Stantec
City of Kelowna
DP-C107



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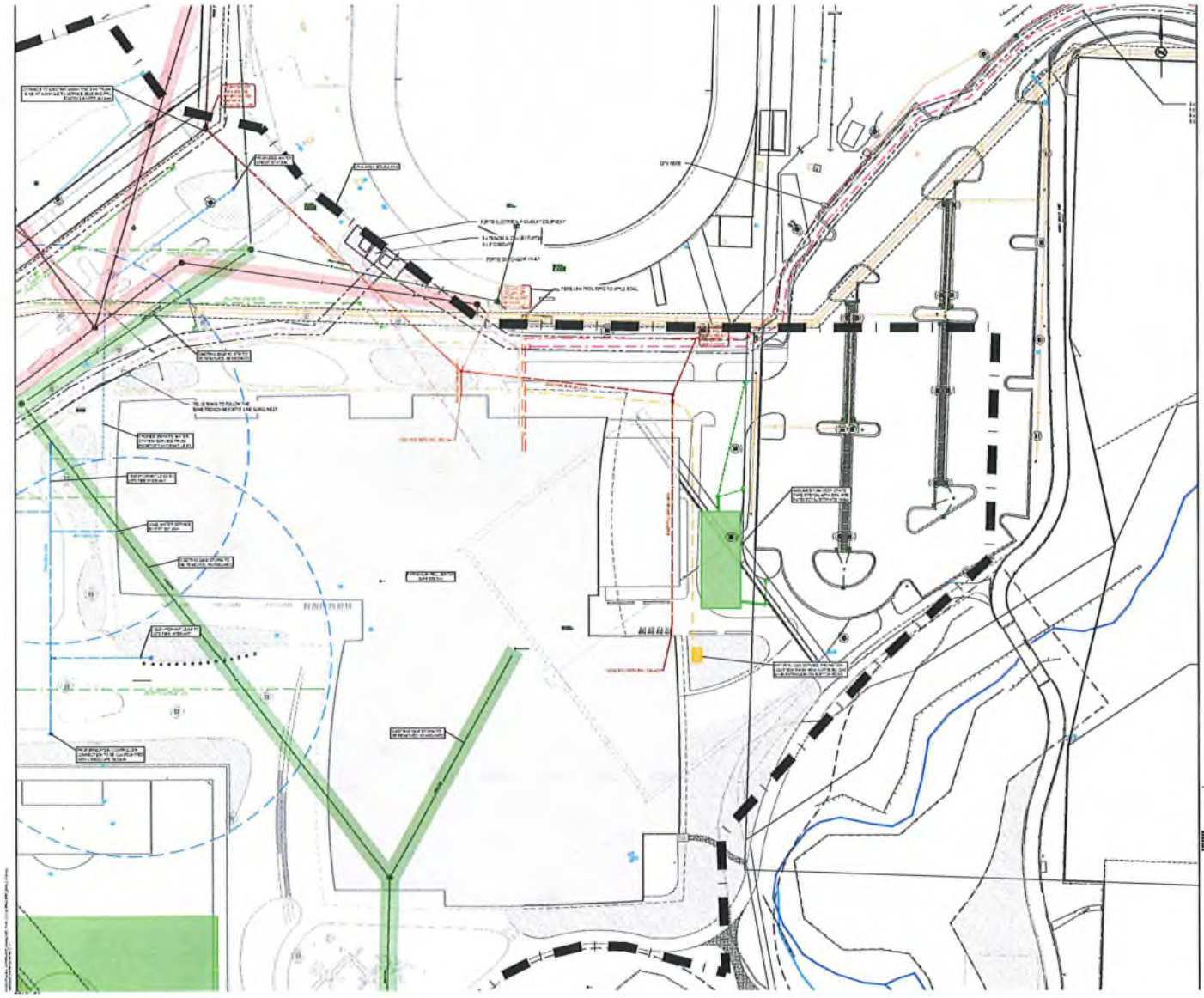
City of Kelowna

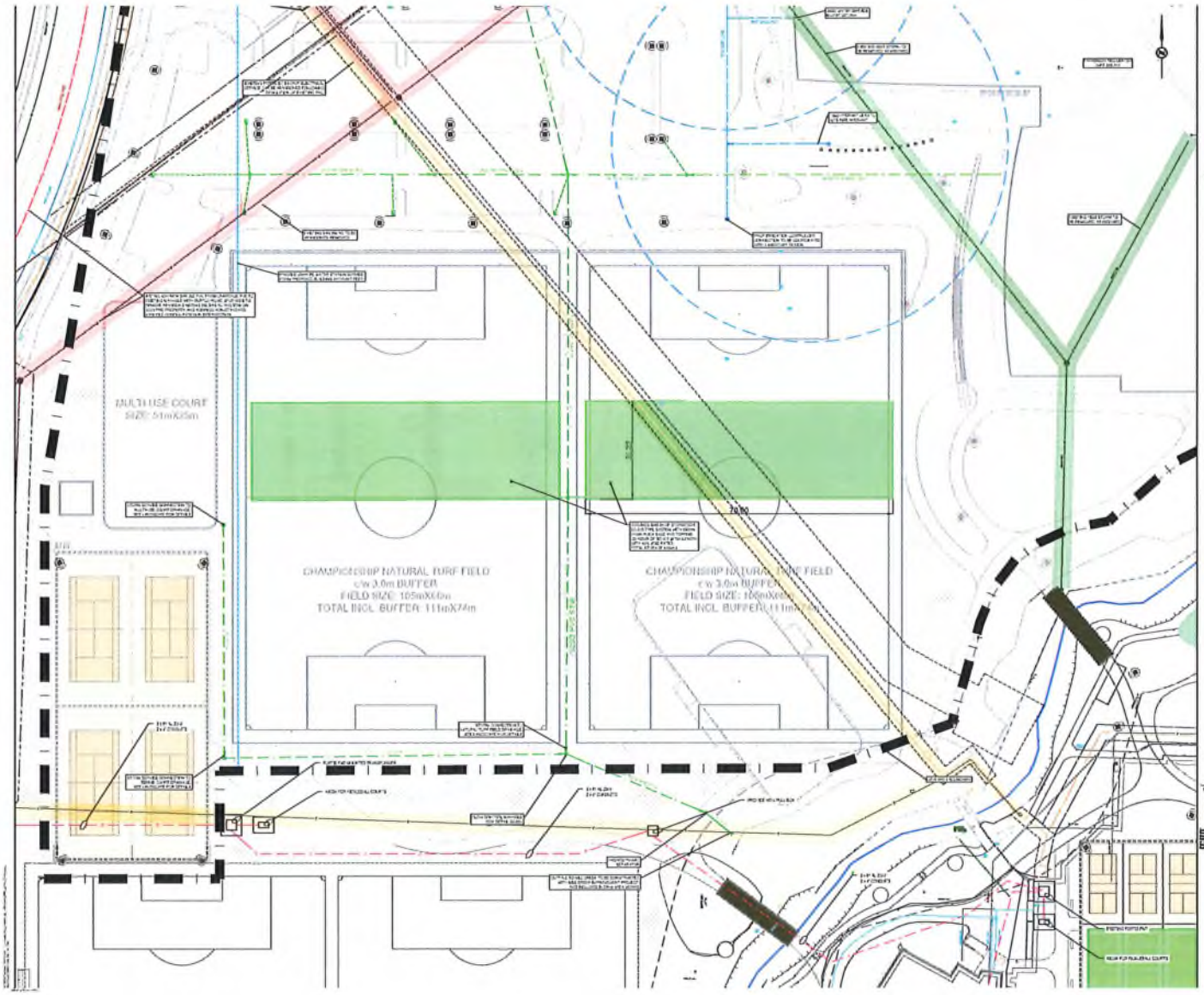
DP-C115



Stantec

City of Kelowna

DP-C116



Stantec

City of Kelowna

DP-C117

Environmental Assessment

Redevelopment of Parkinson Recreation Centre

Prepared for:
City of Kelowna

February 27, 2024

Prepared by:
Stantec Consulting Ltd.

Project/File:
111710161

Stantec Consulting Ltd.

The conclusions in the Report titled Environmental Assessment are Stantec's professional opinion, as of the time of the Report, and concerning the scope described in the Report. The opinions in the document are based on conditions and information existing at the time the scope of work was conducted and do not take into account any subsequent changes. The Report relates solely to the specific project for which Stantec was retained and the stated purpose for which the Report was prepared. The Report is not to be used or relied on for any variation or extension of the project, or for any other project or purpose, and any unauthorized use or reliance is at the recipient's own risk.

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Prepared by

Rehe, Gisele Digitally signed by Rehe, Gisele Date: 2025.02.28 09:24:09 -08'00'

Signature

Gisele Rehe, Biologist, R.P.Bio.

Printed Name

Reviewed by

Penner, Michelle Digitally signed by Penner, Michelle Date: 2025.02.28 08:14:12 -08'00'

Signature

Michelle Penner, Aquatic Biologist, R.P.Bio.

Printed Name

Approved by

Richardson, Noelle Digitally signed by Richardson, Noelle DN: CN="Richardson, Noelle", OU=Internal, OU=users, OU=stantec, DC=corp, DC=ads Date: 2025.02.27 11:42:58-08'00'

Signature

Noelle Richardson, Environmental Scientist, GIT

Printed Name

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Acronyms / Abbreviations

°C	degrees Celsius
BC	British Columbia
BMP	Best Management Practice
CEMP	construction environmental management plan
the City	City of Kelowna
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
cm	centimetre
DFO	Fisheries and Oceans Canada
DP	Development Permit
DPA	Development Permit Area
EA	Environmental Assessment
EM	Environmental Monitor
ESA	Environmentally Sensitive Area
GOC	Government of Canada
HADD	Harmful Alteration, Disruption or Destruction
km	kilometre
m	metre
mg/L	milligram per litre
mm	millimetre
m^3/s	cubic metres per second
MBCA	*Migratory Birds Convention Act*
MOF	Ministry of Forests
MOE	Ministry of Environment
NTU	Nephelometric Turbidity Units
OCP	Official Community Plan
ONA	Okanagan Nation Alliance
PPxh	Ponderosa Pine very dry hot
PRC	Parkinson Recreation Centre
QEP	Qualified Environmental Professional
RDCO	Regional District of Central Okanagan
RFR	Request for Review

RIC	Resources Inventory Committee
RMA	Riparian Management Area
RPRC	Redevelopment of Parkinson Recreation Centre
SARA	*Species at Risk Act*
SWD	small woody debris
Stantec	Stantec Consulting Ltd.
the Park	Parkinson Recreation Park
the Project	Redevelopment of Parkinson Recreation Centre
the Property	the five parcels the overlap the Project
TOR	Terms of Reference
WLRS	Water, Land and Resource Stewardship
WSA	*Water Sustainability Act*

1 Introduction

The City of Kelowna (the City) has retained Stantec Consulting Ltd (Stantec) to provide environmental services for the proposed Redevelopment of Parkinson Recreation Centre (RPRC; the Project), which consists of the construction of a new Parkinson Recreation Centre (PRC), redevelopment of the Parkinson Recreation Park (the Park), and naturalization of Mill Creek, which flows through the Park. The Project overlaps with five parcels in Kelowna, British Columbia (BC; the Property, Figure 1):

- 1700 - 1800 Parkinson Way, PID 001-556-789, Plan KAP32159, Lot 2
- 1800 Parkinson Way, PID 003-512-126, Plan KAP32159, Lot 18
- 1456 Spall Road, PID 005-788-820, Plan KAP37596, Lot A
- Plan KAP27683, Lot: PARK
- 1800 Parkinson Way, PID 006-285-368, Plan KAP23634, Lot 2

The Property overlaps with P1 and P3 (Public and Industrial) zoning and each parcel, except for PID 003-512-126 and PID 006-285-368, is within a Natural Environment (Sensitive Aquatic) Development Permit Area (DPA) for Mill Creek (Figure 1). A Natural Environment Development Permit (DP) requires that a qualified environmental professional (QEP[1]) be retained to prepare an environmental assessment (EA) report following the City's Terms of Reference (TOR) for Professional Reports (the City n.d.). This EA report supports the Natural Environment DP(s) that are triggered for the Project. Given timelines and phased schedule of construction works, the City permitting staff and the Project have agreed to phased Natural Environment DP applications as follows:

- Natural Environment DP to support the construction of the new PRC building and the Park features (e.g., fields, courts, parking lots, and landscaping) starting in spring 2025.
- Natural Environment DP to support the naturalization of Mill Creek in 2026 and 2027.

This EA report focuses on the first DP submission for the development of the new PRC building and Park features. It excludes the naturalization of Mill Creek, which will be detailed in a separate submission. For consistency, the following report summarizes the existing environmental values for the Property (i.e., the new PRC building, the Park, and Mill Creek), but the Project impacts in this report are limited to the new PRC building and the Park, and excludes the Mill Creek upgrades. Impacts associated with planned instream works will be of focus within a Supplemental EA report prepared by Stantec. The Supplemental EA report will accompany this EA report for a second Natural Environment (Sensitive Aquatic) DP for works within Mill Creek and will be used to support a *Water Sustainability Act* (WSA) Section 11 Change Approval application, a Fisheries and Oceans Canada (DFO) Request for Review application, and a provincial fish collection permit.

[1] Qualified Environmental Professional (QEP) requires that the professional be licensed in BC (i.e., Registered Professional Biologist or Professional Agrologist)

Additional permitting for the new PRC building includes a WSA Section 10 permit, which is prepared by others; the permit is triggered for dewatering required to construct the proposed swimming pool within the new PRC building. The City has indicated that issuance of the Natural Environment DP is first subject to the approval of the WSA Section 10 application.

1.1 Project Background

PRC and the adjacent Park are a multi-use space originally constructed in 1972. The current facility is reaching the end of its service life and a feasibility study showed that redeveloping the Property was a better investment than renovating the existing facilities. The Project was endorsed by City council in 2023, at which time the proposed redevelopment did not include the naturalization of Mill Creek.

Separately, in 2019, the City secured a grant from the Infrastructure Canada Disaster Mitigation and Adaptation Fund to protect areas adjacent to Mill Creek against extreme flooding while also enhancing fish habitat. The City retained Okanagan Nation Alliance (ONA) to prepare a fisheries habitat assessment report on Mill Creek (2021) as part of a master plan for restoration of Mill Creek through the City of Kelowna. ONA focused their assessment on lower Mill Creek from Okanagan Lake to a point 8.9 kilometres (km) upstream of Okanagan Lake. The ONA (2021) report summarizes fish habitat conditions within Mill Creek and provides restoration recommendations. This report splits Mill Creek into five reaches, with Reach 3 aligning with the section of Mill Creek within the Park. Since 2021, the City has initiated naturalization of areas within Reaches 1 and 2 of Mill Creek, downstream of PRC, with construction of a section along Burne Ave completed in 2024.

To provide integration between the RPRC and Mill Creek naturalization projects, design and construction of Reach 3 was combined with the RPRC. Therefore, the Project consists of the redevelopment of the PRC building and Park as well as the naturalization of Mill Creek within the Park.

1.2 Project Schedule

The tentative high-level Project schedule is show in Table 1, but is subject to change depending on permitting, design development, and procurement. The first DP application and the impacts described in this EA report are only for tasks associated with the new PRC building and Park construction (i.e., does not include tasks associated with Mill Creek shown in Table 1).

Table 1 Tentative Project Schedule

Timeline	Activity
June 2025	Initiate New PRC building excavation
July 2025 – November 2027	New PRC building construction
July 2025 – November 2027	Park construction – north of Mill Creek
March 2026 – September 2026	Mill Creek Phase 1 (upstream half)
March 2027 – September 2027	Mill Creek Phase 2 (downstream half)
2028	Park construction – south of Mill Creek

Notes
1. Coordinate System: NAD 1983 UTM Zone 11N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: Google Earth 2024

- Watercourse Centerline
- Parcel Boundary
- Property
- Project Footprint
- Excavation Extent – Project Footprint for New PRC Building
- Approximate Proposed 15 m Riparian Area - Mill Creek Alignment (to be confirmed in Supplemental EA)
- Existing 15 m Riparian Management Area
- Natural Environment Development Permit Area - Watercourse

0 50 100 150 200 m

1:5,000 (at original document size of 8.5x11)

Stantec

Project Location:
Kelowna, BC
NTS 50K Grid: 82E/14

Project Number: 111710161
Prepared by KWONG on 20241122
Requested by GREHE on 20241122
Checked by NRICHARDSON on 20250109

Client/Project/Report
City of Kelowna
Parkinson Recreation Centre
Environmental Overview Assessment

Figure No.
1

Title
Project Location

1.3 Scope of Assessment

The proposed development includes replacing the existing 50-year-old PRC building with a new building, redeveloping the existing sports fields and courts, and adding new sports fields. This EA report has been completed for the proposed building development on the Property that have potential to impact environmentally sensitive areas, including the Natural Environment DPA, and follows report requirements outlined by the City for Natural Environment DP guidelines (as per the City's OCP [the City 2022a]).

The scope of this EA report is to:

- Summarize existing environmental conditions adjacent to and within Reach 3 of Mill Creek, including vegetation, wildlife and wildlife habitat, and fish and fish habitat values.
- Determine the amount (m^2) of ESAs within the Property using the City's four class rating system.
- Outline the current environmental regulatory setting, including potential permits, approvals, authorizations that may be required for the Project as well as their requirements.
- Recommend mitigation measures for environmentally sensitive resources within and adjacent to the Project alignment, including environmental monitoring during construction.

The four class rating system (outlined in the City's OCP) for Environmentally Sensitive Areas (ESAs) was used to classify habitat within the Project. An impact summary table (Table 9, Section 4.4) was developed to show proposed amounts of habitat impacted through the new PRC building development; Section 7 discusses habitat compensation.

1.4 Study Area

The Property consists of existing PRC amenities, such as the existing PRC building, fields, and courts, as well as the existing Mill Creek alignment and associated Riparian Management Area (RMA). The upstream extent of Mill Creek within the Property is located at the crossing within the PARK lot (Plan KAP27683) and the downstream extent is at the Mill Creek and Highway 97/Harvey Avenue crossing (Figure 1). Project terminology to describe the areas within the Property are presented in Table 2.

Table 2 Project Terminology

Term	Description
The Property	Location of the Project which include five parcels encompassing the redevelopment of the PRC, Park, and Mill Creek upgrades (Figure 1).
Study Area	A 2 km buffer around the Property for the purposes of identifying potentially sensitive environmental resources that may be disturbed directly or indirectly by the Project works (Figure 2). Figure 2 provides a magnified view of the Study Area (for the purposes of detail) and does not show all environmental sensitivities within the Study Area.
RMA	The riparian management area adjacent to watercourses that provides riparian vegetation and ecosystem connectivity. The RMA is defined as the 15 metre (m) setback from top of bank of Mill Creek as specified in the City's OCP for the reaches downstream of Hardy Street (Figure 2; the City 2022a).

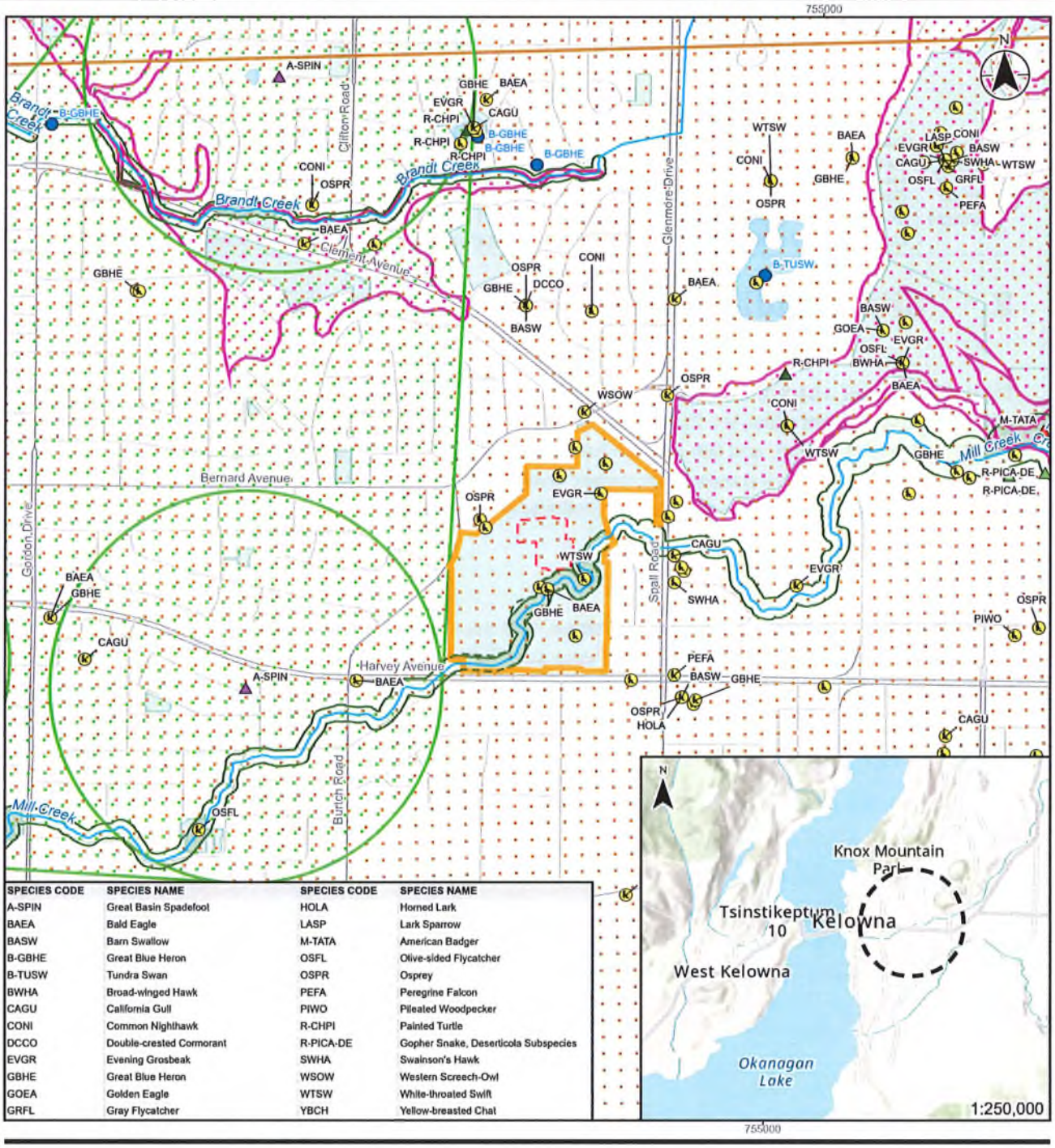
Term	Description
Project Footprint	Direct disturbance of the Property through anticipated construction activities and includes temporary and permanent disturbance (Figure 4). The Project Footprint for the Mill Creek upgrades will be confirmed in the Supplemental EA report, but an approximation of this area is shown in Figure 4.

2 Site Conditions and Environmental Values

Stantec completed a background (desktop) review within the Study Area of publicly available information and a field assessment within the Property to inventory site conditions and characterize vegetation, wildlife and wildlife habitat, and fish and fish habitat values that have the potential to be affected by the Project. This EA report characterizes the current level of disturbance within the Study Area and identifies environmental sensitivities. The assessment methods and results are described in the subsections below.

2.1 Methods

The methods used to complete the desktop review, field assessment, ESA mapping, and the identification of Project effects are described below. ESAs were stratified into categories of "environmental sensitivity" for mapping (Section 2.1.3) to describe the Property's environmental and biophysical characteristics. The condition of vegetation and ecological communities and occurrence of environmentally sensitive features (wildlife habitat, bird nesting habitat, fish habitat) were used in mapping ESA areas.



SPECIES CODE	SPECIES NAME	SPECIES CODE	SPECIES NAME
A-SPIN	Great Basin Spadefoot	HOLA	Horned Lark
BAEA	Bald Eagle	LASP	Lark Sparrow
BASW	Barn Swallow	M-TATA	American Badger
B-GBHE	Great Blue Heron	OSFL	Olive-sided Flycatcher
B-TUSW	Tundra Swan	OSPR	Osprey
BWHA	Broad-winged Hawk	PEFA	Peregrine Falcon
CAGU	California Gull	PIWO	Pileated Woodpecker
CONI	Common Nighthawk	R-CHPI	Painted Turtle
DCCO	Double-crested Cormorant	R-PICA-DE	Gopher Snake, Deserticola Subspecies
EVGR	Evening Grosbeak	SWHA	Swainson's Hawk
GBHE	Great Blue Heron	WSOW	Western Screech-Owl
GOEA	Golden Eagle	WTSW	White-throated Swift
GRFL	Gray Flycatcher	YBCH	Yellow-breasted Chat

Notes
1. Coordinate System: NAD 1983 UTM Zone 11N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: Google Earth 2024

- Watercourse
- Waterbody
- Local Greenspace
- Property
- Study Area
- Excavation Extent – Project Footprint for New PRC Building
- Approximate Proposed 15 m Riparian Area - Mill Creek Alignment (to be confirmed in Supplemental EA)
- Existing 15 m Riparian Management Area
- eBird Observation

Red and Blue-listed Bird Observations
- Blue

Incidental Wildlife Observations (BC CDC) – Species at Risk Occurrences (Blue and Red Listed)
- American Badger
- Gopher Snake
- Great Basin Spadefoot
- Painted Turtle

Critical Habitat for Federally-Listed Species at Risk
- American Badger jeffersonii subspecies
- Great Basin Gophersnake
- Great Basin Spadefoot

0 150 300 450 600 m
1:15,000 (at original document size of 8.5x11)

Stantec

Project Location:
Kelowna, BC
NTS 50K Grid: 82E/14

Project Number: 111710161
Prepared by KWONG on 20241122
Requested by GREHE on 20241122
Checked by NRICHARDSON on 20250109

Client/Project/Report
City of Kelowna
Parkinson Recreation Centre
Environmental Overview Assessment

Figure No.
2

Title
Environmentally Sensitivities within the Study Area

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2.1.1 Desktop Review

A background information review was completed for the Study Area focusing on vegetation, wildlife and fish species of conservation concern[2], ecological communities of conservation concern (i.e., provincially Red- or Blue-listed), invasive plant species, and sensitive habitats (e.g., designated critical habitat). Information identified during the background information review was used to determine mapped environmental values and sensitive areas, least risk timing windows for construction, and to provide context for the field assessment.

The desktop review includes review of previous reports for Mill Creek, searches of publicly accessible databases for occurrence records of species or ecological communities of conservation concern, invasive plant species, wildlife habitat areas, critical habitat for species at risk and ungulate winter ranges (BC Ministry of Environment, Lands and Parks [BC ENV] 1999, BC Government [BC Gov] 2024a and BC Gov 2024b). The BC Species and Ecosystem Explorer (BC Conservation Data Centre [BC CDC] 2024) was used to compile an initial list of vegetation, fish, and wildlife species of conservation concern (as well as other fish species documented within Mill Creek), and ecological communities of conservation concern known or likely to occur in the Study Area based on the available habitat (e.g. urban/riparian/stream).

Existing and/or historical environmental features were reviewed using the following reports, desktop tools, and public data sources:

- Mill Creek Habitat Assessment and Restoration Planning prepared for the City, by Okanagan Nation Alliance (ONA 2021)
- Mill Creek Flood Recovery: Burne Avenue Mill Creek Improvements Environmental Assessment prepared for Urban Systems Ltd., by Northland Environmental Ltd. (2023)
- Biogeoclimatic Ecosystem Classification Program (BC Ministry of Forests [MOF] 2023)
- The City GIS mapping (the City 2024) – provides environmentally sensitive areas within the City
- BC CDC Species and Ecosystem Explorer (BC CDC 2024) – provides a detailed catalogue of the species and ecosystems of BC including life history, occurrence data, and conservation status of plant, wildlife, and fish species
- eBird (Birds Canada 2024a) Nature Counts search by conservation concern - provides occurrence data for bird species
- Fisheries Inventory Data Queries (BC ENV 2024) - provides occurrence data for fish species

[2] Wildlife species of conservation concern include provincially Red- or Blue-listed species, species listed as Special Concern, Threatened, or Endangered on Schedule 1 of the federal *Species at Risk Act* (SARA), species whose nests are protected year-round under Schedule 1 of the Migratory Birds Regulations, and species whose nests are protected year-round under Section 34 of the BC *Wildlife Act*.

- Google Earth© Pro (Google Earth© 2024) online imagery – provides imagery for potential environmentally sensitive features (e.g., rocky outcrops, talus slopes)
- HabitatWizard (BC Gov 2024a) – provides a detailed catalogue of species and ecosystems of plant, wildlife and fish (with known or historical occurrences of federally and provincially listed species)
- iNaturalist (2024) – provides publicly reported species occurrences of vegetation, fish and wildlife
- InvasivesBC (2024) – Invasive Plants of BC Map Viewer – provides occurrences of documented invasive plants
- Birds Canada (2024b) Important Bird Areas Canada Map Viewer – provides maps of Important Bird and Biodiversity Areas in Canada
- *Species At Risk Act* (SARA) Aquatic Species at Risk Map (Government of Canada [GOC] 2024a) - mapped or historical occurrences of potential aquatic species at risk
- SARA Public Registry (GOC 2024b) – provides status, range, and life history for species at risk

The following applicable municipal bylaws, policy and Best Management Practices (BMPs) were reviewed for applicable requirements and mitigations measures:

- Guidelines for Amphibian and Reptile Conservation During Road Building and Management Activities in British Columbia (BC MOE 2014a)
- Avoiding Harm to Migratory Birds (GOC 2024c)
- Okanagan timing windows (BC Gov 2024b)
- Develop with Care 2014: Environmental Guidelines for Urban and Rural Land Development in British Columbia (BC MOE 2014b)
- The City of Kelowna Official Community Plan Bylaw No. 12300 (the City 2022a)
- Requirements and Best Management Practices for Making Changes in and About A Stream in British Columbia (BC Gov 2022)
- Guidelines for Raptor Conservation during Urban and Rural Land Development in British Columbia (BC Gov 2013)
- General Nesting Periods of Migratory Birds in Canada (ECCC 2024)
- Guidelines to Avoid Harm to Migratory Birds (ECCC 2023)
- Land Development Guidelines for the Protection of Aquatic Habitat (DFO 1993)

The City's TOR (the City n.d.) require the stratification of the Property based on the area's environmental sensitivity. This EA report follows the Environmental Inventory Phase, Impact Assessment Phase, and Protection, Mitigation, Compensation, and Implementation Strategy of the City's TOR (the City n.d.) for an EA under the City's guidance. The Project does not trigger a provincial Environmental Assessment as defined under the Reviewable Project Regulations under the BC *Environmental Assessment Act*. The EA identifies environmental values that are to be protected during the proposed site development. This report

provides a summary of existing conditions for environmental features and evaluates potential effects of the Project on those components.

ESAs are ranked using the following four class rating system as per the City's TOR (n.d.):

- ESA – 1 (*Very High*) - *These areas contain significant vegetation and wildlife characteristics representing a diverse range of sensitive habitat. These features contribute significantly to the overall connectivity of habitat and ecosystems. Avoidance and conservation of ESA-1 designations should be the primary objective. If development should occur within these areas, compensation to promote no net loss at a ratio of 3:1 of equivalent functioning habitat may be required only after it proves impossible or impractical to maintain the same level of ecological function. Refer to the City's Official Community Plan (OCP) Chapter 7.8 for aquatic habitat compensation policies.*
- ESA – 2 (*High*) – *These areas of moderate significance contribute toward the overall diversity and contiguous nature of the surrounding natural features. If development is pursued in these areas, portions of the habitat should be retained and integrated to maintain the contiguous nature of the landscape. Some loss to these ESAs can be offset by habitat improvements to the remaining natural areas found on a property.*
- ESA – 3 (*Moderate*) – *These areas are typically delineated as low significance representing disturbed habitats of fragmented features. These areas contribute to the diversity to the landscape although, based on the condition and adjacency of each habitat, significant function within the landscape is limited. If development is pursued in these areas, the impacts should be offset by habitat improvements in other more sensitive natural areas found on a property.*
- ESA 4 – (*Low*) – *These delineated areas contribute little or no value to the overall diversity or vegetation, soils, terrain, and wildlife characteristics of an area. Development is encouraged to be focused on these sites before consideration of developing higher rated sites of the area. These areas shall not be considered as areas for restoration and enhancement or as recruitment as higher value ESAs in offsetting development in other areas.*

2.1.2 Field Assessment

Two Stantec QEPs completed the field assessment on October 10 and 25, 2024. The field assessment focused on the environmental resources present within the Project Footprint at the new PRC building footprint, the Park, and future Mill Creek footprint, specifically where the Project Footprint overlaps with the RMA of Mill Creek (Figure 1). The purpose of the field assessment was to confirm the findings of the desktop review and characterize existing environmental conditions as they relate to vegetation, wildlife, and fish and fish habitat values present within and adjacent to the Project Footprint. The field assessment for Mill Creek followed the RIC (2001) standard for a Reconnaissance Fish and Fish Habitat Inventory sample-based survey.

The field assessment included documentation of the following vegetation resources:

- Presence or potential occurrence of vegetation communities of conservation concern (e.g., sensitive ecological communities; BC ENV 2010)
- Presence or potential occurrence, density, and distribution of vegetation species of management concern (e.g., invasive species and noxious weeds)
- The presence and distribution of native vegetation species

Observations of wildlife habitats and resources include:

- Observations of wildlife or signs of wildlife (e.g., trails, tracks, scat)
- Potential amphibian breeding habitat
- Potential bat roosting habitat
- Wildlife features (e.g., stick nests, tree cavities, dens)

Fish habitat observations included:

- Average channel and wetted width
- Overall instream habitat (i.e., pool, run) and substrate observed
- Existing cover types (instream and overhead)
- Visual observations of fish including life stage

Riparian habitat observations included:

- Riparian species composition and riparian width
- ESA level
- Riparian buffer (polygon created in field)

Vegetation, wildlife and wildlife habitat, and fish and fish habitat observations were recorded using global positioning system (GPS) coordinates, photos, and relevant field notes (e.g., species description, number observed, etc.).

2.1.3 Environmentally Sensitive Area Mapping

Spatial boundaries of ESAs were delineated using the Central Okanagan Sensitive Ecosystem mapping database as a base map (Ryan et al. 2022) and the City's TOR as guidance (the City n.d.). Stantec mapped ESAs in the Property in a manner consistent with the City's TOR (the City n.d.). The City's OCP requires projects to comply with RMA minimum setbacks (i.e., buffers on streams and wetlands) for the protection of sensitive ecosystems. ESAs were delineated as a basemap (Iverson 2008) and stratified using ArcGIS tools (i.e., ArcGIS Pro 3.0[3]). They were then ground-truthed during the field assessment by evaluating the site condition (i.e., disturbance), vegetation and ecosystems present, wildlife habitat

[3] ESRI 2024. ArcGIS Pro Desktop: Release 3.0. Redlands, CA.

suitability, wildlife species at risk with potential occurrence, and professional interpretation. Figure 3 incorporates environmental sensitives that were identified the field.

2.1.4 Effects Assessment

Stantec identified potential Project-related effects on environmental components based on recommendations provided in the OCP's guidelines for Natural Environment DPAs and the TOR (the City 2022a., n.d.). The OCP (the City 2022a) recommends minimizing impacts on environmental sensitive areas by:

- Protecting, restoring and enhancing ESAs as functioning ecosystems
- Protecting and enhancing water quality
- Protecting drinking water sources and subsurface aquifers against possible contamination from land use and development activities
- Managing the introduction and spread of invasive species
- Minimizing soil disturbance
- Protecting hydrological functions
- Protecting biodiversity, as well as wildlife habitats, features and functions
- Promoting the efficient use of water to ensure a sustainable hydrologic system

2.2 Results

2.2.1 Background Information Review

The findings of the background information review are described below and presented in Figure 2. The background review was completed for a 2 km radius (Study Area) around the Property and results described herein include sensitivities identified within the 2 km buffer; however, Figure 2 is zoomed to a 1 km radius for the purposes of seeing detail.

A review of historical air photos from 2002 to 2023 shows that properties within the Study Area have undergone substantial land development during this time period. However, the Property has undergone little land development since the centre's construction in 1972 other than the addition of a new physical activity centre (PAC on Figure 3; 1,226 m^2) which was completed in 2012 on the south portion of the Property adjacent to Mill Creek (Google Earth© Pro 2024, the City 2024). Stantec understands the physical activity centre will not be removed or renovated for the Project but will remain in place (Figure 4).

2.2.1.1 Vegetation and Ecosystems

The Study Area consists of aquatic and riparian habitats (with a narrow riparian buffer) surrounded by urban development including park area, residential buildings, and the PRC community buildings and infrastructure. The lack of undisturbed areas within the Study Area indicates a low probability of

occurrence of listed plant species or at-risk ecosystems on the Property except for the Mill Creek riparian area on the east / northeast portion of the Property.

The Study Area is located within the Ponderosa Pine very dry hot subzone (PPxh) as described under the biogeoclimatic ecosystem classification system. The zone has a mean annual temperature range of 4.8 to 10 degrees Celsius (°C) and occurs at an elevation range from 335 to 900 metres (m). The mosaic of grasslands and forests in this zone consist mainly of a canopy of ponderosa pine (*Pinus ponderosa*) and an understory of bluebunch wheatgrass (*Agropyron spicatum*) and often contain arrow-leaved balsam root (*Achillea millefolium*) and Saskatoon (*Amelanchier alnifolia*). The very dry hot subzone is characterized by more Rocky Mountain fescue (*Festuca saximontana*) than in other subzones, Idaho fescue (*Festuca idahoensis*), slender hawksbeard (*Crepis atribarba ssp. artribarba*), and timber milk-vetch (*Astragalus miser*) (Hope et al. 1991).

Plant species and ecological communities of conservation concern were queried during the desktop review and 45 listed potential communities and 32 listed plants/lichens were identified to be associated with the PPxh subzone/variant. Based on the regional filters (the City's boundaries), habitat suitability, and known species ranges within the Study Area, the list has been reduced to what is included in Table 3, which includes two ecosystems at risk and 11 plant species at risk with potential to occur within the Study Area (BC CDC 2024).

Table 3 Ecological Communities and Plant Species at Risk with Potential to Occur Within the Study Area

Species	Scientific Name	BC Status[1]	Site Series
Plant Communities			
Common cattail marsh	*Typha latifolia Marsh*	Blue	PPxh1/Wm05
Black cottonwood – common snowberry / rose	*Populus trichocarpa / Symphoricarpos albus - Rosa spp.*	Red	PPxh/Fm01
Vascular Plants			
Cut-leaved water-parsnip	*Berula incisa*	Blue	-
Columbian carpet moss	*Bryoerythrophyllum columbianum*	Blue	-
Slender hawksbeard	*Crepis atribarba ssp. atribarba*	Blue	-
Englemann's spike-rush	*Eleocharis engelmannii*	Blue	-
Rusty cord-moss	*Entosthodon rubiginosus*	Blue	-
Yellowseed false pimpernel	*Lindernia dubia var. dubia*	Blue	-
Hairy water-clover	*Marsilea vestita*	Blue	-
Nugget moss	*Microbryum vlassovii*	Blue	-
Showy phlox	*Phlox speciosa ssp. occidentalis*	Red	-
Idaho blue-eyed grass	*Sisyrinchium idahoense var. occidentale*	Red	-
Short-rayed aster	*Symphyotrichum frondosum*	Red	-

Species	Scientific Name	BC Status[1]	Site Series

Notes:

[1] BC List categories:

Red: species or ecosystem that is at risk of being lost (Extirpated, Endangered or Threatened)

Blue: species or ecosystem that is of Special Concern

Source: BC CDC 2024

Eleven invasive weed occurrences from three invasive plant species were identified within 2 km of the Study Area (InvasivesBC 2024). The invasive plant species included baby's breath (*Gypsophila paniculata*), common burdock (*Arctium minus*), and tree of heaven (*Ailanthus altissima*).

2.2.1.2 Wildlife and Wildlife Habitats

Habitat within the Project Footprint is highly disturbed and is most likely to be used by wildlife species tolerant of urban and disturbed habitat. A variety of habitats with the potential to support wildlife occur within the Study Area including urban residential areas, urban commercial areas, a naturalized terrestrial corridor (with rocky outcrops) to the east, a golf course to the northeast, orchards (agricultural fields) to the south, anthropogenic grassland areas, riparian areas with mature trees and shrubs along Mill Creek, and aquatic habitat within Mill Creek. Habitat within the Property includes riparian areas with mature trees and shrubs along Mill Creek, anthropogenic grassland areas, paved walking paths, a paved parking lot, and existing commercial buildings. Several observations of wildlife species of concern (Appendix A) have been documented within the Study Area in available online data sources (BC CDC 2024; Birds Canada 2024a). The Project Footprint is within a critical habitat polygon for gophersnake (*Pituophis catenifer deserticola)* and adjacent to critical habitat polygons for American badger (*Taxidea taxus)* and Great Basin spadefoot *(Spea intermontane)* (Figure 2).

Thirty-four (34) wildlife species of conservation concern were identified through a background review of known species at risk occurrences, the PPxh biogeoclimatic ecosystem classification subzone, habitat subtypes including urban/suburban, riparian forest, and stream, and known species ranges and distributions within the Study Area (BC CDC 2024). Of these, there were 26 bird species, eight mammals, two amphibians, and five reptile species of conservation concern that are known or likely to occur in the Study Area (Appendix A).

Of the 26 bird species of conservation concern with potential to occur in the Study Area, there are occurrence records of 21 bird species within the Study Area (with 23 birds shown in the magnified Figure 2) (Appendix A; iNaturalist 2024, Birds Canada 2024a), six (6) of which are within the Property including the osprey (*Pandion haliaetus*), bald eagle(*Haliaeetus leucocephalus*), evening grosbeak (*Coccothraustes vespertinus*), white-throated swift (*Aeronautes saxatalis*), great blue heron (*Ardea Herodias*), and peregrine falcon (*Falco peregrinus*) (Figure 2). Of the 26 bird species, the great blue heron, pileated woodpecker (*Dryocopus pileatus*), bald eagle, golden eagle (*Aquila chrysaetos*), peregrine falcon, and osprey are species that have nests protected year-round under the Migratory Birds Regulation or *Wildlife Act*.

Habitat within the Project Footprint is highly disturbed and is most likely to be used by species tolerant of urban and disturbed habitat. This includes species such as killdeer (*Charadrius vociferus*) and barn

swallow (*Hirundo rustica*). Killdeer commonly nests on rocky, gravel, paved, or other open habitat (BC Breeding Bird Atlas 2024), and barn swallow nests almost exclusively on anthropogenic structures. Species such as common nighthawk (*Chordeiles minor*) and white-throated swift may forage over the Project Footprint, but based on the level of disturbance in the Project Footprint, suitable nesting habitat may be limited.

There are eight mammal species of conservation concern that are known or likely to occur in the Study Area (Appendix A). Of these, an American badger (*Taxidea taxus*) occurrence polygon overlays the Study Area and extends along most of the Okanagan Valley (BC Gov 2024a). The American badger is provincially red-listed and federally listed as endangered under Schedule 1 of SARA (BC CDC 2024). The presence of this polygon indicates the presence of American badger in the Okanagan region; however, population numbers are small, and their range is limited to a smaller area than predicted by the occurrence polygon. Further, the Study Area is mapped as Very Low (Class 5) for American badger Summer and Winter Living Capability and Suitability (BC Gov 2024a); this species is less likely to occur in the urbanized and disturbed habitat within the Project Footprint. Bat species may forage over and roost in the Study Area, however roosting habitat is expected to be limited within the disturbed footprint.

There are two amphibian species of conservation concern that are known or likely to occur in the Study Area (Appendix A). One amphibian of conservation concern, Great Basin spadefoot (*Spea intermontana*), has been documented within 290 m of the Property (BC CDC 2024). The Study Area overlaps a spadefoot critical habitat polygon, which occurs 215 m from the Project Footprint. Spadefoot are known to travel up to 2 km between breeding/winter/other habitat sites where suitable movement habitat is present. The area between the critical habitat polygon and the Project Footprint is a busy urban road (Burtch Avenue) area which is likely to limit dispersal through the Project Footprint (Figure 2). Aerial imagery of the Study Area indicates potentially suitable habitat for overwintering within the forested upslope areas (i.e. friable soils with the presence of rodent holes).

There are five reptile species of conservation concern that are known or likely to occur in the Study Area (Appendix A). There are two reptiles of conservation concern (western painted turtle [*Chrysemy picta* pop. 2] and gophersnake [*Pituophis catenifer deserticola*]) that have been documented within the Study Area. Western painted turtle are special concern on provincial and federal lists and have been documented within 566 m of the Property (Figure 2). Aerial imagery indicates that the closest suitable aquatic habitat for western painted turtles (Redlich Pond) is located 1.1 km from Project Footprint. Female western painted turtle may migrate through the Study Area to and from nest sites in disturbed areas.

Gophersnake, *deserticola* subspecies has been documented within 1 km of the Project Footprint. The Study Area is within a critical habitat polygon for gophersnake, *deserticola* subspecies that may contain the biophysical attributes of critical habitat (Figure 2). Snakes and lizards are likely to forage, bask on exposed rock (paved surfaces) and seek refuge within the Study Area. Gophersnakes use rocky outcrops to bask and small mammal dens (rodent holes) or large woody debris for refuge (COSEWIC 2002). Dens and rock crevices that extend below the frost line are used as hibernacula during the overwintering period (COSEWIC 2002).

2.2.1.3 Fish and Fish Habitat

The Study Area partially overlaps with Mill Creek (watershed Code: 310-808200; Figure 2). Mill Creek is a fourth order stream that originates from Postill Lake in Winfield, BC and flows into Okanagan Lake at the south side of the William R Bennet Bridge in Kelowna (BC Gov 2024a). Mill Creek has records of sixteen fish species and species groups (Table 4; BC Gov 2024a). There are no documented barriers between Okanagan Lake and the Study Area (BC ENV 2024). No listed fish species or critical habitat areas for aquatic species were found within Mill Creek (BC CDC 2024; Government of Canada [GOC] 2024a).

Table 4 Fish Species Recorded within Mill Creek

Common Name	Scientific Name	BC List[1]	COSEWIC[2]	SARA[2]
brook trout	*Salvelinus fontinalis*	Exotic	NS	NS
burbot	*Lota lota*	Yellow	NS	NS
carp (general)	*Cyprinus* sp.	NA	NA	NA
dace (general)	*Rhinichthys* sp.; *Phoxinus* sp.	NA	NA	NA
kokanee	*Oncorhynchus nerka*	Yellow	NA	NA
largescale sucker	*Catostomus macrocheilus*	Yellow	NS	NS
longnose dace	*Rhinichthys cataractae*	Yellow	NS	NS
longnose sucker	*Catostomus catostomus*	Yellow	NS	NS
mountain whitefish	*Prosopium williamsoni*	Yellow	NS	NS
northern pikeminnow	*Ptychocheilus oregonensis*	Yellow	NS	NS
peamouth chub	*Mylocheilus caurinus*	Yellow	NS	NS
prickly sculpin	*Cottus asper*	Yellow	NS	NS
rainbow trout	*Oncorhynchus mykiss*	Yellow	NS	NS
redside shiner	*Richardsonius balteatus*	Yellow	NS	NS
sculpin (general)	*Cottus* sp.	NA	NA	NA
sucker (general)	*Catostomus* sp.	NA	NA	NA

Notes:

[1] BC List categories:

Yellow: includes species or ecological communities that are apparently secure and not at risk of extinction

Exotic: species that are non-native species that have become established and/or naturalized in BC as a result of human activity

NA: There has not been an investigation to determine if the species has a status or not

[2] COSEWIC and SARA status categories:

NS: The fish species has no status

NA: There has not been an investigation to determine if the species has a status or not

Source: BC Gov 2024a

Generally, ONA (2021) indicated that Reach 3 of Mill Creek is highly modified with poor water quality (visually turbid) and the absence of resting pools, instream cover, and riparian cover which present poor migration conditions and hinders access to the more natural spawning and rearing habitat upstream of the Property. Urban development has reduced productive riparian habitat, including reduced extent (e.g.,

width) and density, leaving banks exposed and impacting water temperatures. The Mission Creek diversion has reduced the Mill Creek's hydraulic capacity to flush streambed substrates and sediment and as a result, high turbidity inputs (e.g., bank erosion) are causing siltation of spawning gravels. Poor water quality, partly caused by urban and industrial runoff, is believed to be the primary limitation to fish production capacity; however, there are also several crossings of Mill Creek that cause debris jams and act as fish barriers (ONA 2021).

The reach in the Park was characterized by an abundance of slow, deep glides and poor water quality. The downstream end of the reach is highly modified and lacks riparian vegetation. The reach contained limited suitable spawning habitat for kokanee (*Oncorhynchus nerka)* and rainbow trout (*Oncorhynchus mykiss)*, based on species specific preferences for substrate sizes, depth, and velocity (ONA 2021). No spawning activity was observed by ONA (2021), suggesting that the reach acts as a migration corridor to upstream reaches where higher quality fish habitat was present (e.g., spawning gravels, pools, off-channel habitat).

2.2.2 Field Assessment

2.2.2.1 Vegetation and Ecological Communities

The purpose of the field assessment, completed by Stantec staff, was to ground-truth environmental sensitivities that were highlighted within the desktop review. A photolog showing conditions during the field assessment is appended as Appendix B. The RMA within the Property (Mill Creek, Reach 3) consists of a narrow riparian buffer that is a product of a long history of urban development. The riparian buffer is less than 1 m for first 150 m (downstream/western portion), then averages between 3 to 5 m for the next 330 m. The riparian buffer is up to 10 m wide in upstream portion for the last 300 m of Reach 3 within the Property. The RMA has been impacted by channelization and encroaching development, with the south side of Mill Creek being more heavily encroached by existing buildings and Highway 97/Harvey Avenue. The riparian buffer includes a mixture of native (deciduous and coniferous) and introduced (deciduous) trees and shrubs, invasive weeds, exposed soils, and a concrete rock wall (Appendix B: Photographs 1-6). Existing native riparian vegetation within the RMA consists of Pacific willow (*Salix lucida*), black cottonwood, Douglas maple (*Acer glabrum*), ponderosa pine, Douglas fir (*Pseudotsuga menziesii*), red-osier dogwood (*Cornus sericea*), rose, common snowberry, tall Oregon grape (*Mahonia aquifolium*). Introduced or ornamental species include maple (*Acer* sp.), elm (*Ulmus* sp.), poplar (*Populus* sp.), oak (*Quercus* sp.), cedar (*Cedrus* sp.), walnut (*Juglans* sp.), and willow (*Salix* sp.) species. The area between new PRC building Project Footprint and RMA consists of manicured lawn, weeds, and paved paths.

An occurrence of the black cottonwood and common snowberry-roses red-listed ecological community was identified (polygon approximately 426 m^2, Figure 3) within the RMA at 49.884805, -119.457404 N (Appendix B: Photograph 7). These areas are located between Mill Creek and the paved pathway along the tennis courts/paved parking lot. Although the Project Footprint, specifically the proposed new PRC building within the tennis court and north sports fields, has highly disturbed existing conditions (e.g., paved surface of tennis court, manicured lawn, and paved paths; Appendix B: Photograph 8-10), it is adjacent to the black cottonwood and common snowberry-roses red-listed ecological community. Section 5.2 recommends mitigation measures to protect the red-listed ecological community.

A landscape architect has conducted a Property-wide tree survey which will be submitted along this EA as part of the DP application. A tree management plan will be provided to detail tree species, quantities that can be retained, quantities lost, and size. The surveys completed by the landscape architects informed the summary of impacts (Section 4.1 and Section 4.4), and compensation (Section 7).

2.2.2.2 Weeds and Invasive Plant Species

Table 5 lists the exotic, noxious, and invasive plant species observed throughout the Project Footprint with the majority observed within the RMA. The location, relative amount within the Project Footprint, and provincial and regional rankings are also provided in Table 5.

Table 5 Weeds, Noxious Weeds, and Invasive Plant Species Observed within the Project Footprint

Common Name	Scientific Name	BC List[1]	Weed Control Regulation Status[2]	Regional District of Central Okanagan Status[3]	Level of Infestation on the Study Area
Common burdock	*Arctium minus*	Exotic	-	Noxious	Low
Cheatgrass	*Bromus tectorum*	Exotic	-	Invasive	High
Canada thistle	*Cirsium arvense*	Exotic	Noxious	Noxious	Low
Common cordgrass	*Spartina sp.*	Exotic	Prevent	-	Moderate
Curled dock	*Rumex crispus*	Exotic	Invasive	Noxious	Moderate
Diffuse knapweed	*Centaurea diffusa*	Exotic	Management, noxious[1]	Noxious	Moderate
Field Bindweed	*Convolvulus arvensis*	Exotic	Invasive	Noxious	Low
Great mullein	*Verbascum thapsus*	Exotic	-	Noxious	Low
Hoary alyssum	*Berteroa incana*	Exotic	Regional Containment/Control	Noxious	Moderate
Night-flowering catchfly	*Silene noctiflora*	Exotic	-	-	Low
Climbing nightshade (European bittersweet)	*Solanum dulcamara*	Exotic	Invasive	Noxious	Moderate
Quackgrass	*Elymus repens*	Exotic	-	Noxious	Moderate
Curled dock	*Rumex crispus*	Exotic	Invasive	Noxious	Moderate
Russian olive	*Elaeagnus angustifolia*	Exotic	Management	Noxious	Low
Siberian elm	*Ulmus pumila*	Exotic	Management	Noxious	Low
Sulphur cinquefoil	*Potentilla recta*	Exotic	Management	Noxious	Moderate
Western Goatsbeard (Yellow salsify)	*Tragopogon dubius*	Exotic	Invasive	Noxious	Low
Wild (corn) mustard	*Sinapsis arvensis*	Exotic	-	Noxious	Low

Common Name	Scientific Name	BC List[1]	Weed Control Regulation Status[2]	Regional District of Central Okanagan Status[3]	Level of Infestation on the Study Area

Notes:

[1] Native or Exotic rankings follow the BC Plant List classifications (BC CDC 2024)
[2] British Columbia Weed Control Regulation
[3] Regional District of Central Okanagan Noxious Weed Control Bylaw No. 1544, 2024

- Indicates no status

Sources: Invasive Species Council of British Columbia 2023, BC Inter-Ministry Invasive Species Working Group 2023, Okanagan and Similkameen Invasive Species Society 2024

2.2.2.3 Wildlife and Wildlife Habitats

Wildlife habitats within the Study Area with the potential to support wildlife include urban residential areas, urban industrial areas, a golf course to the northeast, manicured grass within the Park, riparian areas along Mill Creek, and aquatic habitat within Mill Creek. Habitat within the Project Footprint is dominated by manicured lawns, sports fields, paved pathways, parking lots, buildings, and infrastructure. Given the field assessment was completed in October, Stantec did not anticipate observing migratory birds or bird nesting activity.

During the field assessment, fourteen bird species were heard or seen (Table 6). No stick nests were observed within the Project Footprint; however, one raptor nest was identified north of the Project Footprint, over 100 m from the temporary construction footprint (Figure 3). The nest is known to be that of an osprey based on historical records (Birds Canada 2024a) and local knowledge of the Property. No barn swallow (*Hirundo rustica*) nests, or nesting activity were observed within the Project Footprint. One mature tree with a nesting cavity was observed in the riparian area of Mill Creek (Figure 3; Appendix B: Photograph 11). Two northern flickers (*Colaptes auratus*) were observed feeding on an adjacent tree. Small woodpecker feeding holes and small cavities suitable for songbird nesting (i.e. nuthatches) were observed within the wildlife tree (Figure 3). No pileated woodpecker nesting cavities were observed within the Project Footprint.

Table 6 Birds Detected Within the Study Area During Field Assessment

Common Name	Scientific Name	Auditory/ Visual Observation	Observation of Behavior
American crow	*Corvus brachyrhynchos*	Auditory	-
American goldfinch	*Spnus tristis*	Auditory & Visual	Flying and perching on trees above
American robin	*Turdus migratorius*	Auditory	-
Black-billed magpie	*Pica hudsonia*	Auditory & Visual	Foraging within shrubs
Black-capped chickadee	*Poecile atricapillus*	Auditory	-
Chipping sparrow	*Spizella passerina*	Auditory	-
California quail	*Callipepla californica*	Auditory & Visual	Potential nesting behavior in shrubs
Dark-eyed junco	*Junco hyemalis*	Auditory	-
Eurasian starling	*Sturnus vulgaris*	Auditory & Visual	Flying and perching on trees above
House sparrow	*Passer domesticus*	Visual	Nesting on pillar of office building
Mourning dove	*Zenaida macroura*	Auditory	-
Northern flicker	*Colaptes auratus*	Auditory	-
Red-tailed hawk	*Buteo jamaicensis*	Auditory & Visual	Flying overhead fields looking for prey
Song sparrow	*Melospiza melodia*	Auditory	-

No bats or evidence of roosting activity was observed during the field assessment; however, potential roosting habitat was observed within the peeling bark of mature trees and decaying trees as well as at buildings adjacent to the Project Footprint.

No rodent holes or dens were observed. No large mammals were observed during the field assessment; however, evidence of deer (e.g. tracks and scat) was observed. Wildlife trails were observed through the riparian grassy areas, which lead to a naturalized terrestrial area below the Kelowna Cemetery, which extends through to Dilworth Mountain. There were no signs of badger activity, and no suitable badger habitat observed in the Project Footprint during the field assessment.

No reptiles were observed during the field assessment; however, the background information review determined that the Study Area overlaps a critical habitat polygon for gophersnake (*deserticola* subspecies) (Figure 2). The field assessment confirmed areas suitable for snake refuge, foraging, and basking within the Project Footprint. Mitigation measures to reduce impact on snakes are discussed in Section 5.4. No potential snake hibernacula were observed during the field assessment. The grassy areas within the riparian areas surrounding Mill Creek provide suitable habitat for gophersnake, and other snakes (i.e. northern rubber boa (*Charina bottae*). No suitable breeding habitat or nesting sites for western painted turtle were observed within the Project Footprint.

The field assessment crew did not observe suitable amphibian breeding habitat or amphibians within the Project Footprint; however, the field assessment was conducted outside the amphibian breeding window. No suitable overwintering amphibian habitat (e.g., small mammal burrows) was observed.

2.2.2.4 Fish and Fish Habitat

Following the RIC (2001) standard, Reach 3 of Mill Creek was divided into two sections (sub-reaches) as shown on Figure 3, based on habitat types, with sub-reach 3.1 as the downstream 400 m and sub-reach 3.2 as the upstream 270 m. Sub-reach 3.1 was observed to be highly modified in comparison to the sub-reach 3.2 with a lack of habitat complexity and abundant slow, deep runs (Appendix B: Photograph 1 and 2). It also lacked riparian vegetation and had an average canopy cover of 5 to 10%. Gravels (i.e., 2-64 mm) were absent for most of sub-reach 3.1 with the dominant substrate categorized as fines (i.e., < 2 mm [millimeters] with cobbles (i.e., 64-256 mm) (Appendix B: Photograph 12). No fish were observed in sub-reach 3.1; however, water visibility was poor which limited observations. No water quality measurements were taken but turbidity was visually observed as high. Sub-reach 3.1 was identified as adequate as a fish migration corridor but lacked small woody debris (SWD), course woody debris, clean gravels (suitable for spawning), boulders, riffles and deep pools used for rearing and overwintering habitat.

Sub-reach 3.2 was observed to have more canopy cover (upwards of 20%) and greater complexity (i.e., SWD, course woody debris, deep pools, boulders with riffles, and clean gravel beds) contributing to fish habitat (Appendix B: Photographs 13 and 14). On October 10, 2024, five spawning areas were observed with approximately 23 redds and 33 kokanee pairs exhibiting spawning behaviors (Figure 3; Appendix B: Photographs 14 and 15); one spawning area was adjacent to the proposed new PRC building (Figure 3). Female kokanee were observed darting and guarding redds within clean gravels at the downstream ends of runs, above riffles. An abundance of SWD and large cobbles were available for cover. Female kokanee were observed actively digging in two spawning areas. Water quality (i.e., turbidity) was observed to be clearer in the upstream end of sub-reach 3.2. Spawning was rated as good in sub-reach 3.2 as there were areas with suitable gravels as well as cobbles, SWD, and overhanging vegetation. Rearing was rated as good due to sufficient cover and flows. Overwintering was rated as poor due to lack of deep pools; the deepest pool within the reach had a depth of 0.5 m and has the potential to freeze to bottom over winter. Fish migration was rated as moderate as no barriers to fish passage were observed; however, resting areas (i.e., pools) were limited. Fish habitat ratings apply to both kokanee and rainbow trout.

There are three existing storm outfalls within Reach 3 of Mill Creek, two on the south bank and one on the north bank, at the following approximate coordinates: 49.882805° -119.459576°, 49.883941° -119.458859°, and 49.883915° -119.457557° (Figure 3). Stantec understands these storm outfalls will be rerouted during construction of the new channel and reinstated upon completion.

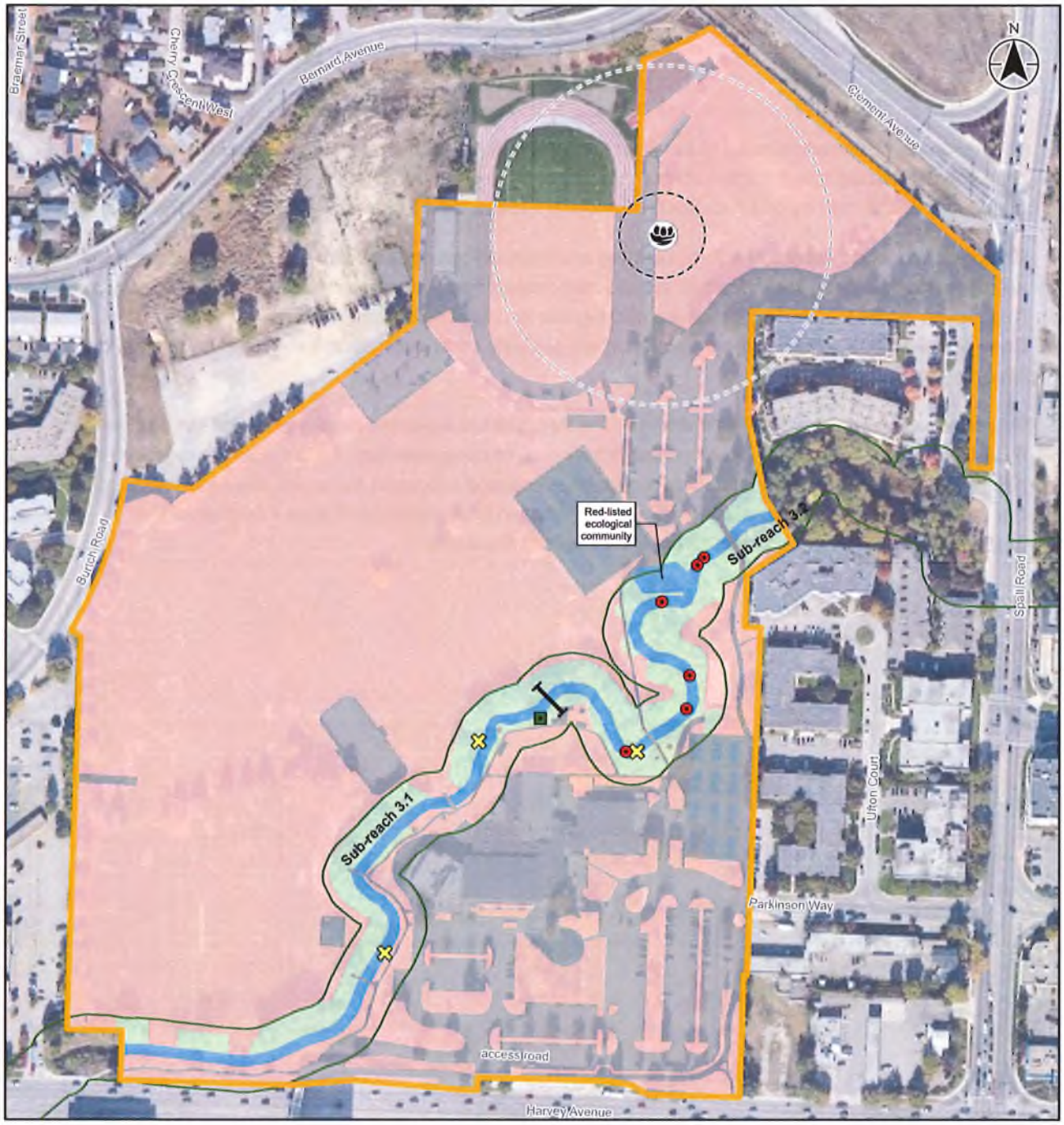
2.2.2.5 Environmentally Sensitive Area Mapping

ESAs are summarized in Figure 3. Due to its high ecological significance and sensitive habitat, Mill Creek is classified as ESA 1 while effective riparian vegetation within the surrounding RMA (up to a 15 m buffer) is classified as ESA 2. Manicured lawn or hardscapes within the RMA were classified as ESA 3 and ESA 4, respectively (Figure 3). The RMA provides connectivity to the naturalized terrestrial areas south of the Kelowna Cemetery across Spall Road which connects to Dilworth Mountain and is used by wildlife (see Section 2.2.2.3). Although weeds and invasive plants were observed within the ESA 2 areas due to the proximity to disturbance along paved areas, the RMA, particularly within sub-reach 3.2, has significant

vegetation cover and contributes to the diversity and contiguity of the landscape. An additional ESA 1 area has been categorized within sub-reach 3.2 due to the presence of the red-listed ecological community (black cottonwood / common snowberry – roses, as detailed in Section 2.2.2.1; Figure 3).

The proposed works for the new PRC building and Park will take place mainly on the pre-existing paved areas, manicured lawn, and disturbed areas in the Project Footprint. Areas with existing paved surfaces (e.g., tennis courts), paved paths, paved parking lots and existing buildings and infrastructure, are classified as ESA 4. Areas that are pre-disturbed, showing no or minimal native vegetation growth, are classified as ESA 3.

Proposed works for the new PRC building or the Park are not expected to take place in ESA 1; however, if ESA 1 is encroached on by development, it may require compensation of a 3:1 ratio of equivalent habitat (the City 2022a). Potential Project-related effects and mitigation measures are described in Section 4 and Section 5, respectively. The extent of each ESA within the Project Footprint of the proposed PRC building is listed in Section 4.4 - Impact Summary.



Property
Existing 15 m Riparian Management Area
Reach Break
Storm Sewer Outfall
Observed Kokanee Spawning Area
Wildlife Tree

Nest Location
25m Buffer of Nest
100m Buffer of Nest

Environmentally Sensitive Area
ESA 1
ESA 2
ESA 3
ESA 4

0 50 100 150 m
1:3,500 (at original document size of 8.5x11)

Notes
1. Coordinate System: NAD 1983 UTM Zone 11N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: Google Earth 2024

Stantec

Project Location:
Kelowna, BC
NTS 50K Grid: 82E/14

Project Number: 111710161
Prepared by KWONG on 20241122
Requested by GREHE on 20241122
Checked by NRICHARDSON on 20250109

Client/Project/Report
City of Kelowna
Parkinson Recreation Centre
Environmental Overview Assessment

Figure No.
3

Title
Environmentally Sensitive Areas

3 Regulatory Framework

Table 7summarizes the federal, provincial, and municipal regulatory requirements that may apply to the Project. Final designs and confirmation of construction footprint and activities will be required to determine the final permit list.

Table 7 Federal, Provincial, and Municipal Environmental Permits or Approvals

Relevant Legislation	Permit/Approval	Description	Estimated Timelines[5]	Project Consideration
Species at Risk Act (SARA)	Section 2 Permit Authorizing an Activity Affecting Listed Wildlife Species Regulations	SARA protects federally listed species, their residences, and critical habitat on federal lands. SARA applies to non-federal lands if the species is a migratory bird under the *Migratory Birds Convention Act* or if the species is an aquatic species (fish, shellfish). Under Sections 32 and 33 of SARA, it is an offence to kill, harm, harass, capture, or take a federally listed species that is endangered or threatened; damage or destroy the residence of one or more individuals of a listed endangered or threatened species or of a listed extirpated species if a recovery strategy has recommended its reintroduction. Species listed on SARA Schedule 1 have potential to occur in the Study Area. Mitigation measures described in Section 5.4 are intended to avoid and reduce potential impacts on wildlife species at risk.	Approximately 90 days after submission	The Project is not within federal lands and no protected nests (i.e. pileated nesting cavities) were identified within the Project Footprint; therefore, a SARA permit is unlikely to be triggered.
Fisheries Act	Request for Review	A Request for Review seeks a formal opinion from Fisheries and Oceans Canada through a Letter of Advice as to whether a HADD[1] of fish habitat is likely to occur as a result of Project activities. If a HADD[1] is unavoidable, then an Authorization is required (see below).	90 days	Unlikely for proposed works outlined in this EA report. Required for works proposed in Supplemental EA report which will be completed by Stantec in spring 2025.
	Authorization	If it is determined that a HADD[1] will occur as a result of the Project, an application to Fisheries and Oceans Canada for Authorization under Section 35 (2) of the *Fisheries Act* is required.	1-2 years	Unlikely for proposed works outlined in this EA report. Possible for works proposed in Supplemental EA report which will be completed by Stantec in spring 2025.
Migratory Birds Convention Act (MBCA[2]) and	Section 9 Permit	The MBCA[2] prohibits the possession, disturbance, and destruction of migratory birds (as identified in the MBCA), their occupied nests, or eggs. A QEP should undertake a survey prior to construction works to confirm no nests, birds, or eggs are present	Approximately 90 days after submission	Project works may involve removal or disturbance of vegetation or habitat potentially used by migratory birds for stopover, staging, breeding, and summer

Relevant Legislation	Permit/Approval	Description	Estimated Timelines[5]	Project Consideration
Migratory Birds Regulation		at the site. If a nest or bird is detected before construction activities are to be initiated, a QEP is to be consulted for species-specific guidance and coordination with the Canadian Wildlife Service. A permit is required to remove an active nest protected under the MBCA or Migratory Birds Regulation.		foraging. Based on Environment and Climate Change Canada's (ECCC 2024) nesting calendar, the primary nesting period for the Study Area when birds are most likely to nest is March 26 to August 16. Mitigation measures are described in Section 5.4.
Riparian Areas Protection Act Riparian Areas Protection Regulation (RAPR[3])	RAPR Assessment Report	The City has its own regulation for development within RMAs and therefore RAPR[3] does not apply in the City. See the Kelowna Community Development Plan in the municipal section for more details on permits required when working within the RMA.	N/A	Not required
Water Sustainability Act (WSA)	Section 10 Use Approval	Section 10 of the WSA outlines requirements to authorize the short-term diversion or use of water from a stream or aquifer to construct works for a term not exceeding 24 months.	2 – 4 months	The Short-term Use Approval under Section 10(3) is triggered for dewatering to excavate and construct the swimming pool within the proposed PRC building. Permit application will be submitted by others.
	Section 11 Change Notification or Approval	Change approvals are written authorization to make complex changes in and about a stream including "any modification to the nature of a stream, including any modification to the land, vegetation and natural environment of a stream or the flow of water in a stream." A 'Notification' is required when proposed works is an authorized works as described under Section 39 of the Water Sustainability Regulation; whereas a 'Change Approval' is required for changes in and about a stream that do not comply with Section 39 of the Water Sustainability Regulation.	2 months (Notification) 8-12 months (Approval)	Unlikely for proposed work in this EA report. Required for works proposed in Supplemental EA report which will be completed by Stantec in spring 2025.
Wildlife Act	Scientific Fish Collection Permit	A fish collection permit is required for salvaging fish during the isolation of the stream.	2 months	Unlikely for proposed work in this EA report. Required for works proposed in Supplemental EA report which will be completed by Stantec in spring 2025.

Relevant Legislation	Permit/Approval	Description	Estimated Timelines[5]	Project Consideration
	General Wildlife Permit	Required to salvage and relocate wildlife (herptiles, small mammals), including Species at Risk, which may be affected by the Project.	4 - 6 months	Recommend if construction is planned outside October 31 to March 31 (when reptiles are overwintering).
	Section 34 of the Act, Section 3(1)(d) of the Permit Regulation	Nests of eagle species, peregrine falcon *(Falco peregrinus)*, gyrfalcon (*Falco rusticolus*), osprey (*Pandion haliaetus*), or great blue heron (*Ardea Herodias*) are protected year-round, regardless of the status of the nest. A permit to possess, take, or destroy bird, nest and/or egg can be applied for; however, a QEP[2] is required to complete surveys, and the application requires a compelling reason for moving or destroying a nest.	30 days	Unlikely, as raptor nests were not identified in the field assessment.
Heritage Conservation Act	Alteration of a known archaeological site	An Alteration Permit is required should it be determined, following investigation, that an archaeological site cannot be avoided.	6-12 months	An archaeological assessment is underway by others which will provide guidance on permitting requirements under the *Heritage Conservation Act,* or establishment of an Archaeological Change Find Procedure.
	Heritage Inspection Permit	The Heritage Inspection Permit is not a regulatory requirement, rather it is a recommended risk management tool. The inspection permit allows an archaeologist to conduct subsurface testing to identify whether an archaeological site is present.	6-12 months	
Weed Control Act	Permit to treat noxious weeds using herbicides	Government agencies and landowners are mandated by law to control species that occur on their property or under their jurisdiction. It is recommended that the City manage the noxious weeds prior to construction in the Project Footprint.	1 month	Recommend to follow the weed management mitigations in Section 5.3
Kelowna OCP (the City 2022a)	Natural Environment Development Permit Area (RMA Variance)	The Project Footprint overlaps with the riparian area of Mill Creek, which is a Natural Environmental DP area (the City 2022a) typically requiring a development permit per the City's OCP.	2 months	Required. The City will be applying for two DP's, one DP for the proposed building and infrastructure works associated with the redevelopment of PRC, and a second DP for the works proposed works within Mill Creek.
Kelowna Tree Protection Bylaw (No. 8041; the City 2022b)	Tree Removal Permit	Relevant since non-native trees are anticipated to be removed.	Unknown	Required

Relevant Legislation	Permit/Approval	Description	Estimated Timelines[5]	Project Consideration
RDCO[4] Noxious Weed Control Bylaw (No. 1544; RDCO 2024)	NA	Incorporate invasive weed management strategies when developing Project mitigations.	NA	Likely
Kelowna Noxious Weed and Grass Control Bylaw (No. 8133; the City 1997)	NA	Incorporate noxious weed management strategies when developing Project mitigations.	NA	Likely

Notes:

[1] HADD – harmful alteration, disruption or destruction

[2] MBCA – *Migratory Birds Convention Act*

[3] RAPR – Riparian Area Protection Regulation

[4] RDCO – Regional District of Central Okanagan

[5] Estimated timelines are for regulatory review, not including application preparation and submission.

4 Potential Project Effects

The following information was considered during the assessment of potential Project-related effects, specifically related to the construction of the new PRC building and Park features (excluding Mill Creek naturalization):

- The Project Footprint as shown in Figure 4.
- High level understanding of the construction schedule and approach.
- Environmental conditions, specifically the presence of, or potential for, species or ecosystems of conservation concern or sensitive areas.
- Desktop and field assessment observations for vegetation, wildlife and wildlife habitat, fish and fish habitat.
- Potential interactions between vegetation, wildlife and wildlife habitat, fish and fish habitat, and Project impacts on Mill Creek.
- Implementation of environmental mitigation measures to avoid or reduce identified Project-related effects.

Effects to vegetation, wildlife, and aquatic resources can be avoided and reduced through the implementation of mitigation measures developed in consideration of applicable legislation, regulations, and industry best practices. Mitigation measures to address potential effects of the Project are presented in Section 5 below.

4.1 Vegetation

Potential Project-related effects on vegetation consist of the following:

- **Change in ecosystems**: eight ornamental trees outside of the RMA will be removed for the proposed PRC building, as will 89 trees in the remaining Park which are also outside of the RMA (see Tree Management Plan, drawing DPL-1.3 submitted as part of the DP application). Vegetation removal within the Project Footprint could result in change in ecosystems, and loss of the red-listed ecological community, if not avoided.
- **Spread of noxious weeds:** due to the ground disturbance associated with the Project, there is potential for noxious weed species to be spread during site preparation, construction, and post-construction activities, including during equipment mobilization and soil disturbance. Ground disturbance may create microhabitats that favour the proliferation of invasive or noxious weed species.

The quantity of trees that will be impacted as a result of the Project are listed in Table 8. They are separated by activity (i.e., new PRC building and Park) and exclude Mill Creek as only trees associated with the new PRC building and Park are part of this first Natural Environment DP. The quantities of trees to be removed for the Mill Creek naturalization will be provided in the Supplemental EA. There are 209 trees within the Park that will be retained. The quantity of tree being removed is summarized by size to inform tree replacement quantities based on the City's tree replacement criteria (the City 2022b);

however, given that the trees listed in Table 8 are outside of the RMA, trees will be replaced 2:1 for the 97 removals per the City of Kelowna Municipal Properties Tree bylaw No. 8042 (the City 2021).

Table 8 Tree Removal associated with the Project

Diameter at Breast Height (cm)	PRC building	Park
0 – 15.1	0	9
15.2 – 30.4	3	34
30.5 – 45.6	5	29
45.7 – 60.9	0	13
>61.0	0	4
Total by Activity	**8**	**89**
Property Total (excluding Mill Creek RMA)	**97**	

4.2 Wildlife and Wildlife Habitats

Potential Project effects on wildlife and wildlife habitat include:

- **Change in habitat**: the removal or alteration of vegetation due to clearing required for building construction and related changes in drainage patterns may result in change in habitat for some wildlife species. Construction noise may result in temporary disturbance of wildlife. Erosion, sedimentation, or spills/leaks (e.g., hydrocarbon, concrete wash water) may result in changes in water quality for wildlife.
- **Change in mortality risk**: ground disturbance and vegetation clearing during construction may result in physical destruction of key habitat features (e.g., nests, small mammal burrows). Vehicle and equipment movement during construction may result in accidental mortality of smaller, less mobile species or individuals (e.g., snakes, rodents). Animal-vehicle collisions with larger species (e.g., deer) may occur during construction activities. Increased risk of mortality to wildlife and changes in water quality from potential spills/leaks from construction equipment.
- **Change in wildlife movement**: alteration or blockage of wildlife movement due to physical barriers, sensory disturbance, or vegetation clearing. Habitat fragmentation and/or loss of wildlife movement corridors from Mill Creek to upland habitat.

4.3 Fish and Fish Habitat

Potential effects of the Project on local fish and fish habitat consist of the following:

- **Changes to water quality**: potential impact of sedimentation on Mill Creek and connected downstream habitats of Mill Creek during construction and potential to increase total suspended solid concentrations/turbidity in Mill Creek. The Project has potential to introduce deleterious substances into Mill Creek (e.g., accidental hydrocarbon releases).
- **Changes to flows**: the building excavation requires dewatering to facilitate construction of the pool, with pumped groundwater to be discharged back into Mill Creek (see dewatering plan prepared by Western Water Associates Ltd. 2024).

- **Changes in runoff**: the proposed development will alter the layout of impermeable areas within the Property, which has potential to alter runoff patterns.

4.4 Impact Summary

Project effects related to construction of the proposed new PRC building and Park have the potential to cause:

- Spread of noxious weeds through construction.
- Increased wildlife mortality or decreased quality of life and habitat through movement of construction equipment, presence of construction crew, and fuel spills or leaks.
- Increased numbers of wildlife in construction area due to wildlife attractants.
- Disturbance of potential wildlife denning through use of construction equipment movement and noise.
- Disturbance of wildlife movement through naturalized wildlife corridor.
- Disturbance to migratory bird nesting if construction is between March 26 to August 16 (ECCC 2024).
- Deleterious substances to enter Mill Creek including increased erosion and release of sediment laden waters into Mill Creek.
- Changes in runoff patterns from altered locations of impermeable surfaces.

The footprint of the new PRC building and Park features on ESAs within the Project are presented in Table 9 and Figure 4. There are 97 trees to be removed as part of the new PRC building and Park developments (as shown on landscape drawing submitted with DP application). The building footprint and Park features (fields, courts, parking lots) are permanent, whereas the construction footprint is required for material storage, stockpiling, equipment laydown areas, and access roads is temporary. The impacts associated with the Mill Creek naturalization are excluded from this impact assessment and will be provided in the Supplemental EA.

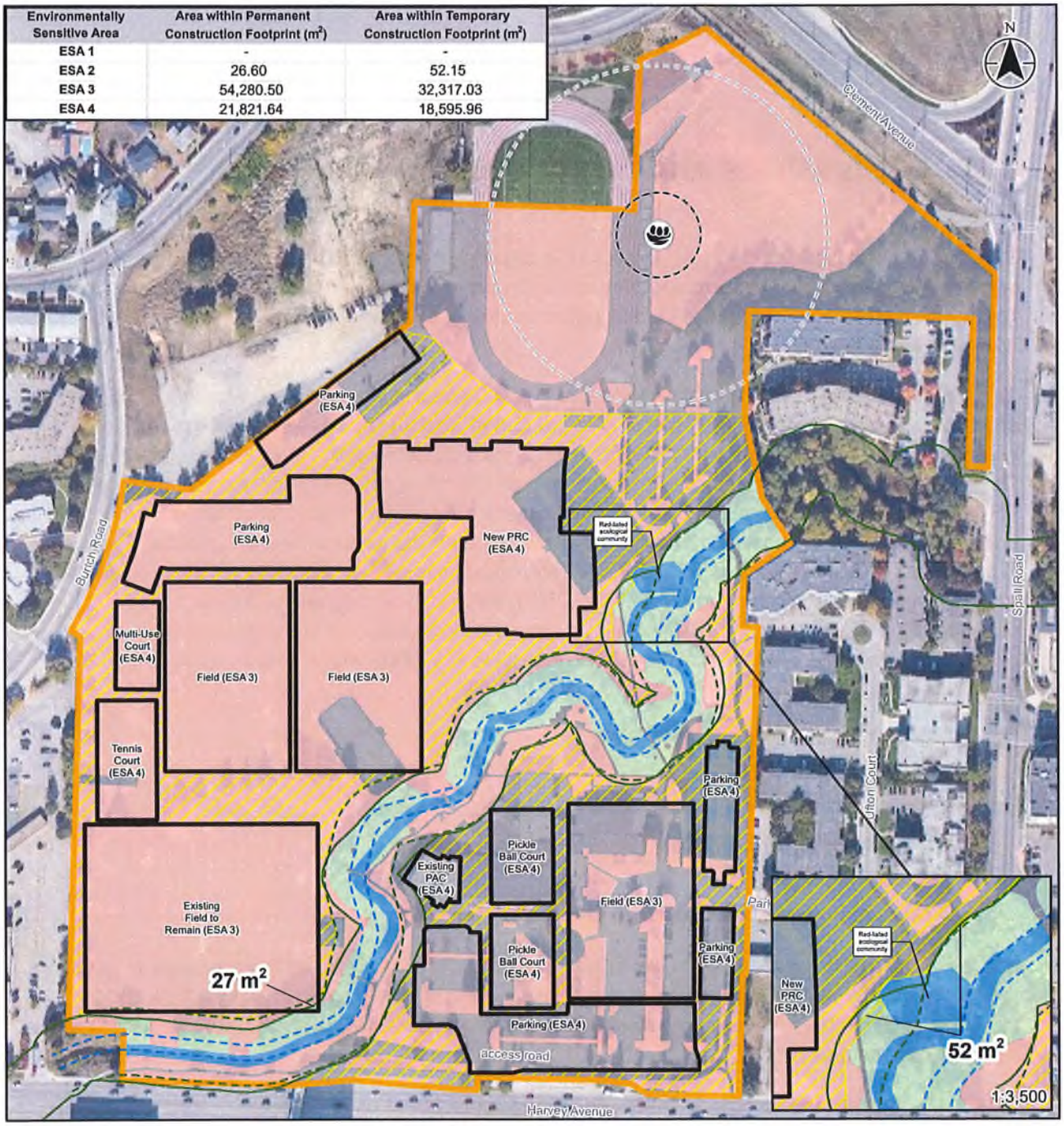
For the new PRC building and Park construction, no development is proposed within ESA 1. There is an encroachment on ESA 2 (52 m^2) within the existing 15 m riparian buffer associated with the temporary footprint in the northeast corner; however, this area is currently planned to be outside of the proposed 15 m riparian setback after the Mill Creek naturalization phase (Figure 4). There is also a small encroachment on ESA 2 (27 m^2) associated with the existing fields in the southwest corner (Figure 4). These fields are not planned to be redeveloped, so no changes are proposed within this ESA 2 encroachment. Further, the encroachment of these fields on the proposed 15 m riparian setback is planned to be compensated for elsewhere and will be detailed in the Supplemental EA. There are larger footprints within ESA 3 and 4 areas; however, proposed works are rearranging existing features such that the amount of hardscape (i.e., parking lot, courts) and softscape (i.e., fields) will be relatively comparable to existing conditions, but will include tree replacements at a 2:1 ratio.

Table 9 Potential Project-Related Effects Within the proposed PRC building and Park Footprints

ESA Classification	Habitat Type within Project Site	Area of Disturbance within Permanent Project Footprint [1]		Area of Disturbance within Temporary Project Footprint [1]	
		(m^2)	(%)	(m^2)	(%)
ESA 1 (Very High)	Creek channel, riparian buffer 3 to 5 m from top of bank	0	0	0	0
	Red-listed ecological community polygon	0	0	0	0
ESA 2 (High)	Riparian habitat adjacent to creek within 15 m Mill Creek buffer	27	<1	52	<1
ESA 3 (Moderate)	Areas outside 15 m Mill Creek buffer and outside red-listed ecological community polygons	54,280	71	32,317	63
ESA 4 (Low)	Paved pathways, parking lot, buildings, and infrastructure (i.e. tennis courts)	21,822	29	18,596	36
	Total	**76,129**	**100**	**50,965**	**100**

[1] The footprint is shown for the proposed PRC building and Park portion of the Project Footprint only, the Mill Creek Project Footprint will be presented in a Supplemental EA.

Environmentally Sensitive Area	Area within Permanent Construction Footprint (m^2)	Area within Temporary Construction Footprint (m^2)
ESA 1	-	-
ESA 2	26.60	52.15
ESA 3	54,280.50	32,317.03
ESA 4	21,821.64	18,595.96



Property
Project Footprint
Temporary Workspace
Proposed Top of Bank
Approximate Proposed 15 m Riparian Area - Mill Creek Alignment (to be confirmed in Supplemental EA)
Existing 15 m Riparian Management Area

Nest Location
25m Buffer of Nest
100m Buffer of Nest

Environmentally Sensitive Area
ESA 1
ESA 2
ESA 3
ESA 4

0 50 100 150 m
1:3,500 (at original document size of 8.5x11)

Notes
1. Coordinate System: NAD 1983 UTM Zone 11N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: Google Earth 2024

Stantec

Project Location:
Kelowna, BC
NTS 50K Grid: 82E/14

Project Number: 111710161
Prepared by KWONG on 20241122
Requested by GREHE on 20241122
Checked by NRICHARDSON on 20250109

Client/Project/Report
City of Kelowna
Parkinson Recreation Centre
Environmental Overview Assessment

Figure No.
4

Title
Project Impacts

5 Mitigations and Recommendations

Specific mitigation measures to avoid or reduce the potential environmental effects of the Project are presented in this section. The measures provided in this section have been developed based on accepted BMPs, standard industry procedures, and an understanding of the environmental baseline conditions within the Study Area.

This section provides recommendations to reduce Project-related effects on ESAs, vegetation, and fish and wildlife species in the Project Footprint. Construction recommendations are proposed to meet or exceed the objectives for protecting, restoring, or enhancing ESAs, as defined by the TOR (the City n.d.). The following mitigation measures (Sections 5.1 through 5.5) are applicable to construction of the new PRC building and Park features, with environmental oversight during periods or for activities of higher environmental risk (i.e., vegetation clearing, dewatering). During the works within Mill Creek (as described in the Supplemental EA), construction environmental mitigation measures will be implemented using the construction environmental management plan (CEMP), which is to be prepared by Stantec for the Contractor prior to construction. The following categories for mitigation measures are to be used as a general guide for the development of the specific measures in a CEMP and are summarized in the subsections below:

- Protection of water quality and hydrology
- Protection of fish and fish habitat
- Protection of vegetation
- Weed management
- Protection of wildlife
- Fuel storage, waste management, and spill contingency plan

Environmental monitoring and habitat restoration are described in Sections 6 and 7, respectively. In addition to both the specific mitigation measures provided in the sections below and the development of a CEMP, the following general recommendations must be followed during construction of the new PRC building and adjacent Park features:

- Do not remove vegetation for machinery access within ESA 1 or ESA 2 areas.
- Do not disturb soil or vegetation within the ESA 1 habitat (i.e., no new footprint, no clearing or grubbing).
- Do not place excavated material within the ESA 1 habitat.
- Avoid encroachment into high-value habitat (ESA 2), if possible.
- Maintain a 15 m setback from Mill Creek (at the highwater mark) within sensitive riparian areas other than where indicated on Figure 4.

5.1 Protection of Water Quality and Hydrology

The following mitigation measures are intended to avoid or reduce impacts on water quality during construction:

- Avoid construction during major rainfalls (i.e., 10 mm in one hour or 25 mm over 24 hours) or storm events based on weather predictions and observations to protect the soil structure and reduce the transport of sediment.
- Install silt fencing prior to ground disturbance along the downslope construction limit where there is potential for downslope transport of disturbed soils.
- Install silt fencing to separate the Project Footprint from neighbouring ESA 2 and ESA 1 habitat, where applicable.
- Stake the silt fence into the ground and bury the base a minimum of 15 centimetre (cm) deep to prevent sediment transport underneath the fence.
- Inspect erosion control structures at least once a week and after major rainfalls (i.e., 10 mm in one hour or 25 mm over 24 hours) to maintain effectiveness, to identify where replacement or maintenance is required, and to identify where trapped sediments need to be removed. Undertake repair or maintenance of erosion control structures, as required.
- Locate soil stockpiles within the construction limit, upslope of silt fencing.
- Do not stockpile material within 15 m of Mill Creek.
- Cover stockpiled material with tarps during periods of high rainfall. Install silt fencing immediately downslope of stockpiles to capture loose and eroding material.
- Keep additional erosion and sediment control materials on site (e.g., silt fence, filter fabric, hay bales).
- Revegetate areas as soon as possible post-construction, following the landscape plan.

5.1.1 Water Quality Monitoring During Dewatering

Water quality monitoring is intended to identify potential effects to downstream water quality in Mill Creek during construction of the Project. The Project will require dewatering within the new PRC building footprint with a phased discharge plan to reduce potential sediment inputs into Mill Creek. This includes discharging in a grassy area away from the creek during initiation and then discharging through a manhole equipped with a hydrodynamic separator for the remainder of the works (Western Water Associates Ltd. 2024). Upon initiation of discharge to Mill Creek, water quality will be monitored daily to confirm discharging groundwater is not impacting applicable surface water quality parameters (Table 10). After water quality parameters are consistent / stabilized (and within applicable guidelines), an environmental representative from Stantec will monitor water quality during weekly monitoring visits (see Section 6) or after major rainfall events (i.e., 10 mm in one hour or 25 mm over 24 hours), as needed. As the intent of monitoring water quality during dewatering is to assess the impacts of discharging into Mill Creek, water quality measurements will be taken both upstream and downstream of the discharge outlet. Water quality will be completed using handheld portable monitors, such as a YSI ProDSS or LaMotte

turbidity monitor with the intent to monitor turbidity. Temperature, dissolved oxygen, and pH will also be collected for additional information on existing conditions within Mill Creek.

Table 10 describes the in-situ water quality parameters that will be measured and the compliance criteria required to be in compliance with the BC Approved Water Quality Guidelines (Water, Land and Resource Stewardship [WLRS] 2025).

Table 10 BC Approved Water Quality Guidelines for the Protection of Aquatic Life

Parameter	Water Quality Criteria
Turbidity – Nephelometric Turbidity Units (NTU)	• Change from background of 8 NTU at any one time for a duration of 24 hours in all waters during clear flows or in clear waters. • Change from background of 2 NTU at any one time for a duration of 30 days in all waters during clear flows or in clear waters. • Change from background of 5 NTU at any time when background is 8–50 NTU during high flows or in turbid waters. • Change from background of 10% when background is > 50 NTU at any time during high flows or in turbid waters.
Temperature (°C)	• +/- 1°C change per hour from ambient background
Dissolved Oxygen (mg/L)	• 8 mg/L long term chronic for all life stages. • 5 mg/L instantaneous minimum for all life stages.
pH	• Downstream pH is above 6.5 or below 9.0 pH units

5.1.2 Water Level Monitoring During Dewatering

Dewatering associated with the new PRC building construction triggers the requirement of a Short-term Use Approval under Section 10 of the WSA. An application was submitted to WLRS on December 19, 2024, by the dewatering contractor along with a dewatering plan (Western Water Associates Ltd. 2024). Flows in Mill Creek, at the lowest flow periods, are 0.4 m^3/s (ONA 2021), whereas the pumping rate will be a maximum of 0.058 m^3/s, which is less than 15% of Mill Creek's flows during the lowest period if pumping was directly from Mill Creek. Given the dewatering footprint will occur adjacent to the 15 m riparian buffer of Mill Creek and discharge is occurring near the centre of the building footprint and not upstream of the potential groundwater-surface water interface (Western Water 2024), WLRS expressed concern with water levels potentially lowering within Mill Creek upstream of the discharge outlet. An environmental representative from Stantec will conduct water level monitoring, both as a part of weekly monitoring visits (see Section 5.1.1 and 6) and through the use of continuous monitoring equipment. The sections below describe the proposed methods to monitor water levels during the dewatering operations, which will follow guidance and criteria outlined in the British Columbia Manual of British Columbia Hydrometric Standards (Resources Information Standards Committee 2018).

The monitoring methods presented do not included flow (i.e., discharge in m^3/s), as establishing a reliable stage-discharge relationship requires long term data collection (e.g., >1 years) and dewatering is only occurring over a short period (i.e., 8 months).

5.1.2.1 Methods

A Stantec QEP will install two gauging stations using a standard 1 m staff gauge fixed into the creek, with a stable control (natural or artificial) to be read during each site visit. The gauging stations will also be affixed with a water level logger, such as the HOBO MX 2001 datalogger, along with a pressure transducer and barometer. The loggers will be installed in a vertically mounted acrylonitrile butadiene styrene tube, which acts as both a stilling well and protective housing. The locations of the gauging stations will be selected by the QEP onsite; however, one will be placed at an appropriate distance upstream of the discharge pipe to target the area where the dewatering operations could lower creek levels upstream of the discharge point (e.g., instream near the red-listed ecological community on Figure 4, which is approximately 150 m upstream of the discharge outlet), and the other will be placed downstream of the Property to capture 'natural' conditions. The locations in the channel will be selected to consider river morphology (i.e., placed within the thalweg or low flow notches), security (i.e., theft), and comparable depths at the time of installation (e.g., both reading 0.2 m deep at time of install) and water profile stability (i.e. avoiding areas with stable significant wave action). In order to establish a baseline relationship between water depth at the two stations, water level monitoring will commence approximately a month before the start of the dewatering operations.

Stage data on the level logger will be recorded at 1-hour intervals. Water level will be recorded as a depth measurement and not as an elevation given the elevation will not be relevant to the concerns associated with decreased depths. The level loggers data will be reviewed by the QEP weekly but will also be set to notify appropriate personnel (i.e., site supervisor) if water levels are below a set depth (described in Section 5.1.2.2). If possible, multiple users will receive the alarm, followed by notification to Stantec's QEP for guidance (if not already receiving alarm). The QEP will work with the contractor to develop additional mitigations as required, from least to most invasive, such as decreasing the pumping rate in the excavation to moving the discharge point. Western Water Associates Ltd. (2024) provided an alternative discharge location in the dewatering plan, should lowered water levels be consistently observed.

Continuous data measurements on the level logger will be compared to the water level observed on the staff gauge during weekly site visits (see Section 6). However, the QEP will attend the site daily during the first phase of dewatering to assess the speed of change of the upstream water levels in comparison with the downstream ones until observed levels are consistent / stabilized.

5.1.2.2 Water Level Triggers

The intent of the water level loggers is to monitor if water levels are declining as a result of dewatering outside of the creek. Two loggers will be installed for a comparison of the levels in the area susceptible to dewatering and natural conditions. Based on weekly reviews of the water levels, the QEP will increase the review frequency to daily if water levels at the upstream monitoring station drops by more than 10% of the range expected based on downstream monitoring stations readings and will notify the contractor if the difference exceeds 15%.

In addition to the comparison of upstream and downstream gauges, an alarm will be set for a minimum water depth based on aquatic species. Minimum water depths required for kokanee and rainbow trout

spawners are >0.1 m and 0.2-2.5 m, respectively (ONA 2021). These are considered as the limiting depths as this is a critical and sensitive life stage for fish. Therefore, the level logger in the upstream location will be set to trigger notifications when depths reach below 0.25 m. The following process will be followed when these notifications are triggered:

- QEP will be notified of the trigger.
- QEP or designate will attend the site as soon as possible to collect a manual measurement and make additional observations (i.e., evidence for creek dewatering, fish stranding potential).
- Manual measurements will be collected at additional upstream and downstream locations including one measurement a minimum of 40 m upstream of the gauge (5 times the average stream width of the reach, which is 7.5 m [ONA 2021]) and one at the downstream logger.
- The QEP will provide guidance based on the conditions relative to upstream and downstream control stations. Guidance will consider whether water depths are consistent with natural conditions or may be a result of the works.

The QEP may adjust logging intervals, data review, and triggers depending on results during dewatering (i.e., increasing the trigger if the water levels are consistently below 0.2 m naturally).

5.2 Protection of Vegetation

The following mitigation measures are intended to avoid or reduce impacts on vegetation during construction:

- Retain the red-listed ecological community south of tennis courts where possible (Figure 4). The QEP will flag the outer limits of the red-listed ecological community to protect the community from the disturbance during construction.
- Reduce vegetation removal to only what is required for construction and site safety. Flag limits of disturbance prior to entering new areas. Avoid disturbing the roots of large diameter mature trees (over 20 cm diameter at breast height) that are not being removed for the Project, setbacks are to be flagged by a QEP when trees are identified that will not be disturbed.
- Retain mature trees, wildlife trees, and native vegetation unless the trees must be removed for the construction footprint or the safety of construction personnel.
- If tree, shrub, or grassland vegetation removal occurs between March 26 and August 16 (ECCC 2024), retain a QEP to conduct pre-disturbance bird nesting surveys to avoid contravening the *Migratory Birds Convention Act*, 1994. If active nests are found within the clearing limits, establish a buffer around the nest that is appropriate for the species affected in consultation with the QEP.
- Stockpile topsoil separately from subsoil for use in reclamation.
- Locate stockpiles on previously disturbed areas, where possible.
- Restore disturbed areas as soon as possible once construction is completed.
- Restore grassland communities as soon as possible post-construction using a certified weed-free interior native grass seed mix to be approved by a QEP.

5.3 Weed Management

The *Weed Control Act* states that any noxious weed species must be controlled by the owner of the land on which they occur. The following measures are intended to reduce the potential of introduction, transfer, or establishment of weeds:

- Equipment, tools, and personnel arriving and leaving the Property are to be clean and free of seeds and vegetative material.
- Remove invasive species and noxious weeds manually from the Project Footprint prior to construction and discourage their growth by planting native vegetation as soon as possible following removal and post-construction.
- Import clean and certified weed-free soils or fill for site construction.
- Revegetate and landscape with native species to discourage the establishment of weed species using a certified weed-free interior native grass seed mix.

5.4 Protection of Wildlife

The following mitigation measures are intended to reduce effects on wildlife and wildlife habitat during Project construction:

- Project wastes and recycling materials, including sewage, food wastes, and wastes associated with equipment maintenance and repairs temporarily stored onsite will be stored in wildlife-proof containers and will be regularly transferred to an approved disposal or sorting facility.
- Secure wildlife attractants (e.g., garbage, food) in bear-resistant containers or in the cab of work vehicles.
- Wildlife incidents related to garbage or human food attractants will be reported to the EM.
- Feeding of wildlife will not be permitted.
- Avoid disturbance and maintain protection of the Mill Creek RMA where the Project Footprint does not overlap with the RMA.
- The nests of most bird species are protected under the *Migratory Birds Convention Act* while they are active (i.e., when the nest is occupied) or suspected to be active. If a bird nest is encountered during construction, the QEP will be contacted immediately.
- Nests of eagles, peregrine falcons, gyrfalcons, ospreys, herons, and burrowing owls are protected year-round under the provincial *Wildlife Act*, regardless of their status. If a raptor or heron nest is encountered during construction, work in the vicinity of the nest will be stopped and the Project QEP will be contacted immediately.
    - » Even though the osprey nest is over 100 m away from the Project Footprint (Figure 4), construction traffic will use the road to and from the Project Footprint that is within the 100 m buffer. Ospreys are relatively tolerant of human activity (BC Gov 2013); however, an environmental monitor will monitor the osprey nest during weekly monitoring visits (see Section 6) for evidence of sensitivity while nesting.
- The nests of barn swallow are considered residences under SARA and are protected from May 1 or the date when adults are first seen building or occupying the nest, whichever is earlier, to

August 31 or the date when a bird is last seen at the nest, whichever is later. If a barn swallow nest is detected during construction, the QEP will be contacted immediately.

- Complete vegetation clearing outside of the primary bird nesting period (March 26 to August 16 [ECCC 2024]) where possible. If clearing must occur during the primary nesting period, retain a QEP to complete pre-clearing nest surveys and implement a no-go buffer around active nests. If no active nests are found, and the QEP confirms that clearing can proceed, clearing must commence within three days of the nest survey.
- If clearing has not commenced within three days following the nest survey, another nest survey must be completed before clearing can proceed.
- If nesting activity is identified during the pre-disturbance survey, appropriate no disturbance setbacks will be implemented as directed by the QEP and consistent with federal or provincial guidelines (ECCC 2023; BC Gov 2013).
- If clearing and grubbing occurs between April 1 and October 31 (i.e., when snakes are out of hibernation and most active), a wildlife permit will be required, and pre-clearing snake surveys will be required to reduce the risk of mortality.
- Where possible, top danger trees instead of felling them and retain them as wildlife habitat.
- If wildlife are detected within the worksite, including laydown areas and temporary workspaces, prior to or during construction, wildlife are to be left undisturbed and the QEP should be informed promptly.
- Incidental wildlife observations/encounters (e.g., discovery of a previously unseen nest) will be reported to the QEP prior to conducting work that would disturb that wildlife.
- The QEP will decide if and where wildlife exclusion fencing for reptiles is needed.
- Be aware of wildlife such as snakes, amphibians, turtles, birds, and small-medium sized mammals, and allow for passage through the work site. This may require temporary work stoppages – contact the QEP for guidance.
- Suspend construction and notify the QEP if American badgers are found in the work area. Works will be suspended until the badger(s) leave the construction area. If an active badger den is observed within or proximal to the Project, construction will be suspended until the den is determined to be inactive. This means that work may be postponed to September when juvenile badgers have dispersed from their dens. If an active badger den is observed, the QEP must contact the BC Ministry of Water, Land, and Resource Stewardship.
- Contact a QEP if wildlife are at risk of injury or death as a result of construction.

5.5 Fuel Storage, Waste Management and Spill Contingency Plan

The fuel storage, waste management, and spill contingency plan provided below is intended to offer guidance on how to properly store and manage fuel and waste to prevent contamination to soils and water. This plan also provides the best management practices that should be implemented if a spill is to occur.

Fuel Storage and Waste Management

The following points must be followed to mitigate the potential impacts of fuel and waste as a result of Project works:

- Store construction materials separately from wastes and on previously disturbed ground.
- Store hazardous materials (e.g., gasoline and lubricating oils) in secondary containment that is at least 110% of the volume being stored.
- Keep safety data sheets for dangerous goods and controlled products proposed for use maintained on site and made available to on-site personnel. The contractor will keep an updated list of any hazardous materials used on site.
- Keep hazardous materials clearly labelled and stored safely.
- Keep hazardous waste disposal containers clearly marked and contained in a manner that complies with applicable legislation.
- Remove waste from the site and dispose of it at an approved facility or disposal site.
- Keep a fully stocked and appropriately sized spill kit stored on site and ready for use, particularly when operations are being conducted adjacent to a watercourse.
- Restrict refuelling to at least 30 m from the top of the wetted perimeter of Mill Creek.

Spill Response and Contingency

The following points must be followed to reduce the risk of spills and to manage spills, should one occur:

- Construction personnel are to be trained to use equipment to reduce the risk of and control spills before active construction begins.
- Construction personnel are to be trained in spill reporting procedures and provided with spill response and reporting guidelines in an easy-to-follow, written format.
- Refueling devices must have connections that shut off automatically when the container is full.
- Collect condensation siphoned from fuel tanks in a separate tank for disposal at a licensed facility.
- Equipment used on the Project site is to be in sound mechanical condition. No equipment with fuel leaks or deteriorated hydraulic hoses are to be used.
- Inspect equipment daily to check that it is kept clean and free of oil, grease, coolant, or other contaminants.
- Equip stationary machines with drip trays to contain leakage of fuel, lubricant, or any other fluid.
- Limit servicing of equipment such as oil changes, fueling, and lubrication to at least 30 m from the top of the wetted perimeter of Mill Creek or at such a distant that petroleum products will not be released into surface drainage.
- Follow the spill response and contingency plan in Table 11 below should a spill occur:

Table 11 Spill Response and Contingency Plan

Step	Actions
1. Confirm Safety	• Confirm personal, public, and environmental safety. • Wear appropriate protective gear.

Step	Actions
	• Determine the product spilled before cleaning it up. • Warn people in the vicinity. • Confirm no ignition sources exist if the spill is flammable.
2. Stop the Flow	• Act quickly to reduce the risk to the environment. • Close valves, shut off pumps, or plug leaks. • Stop the flow at its source.
3. Secure the Area	• Limit access to the area. • Prevent unauthorized entry onto the site.
4. Contain the Spill	• Limit the spill so that it does not enter any drainage structures. • Use spill-absorbent material to contain the spill. • Limit environmental contamination.
5. Notify and Report	• See Environmental Incident Reporting.
6. Clean Up	• Full clean up of spill in consultation with QEP.

Environmental Incident Reporting

As specified under the *Environmental Management Act* [SBC 2003] Chapter 53, spills of any size are to be reported to a designated responsible person as soon as it is safe to do so. The responsible person will be required to designate qualified personnel to document all spills that occur on site and for preparing an incident report. Photographs, measurements, notes, and any other relevant documentation will be collected and made available to the Ministry of Environment and Climate Change Strategy, if requested.

An environmental incident report must be filled out for all environmental incidents and for all spills for the City's records; a file containing all incident reports will be located on site at all times. The incident report shall include:

- Name and telephone number of the person who reported the spill
- Name and telephone number of the person who caused the spill
- Spill location, cause, and a description of the surrounding area
- Type (including safety data sheet number) and quantity of the spilled material
- Details of the spill location and surrounding area
- Details of the spill response, including the location of the disposal site
- Cause and effect of the spill
- Names of all people on the scene, including ministry representatives
- Names of people and agencies notified after the spill
- Sequence of events, including notifications and timing
- Comments on the handling of the incident
- Details of further action contemplated or required

The Spill Reporting Regulation (BC Reg. 263/90) requires all persons who manage hazardous materials to report significant spills to BC Spill Response at 1-800-663-3456. A spill of any size in an aquatic

environment must be reported by the construction supervisor. For terrestrial spills, the type of materials likely to be present at the Project site and the amount of spill above which BC Spill Response must be immediately advised include, but may not be limited to:

- Fuels, engine oils, and hydraulic fluids: 100 L
- Petroleum oils and emulsions: 100 L
- Antifreeze: 5 L
- Propane: 10 kg

6 Environmental Monitoring

A QEP will be onsite during critical construction activities such as vegetation clearing, dewatering, and works within or adjacent to ESA 1 and ESA 2. The QEP will:

- Complete a nest survey prior to work commencing if vegetation clearing, grubbing, or ground disturbance will occur during the primary nesting period (March 26 to August 16 [ECCC 2024]).
- Complete a survey for pileated woodpecker nests prior to tree removal.
- Check that silt-fencing is properly installed and maintained.
- Check that wildlife exclusion fencing, if used, is properly installed and maintained.
- Attend key meetings at which environmental protection measures are to be discussed, including the construction kick-off meeting.
- Select water quality monitoring locations and water level logging location for installation of in-situ logger. Review data compared to guidelines (Section 5.1.1) and target water levels (Section 5.1.2) and provide recommendations for contingencies, if needed.

An Environmental Monitor, under the direction of a QEP, will:

- Bring a copy of this EA report to the pre-construction meeting and keep on site. A description of the mitigation measures and BMPs must be kept readily available at the site for reference while the work is being conducted. Copies of relevant permits and emergency contact information must also be kept on site and readily available.
- Conduct weekly environmental monitoring site visits for the duration of the works approved under this DP (estimated to be between Jun 2025 and March 2026, at which time monitoring will be coordinated with Mill Creek naturalization). Weekly monitoring visits will include:
    - » Water quality monitoring during dewatering in accordance with Section 5.1.
    - » Water level monitoring during dewatering in accordance with Section 5.1.
    - » Monitor for disturbance to the osprey nest should they be nesting in the nest >100 m north of the building footprint.
    - » Check that silt-fencing is properly maintained.
    - » Check that wildlife exclusion fencing (if required by the QEP) is properly maintained.
- In addition to the above weekly tasks, the Environmental Monitor will:

- Be present and on site prior to earthworks and vegetation clearing, and after significant precipitation events.
- Conduct additional site visits during the initiation of dewatering to assess the speed of change of the upstream water levels in comparison with the downstream ones.
- Stop construction in the event that wildlife is encountered in the Project Footprint and advise the contractor on when they can resume construction.
- Stop construction if activities contravene mitigation recommendations or permit conditions.
- Provide recommendations that will improve the efficacy of the environmental mitigation measures.
- Document environmental incidents or accidents that occur and provide guidance in addressing such incidents.
- Prepare a final report upon the substantial completion of construction works summarizing the project activities and listing deficiencies noted throughout the works

7 Habitat Restoration and Compensation

Project impacts described in Table 8 of Section 4.1 (tree removal) and Table 9 of Section 4.4 (ESA footprints) are for the first stage of the Project: the new PRC building and Park features. With respect to tree removal and replacement, landscape architects developed a tree management plan (submitted with DP application and excludes Mill Creek) which illustrates that 97 trees will be removed for the new PRC building and Park. Given that these 97 trees are outside of the RMA, the Project targeted a minimum 2:1 replacement ration for the 97 removals per the City of Kelowna Municipal Properties Tree bylaw No. 8042 (the City 2021). The landscape plan includes the installation of 309 trees, 221 of these are within the Park (adjacent to fields, along pathways) and 88 are within parking lots. It is understood that trees within the parking lots will not count for compensation; therefore, the replacement ratio is 2.3:1 for the new PRC building and Park. For Mill Creek, a planting plan will be submitted along with the Supplemental EA and will target increasing tree density within the RMA and expanding the RMA width where possible.

Construction of the new PRC building and the Park (i.e., parking lots, fields, courts) will not cause disturbance within areas mapped as ESA 1 but encroaches on 27 m^2 to ESA 2 for permanent features, and on 52 m^2 to ESA 2 for the temporary construction footprint. These encroachments are associated with the ESA 2 habitat delineated within the existing RMA. When compared to the potential overlap associated with the proposed RMA associated with Mill Creek works (Figure 4), the temporary construction work would no longer encroach on ESA 2, and the encroachment of permanent features increases to 91 m^2. However, no permanent works is taking place within this encroachment on the proposed RMA as the existing field in the southwest corner will remain in place. The compensation for the existing fields encroaching on the new 15 m RMA will be detailed in the Supplemental EA.

The 52 m^2 of disturbance within the RMA (ESA 2) for the temporary construction workspace overlaps with an area that will be disturbed for the naturalization of Mill Creek, to be completed in subsequent years. Compensation is planned to occur as a part of subsequent works given that the RPRC is initiating

construction works of the new PRC building and Park in summer 2025, with naturalization of Mill Creek occurring in 2026 and 2027. Restoration efforts cannot be completed until the Mill Creek alignment is designed and constructed, and landscaping is installed upon completion of PRC building and Park features. For instance, landscaping within the Park cannot occur until the fields, new courts, pathways, and temporary construction areas are complete. Similarly, compensation within the RMA of Mill Creek cannot be completed until the new channel alignment is constructed. Given that the Mill Creek naturalization is still in the preliminary design stages, the proposed compensation efforts cannot be quantified until detailed design is complete, which will be submitted as part of the Supplemental EA. It is expected, however, that restoration of the Property will provide a surplus relative to the impacts.

Upon completion of the work, construction materials will be removed from the Project site by the contractor. Stockpiled topsoil and overburden will be replaced on disturbed areas, where applicable, per the landscape plan for the Project. The topsoil and overburden will be protected from future erosion events and is expected to be replanted per the landscape plan. Planting a native seed mix and native vegetation will limit invasive species establishment. The Project Footprint will be left in a condition that is acceptable to the QEP.

8 Summary

Stantec completed a desktop review and a field assessment to document the existing environmental conditions with potential to be affected by the Project. Key highlights include:

- Spawning kokanee were observed along Mill Creek on October 10, 2024. The field assessment documented kokanee spawning activity and suitable spawning habitat for kokanee and rainbow trout.
- An ecological community at risk (red-listed black cottonwood/ snowberry – roses) was observed within the Study Area, adjacent to the Project Footprint. No occurrences of rare plants were observed; however, a detailed rare plant survey was not conducted.
- Invasive plant species are prevalent within the Property and were mostly observed along paved pathways.
- Monitoring of programs are included to assess potential impacts to Mill Creek as a result of the redevelopment of PRC and Park component of the Project (i.e., new building, field, or court construction).
- Although no wildlife species at risk were observed during the field assessment, they have the potential to occur within the Project Footprint.
- Evidence of wildlife use (e.g., deer, rodents and birds) was observed in the Study Area, as were potential areas of refuge. No potential amphibian breeding habitat or overwintering sites for aquatic amphibians or reptiles were observed. No small mammal burrows were observed.
- Multiple bird species were observed within the forested areas. No stick nests were recorded in the Project Footprint; however, an osprey nest was observed over 100 m north of the Project Footprint.
- One unoccupied wildlife tree was observed within the Study Area but is outside the Project Footprint for the new PRC building.
- Potential Project effects include changes to temporary disruption of vegetation communities and terrestrial habitats for wildlife due to Project related clearing, temporary disturbances to wildlife from construction-related noise and activity, and temporary changes to water quality during construction.
- The Project may require provincial environmental permitting if snakes require salvaging. If works are completed within the reptile overwintering period (October 31 to March 31), a salvage may be avoided.
- The majority of proposed disturbance for the new PRC building and Park (excluding Mill Creek) is within areas mapped as ESA 3 and ESA 4. No disturbance is planned within areas mapped as ESA 1.
- Existing trees were retained where possible; however, 97 trees are to be removed for the new PRC building and Park, replaced at a 2.3:1 ratio (221 replacements, excluding parking lots).
- Compensation for impacts within ESAs and tree replacements within the RMA will be detailed in the Supplemental EA alongside designs for the naturalization of Mill Creek.
- Weekly site visits will be conducted as a requirement of a Natural Environment DP, which will include water quality monitoring and water level monitoring associated with dewatering at the new PRC building.

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Appendices

Appendix A Wildlife Species of Conservation Concern with the Potential to Occur within the Study Area

Species	Scientific Name	Species Code (from BC CDC 2024)	BC Status[1]	COSEWIC Status[2]	SARA Status[2]	Record of Observation[3] within Study Area
Birds						
White-throated swift	*Aeronautes saxatalis*	B-WTSW	Blue	-	-	√[4]
Golden eagle*	*Aquila chrysaetos*	GOEA	Yellow	NAR	-	√
Great blue heron, *herodias* subspecies*	*Ardea herodias herodias*	B-GBHE	Blue	-	-	√[4]
Rough-legged hawk	*Buteo lagopus*	B-RLHA	Blue	-	-	-
Broad-winged hawk	*Buteo platypterus*	BWHA	Yellow	-	-	√
Swainson's hawk	*Buteo swainsoni*	B-SWHA	Red	-	-	√
Canyon wren	*Catherpes mexicanus*	B-CAWR	Blue	NAR	-	-
Lark sparrow	*Chondestes grammacus*	B-LASP	Blue	-	-	√
Common nighthawk	*Chordeiles minor*	B-CONI	Blue	SC	1-SC	√
Evening grosbeak	*Coccothraustes vespertinus*	B-EVGR	Yellow	SC	1-SC	√[4]
Olive-sided flycatcher	*Contopus cooperi*	B-OSFL	Yellow	SC	1-SC	√
Tundra swan	*Cygnus columbianus*	B-TUSW	Blue	-	-	√
Black swift	*Cypseloides niger*	B-BLSW	Blue	E	1-E	-
Pileated woodpecker*	*Dryocopus pileatus*	B-PIWO	Yellow	-	-	√
Gray flycatcher	*Empidonax wrightii*	B-GRFL	Blue	NAR	-	√
Horned lark	*Eremophila alpestris*	HOLA	Red	-	-	√
Peregrine falcon*	*Falco peregrinus*	B-PEFA	-	SC	1-SC	√[4]
Bald eagle*	*Haliaeetus leucocephalus*	B-BAEA	Yellow	-	-	√[4]
Barn swallow	*Hirundo rustica*	B-BASW	Yellow	SC	1-T	√
Yellow-breasted chat	*Icteria virens*	YBCH	Red	E	1-E	√
California gull	*Larus Californicus*	CAGU	Red	-	-	√
Western screech-owl, *macfarlanei* subspecies	*Megascops kennicottii macfarlanei*	B-WESO	Blue	T	1-T	√
Lewis's woodpecker	*Melanerpes lewis*	B-LEWO	Blue	T	1-T	-
Double-crested cormorant	*Nannopterum auritum*	DCCO	Blue	NAR	-	√
Osprey*	*Pandion haliaetus*	B-OSPR	Yellow	-	-	√[4]
Flammulated owl	*Psiloscops flammeolus*	B-FLOW	Blue	SC	1-SC	-

Species	Scientific Name	Species Code (from BC CDC 2024)	BC Status[1]	COSEWIC Status[2]	SARA Status[2]	Record of Observation[3] within Study Area
Mammals						
Pallid Bat	*Antrozous pallidus*	M-PABA	Red	T	1-T	-
Townsend's Big-eared Bat	*Corynorhinus townsendii*	M-TOBE	Blue	-	-	-
Spotted Bat	*Euderma maculatum*	M-SPBA	Blue	SC	1-SC	-
Western Small-footed Myotis	*Myotis ciliolabrum*	M-WESM	Blue	-	-	-
Little Brown Myotis	*Myotis lucifugus*	M-LBMY	Blue	E	1-E	-
Fringed Myotis	*Myotis thysanodes*	M-FRMY	Blue	DD	-	-
Western Harvest Mouse	*Reithrodontomys megalotis*	M-WEHA	Blue	E	1-SC	-
American Badger	*Taxidea taxus*	M-AMBA	Red	E	1-E	-
Amphibians						
Western toad	*Anaxyrus boreas*	A-WETO	Yellow	SC	1-SC	-
Great Basin Spadefoot	*Spea intermontana*	A-GBSP	Blue	T	1-T	√
Reptiles						
Western painted turtle	*Chrysemy picta pop. 2*	R-WEPA	Blue	SC	1-SC	√
North American Racer (Western yellow-bellied racer)	*Coluber constrictor*	R-NARA	Blue	T	1-T	-
Western rattlesnake	*Crotalus oreganus*	R-WERA	Blue	T	1-T	-
Gophersnake, *deserticola* subspecies	*Pituophis catenifer deserticola*	R-GOSN	Blue	T	1-T	√
Western skink	*Plestiodon skiltonianus*	R-WESK	Blue	SC	1-SC	-

Notes:
*Species with nests protected year-round under the MBR or *Wildlife Act* are considered species of conservation concern per the definition of species of conservation concern.

SARA: *Species at Risk Act*

COSEWIC: Committee on the Status of Endangered Wildlife in Canada

[1] BC List categories:
Yellow: includes species or ecological communities that are apparently secure and not at risk of extinction
Red: species or ecosystem that is at risk of being lost (Extirpated, Endangered or Threatened)
Blue: species or ecosystem that is of Special Concern

[2] COSEWIC and SARA status categories:
SC: special concern
E = endangered
T = threatened
DD = data deficient

[3,4] Birds Canada (eBird) 2024 and/or BC CDC 2024

Appendix B Photolog

Stantec

Photographic Log

Client: City of Kelowna	**Project: 111710161**
Project: Redevelopment of Parkinson Recreation Centre	**Site Location: Parkinson Recreation Centre, Kelowna BC**

Photograph ID: 1	
Photo Location: Sub-reach 3.1 49.882225°, -119.461885°	
Direction: East	
Survey Date: 10/10/2024	
Comments: Upstream view of Mill Creek (sub-reach 3.1) with Highway 97/Harvey Avenue to the right of the photo (south of creek) and the park fields to the left (north of creek). Thin modified riparian area within the downstream 150 m and retaining wall on north side of creek.	
Photograph ID: 2	
Photo Location: Sub-reach 3.2 49.883995°, -119.457594°	
Direction: Northeast	
Survey Date: 10/25/2024	
Comments: Upstream view showing the riparian area of Mill Creek approximately 480 m upstream of the Highway 97/Harvey Avenue crossing. The bend of the river is adjacent to the access to PRC from Highway 97. Douglas maple (*Acer glabrum*), weeping willows (*Salix babylonica*), and poplar (*Populus nigra*) can be seen.	

Client: City of Kelowna

Project: 111710161

Project: Redevelopment of Parkinson Recreation Centre

Site Location: Parkinson Recreation Centre, Kelowna BC

Photograph ID: 3 **Photo Location:** Sub reach 3.2 49.883778°, -119.457783° **Direction:** South **Survey Date:** 10/25/2024 **Comments:** View of current PRC building looking south from Mill Creek by the outdoor fitness area. The paved walking path is within the RMA on the left bank of Mill Creek (creek is to the left of photo).	
Photograph ID: 4 **Photo Location:** Sub reach 3.1 49.884024°, -119.458018° **Direction:** West **Survey Date:** 10/25/2024 **Comments:** Mill Creek at the outdoor fitness area, north of the existing PRC building (left of photo). Mill Creek is to the right (north) of the outdoor fitness area; the fitness equipment and paved pathway are within the 15 m RMA.	

Client: City of Kelowna	**Project: 111710161**
Project: Redevelopment of Parkinson Recreation Centre	**Site Location: Parkinson Recreation Centre, Kelowna BC**

Photograph ID: 5

Photo Location:
Sub-reach 3.2
49.883978°, -119.457477°

Direction:
Southwest

Survey Date:
10/25/2024

Comments:
Downstream view of Mill Creek approximately 500 m upstream of the Highway 97/Harvey Avenue crossing. The photo was taken from the pedestrian bridge west of the pickleball courts. A grouted retaining wall forms the bank on river left. Introduced Siberian elm (*Ulmus pumila*) trees on the left and shrubs on the right.

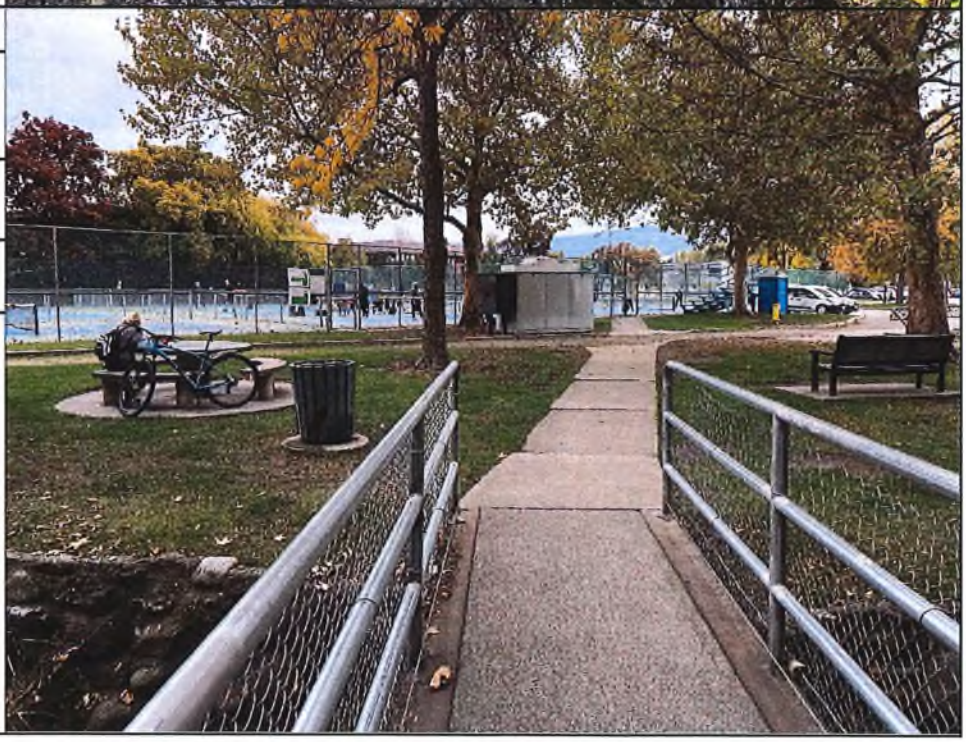
Photograph ID: 6

Photo Location:
Sub-reach 3.2
49.883978°, -119.457477°

Direction:
Southeast

Survey Date:
10/25/2024

Comments:
View of pedestrian bridge and pickleball courts to the left. Manicured lawn on north side of Mill Creek. Black locust (*Robinia pseudoacacia*) trees can be seen in the photo.



Client: City of Kelowna	**Project: 111710161**
Project: Redevelopment of Parkinson Recreation Centre	**Site Location: Parkinson Recreation Centre, Kelowna BC**

Photograph ID: 7 **Photo Location:** Sub-reach 3.2 49.884742, -119.457494 **Direction:** North **Survey Date:** 10/25/2024 **Comments:** A 426 m^2 occurrence of black cottonwood/common snowberry – roses ecosystem *(Populus trichocarpa / Symphoricarpos albus - Rosa* spp.) a red listed eocological community was identified between the tennis courts and Mill Creek.	
Photograph ID: 8 **Photo Location:** Sub-reach 3.2 49.884476°, -119.457682° **Direction:** North **Survey Date:** 10/25/2024 **Comments:** View of paved walking trail, manicured lawn, and tennis courts looking north. Mill Creek is to the right of photo. This area overlaps with the proposed footprint for the new PRC building. The red-listed community is located to the right (east) of this photo.	

Client: City of Kelowna	**Project: 111710161**
Project: Redevelopment of Parkinson Recreation Centre	**Site Location: Parkinson Recreation Centre, Kelowna BC**

Photograph ID: 9	
Photo Location: Sub-reach 3.2 49.884673°, -119.457728°	
Direction: West	
Survey Date: 10/25/2024	
Comments: Manicured lawn area and weeds within the proposed footprint for the new PRC building. Mill Creek is to the left of photo (south); the southwest corner of the tennis courts can be seen on the right of the photo.	
Photograph ID: 10	
Photo Location: Sub-reach 3.2 49.884928°, -119.457453°	
Direction: North	
Survey Date: 10/25/2024	
Comments: Looking north from walking path along the north (right) bank of Mill Creek. Proposed footprint for the new PRC building overlaps with tennis courts to left (west), sidewalks, walking path, manicured lawns, and parking lot. Mill Creek is behind (south) of where photo is taken from.	

Client: City of Kelowna	**Project: 111710161**
Project: Redevelopment of Parkinson Recreation Centre	**Site Location: Parkinson Recreation Centre, Kelowna BC**

Photograph ID: 11

Photo Location:
Sub-reach 3.1
49.884144°, -119.458301°

Direction:
N/A

Survey Date:
10/10/2024

Comments:
Nesting cavity was observed in a willow tree within the riparian area of Mill Creek. This tree is located approximately 400 m upstream of the crossing with Highway 97/Harvey Avenue on the north side of Mill Creek.

Photograph ID: 12

Photo Location:
Sub reach 3.1
49.882448, -119.460119

Direction:
N/A

Survey Date:
10/10/2024

Comments:
Instream conditions within sub-reach 3.1 showing fine substrate as dominant.

Client: City of Kelowna	**Project: 111710161**
Project: Redevelopment of Parkinson Recreation Centre	**Site Location: Parkinson Recreation Centre, Kelowna BC**

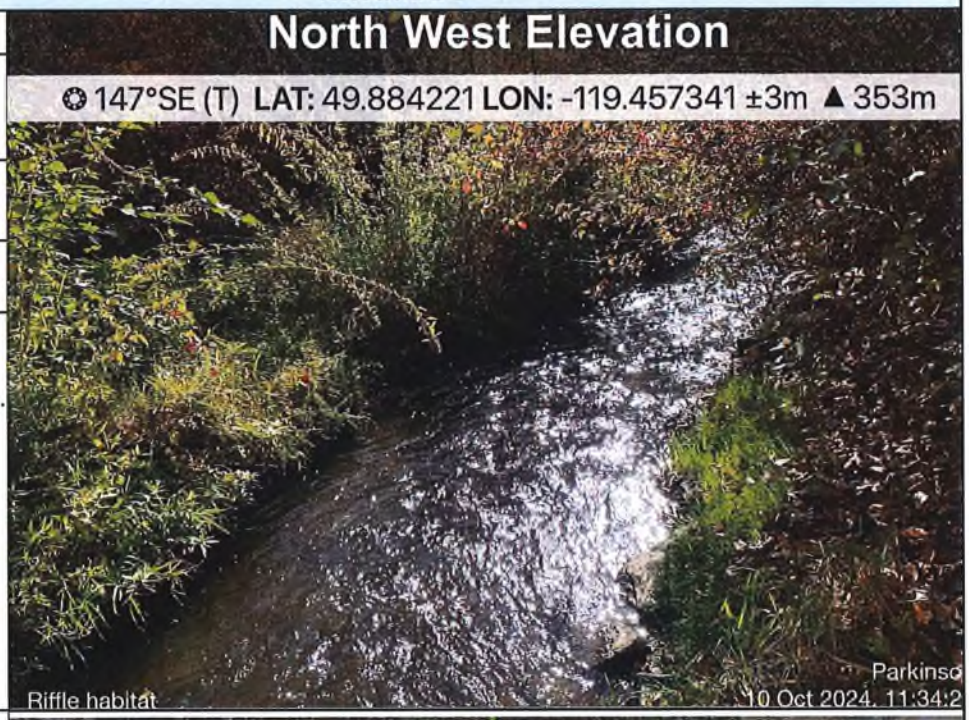
Photograph ID: 13

Photo Location:
Sub-reach 3.2
49.884221, -119.457341

Direction:
Southeast

Survey Date:
10/10/2024

Comments:
Upstream view of riffle habitat within sub-reach 3.2.



Photograph ID: 14

Photo Location:
Sub-reach 3.2
49.884952, -119.457135

Direction:
Southwest

Survey Date:
10/10/2024

Comments:
Looking downstream at a spawning area with cover provided by overhanging vegetation and woody debris.

Client: City of Kelowna

Project: 111710161

Project: Redevelopment of Parkinson Recreation Centre

Site Location: Parkinson Recreation Centre, Kelowna BC

Photograph ID: 15

Photo Location:
Sub-reach 3.2
49.884898, -119.457224

Direction:
East

Survey Date:
10/10/2024

Comments:
Looking upstream at a spawning area where kokanee pairs (*Oncorhynchus nerka*) were observed exhibiting spawning behavior.

Stantec

Stantec is a global leader in sustainable architecture, engineering, and environmental consulting. The diverse perspectives of our partners and interested parties drive us to think beyond what's previously been done on critical issues like climate change, digital transformation, and future-proofing our cities and infrastructure. We innovate at the intersection of community, creativity, and client relationships to advance communities everywhere, so that together we can redefine what's possible.

FPA Fletcher Paine Associates Ltd.
Consulting Geotechnical and Materials Engineers
Vernon Office
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Vernon, B.C. V1T 7X8

Kelowna Office
6-3312 Appaloosa Road
Kelowna, B.C. V1V 2W5

File 7052

January 29, 2025

City of Kelowna
1435 Water Street
Kelowna B.C.
V1Y 1J4

Attention: Scott Bushell, P.Eng., PMP
Senior Project Manager

Dear Scott,

Preliminary Geotechnical Investigation and Report
Parkinson Recreational Centre Redevelopment
1800 Parkinson Way, Kelowna, B.C.

1.0 INTRODUCTION

1.1 Authorization

The work reported upon in this document was authorized by Scott Bushell P.Eng. on behalf of the City of Kelowna (The Client) on July 4, 2024.

1.2 Qualifications

Use of this report is subject to the Statement of Qualifications and General Conditions, which is attached. The reader's attention is specifically drawn to these conditions as it is considered essential that they be followed for the proper use and interpretation of this report.

This report has been prepared exclusively for the client listed above, for the use of other consultants on their design team and for the relevant approving authorities provided that all Fletcher Paine Associates Ltd. (FPA) recommendations are adhered to as outlined in this document and its attachments.

1.3 Terms of Engagement

The terms under which our services are provided are attached.

1.4 Scope of the Report

This report is intended to address preliminary geotechnical recommendations for the proposed Parkinson Recreation Park Redevelopment located at 1800 Parkinson Way, in Kelowna, B.C. The proposed site redevelopment includes a new recreation facility, which consists of leisure and lap pools, gym and fitness spaces, and change room areas, modifications to the existing playing fields and courts, which will be reconfigured around the new facility, and parking areas and access roads.

The proposed redevelopment also includes demolition of the existing recreation facility, which will be replaced with new playing artificial playing fields and courts. The project scope is referenced from information provided in The Client's request for proposal. Integrated Project Delivery (IPD) is the project delivery model used for this project.

The following specific items are addressed in this document:

a) Site description and surficial geology

b) The field and laboratory investigations carried out for the project

c) Engineering properties and characteristics of the subsoils

d) Potential reuse of existing materials within proposed construction

e) Preliminary recommendations for shallow foundations and ground preparation

f) Preliminary recommendations for anti-buoyancy anchors.

g) Recommendations related to frost protection

h) Recommendations for site and perimeter foundation drainage

i) Recommendations for trench excavations and backfill procedures

j) Recommended pavement structure design, construction methods and procedures

k) Recommendations for synthetic and turf playing field subgrade preparation

l) Permanent site grading considerations

m) Preliminary recommendations for pedestrian bridge abutment design at Mill Creek

1.5 Reference Documents

A prior Fletcher Paine Associates Ltd. geotechnical feasibility report was completed for this property FPA File 6662, dated August 11, 2022, titled, "Preliminary Geotechnical Investigation and Report, Kelowna Community Campus, Parkinson Recreation Park, Kelowna, B.C." The investigation results from the file #6662 report are included in the appendix for this report and are used in part for design recommendations in this report. The recommendations contained in this report supersede the previous FPA file #6662 report.

2.0 SITE DESCRIPTION AND SURFICIAL GEOLOGY

2.1 Site Description

Parkinson Recreational Park is located at 1800 Parkinson Way, in Kelowna, B.C. as shown on the attached Site Location Plan, Figure 7052-1. The site is bordered by Highway 97 on the south, Burtch Road to the west, Bernard Avenue to the north and Spall Road to the east. Commercial and residential properties surround the site.

The park includes sports fields and a batting cage located in the north and west areas, and a recreation facility, tennis courts and pickle ball courts towards the southeast and east areas. Gravel surfaced and paved parking areas are located in the northwest, east and southeast areas of the park. The site is predominantly grassed with occasional trees. The ground surface gradients are nearly level with a slight downward gradient toward the south and east. The southerly flowing Mill Creek traverses through the centre of the park. The creek has an armoured bank and trees are common along its length.

2.2 Surficial Geology

Surficial geology mapping indicates that the surficial soils at the proposed site are alluvial fan sediments consisting of poorly sorted gravel, sand, silt and clay. The materials encountered during this field investigation were consistent with surficial geological mapping of the area. Lacustrine sediments were observed at depth at investigated areas north and west of Mill Creek within the project extents.

3.0 INVESTIGATIONS

3.1 Field Investigation

The borehole investigation consisted of drilling fifteen exploratory boreholes (BH) on July 30 and 31, and August 1, 2024 using truck and track mounted auger drill rigs, and a track mounted sonic rig owned and operated by Mud Bay Drilling Ltd. Five test pits (TP) were excavated on December 13, 2024 using a mini excavator owned and operated by Redline Bobcat Services Ltd. The boreholes and test pits were made for the purposes of identifying the subsoil stratigraphy at the exploration locations and recovering disturbed

and undisturbed samples of the soils encountered for further classification and testing in the laboratory. Standard Penetration and SDS Cone Penetration testing was carried out at select borehole locations to estimate the available shear strength of the subsoils. Standpipe piezometers were installed at select borehole locations such that groundwater levels could be monitored within the investigation depths.

Detailed borehole and test pit logs are provided on the attached Records of Exploration and the locations are shown on the attached Site Plan, Figure 7052-2. The proposed redevelopment locations are shown on the attached Redevelopment Plan, Figure 7052-3. Geodetic surface elevations at the borehole and test pit locations were approximated from available contour plans prepared by Stantec, dated August 2, 2024.

3.1.1 Borehole Investigation

Proposed Facility Location: BH 7 through BH 11

At the borehole locations a surficial 0.2 m thick topsoil layer was encountered. Fill was encountered below the topsoil and extended to depths ranging between 0.8 m and 1.7 m below the existing ground surface. The fill consisted of loose to compact sands, silts and sands, and sandy silts.

The in situ and undisturbed soils encountered at the borehole locations consisted of alluvium deposits that were predominantly loose to very loose sands, silts, sandy silts, and sands and silts, and loose to dense sands and gravels and gravels and sands that extended to depths ranging between 5.2 m and 10.1 m below the existing ground surface. At the location of BH 7, layers of medium to highly plastic, soft to stiff clayey silts, silty clays and clays were encountered within the alluvium deposits ranging between 0.3 m and 0.5 m in thickness. With the exception of BH 10, fine grained lacustrine deposits were encountered below the alluvium deposits, and consisted of compact silts, and medium to highly plastic clays, silty clays, clayey silts. The boreholes ended at depths ranging between 7.6 m and 30.5 m below the existing ground surface.

Proposed Turf Playing Fields: BH 12, BH 13, BH 14 and BH 21

At the borehole locations a surficial 0.2 m thick topsoil layer was encountered. Fill was encountered below the topsoil and extended to depths ranging between 0.5 m and 1.5 m below the existing ground surface. The fill consisted of compact sands and gravels, sands, and silty sands.

The in situ and undisturbed soils encountered at the borehole locations consisted of loose to compact sandy silts, silty sands, sands and gravels, and medium to highly plastic, stiff to very stiff clays and silty clays. The boreholes ended at depths ranging between 3.0 m and 10.7 m below the existing ground surface.

Proposed Synthetic Field and Courts: BH 15 through BH 20

With the exception of BH 15, the surface materials at the borehole locations consisted of asphalt, that ranged between 30 mm and 60 mm in thickness. Fill materials consisting of compact sands, sands and gravels, gravelly sands, sands and silts, silts and sands were encountered below the asphalt and extended to depths ranging between 0.6 m and 1.2 m below the existing ground surface. A surficial 600 mm thick topsoil layer was encountered at the location of BH 15.

The native in situ soils at the borehole locations underlying the fill and topsoil consisted of loose to compact silty sands, sands and gravels, gravelly sands, sandy silts, sands and silts, and sands, and low to medium plastic, firm to stiff silts and silty clays. The boreholes ended at depths ranging between 3.0 m and 4.6 m below the existing ground surface.

3.1.2 Test Pit Investigation

TP 1

The surficial materials consisted of 0.2 m of topsoil. Fill materials were encountered below the topsoil consisting of a mixture of topsoil, sand and silt that extended to 0.9 m below the existing ground surface. The native in situ soils encountered at the test pit location consisted of loose to compact gravelly sands and the test pit ended in these materials at 1.2 m below the existing ground surface.

TP 2 through TP 5

The surficial materials consisted of topsoil that ranged in thickness between 0.2 m and 0.3 m. Fill materials were encountered below the topsoil consisting of a clean sand with occasional cobble that extended to depths ranging between 0.5 m and 0.8 m below the existing ground surface. A second layer of fill was encountered that consisted of a mixture of sand and silt with some gravel that extended to depth of 0.9 m below the existing ground surface, and TP 2 ended in the fill materials.

The native in situ soils encountered at the location of TP 3, TP 4 and TP 5 consisted of loose to compact sands and silts and the test pits ended in these materials at depths ranging between 1.0 m and 1.2 m below the existing ground surface.

3.2 Standpipe Piezometers

Standpipe piezometers were installed at select borehole locations so that static groundwater levels could be monitored within the investigated depth. Recent groundwater level measurements, including the standpipe piezometers installed during the previous investigation for FPA file #6662 are shown in the following table. Geodetic surface elevations shown on the table were approximated from available contour plans prepared by Stantec, dated August 2, 2024.

Location	Estimated surface elevation (m)	Depth to groundwater (m)	Estimated groundwater elevation (m)	Date of measurement
6662 BH 1	355.4	0.9	354.5	20-Nov-20
6662 BH 2	356.4	1.7	354.7	20-Nov-20
6662 BH 3	357.8	1.4	356.4	20-Nov-20
6662 BH 4	355.5	0.6	354.9	20-Nov-20
6662 BH 5	358.0	1.2	356.8	03-Nov-21
6662 BH6	357.7	1.1	356.6	26-Aug-24
BH 7	See Below Table			
BH 9	358.0	1.6	356.4	26-Aug-24
BH 10	357.9	1.4	356.5	26-Aug-24
BH 11	357.3	1.3	356.0	26-Aug-24
BH 12	357.0	1.3	355.7	26-Aug-24
BH 15	356.6	1.2	355.4	26-Aug-24
BH 18	357.2	1.4	355.8	26-Aug-24
BH 21	357.0	1.3	355.7	26-Aug-24

Groundwater level measurements were taken at the nested piezometer at the location of BH 7, on August 26, 2024, and are shown on the following table:

Standpipe Location	Depth of standpipe (m)	Approximate Surface Elevation (m)	Date Measured	
			August 26, 2024	
			Depth (m)	Elevation (m)
BH 7	30.5	357.9	0.6	357.3
BH 7	12.2		1.7	356.2
BH 7	4.3		1.5	356.4

The nested standpipe piezometer measurements indicate a minor artesian condition at depth.

Standpipe piezometers with artesian hydraulic heads should be permanently sealed by a qualified contractor prior to construction provided that no further monitoring is required. An option to permanently seal the standpipes would consist of drilling out the existing standpipes and bentonite seals to the full extents of the borehole. The borehole would then need to be grouted with a cement or bentonite-based grout that is heavy enough to suppress the artesian hydraulic heads.

3.3 Laboratory Investigation

Natural moisture contents were determined for all recovered samples and several miniature shear vane tests were completed on undisturbed Shelby tube samples, which are reported on the attached Record of Exploration. Ten Atterberg liquid and plastic limit determinations and eight grain size distribution tests were completed on select samples of native and fill soils. Two consolidation tests were completed on select samples of the in situ native clay soils. The test results are attached to this report.

Two select samples were sent to a chemical analysis laboratory to determine information related to their potential for corrosion to ductile iron and sulphate attack on concrete. The corrosivity characteristics and water-soluble sulphate ion test results for the samples are attached to, and summarized in, this report.

4.0 ENGINEERING PROPERTIES AND CHARACTERISTICS OF THE SUBSOILS

4.1 Shear Strength Parameters

4.1.1 Topsoil and Uncontrolled Fill Materials

Layers of topsoil and fill were encountered to depths ranging between 0.2 m and 1.7 m below the existing ground surfaces at the borehole locations. These materials are not suitable for use as foundation soils due to their inherently weak structure and/or their lack of reliable and consistent engineering properties and characteristics.

4.1.2 Surficial Alluvium Deposits

The undisturbed in situ surficial alluvium deposits consisting of sands, silty sands, silts, and sandy silts, and soft clayey silts encountered at the site are very loose to loose in terms of relative density and soft to firm in terms of consistency. These soils have estimated effective friction angle (φ') ranging between 27° and 29°, and undrained shear strengths of 20 kPa. These soils are not suitable for use below foundations due to their weak structures.

4.1.3 Lower Alluvium Deposits

The undisturbed in situ granular alluvium deposits consisting of sands and gravels, gravels and sands, gravelly sands, silty sands and silts encountered below the surficial alluvium deposits throughout the site are loose to compact, and dense in terms of relative density. These soils have estimated effective friction angles (φ') ranging between 30° and 36°. These soils will provide satisfactory support for engineered fill and structural foundations for the proposed constructions, provided that all foundation soils preparation, and other recommendations made in this report, are adhered to.

4.1.4 Fine Grained Lacustrine Deposits

The in situ clay, silty clays and clayey silts are stiff to very stiff with measured undrained undisturbed shear strengths (S_u) between 80 kPa and 140 kPa as determined from the laboratory vane shear tests. These soils should provide satisfactory support for the proposed facility constructions provided that the recommendations made in this report are adhered to.

4.2 Clay Consolidation Parameters

Two one-dimensional consolidation tests (ASTM D2435) were completed on select samples from BH 7. The following table summarizes consolidation parameters. The testing characterized the clays as being over consolidated.

Sample	In Situ Effective Stress σ'_o	Compression Index C_c	Recompression Index C_{cr}	Initial Void Ratio e_o	Preconsolidation Pressure σ'_p
BH 7-17 at 9.4 m	92 kPa	1.003	0.088	1.55	440 kPa
BH 7-21 at 15.3 m	140 kPa	0.636	0.061	1.22	580 kPa

4.3 Settlement Potential

The proposed facility main floor elevation of 359.0 m would result in site grade increases that range between 0.8 m and 1.5 m above existing grades with an average site grade increase of 1.0 m across the building footprint. Finished site grades surrounding the structure are proposed to be raised between approximately 0.5 m and 1.0 m above existing grades.

The in situ granular and fine-grained soils encountered at the site are respectively characterized as loose to compact, and dense in terms of relative density, and stiff to very stiff in terms of consistency. These materials may experience some settlement when subjected to net increases in pressure from structural loads and site grade increases; however, provided the recommendations in this report are adhered to, any settlement within these soils is expected to be less than 20 mm over 10 m of differential movement, and less than 25 mm of total movement.

Differential settlement may exceed the recommended tolerances where anchors are installed below foundations for buoyancy protection. Differential settlement can be further defined at these locations during detailed design once foundation layout and structural loading are known.

4.4 Frost Susceptibility

The following table summarizes the fine soils content test results from the grain size distribution tests, specifically presenting the percent passing the 0.075 mm diameter sieve. Soils with more than 7 percent passing the 0.075 mm diameter sieve are frost susceptible to some degree and the complete test results are attached to this report. The clay and silt soils encountered at this site are de facto frost susceptible.

Sample Description and Depth	Material	Percent Passing 0.075 mm Sieve
6662 BH 2-2 at 0.9 m	Silt, sandy	67.5 %
6662 BH 3-4 at 3.7 m	Sand and Gravel, trace silt	6.1 %
6662 BH 4-2 at 2.1 m	Sand and Gravel, trace silt	3.0 %
6662 BH 5-3 at 4.9 m	Gravel and Sand, trace silt	5.7 %
6662 BH 6-4 at 3.7 m	Gravel and Sand, trace silt	5.4 %
BH 7-2 at 0.6 m	Fill – sand, trace gravel, trace silt	3.2 %
BH 7-8 at 4.3 m	Gravel and Sand, trace silt	3.0 %
BH 7-11 at 5.6 m	Sand and Silt	44.3 %
BH 8-3 at 2.1 m	Sand and Gravel, trace silt	7.2 %
BH 13-2 at 0.9 m	Silt, sandy	72.6 %
BH 18-1 at 0.3 m	Fill – sand and gravel, trace silt	6.3 %
BH 18-2 at 1.1 m	Sand, silty	21.3 %
BH 19-2 at 6.4 m	Sand, gravelly, trace silt	6.4 %

4.5 Plasticity and Swelling Potential

Based on the Atterberg limit and moisture content test results the in situ undisturbed medium to highly plastic clays and silty clays encountered at the site have high to very high potential for volume change (shrink/swell) with changes in moisture contents. The in situ undisturbed medium plastic clayey silts and silts have a low potential for volume change with changes in moisture contents. Volume change is not expected to be problematic for soils that are consistently below the static groundwater table.

4.6 Lateral Earth Pressure Parameters

The following parameters should be used for structural foundation wall design at this site. These parameters assume that wall backfill consists of clean (less than 7 percent passing the 0.075 mm diameter sieve) 75 mm (-) sand and gravel backfill materials that are moisture conditioned to within two percent of optimum moisture content, compacted, and tested to at least 95 percent of Modified Proctor maximum dry density (MPD) in

accordance with ASTM D1557. The values provided assume a level finished backfill grade.

Angle of Internal Friction: $\varphi = 34°$ degrees
Active Earth Pressure Coefficient: $K_a = 0.28$
At Rest Earth Pressure Coefficient: $K_o = 0.44$
Passive Earth Pressure Coefficient: $K_p = 3.54$
Seismic Earth Pressure Coefficient: $K_{oe} = 0.11$ (non-yielding wall)
Unit Weight: $\gamma = 21$ kN/m^3
Buoyant Unit Weight $\gamma_b = 11.2$ kN/m^3

Lateral compaction pressures should be considered by the structural engineer when calculating total lateral soil loading on structural walls. The unfactored compaction pressure acting on the wall shall vary linearly from 12 kPa at the fill surface to 0 kPa at 2.0 m below the surface. These values are based on the assumption that a Wacker Neuson DPU6555Heh reversible vibrating plate tamper (1000 lb), or an equivalent approved by the geotechnical engineer, is used for compacting backfill soils supported by the structural walls within 1.5 m of the wall.

4.7 Site Seismicity

On the basis of the information gathered, the project site has a Site Designation of X_D for seismic site response and design purposes, in accordance with the 2024 British Columbia Building Code.

The 2020 National Building Code of Canada on-line Seismic Hazard Calculator provides the following seismic parameters at this location for seismic Site Designation X_D:

- PGA = 0.111g, Sa (0.2) = 0.266g, and PGV = 0.221 m/s.

4.8 Evaluation of Liquefaction Potential

Liquefaction potential was evaluated using the cyclic stress approach, which includes the calculation of cyclic shear stress (CSR) using Seed's Simplified Equation as it relates to cyclic resistance ratio (CRR). The evaluation determined that the subsoils encountered at this site, for a design M 5.9 earthquake are not susceptible to liquefaction.

4.9 CBR Value

An estimated California Bearing Ratio (CBR) value of 3 can be used for design where the paved area subgrade will consist of the undisturbed in situ clays, silty clays and clayey silts.

An estimated CBR value of 6 can be used for design where the paved area subgrade will consist of the undisturbed in situ sands, silty sands, sands and silts, silts and sands, and sandy silts.

An estimated CBR value of 15 can be used for design where the paved area subgrade will consist of the undisturbed in situ sands and gravels, sandy gravels, and gravels and sands.

4.10 Estimated Permeability Coefficients

The following list provides estimated permeability coefficients (k) for the in situ materials for use in storm water disposal assessment:

Sand and Gravel, and Gravel and Sand	$k = 1 \times 10^{-3}$ cm/sec
Sand, some silt	$k = 5 \times 10^{-4}$ cm/sec
Silty Sand, and Sand and Silt	$k = 1 \times 10^{-5}$ cm/sec
Sandy Silt, and Silt and Sand	$k = 1 \times 10^{-6}$ cm/sec
Silt, and Clayey Silt	$k = 1 \times 10^{-7}$ cm/sec
Clay, and Silty Clay	$k = 1 \times 10^{-8}$ cm/sec

These values are based on the grain size distribution test results on select samples retrieved during the field investigation. Permeability coefficients can be impacted by relative density, frost penetration, seasonal variations in groundwater, natural variations in grain size distribution and the introduction of contaminants.

4.11 Corrosivity and Sulphate Attack Considerations

Two select specimens were tested for characteristics that relate to corrosivity against ductile iron and sulphate attack against concrete. Corrosivity potential was based on ANSI/AWWA C-105/A21.5 standards and the interpreted soil-test evaluation results. Sulphate attack was based on the CSA A23.1/A23.2 standards and the concentration of water-soluble sulphate. The results of the tested samples are summarized in the following table.

Sample Description and Depth	Material	Corrosivity Potential	Sulphate Attack
BH 7-6 at 2.6 m	Gravel and Sand	Not Corrosive	Negligible
BH 7-16 at 8.2 m	Clay	Not Corrosive	Negligible

5.0 POTENTIAL REUSE OF IN SITU SOILS FOR PROPOSED CONSTRUCTIONS

The materials encountered at this site are suitable for reuse for fill at this site as described below. Soils intended for reuse should be inspected the geotechnical engineer to confirm

their suitability in advance of reuse as backfill. There were no soils encountered during the site investigation that would be suitable for reuse as structural fill for foundations.

5.1 In Situ Clay, Silty Clay, Clayey Silt, Silt, Sandy Silt, Silt and Sand, Topsoil, and Fine-Grained Fill

The native clay, silty clay, clayey silt, silt, sandy silt, silt and sand, topsoil, and fill soils with appreciable amounts of fine-grained soils and organics should not be used for subgrade fill, synthetic field subgrade fill, trench backfill, under travelled areas or backfill surrounding structures. These soils may be suitable for reuse at greenspace and park locations outside of structures and travelled areas, provided they are be placed in thin lifts (less than 150 mm) moisture conditioned and compacted with a pad foot roller.

The silts, sandy silts, and silt and sands are suitable for reuse as turf field subgrade backfill. These soils should be placed in thin (less than 200 mm) lifts, moisture conditioned to within two percent of optimum moisture content and compacted to at least 95 percent of MPD and compacted with a pad foot roller.

5.2 In Situ Sand, Silty Sand, Sand and Gravel, Gravel and Sand, and Granular Fill

The in situ sand, silty sand, sand and gravel, gravel and sand, and granular fill soils encountered at the site are suitable for reuse as subgrade fill, turf and synthetic field subgrade fill, and as trench backfill. These soils should be placed in thin (less than 300 mm) lifts, moisture conditioned and compacted in accordance with this report.

5.3 Existing Asphaltic Concrete Roadway Surface

The existing asphaltic concrete roadway surface can be reused as Reclaimed Asphalt Pavement (RAP) provided it is reclaimed to a 25 mm (-) condition and blended with the existing road structure fills at the site, or with imported 150 mm (-) sands and gravels. The blend should be such that there are at least three volumes of granular soil for every one of asphaltic concrete (3G:1A). This RAP material can then be reused as subgrade fill, turf and synthetic field subgrade fill, and trench backfill when moisture conditioned and compacted in accordance with this report.

6.0 FACILITY TEPORARY EXCAVATIONS AND GROUNDWATER

The following are preliminary guidelines for safe excavation geometries and groundwater control specific to the proposed facility.

6.1 Groundwater

Groundwater and groundwater seepage was measured at the borehole locations and static groundwater elevations measured within the vicinity of the proposed facility on August 26, 2024 range between 355.7 m and 356.6 m. Groundwater levels fluctuate on a seasonal basis

and it is expected that groundwater will impact the facility constructions at this site due to the proposed depths of foundations, and the proximity and water level of Mill Creek.

6.2 Construction Dewatering

The proposed excavation base is susceptible to boiling/heaving such that a well-designed dewatering program is critical to ensure that the foundation soils retain their strength during the construction phase. General guidelines for groundwater control are provided in this section and should be considered as part of the temporary excavation and shoring design for the proposed facility. Dewatering activities are expected to be continuous over the duration of the construction such that its related impact to Mill Creek should be determined by a qualified hydrogeologist.

6.2.1 Sump and Pump Dewatering

Conventional pump and sump systems should be able to maintain groundwater control during excavation where the static water level is 1.2 m, or less, above the base of excavation. Sumps and drainage trenches should be installed and spaced in order to maintain groundwater elevations to at least 300 mm below the underside of the excavated surface in its entirety.

6.2.2 Well Point and Deep Well Dewatering

A complimentary system of well points and deep wells is recommended at locations where the static water levels are more than 1.2 m above the base of the excavation. These wells can help relieve water pressures that could cause heaving and soil strength loss at the excavation base.

Well points and deep wells should be installed as required to maintain groundwater elevations at least 300 mm below the underside of the excavation in its entirety. The lowered water surface at the excavation base should be confirmed prior to allowing personnel to gain entry into the excavation. The final well point layout should be determined by a qualified dewatering contractor, on the basis of available equipment, their review of this document, and prepared in conjunction with temporary shoring design.

The proposed dewatering plan should be provided to the owner's representative prior to construction to confirm that the plan meets the project requirements.

6.3 Temporary Excavations Above Groundwater Table

Temporary excavated slopes can be made as steep as they can be safely maintained by the contractor provided that they are in compliance with the current WorkSafe BC regulations and the project requirements. If unsure of the stability of the excavation side slopes, the contractor should engage the services of a geotechnical engineer to assure compliance with the WorkSafe BC guidelines. The recommendations made in this report are guidelines and are not intended to provide assurances of excavation safety during construction.

6.4 Temporary Excavations of Dewatered Soils

For preliminary design purposes, the following unsupported and dewatered temporary excavated slope configurations can be used for the proposed excavation depths below the ground surface.

a) Depth 0 m to 2.0 m: 1.25H:1.0V
b) Depth 2.0 m to 3.0 m: 1.5H:1.0V
c) Depth 3.0 m to 5.0 m: 2.0H:1.0V

The actual stable gradients would be dependent on groundwater elevations, dewatering efforts, precipitation, surcharge loads, and methods and procedures applied at the time of construction. Recommendations related to excavation geometry, dewatering and excavation support should be provided by a qualified geotechnical engineer at the time of construction, and in compliance with WorkSafe BC guidelines.

Excavation shoring may be used throughout the site due to the high groundwater tables, proximity to Mill Creek, and existing weak soils near the surface. For preliminary design purposes, self-supporting sheet piles are considered a suitable shoring method due to the high water table and proximity to Mill creek. The use of sheet piles should consider the hydraulic connection to Mill Creek and extend down towards the fine grained Lacustrine soils at depth. Additional sheet pile recommendations can be provided during detailed design once excavation depths and building configurations are known.

7.0 PRELIMINARY SHALLOW FOUNDATION DESIGN

7.1 Discussion

Preliminary architectural drawings were not available at the time of writing this report. As reported by The Client representative, the proposed facility will be a two storey recreation centre that includes gym and fitness areas, change rooms, pool facilities and below grade mechanical rooms. Based on a proposed main floor slab elevation of 359.0 m reported by The Client representative, site grades are proposed to be raised between 0.8 m and 1.5 m above existing grades with an average site grade increase of 1.0 m across the building footprint.

The civil, architectural, mechanical, and structural design drawings should be provided to the geotechnical engineer prior to issuing finalized design drawings to ensure the recommendations provided in this report are still appropriate.

7.2 Foundation Design

7.2.1 Strip and Pad Foundations

Conventional strip and pad foundations are recommended for the facility. Irrespective of the factored bearing capacities provided in the table below no strip foundation should be less than 600 mm in width and no pad foundation should have a horizontal dimension of less than 900 mm, and perimeter foundations should be placed at least 900 mm below finished grades. Slab thickenings under non-load bearing walls should have minimum widths no less than 400 mm.

The factored bearing capacity values provided in this report for conventional shallow foundations assume that there will be at least 900 mm of engineered granular soils between the base of the foundation or slab/slab thickening and the surface of the in-situ, undisturbed soils at the site.

7.2.2 Engineered Raft Slab

Engineered reinforced raft slab foundations are recommended for below grade slabs. Factored bearing capacity values for engineered raft slabs assume that there will be at least 900 mm of engineered granular soils between the base of slab and the surface of the in-situ soils at the site. Design for raft slab foundation made in this report assume a slab dimension of 20 m x 50 m set at a depth of 4.5 m below the finished floor elevation.

A safe average modulus of subgrade reaction (k_{avg}) value equal to 6 MPa/m can be used for engineered reinforced concrete slab design above the undisturbed materials encountered at site provided that all foundation soils preparation and other recommendations made in this report are adhered to.

7.2.3 Bearing Capacity

The following factored Ultimate Limit States (ULS) and Serviceability Limit States (SLS) bearing capacities should be used for shallow foundation design on the prepared surface as described in this report, provided that all recommendations made in this report are adhered to. Resistance factors and calculated bearing capacities are and shown on the following table:

Location	ULS Bearing Capacity	SLS Bearing Capacity
Strip and Pad Foundations	250 kPa	150 kPa
20 m x 50 m raft slab	100 kPa	60 kPa

7.3 Buoyancy Protection

The groundwater table at the project site is high and influenced by Mill Creek flooding events, as reported by the hydrotechnical engineer. The potential buoyancy impacts on below grade slabs due a fluctuating groundwater table should be addressed in design.

7.4 Ground Preparation for Shallow Strip and Pad Foundations, Engineered Raft Slabs and Slab-on-Grades

The following procedures for ground preparation should be adhered to for good performance of a concrete foundations and slabs at this site:

a) Excavation procedures must conform with current WorkSafe BC regulations and guidelines.

b) All existing uncontrolled fill, organic materials, frozen soils, and all other soft and/or loose materials, should be removed within a perimeter defined as being 2.0 m outside the proposed structures. This depth includes the removal of the very loose, loose and soft alluvium materials encountered to depths ranging between 1.8 m and 2.5 m below the existing ground surface.

The excavation base of the proposed structure should be extended to at least 900 mm below the undersides of conventional strip and pad foundation and engineered raft slabs. The base of excavation below foundations and raft slabs should be continued horizontally over a width that is at least 1.0 m on all sides of the foundations, or a horizontal distance equal to the thickness of the fill below the foundation, whichever distance is greater.

There are existing underground utilities and wells located within the proposed building footprint and the utilities and wells should be decommissioned and removed within the building excavation perimeter.

The excavation should be done backwards and away from the excavation front so that the soils on the excavation base are not disturbed. The finished excavation should be inspected by the geotechnical engineer before proceeding with the construction.

c) A non-woven geotextile filter (Terrafix 200R or an approved equivalent) should be placed on the base and sides of the excavation, with joints overlapped by at least 600 mm. Clear and fractured 25 mm to 50 mm diameter drain rock should be placed on top of the geotextile in one 300 mm lift thickness and provide with nominal compaction prior to placing engineered sand and gravel backfill. The top of the drain rock surface should be covered with a non-woven geotextile filter, which overlaps the ones previously placed on the sides of the excavation.

d) Foundation soil backfill above the drain rock/geotextile preparation, to bring the excavation to 300 mm below underside of footings and engineered raft slabs, should consist of clean, 150 mm (-) sands and gravels. The foundation soil backfill should be placed in 300 mm horizontal loose lift thicknesses, moisture conditioned within 2 percent of optimum, compacted, and tested to at least 97 percent of MPD.

e) At least 300 mm of clean, fractured and well-graded 25 mm (-) sands and gravels should be placed below all foundation elements and engineered raft slabs. The engineered fill should be moisture conditioned to within 2 percent of optimum, compacted, and tested to at least 97 percent of MPD.

f) Concrete for foundations can be placed directly on the above prepared surfaces.

g) Where conventional footings are used following removal of form-work from foundations and foundation/frost walls, the areas inside of perimeter foundation walls should be backfilled to levels 150 mm below the undersides of slab-on-grade with clean, 150 mm (-) sands and gravels, that are moisture conditioned within 2 percent of optimum moisture content, placed in 300 mm thick horizontal loose lifts, compacted and tested to at least 97 percent of MPD.

i) A 150 mm thick layer of 25 mm (-) crushed sand and gravel should be placed beneath all concrete floor slab-on-grade areas, that is moisture conditioned within 2 percent of optimum, compacted and tested to at least 97 percent of MPD.

j) If radon rock is to be installed it can be substituted for the 25 mm (-) crushed sand and gravel preparation. The radon rock should consist of clear, crushed stone that ranges between 4.75 mm and 25 mm in diameter with no more than 5 percent passing the 4.75 mm sieve. The radon rock should be placed to a minimum thickness of 150 mm, and nominally compacted.

k) Concrete for floor slabs can be placed directly on the above prepared surface.

8.0 PRELIMINARY ANTI-BUOYANCY ANCHOR DESIGN

8.1 Discussion

Helical pile anchor design will be presented as a means to counter buoyancy forces of below grade raft slabs.

8.2 Preliminary Anchor Design Example

The helical anchor configuration should consist of a 114 mm round shaft (4.5 inch) pile, with three 504 mm (20 inch) helices. Helix thickness should be 12.7 mm (1/2 inch) and a helix pitch should be 76 mm (3 inch). Helix spacing should be equal to 3 times the helix diameter. Minimum pile spacing should be equal to 3 helix diameters measured from pile centres. Helical piles should be at least 15 m in length.

a) For the given parameters, the ultimate geotechnical static resistance (R_u) and seismic resistance ($R_{u\ seismic}$) for anchors bearing in the clays and clayey silts have been computed to be:

	Helical Anchor Length = 15 m
Static Analysis Ultimate Tension Resistance, R_u	520 kN
Seismic Ultimate Tension Resistance, $R_{u\ seismic}$	460 kN

b) Factored Ultimate Limit States (ULS) resistances (R_{uls}) were calculated using consequence level, typical factor of $\psi = 1.0$, and ultimate compression resistance factors (Φ_{gu}) in the following table, for anchors have been computed to be:

	ULS resistance factors, Φ_{gu}	Helical Anchor Length = 15 m
Static Analysis Factored ULS tension Resistance, R_{uls}	0.30	156 kN
Seismic Factored ULS tension Resistance, $R_{uls\ seismic}$	0.50	230 kN

8.3 Pile Load Testing

Pull out load testing should be performed at this site prior to construction, as part of the final design, with the intention of confirming pile depths and capacity. The pull out capacity should be done in accordance with ASTM D3689.

Pull out testing for helical anchors should be done during construction. Testing must be done on the first pile at the beginning of construction, with the intention of using the test pile as a production pile following confirmation that the geotechnical resistance required to support the structural loads were achieved. Load test methodologies can be discussed once acceptable construction methodologies and pile materials are known. The pull out capacity should be done in accordance with ASTM D3689 and a minimum of 10 percent of the piles should be load tested. Helical anchors can be tested immediately after installation.

If pull out load testing shows that design resistances have not been achieved then the anchors should be installed to a lower elevation and retested.

8.4 Helical Pile Contractor Submissions

Contractors that supply and install helical piles are required to provide the following documentation for review by the geotechnical engineer:

a) Helical anchor shop drawings.

b) The manufacturer drive head equipment specification and data sheets.

c) Digital torque monitor calibration certificates. Calibration certificates must be dated within 12 months of pile installation. Other methods of measuring torque will not be considered.

d) Mill certificates for helical anchors.

e) Helical anchor installation and load testing plan. Calibration certificates for all load cells and displacement transducers must be dated within 12 months of the pile load test.

9.0 FROST PROTECTION

Frost protection should be provided for exterior and perimeter structural foundations and should consist of at least 750 mm of ground cover above foundations, at least 750 mm of non frost-susceptible soils below foundations and slabs, or a combination of, placed to distance at least 750 mm horizontally outside of foundation and slab structures. Frost protection is not needed for interior foundations of heated structures.

10.0 PRELIMINARY DRAINAGE RECOMMENDATIONS

10.1 General Site Drainage

Finished outside ground surface gradients should be such that surface water is directed away from and not toward the structures.

10.2 Perimeter Foundation Drainage

Perimeter foundation drains will not be required for the facility as it relates to geotechnical considerations for good foundation performance.

10.3 Roof Drainage

Roof drainage should be done in accordance with the current edition of the British Columbia Building Code.

11.0 TRENCH EXCAVATIONS AND FILLS

11.1 Discussion

Preliminary underground utility design information was not available at the time of writing this report. On site trenching for sanitary sewer, storm sewer, water mains and shallow utilities are proposed for the site. For the purpose of this report, excavation depths are assumed to be 3.0 m, or less, below finished ground surfaces. City of Kelowna Bylaw specifications were referenced for specification and design considerations.

11.2 Dewatering

Groundwater levels are high and are expected to impact trench construction at this site. General guidelines for groundwater control are provided in this section.

11.2.1 Sump and Pump

Conventional pump and sump systems should be able to maintain groundwater control during excavation where the static water level is 1.2 m or less above the base of excavation.

11.2.2 Well Point Dewatering

At locations where static groundwater levels are higher than 1.2 m above the excavated base it is recommended to install a system of well points throughout the project in advance of the work.

Well points should be installed to maintain groundwater elevations at least 300 mm below the underside of the excavated surface in its entirety. The lowered water surface and should be confirmed prior to allowing personnel to gain entry into the excavation. The final well point layout should be in accordance with a qualified dewatering contractor, on the basis of available equipment, and their review of this document.

Water levels should be measured prior to construction to verify where well point dewatering is needed. The proposed dewatering plan should be provided to the owner's representative prior to construction to confirm that the plan meets the project requirements.

11.3 Temporary Excavations

For preliminary design purposes the following unsupported temporary excavated slope configurations for dewatered soils and soils above the ground water table can be used for the following excavated depths:

a) Depth 0 m to 2.0 m: 1.25H:1.0V
b) Depth 2.0 m to 3.0 m: 1.5H:1.0V

The actual stable gradients would be dependent on groundwater elevations, dewatering efforts, precipitation, surcharge loads and methods and procedures applied at the time of construction. Construction excavation geometry, dewatering and excavation support should be recommended by a qualified geotechnical engineer at the time of construction.

Excavation support that includes trench boxes or cage support should be used at locations where steeper side slope gradients are needed, provided that support and excavation configurations are in compliance with Worksafe BC guidelines. The contractors geotechnical engineer should recommend the final dewatering, excavation and shoring design parameters for the excavation, since one is dependent on the other.

11.4 Trench Excavation, Backfills and Pipe Zone Materials

Specifications and methods related to the trench excavations, pipe zone and trench backfill materials, construction methods and procedures, and quality assurance and control testing should conform with this report and the most recent version of the City of Kelowna Subdivision, Development and Servicing Bylaw No.7900 (CoK Bylaw). Backfill placement should not exceed a loose lift thickness of 300 mm prior to being compacted.

11.5 Foundation Soil Preparation

If the base of excavation consists of soft, weak, loose, deleterious or organic soils they should be removed until competent soils are encountered, as determined by the geotechnical engineer.

If natural moisture and groundwater conditions permit, backfill to underside of pipe bedding elevations should consist of clean, well graded 150 mm (minus) sands and gravels, or approved salvage materials, that are moisture conditioned within two percent of optimum, compacted and tested to at least 95 percent of Modified Proctor maximum dry density (MPD) in accordance with ASTM D1557. Loose lifts should not exceed a thickness of 300 mm prior to being compacted.

At locations where the base of trench consists of wet soils the following recommendations should be adhered to:

a) Sump and Pump Dewatering: All existing soft, weak, loose, deleterious or organic soils, and disturbed materials should be removed to expose competent materials, or to the underside of pipe bedding, whichever is deeper. The excavation should be further continued to an elevation at least 300 mm below the pipe invert for sump installation.

The trench base should be backfilled using 12 mm to 25 mm clear drain rock to the underside of pipe elevations and pumping operations should be maintained to keep the water levels below these levels. The surface of the drain rock should be provided with nominal compaction using a light plate tamper. The drain rock should continue to be used for pipe zone and trench backfill purposes until the surface of the drain rock is at least to the pipe spring line elevation. The drain rock should be covered with non-woven geotextile.

b) Well Point Dewatering: All existing soft, weak, loose, deleterious or organic soils, and disturbed materials should be removed to expose competent materials, or to the underside of pipe bedding, whichever is deeper: A thin layer of 25 mm clear drain rock should be placed on the base of trench excavation for bedding and levelling purposes.

The drain rock should continue to be used for pipe zone and trench backfill purposes until the surface of the drain rock is at least to the pipe spring line elevation. The drain rock should be covered with non-woven geotextile.

The above requirements should be confirmed by the geotechnical engineer at the time of construction.

12.0 PAVEMENT STRUCTURE DESIGN

12.1 General

On site pavement structure for parking and access roads are proposed for the facility and should generally used by light passenger vehicles, service trucks, and truck and trailers. Design guidance and relevant specifications were referenced from the CoK Bylaw.

Road structure design options using alternative materials and biaxial geogrids are provided for this project for cost saving purposes.

12.2 Design Qualification

Engineering assurances cannot be provided for road structures that are placed above non engineered fill. If full engineering assurances are required, all fill and other deleterious materials would need to be removed in conjunction with incorporating a structurally adequate pavement structure. Further design details for pavement structure and subgrade preparation recommendations can be provided if The Client requires engineering assurances for the proposed constructions.

The road structure design provided below will satisfy the strength requirements for the specified traffic loads but will not address frost susceptibility in its entirety. Full frost protection for at this site would require a road structure consisting of at least 750 mm of non-frost susceptible granular soils, or its equivalent in insulating value. Standard pavement structure design does not fully address potential stresses associated with shrinking/swelling clay soils.

The road structure design life assumes that a road maintenance program exists such that cracks are filled before the underlying road structure is damaged due to the introduction of excess moisture.

12.3 Pavement Structure Design Criteria

The pavement structure design life for the parking areas and access roads is 20 years. An ESAL value of 2.8×10^4 was selected for use in design and is consistent with municipal loading for local roadways and laneways.

12.4 Pavement Structure Design

Based on the gathered information, the subgrade preparation specified in Sections 12.5 and the qualifications noted above, the following minimum pavement structures for parking areas, access roads and walkways are recommended.

Option A – Full Depth Pavement Structure

THICKNESS (mm)	MATERIAL
50	CoK Surface Course Hot Mix Asphalt
100	CoK 25 mm (-) Crushed Granular Base Course
350	CoK 75 mm (-) Select Granular Subbase Course
	Subgrade Preparation Section 12.5

Option B – Where subgrade has been raised using imported pit run

THICKNESS (mm)	MATERIAL
50	CoK Surface Course Hot Mix Asphalt
100	CoK 25 mm (-) Crushed Granular Base Course
400	MMCD 150 mm (-) Pit Run Sand and Gravel
	Subgrade Preparation Section 12.5

Option C – Where subgrade has been raised using approved salvaged materials

THICKNESS (mm)	MATERIAL
50	CoK Surface Course Hot Mix Asphalt
100	CoK 25 mm (-) Crushed Granular Base Course
250	CoK 75 mm (-) Select Granular Subbase Course
	Tensar BX 1200 Biaxial Geogrid (or an approved equivalent)
	Subgrade Preparation Section 12.5

Option D – Where subgrade consists of existing pavement structure materials

THICKNESS (mm)	MATERIAL
50	CoK Surface Course Hot Mix Asphalt
100	CoK 25 mm (-) Crushed Granular Base Course
	Tensar BX 1200 Biaxial Geogrid (or an approved equivalent)
	Subgrade Preparation Section 12.5

Low Volume Vehicle Concrete Paver Structure

THICKNESS (mm)	MATERIAL
100	Concrete Paver
25	Leveling Sand
100	CoK 25 mm (-) Crushed Granular Base Course
300	CoK 75 mm (-) Select Granular Subbase Course
	Subgrade Preparation Section 12.5

Pedestrian Pathway Concrete Paver Structure

THICKNESS (mm)	MATERIAL
65	Concrete Paver
25	Leveling Sand
100	CoK 25 mm (-) Crushed Granular Base Course
250	CoK 75 mm (-) Select Granular Subbase Course
	Subgrade Preparation Section 12.5

12.5 Subgrade Preparation

The engineered subgrade for travelled surfaces should be constructed as follows:

a) Subgrade preparation should include the removal of all soils to the top of subgrade design elevation. The exposed subgrade surface should be observed by the geotechnical engineer to confirm that all obvious deleterious materials have been removed before proceeding with construction.

b) The subgrade surface excavation should extend outside the edges of the pavement and/or back of curb or sidewalk by a distance equal to the fill thickness that is to be placed beneath the paved surface.

At locations where a soil embankment must be constructed below travelled areas to support the roadway, the excavation should be further widened such that a soil embankment with a slope gradient of 2H:1V or flatter can be constructed to a point 500 mm horizontally behind the edge of pavement, at finished grade elevations.

c) Where the excavation to levels that exceed the pavement structure thickness requirements are needed, backfill materials used to elevate the subgrade to the design elevation should consist of clean, 150 mm (minus) pit run sands and gravels, or approved salvaged soils, that are moisture conditioned within two percent of optimum moisture, and compacted to at least 95 percent of MPD.

d) The finished subgrade surface should be provided with a crown or cross fall gradient of at least two percent to allow efficient drainage toward the outer edges of the roadway of any moisture that may accumulate within the finished road structure.

e) It is recommended that the finished subgrade surface be inspected, and possibly proof rolled, in its entirety in the presence of the geotechnical engineer to identify any soft or weak areas before placing pavement structure materials. Soft or weak areas should be excavated and replaced with 150 mm (-) sands and gravels that are moisture conditioned to within two percent of optimum and compacted to at least 95 percent of MPD.

f) Construction traffic should not continue to travel on any surfaces that appear to be rolling due to pumping actions at the subgrade levels, and vibratory compaction should not

continue in areas where pumping of the soils is occurring. The geotechnical engineer should be contacted immediately for advice if any of these conditions become apparent.

g) During construction, the site should be maintained in a well-drained condition throughout all phases to reduce the potential for damage to wet subgrade soils by construction traffic due to pumping actions in the native subsoils.

h) Option C and Option D: Following the finished subgrade surface observations in the presence of the geotechnical engineer, and subsequent remedial works, if any, Tensar BX 1200 biaxial geogrid, or an equivalent approved by the geotechnical engineer, should be installed at the subgrade surface design elevation. The geogrid installation should be done such that a 0.5 m overlap is provided at all joints. Installation methods and procedures should otherwise be done in accordance with the manufacturer's guidelines.

12.6 Subbase, Base, Asphalt and Concrete Constructions

Specifications and methods related to the pavement structure and concrete materials, construction procedures, and quality assurance and control should conform with this report, Master Municipal Construction Documents (MMCD), and the current CoK Bylaw

12.7 Permanent Drainage

Permanent subgrade drainage should be provided by grading, ditching, swales, French drains and/or piping. If ditching is used the base should be at least 150 mm below subgrade surface levels. The ditches should be designed to keep any intermediate or long-term flow water surfaces at levels that are below top of subgrade surfaces.

13.0 PLAYING FIELDS

13.1 Discussion

A new synthetic field is proposed to be located in the southeast parking lot of the existing facility. The remainder of the turf fields in the southwest and north of the park will be regraded to suit the new Facility. The synthetic field is proposed to be constructed after the demolition of the existing facility.

There are existing structures, parking lots, playing courts and underground infrastructure located within the turf and synthetic field perimeters. All concrete foundations, structures, and playing courts should be removed and all underground infrastructure should be assessed for possible decommissioning and removal.

Preliminary playing field structures were provided by VDZ+A Landscape Architecture (VDZ+A), dated September 13, 2024 and include a 450 mm structure for the turf fields, a 323 mm structure for the synthetic field, and a non-woven geotextile placed on the subgrade surface.

13.2 Site Grading and Settlement

An overall site grading plan was not available at the time of writing this report. As reported by the landscape architect the following preliminary site grade changes are proposed:

Southwest Turf Fields: No change
North Turf Fields: Site grade increases ± 1.0 m
Southeast Synthetic Fields: Site grade increases ± 0.5 m

As reported by VDZ+A the finishing tolerances for the turf and synthetic fields are 6 mm over 3000 mm. Provided the recommendations in this report are adhered to any subgrade differential movement should within these tolerances.

13.2 Frost Protection

Frost protection for the synthetic field should be provided by at least 750 mm of non-frost-susceptible soils below the proposed ground surface and placed to a distance at least 750 mm horizontally outside the edge of field.

13.4 Playing Field Subgrade Preparation

On the basis of structural design requirements noted in the above section, the subgrade for turf and synthetic playing field surfaces should be constructed as follows:

a) All existing turf, organic materials, asphalt, concrete, foundations, construction debris and all soft and/or loose materials should be removed from below the playing field surfaces. The excavation should be further extended to the following depths:

i) Turf Fields: Top of subgrade design elevation.
ii) Synthetic Fields: At least 750 mm below finished grades

The subgrade surface excavation should extend outside the edges of the fields by a distance equal to the fill thickness that is to be placed beneath the surface.

The base of excavation should be sloped down towards the sub-surface drainage, designed by others

A geotechnical engineer should be provided an opportunity to observe the base of excavation prior to proceeding with the engineered fill backfill stage.

b) Subgrade soil backfill placed above excavated surface should consist of clean (less than 7 percent passing the 0.075 mm diameter sieve) 150 (-) pit run sands and gravels, or approved salvaged materials. The subgrade backfill should be placed in 300 mm thick horizontal loose lifts, moisture conditioned within 2 percent of optimum, compacted, and tested to at least 95 percent of MPD.

c) Construction traffic should not continue to travel on any surfaces that appear to be rolling due to pumping actions at the subgrade levels, and vibratory compaction should not continue in areas where pumping of the soils is occurring. The geotechnical engineer should be contacted immediately for advice if any of these phenomena become apparent.

d) During the construction phase, the site should be maintained in a well-drained condition throughout the construction to reduce the potential for damage to damp subgrade soils by construction traffic due to pumping actions in the subsoils and to prevent excessive erosion of the unfinished construction during storm events.

13.4 Permanent Drainage

Preliminary designs for permanent sub-surface subgrade drainage were provided by VDZ+A, dated September 13, 2024.

Permanent surface drainage should be provided by perimeter swales and/or grading, such that water is not allowed to pond on the playing fields.

14.0 PERMANENT SITE GRADING

Unless otherwise directed or approved by the geotechnical engineer, embankment construction gradients should not be steeper than 2.0H:1V and cut slopes should not be steeper than 2.0H:1V. Cut and fill slopes should be provided with erosion protection.

Embankment constructions on existing slopes should be done in accordance with BC MoTI construction specifications, which states that the construction "...shall be terraced in a continuous series of steps a minimum of 1.5 m wide as the embankment rises".

If the above cut and fill slope recommendations are not feasible, over steepened slopes may require mechanical stabilization that may include soil retention structures. A qualified geotechnical engineer should be consulted for recommendations related to slope stability prior to any construction taken place.

15.0 PEDESTRIAN BRIDGE FOUNDATIONS

15.1 Foundation Considerations

Preliminary civil site plan drawings provided by Stantec dated November 9, 2022, show two proposed bridge alignments that are crossing Mill Creek as shown on the attached Site Plan Figure 7052-1. The bridge configuration and elevation were not known at the time of writing this report. A shallow and deep foundation options are provided in this section.

Preliminary structural design loadings and preliminary civil and structural design drawings should be provided to the geotechnical engineer during the detailed design phase.

The final civil and structural design drawings should be provided to the geotechnical engineer prior to issuing finalized drawings to ensure the recommendations provided in this report are still appropriate.

15.2 Shallow Foundation Considerations

A factored ULS bearing capacity of 250 kPa and a factored SLS bearing capacity of 150 kPa can be used for foundation design on the prepared surface as described in Section 7.4 of this report, provided that all recommendations made in this report are adhered to. Irrespective of the maximum safe allowable soil bearing capacity, no abutment foundation should have a horizontal dimension of less than 900 mm.

The depth of top of foundation elements should be below the maximum scour elevation depth of Mill Creek.

15.3 Deep Foundation Considerations

Deep foundations are being considered to support the bridge abutments and two pile options are being considered.

H-piles: A low displacement pile that relies primarily on friction for resistance. The driving resistance of piles in the clays encountered at this site is normally expected to be reduced due to high porewater pressures and disturbance to the soil structure. However, after driving the strength can be expected to increase over time due partly to thixotropic processes and partly due to consolidation of the highly stressed clays immediately surrounding the piles. This time frame for reconsolidation of the clays in order to apply loads should be considered from a construction staging point of view.

Helical Piles: A relatively low-cost deep foundation that relies on bearing resistance using helical plates acting on the clays at depth. These piles have low to negligible lateral resistance so a battered pile can be used to resist lateral forces.

Load testing would be required for both piles. Helical piles can be tested shortly after installation and H-piles should be tested 2 to 3 weeks after installation using Pile Driver Analysis (PDA) test methods once the clay has re-consolidated.

16.0 CONCLUSIONS AND RECOMMENDATIONS

It is concluded that, from a geotechnical point of view, the proposed constructions can safely proceed provided the recommendations made in this document are followed.

It is concluded that, from a geotechnical point of view,

a) The items contained in Sections 5.0 to 15.0, inclusive, of this report are followed.

b) The geotechnical engineer to inspect all soils and soils related construction on the project to assure that:

i) all soils conditions are as good or better than those inferred in this report, and that

ii) all soils and soils related construction conforms to this report, designs provided, and appropriate specifications for the work.

c) Any design(s) or other work for soils or for soils related structures connected with this project and prepared by others be submitted to the geotechnical engineer for review regarding conformity to the project requirements and intent of this report.

We trust that the contents of this report are appropriate for your immediate needs. If you should have any questions, please call our office at your convenience.

Yours truly,
Fletcher Paine Associates Ltd.

Ryan C. Stearns, P.Eng.
Geotechnical Engineer
EGBC Permit to Practice Number: 1001303

Reviewed By:

29-Jan-2025

Robert M. Scherz, P.Eng.
Review Engineer

STATEMENT OF QUALIFICATIONS AND GENERAL CONDITIONS

1. Standard of Care

This report has been prepared in accordance with generally accepted geotechnical engineering practices in this area. No other warranty, expressed or implied, is made.

2. Basis of the Report

This report has been prepared for the specific site, design objective, development and purpose that was described to Fletcher Paine Associates Ltd. (FPA) by the client and summarized in this letter. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the report are only valid to the extent that there has been no material alteration to or variation from any of the said descriptions provided to FPA, unless FPA was specifically requested by the Client to review and revise the report in light of such alteration or variation.

3. Uses of the Report

The information and opinions expressed in this report are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THIS REPORT OR ANY PORTION THEREOF WITHOUT FPA's EXPRESS WRITTEN CONSENT. FPA WILL CONSENT TO ANY REASONABLE REQUEST BY THE CLIENT TO APPROVE THE USE OF THIS REPORT BY OTHER PARTIES AS APPROVED USERS. The ownership and copyright of this report remain the property of FPA, who authorizes only the Client and Approved Users to make copies of the report, and only in such quantities as are reasonably necessary for the use of the report by those parties. The Client and Approved Users may not give, lend, sell or otherwise make available the report or any portion thereof, or any copy of the report or portion thereof, to any other party without the express written permission of FPA.

4. Complete Report

The report is of a summary nature and is not intended to stand alone without reference to the instructions given to FPA by the Client, communications between FPA and the Client, and to any other reports prepared by FPA for the Client relative to the specific site described in the report.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS, AND OPINIONS EXPRESSED IN THE REPORT, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. FPA CANNOT BE RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT.

5. Interpretation of the Report

a) Nature and Exactness of Soil Description: Classification and identification of soils, rocks, and geologic units have been based upon commonly accepted methods employed in professional geotechnical practice. This report contains descriptions of the systems and methods used. Where deviations from these systems have been used they are specifically mentioned. Classification and identification of the type and condition of soils, rocks and geologic units are judgmental in nature. Accordingly, FPA cannot warrant or guarantee the exactness of the descriptions of in situ ground conditions set forth in the Report.

b) Logs of Test Holes, Pits, Trenches, etc.: The test hole logs are a record of information obtained from field observations and laboratory testing of selected samples as well as an interpretation of the likely subsurface stratigraphy at the test holes sites. In some instances normal sampling procedures do not recover a complete or any sample. Soil, rock or geologic zones have been interpreted from the available data. The change from one zone to another, indicated on the logs as a distinct line, may be transitional. The same limitations apply to test pit and other logs.

c) Stratigraphic and Geologic Sections: The stratigraphic and geologic sections indicated on drawings contained in this report are interpreted from logs of test holes, test pits or other available information. Stratigraphy is inferred only at the locations of the test holes or pits to the extent indicated by items 5. a) and b) above. The actual geology and stratigraphy, particularly between these locations, may vary considerably from that shown on the drawings. Since natural variations in geologic conditions are inherent and a function of the historic site environment, FPA does not represent or warrant that the conditions illustrated are exact and the user of the report should recognize that variations may exist.

d) Groundwater Conditions: Groundwater conditions shown on logs of test holes and test pits, and/or given within the text of this report, record the observed conditions at the time of their measurement. Groundwater conditions may vary between test hole and test pit locations and can be affected by annual, seasonal, and special meteorological conditions, or by tidal conditions for sites near the seas. Groundwater conditions can also be altered by construction activity. These types of variation need to be considered in design and construction.

e) Changes of Exposed Ground: Many geologic materials deteriorate rapidly upon exposure to climatic elements. Deterioration may be caused by precipitation, sunshine and/or the action of frost. Therefore, site conditions may vary

considerably from the time of the making of the tests performed for preparation of the report and the time of actual construction.

f) Influence of Construction Activity: Construction activities can alter and damage the in situ ground conditions. The influence of all anticipated construction activities on the geologic environment should be considered in formulating and implementing the final design and construction techniques.

Wherever changes in the site occur after the preparation of the report or conditions are observed which indicate results clearly incompatible with the test results on which the report is based, the client and any other users of this report should notify FPA as soon as possible so that FPA will be able to provide necessary revisions to its report prior to any commencement of or alteration in design and construction.

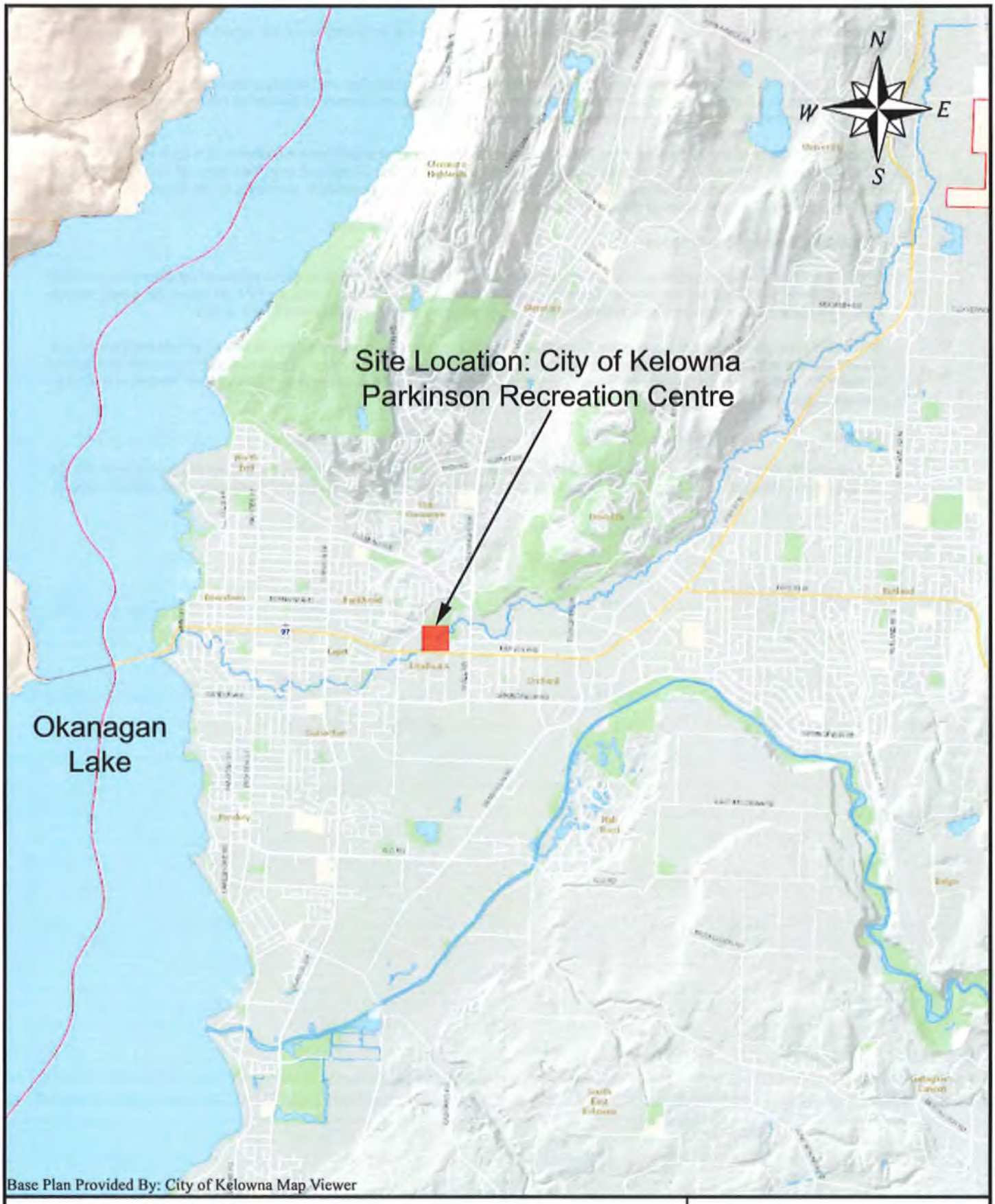
6. Observations during Construction

Observations of geologic conditions should be carried out during the site preparation, excavation and construction to verify the conditions predicted by the report. Such observations should be communicated to FPA to allow for confirmation and/or alteration of the geotechnical recommendations or design guidelines presented in the report.

Whenever changes in the site occur after the preparation of the report or conditions are observed which indicate results clearly incompatible with the test results on which the report is based, then the client should notify FPA as soon as possible so that FPA will be able to provide necessary revisions to its report prior to any commencement of or alteration in design and construction.

7. Samples

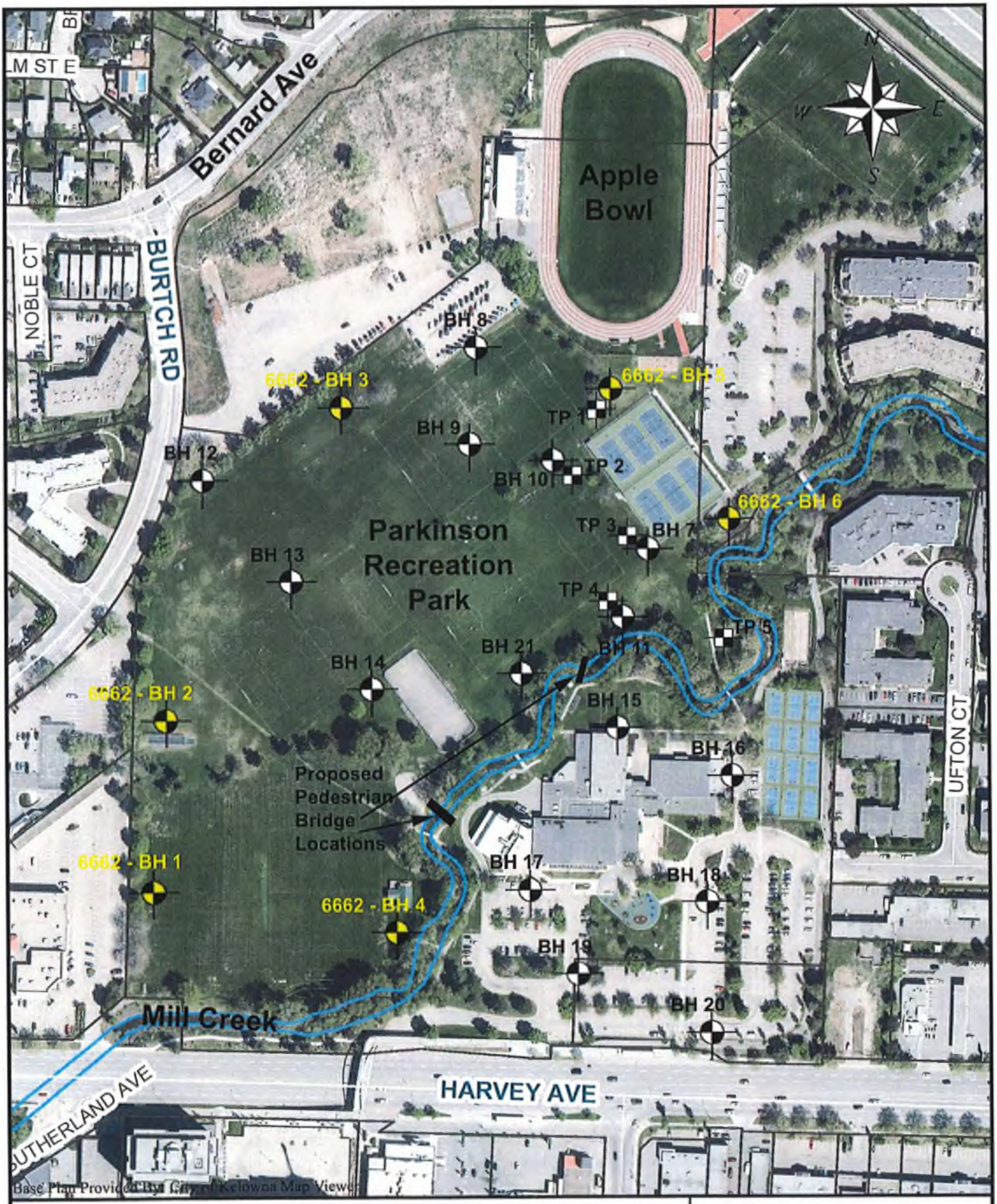
FPA normally disposes of all unused soil and rock samples after 90 days of completing the testing program for which the samples were obtained. Further storage or transfer of samples can be made at the owner's expense upon written request.



Site Location Plan

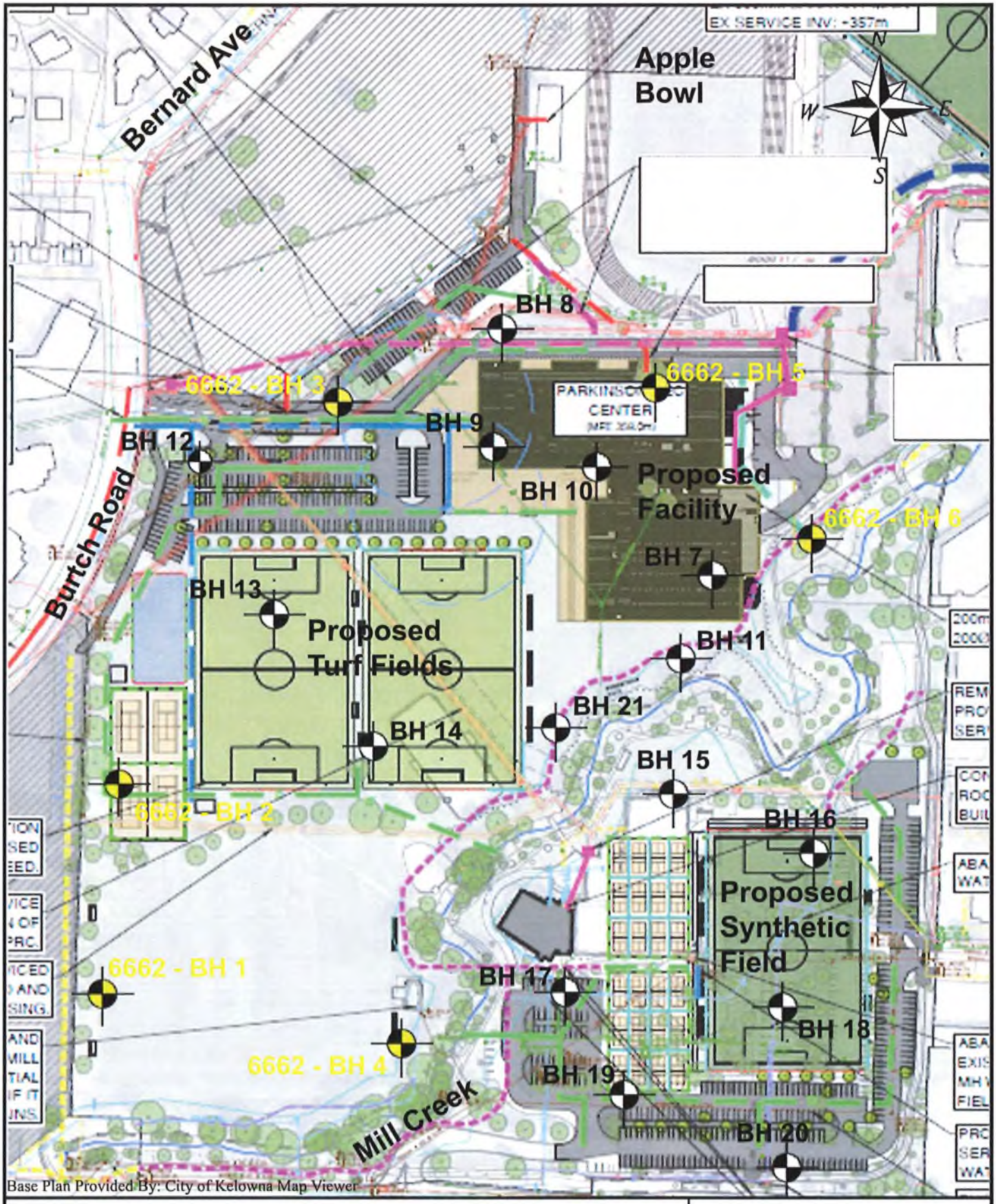
Figure: 7052-1

Date: 09-Sep-2024 | Scale: nts



Base Plan Provided By City of Kelowna Map Viewer

Site Plan	Figure: 7052-2	
	Date: 09-Sep-2024	Scale: nts



Base Plan Provided By: City of Kelowna Map Viewer

Redevelopment Plan	Figure: 7052-3	
	Date: 17-Sep-2024	Scale: nts

Record of Exploration - Borehole No. 7

Project No: 7052
Project: Parkinson Recreation Park Redevelopment
Client: City of Kelowna
Project Location: Kelowna, B.C.

Borehole Location: Figure 7052-2
Drilling Contractor: Mud Bay Drilling Ltd.
Drilling Date: July 30, 2024
Sampler Size: 150 mm diameter sonic

Approximate Elevation (m)	Depth (m)	Description	Number	Sample Type	SPT N Value	% Recovery	qu (kPa) p.p. disturbed	Su (kPa) lab vane	Dynamic Cone Penetration blows/0.3m (20 40 60 80)	Moisture Content (%) (20 40 60 80)
357.9	0	Ground Surface								
		TOPSOIL	1							9
		FILL - silt and sand, trace topsoil and organics, trace gravel, loose to compact, brown, damp	2							4
356.4	1		3							20
355.8	2	SAND - some silt, very loose, brown, wet	4		2	20				35
355.4		SILT - clayey, trace organics, medium plastic, soft to firm, grey, moist to wet	5				50			42
			6							21
	3	GRAVEL AND SAND trace silt, loose to compact, brown, wet	7		8	20				22
	4		8							14
352.7	5		9		11	10				12
352.4		CLAY - silty, trace sand seams, trace organics, medium plastic, stiff, grey, moist to wet	10							46
	6	SAND AND SILT - loose to compact, grey, wet	11							32
351.2			12		11	70				28
350.9	7	CLAY - highly plastic, stiff, brown, moist to wet	13							56
		SAND - silty, loose to compact, brown with oxidation stains, wet	14							31
350.1	8		15		7	100				40
		CLAY highly plastic, very stiff, stiff, grey, moist to wet	16							60
	9	9.1 m - trace sand seams	17				250	100		60
347.2	10									
	11	SILT trace sand, compact, grey, wet	18							24
	12		19							33
345.1	13	CLAY highly plastic, very stiff, grey, moist to wet	20							46
	14									
	15		21				250	140		49

Standpipe #1 - 0.6 m, elevation 357.3 m
Standpipe #2 - 1.7 m, elevation 356.2 m
Standpipe #3 - 1.5 m, elevation 365.4 m
Measured on August 26, 2024

Standpipe Data 1 | Standpipe Data 2 | Standpipe Data 3

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Record of Exploration - Borehole No. 7

Project No: 7052
Project: Parkinson Recreation Park Redevelopment
Client: City of Kelowna
Project Location: Kelowna, B.C.

Borehole Location: Figure 7052-2
Drilling Contractor: Mud Bay Drilling Ltd.
Drilling Date: July 30, 2024
Sampler Size: 150 mm diameter sonic

SUBSURFACE PROFILE				SAMPLE		TESTING								
Approximate Elevation (m)	Depth (m)	Symbol	Description	Number	Sample Type	SPT N Value	% Recovery	qu (kPa) p.p. disturbed	Su (kPa) lab vane	Dynamic Cone Penetration blows/0.3m ▲ 20 40 60 80 ▲	Moisture Content (%) ● 20 40 60 80 ●	Standpipe Data 1	Standpipe Data 2	Standpipe Data 3
	16													
	17			22	D						52			
	18													
	19			23				275			48			
	20			24	D						42			
336.9	21													
	22		SILT clayey, medium plastic, very stiff, grey, moist to wet	25				200	80		47			
	23			26	D			250			51			
	24			27	D						41			
	25			28				200	90		40			
	26			29	D						39			
	27													
	28			30				300			46			
	29													
	30													
327.4				31	D						52			
	31		End of borehole at 30.5 m.											

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Record of Exploration - Borehole No. 8

Project No: 7052
Project: Parkinson Recreation Park Redevelopment
Client: City of Kelowna
Project Location: Kelowna, B.C.

Borehole Location: Figure 7052-2
Drilling Contractor: Mud Bay Drilling Ltd.
Drilling Date: July 31, 2024
Sampler Size: 150 mm solid stem auger

Approximate Elevation (m)	Depth (m)	Description	Sample Number	Sample Type	qu (kPa) p.p. disturbed	Dynamic Cone Penetration blows/0.3m (20 40 60 80)	Moisture Content (%) (20 40 60 80)	Standpipe Data
358.2	0	Ground Surface						
	0	TOPSOIL						
	0.5	FILL silt, sandy, trace topsoil, compact, grey, damp	1				22	
357.1	1	SAND AND GRAVEL trace silt, compact to dense, brown, damp to wet	2				4	
	2		3				10	
	3							
	4		4				9	
353.0	5	CLAY highly plastic, stiff, grey, moist to wet	5				53	
	6		6				54	
350.6	7							
	8	End of borehole at 7.6 m. Groundwater seepage observed at 1.8 m.						
	9							
	10							
	11							
	12							

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Record of Exploration - Borehole No. 9

Project No: 7052
Project: Parkinson Recreation Park Redevelopment
Client: City of Kelowna
Project Location: Kelowna, B.C.

Borehole Location: Figure 7052-3
Drilling Contractor: Mud Bay Drilling Ltd.
Drilling Date: July 31, 2024
Sampler Size: 150 mm solid stem auger

Approximate Elevation (m)	Depth (m)	Description	Sample Number	Sample Type	qu (kPa) p.p. disturbed	Dynamic Cone Penetration blows/0.3m (20 40 60 80)	Moisture Content (%) (20 40 60 80)	Standpipe Data
358.0	0	Ground Surface						
357.4	0	TOPSOIL						
		FILL - silt, sandy, trace topsoil, compact, grey, damp	1				8	Standpipe Data 1.6 m - 26aug2024 elevation 356.4 m
356.9	1	FILL - sand, trace silt, compact, brown, damp	2				20	
356.3		FILL - silt, sandy, compact, grey, damp						
	2	SAND AND GRAVEL trace silt, compact to dense, grey, wet	3				8	
	3							
	4		4				18	
	5		5				18	
351.3	6							
	7	CLAY - highly plastic, stiff, grey with oxidation stains, moist to wet	6				49	
350.7			7				27	
350.4		SILT - sandy, compact, grey with oxidation stains, wet						
	8	End of borehole at 7.6 m.						
	9							
	10							
	11							
	12							

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Record of Exploration - Borehole No. 10

Project No: 7052
Project: Parkinson Recreation Park Redevelopment
Client: City of Kelowna
Project Location: Kelowna, B.C.

Borehole Location: Figure 7052-2
Drilling Contractor: Mud Bay Drilling Ltd.
Drilling Date: July 31, 2024
Sampler Size: 150 mm solid stem auger

Approximate Elevation (m)	Depth (m)	Description	Sample Number	Sample Type	qu (kPa) p.p. disturbed
357.9	0	Ground Surface			
		TOPSOIL			
357.1		FILL - sand, trace silt, compact, brown, damp			
	1	FILL - silt, sandy, compact, grey, damp	1		
356.4					
355.9	2	SAND - silty, loose, grey, wet	2		
		SAND AND GRAVEL trace silt, compact to dense, grey, wet			
	3		3		
	4				
	5		4		
	6				
	7		5		
	8				
348.8	9				
		End of borehole at 9.1 m.			
	10				
	11				
	12				

TESTING

Dynamic Cone Penetration blows/0.3m: 20 40 60 80

Moisture Content (%): 20 40 60 80

Standpipe Data: Standpipe Data 1.4 m - 26aug2024 elevation 356.5 m

Moisture Content values: 15, 30, 17, 10, 13

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Record of Exploration - Borehole No. 11

Project No: 7052
Project: Parkinson Recreation Park Redevelopment
Client: City of Kelowna
Project Location: Kelowna, B.C.

Borehole Location: Figure 7052-2
Drilling Contractor: Mud Bay Drilling Ltd.
Drilling Date: July 31, 2024
Sampler Size: 150 mm solid stem auger

SUBSURFACE PROFILE				SAMPLE		TESTING			
Approximate Elevation (m)	Depth (m)	Symbol	Description	Number	Sample Type	qu (kPa) p.p. disturbed	Dynamic Cone Penetration blows/0.3m (20 40 60 80)	Moisture Content (%) (20 40 60 80)	Standpipe Data
357.3	0		Ground Surface						
			TOPSOIL	1				3	
356.5			FILL - sand, trace silt, compact, brown, damp						
	1		SILT sandy, trace organics, loose, grey, damp	2				40	Standpipe Data 1.3 m - 26aug2024 elevation 356.0 m
355.5									
	2		SAND AND GRAVEL trace silt, compact to dense, grey, wet						
	3			3				16	
	4								
	5			4				9	
351.5									
351.2	6		SAND - silty, compact, brown, wet						
			SAND AND GRAVEL trace silt, dense, brown, wet	5				12	
	7								
349.4									
349.1	8		SAND - silty, compact, grey, wet	6				35	
			SAND AND GRAVEL trace silt, dense, brown, wet						
	9								
347.2	10			7				50	
			CLAY highly plastic, stiff to very stiff, grey, moist to wet			200			
	11								
345.1	12					175			
			End of borehole at 12.2 m.						

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Record of Exploration - Borehole No. 12

Project No: 7052
Project: Parkinson Recreation Park Redevelopment
Client: City of Kelowna
Project Location: Kelowna, B.C.

Borehole Location: Figure 7052-2
Drilling Contractor: Mud Bay Drilling Ltd.
Drilling Date: August 1, 2024
Sampler Size: 150 mm solid stem auger

Approximate Elevation (m)	Depth (m)	Description	Sample Number	Sample Type	qu (kPa) p.p. disturbed	Dynamic Cone Penetration blows/0.3m (20 40 60 80)	Moisture Content (%) (20 40 60 80)	Standpipe Data
357.0	0	Ground Surface						
	0	TOPSOIL	1				7	Standpipe Data 1.3 m - 26aug2024 elevation 355.7 m
356.2	1	FILL - sand and gravel, trace silt, compact, brown, damp	2				15	
355.5		FILL - sand, silty, some gravel, compact grey, damp						
355.2		SILT - sandy, loose, grey, wet	3				27	
	2	SAND AND GRAVEL trace silt, compact, grey, wet	4				20	
354.0	3	End of borehole at 3.0 m.						
	4							
	5							
	6							
	7							
	8							
	9							
	10							
	11							
	12							

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Record of Exploration - Borehole No. 13

Project No: 7052
Project: Parkinson Recreation Park Redevelopment
Client: City of Kelowna
Project Location: Kelowna, B.C.

Borehole Location: Figure 7052-2
Drilling Contractor: Mud Bay Drilling Ltd.
Drilling Date: August 1, 2024
Sampler Size: 150 mm solid stem auger

SUBSURFACE PROFILE				SAMPLE		TESTING			
Approximate Elevation (m)	Depth (m)	Symbol	Description	Number	Sample Type	qu (kPa) p.p. disturbed	Dynamic Cone Penetration blows/0.3m (20 40 60 80)	Moisture Content (%) (20 40 60 80)	Standpipe Data
356.9	0		Ground Surface						
356.3	0		TOPSOIL	1				7	
			FILL - sand, trace silt, compact, brown, damp						
	1		SILT - sandy, loose to compact, grey with oxidation stains, damp to wet	2				23	
354.8	2		SAND AND GRAVEL trace silt, compact, grey, wet	3				15	
353.9	3		End of borehole at 3.0 m. Groundwater seepage observed at 1.5 m.						
	4								
	5								
	6								
	7								
	8								
	9								
	10								
	11								
	12								

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Record of Exploration - Borehole No. 14

Project No: 7052
Project: Parkinson Recreation Park Redevelopment
Client: City of Kelowna
Project Location: Kelowna, B.C.

Borehole Location: Figure 7052-2
Drilling Contractor: Mud Bay Drilling Ltd.
Drilling Date: August 1, 2024
Sampler Size: 150 mm solid stem auger

SUBSURFACE PROFILE				SAMPLE		TESTING			
Approximate Elevation (m)	Depth (m)	Symbol	Description	Number	Sample Type	qu (kPa) p.p. disturbed	Dynamic Cone Penetration blows/0.3m (▲ 20 40 60 80 ▲)	Moisture Content (%) (● 20 40 60 80 ●)	Standpipe Data
356.5	0		Ground Surface						
356.0			TOPSOIL						
355.7			FILL - sand, trace silt, compact, brown, damp						
355.3	1		SILT - sandy, loose, grey, damp	1		250		25	
355.0			CLAY - silty, medium plastic, very stiff, grey, moist						
	2		SAND - silty, compact, grey, damp to wet						
353.5			SAND AND GRAVEL trace silt, compact, grey, damp	2				12	
	3		End of borehole at 3.0 m. Groundwater seepage observed at 1.4 m.						
	4								
	5								
	6								
	7								
	8								
	9								
	10								
	11								
	12								

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Record of Exploration - Borehole No. 15

Project No: 7052
Project: Parkinson Recreation Park Redevelopment
Client: City of Kelowna
Project Location: Kelowna, B.C.

Borehole Location: Figure 7052-2
Drilling Contractor: Mud Bay Drilling Ltd.
Drilling Date: July 31, 2024
Sampler Size: 150 mm solid stem auger

SUBSURFACE PROFILE				SAMPLE		TESTING			
Approximate Elevation (m)	Depth (m)	Symbol	Description	Number	Sample Type	qu (kPa) p.p. disturbed	Dynamic Cone Penetration blows/0.3m (▲ 20 40 60 80)	Moisture Content (%) (● 20 40 60 80)	Standpipe Data
356.6	0		Ground Surface						
356.0			TOPSOIL						
355.7			SAND - silty, loose, brown, damp	1				13	
	1			2		140		38	
355.2			CLAY - silty, medium plastic, stiff, brown, moist to wet						
			SAND AND GRAVEL trace silt, compact, grey, wet	3				13	
	2							Standpipe Data 1.2 m - 26aug2024 elevation 355.4 m	
	3								
				4				14	
352.0	4								
			End of borehole at 4.6 m.						
	5								
	6								
	7								
	8								
	9								
	10								
	11								
	12								

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Record of Exploration - Borehole No. 16

Project No: 7052
Project: Parkinson Recreation Park Redevelopment
Client: City of Kelowna
Project Location: Kelowna, B.C.

Borehole Location: Figure 7052-2
Drilling Contractor: Mud Bay Drilling Ltd.
Drilling Date: July 31, 2024
Sampler Size: 150 mm solid stem auger

Approximate Elevation (m)	Depth (m)	Description	Sample Number	Sample Type	qu (kPa) p.p. disturbed	Dynamic Cone Penetration blows/0.3m (20 40 60 80)	Moisture Content (%) (20 40 60 80)	Standpipe Data
457.4	0	Ground Surface						
456.8	0	ASPHALT - 50 mm	1				5	
		FILL - sand and gravel, trace silt, compact, brown,						
456.2	1	FILL - silt and sand, trace topsoil, trace gravel, compact, brown, damp	2				15	
		SAND AND GRAVEL trace silt, compact, brown and grey, wet	3				10	
454.4	3	SILT some clay, some sand, low plastic, firm, grey, moist to wet	4				36	
453.1	4							
452.8		SAND - gravelly, compact, grey, wet						
	5	End of borehole at 4.6 m. Groundwater seepage observed at 1.2 m.						
	6							
	7							
	8							
	9							
	10							
	11							
	12							

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Record of Exploration - Borehole No. 17

Project No: 7052
Project: Parkinson Recreation Park Redevelopment
Client: City of Kelowna
Project Location: Kelowna, B.C.

Borehole Location: Figure 7052-2
Drilling Contractor: Mud Bay Drilling Ltd.
Drilling Date: July 31, 2024
Sampler Size: 150 mm solid stem auger

SUBSURFACE PROFILE				SAMPLE		TESTING			
Approximate Elevation (m)	Depth (m)	Symbol	Description	Number	Sample Type	qu (kPa) p.p. disturbed	Dynamic Cone Penetration blows/0.3m (▲ 20 40 60 80 ▲)	Moisture Content (%) (● 20 40 60 80 ●)	Standpipe Data
356.0	0		Ground Surface						
355.4			ASPHALT - 60 mm						
			FILL - sand, some gravel, grey, compact, damp	1				5	
354.8	1		SILT - sandy, trace clay, loose to compact, grey, wet	2				30	
			SAND AND GRAVEL trace silt, compact, grey, wet	3				12	
353.0	3		End of borehole at 3.0 m. Groundwater seepage observed at 1.1 m.						
	4								
	5								
	6								
	7								
	8								
	9								
	10								
	11								
	12								

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Record of Exploration - Borehole No. 18

Project No: 7052
Project: Parkinson Recreation Park Redevelopment
Client: City of Kelowna
Project Location: Kelowna, B.C.

Borehole Location: Figure 7052-2
Drilling Contractor: Mud Bay Drilling Ltd.
Drilling Date: July 31, 2024
Sampler Size: 150 mm solid stem auger

Approximate Elevation (m)	Depth (m)	Description	Number	Sample Type	qu (kPa) p.p. disturbed	Dynamic Cone Penetration blows/0.3m (20 40 60 80)	Moisture Content (%) (20 40 60 80)	Standpipe Data
357.2	0	Ground Surface						
356.6	0	ASPHALT - 30 mm	1				4	
356.3	0	FILL - sand and gravel, trace silt, compact, brown,						
355.7	1	FILL - silt and sand, trace gravel, compact, grey, damp	2				23	
	2	SAND - silty, loose to compact, grey, damp 1.35 m - 150 mm thick peat seam						
353.8	2	SAND AND GRAVEL compact, grey, wet	3				12	Standpipe Data 1.4 m - 26aug2024 elevation 355.8 m
352.9	3	SILT some clay, some sand, low plastic, firm, wet	4				30	
352.6	4	SAND AND SILT - loose, grey, wet						
	5	End of borehole at 4.6 m.						
	6							
	7							
	8							
	9							
	10							
	11							
	12							

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Record of Exploration - Borehole No. 19

Project No: 7052
Project: Parkinson Recreation Park Redevelopment
Client: City of Kelowna
Project Location: Kelowna, B.C.

Borehole Location: Figure 7052-2
Drilling Contractor: Mud Bay Drilling Ltd.
Drilling Date: July 31, 2024
Sampler Size: 150 mm solid stem auger

Approximate Elevation (m)	Depth (m)	Symbol	Description	Number	Sample Type	qu (kPa) p.p. disturbed	Dynamic Cone Penetration blows/0.3m (20 40 60 80)	Moisture Content (%) (20 40 60 80)	Standpipe Data
356.3	0		Ground Surface						
355.7	0		ASPHALT - 50 mm	1				4	
	0		FILL - sand and gravel, trace silt, compact, brown,						
	1		SAND gravelly, trace silt, interlayered sand seams, compact, brown, damp to wet	2				12	
	2			3				19	
353.3	3		End of borehole at 3.0 m. Groundwater seepage observed at 0.9 m.						
	4								
	5								
	6								
	7								
	8								
	9								
	10								
	11								
	12								

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Record of Exploration - Borehole No. 20

Project No: 7052
Project: Parkinson Recreation Park Redevelopment
Client: City of Kelowna
Project Location: Kelowna, B.C.

Borehole Location: Figure 7052-2
Drilling Contractor: Mud Bay Drilling Ltd.
Drilling Date: July 31, 2024
Sampler Size: 150 mm solid stem auger

Approximate Elevation (m)	Depth (m)	Description	Sample Number	Sample Type	qu (kPa) p.p. disturbed	Dynamic Cone Penetration blows/0.3m (20 40 60 80)	Moisture Content (%) (20 40 60 80)	Standpipe Data
356.5	0	Ground Surface						
355.9	0	ASPHALT - 50 mm	1				4	
		FILL - sand, gravelly, trace silt, compact, brown, damp						
	1	SAND silty, compact, brown with oxidation stains, damp to wet	2				23	
355.0								
354.7		CLAY - silty, stiff, medium plastic, grey, wet						
	2	SAND AND GRAVEL compact, grey, wet	3				12	
	3							
352.5	4							
351.9		SAND - some silt, loose to compact, grey, wet	4				21	
	5	End of borehole at 4.6 m. Groundwater seepage observed at 1.2 m.						
	6							
	7							
	8							
	9							
	10							
	11							
	12							

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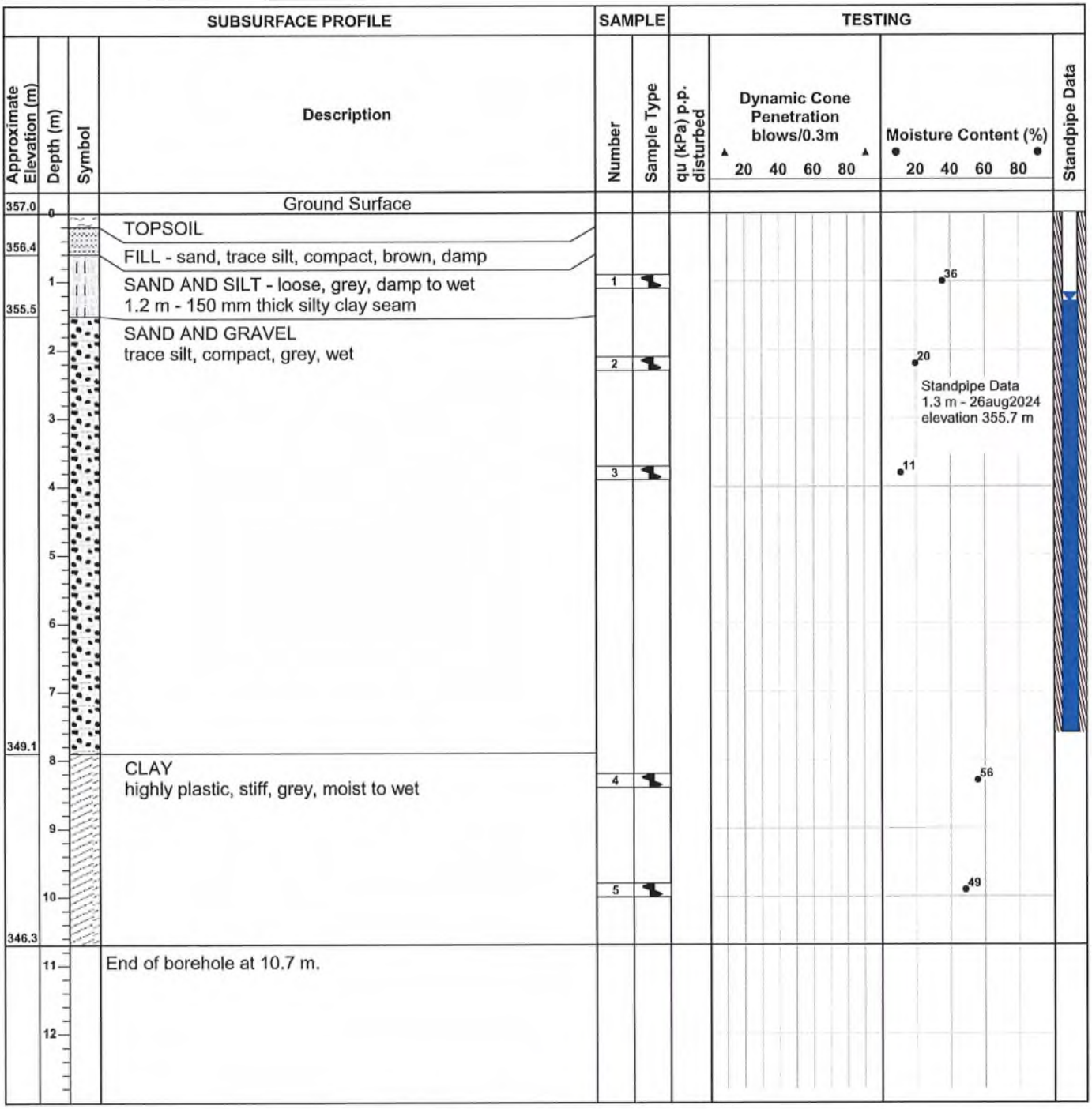
Record of Exploration - Borehole No. 21

Project No: 7052
Project: Parkinson Recreation Park Redevelopment
Client: City of Kelowna
Project Location: Kelowna, B.C.

Borehole Location: Figure 7052-2
Drilling Contractor: Mud Bay Drilling Ltd.
Drilling Date: August 1, 2024
Sampler Size: 150 mm solid stem auger



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Record of Exploration - Test Pit No. 1

Project No: 7052
Project: Parkinson Recreation Park Redevelopment
Client: City of Kelowna
Project Location: Kelowna, B.C.

Test Pit Location: Figure 7052-2
Excavation Contractor: Redline Bobcat Services Ltd.
Excavation Date: December 13, 2024
Excavation Method: mini excavator

SUBSURFACE PROFILE				SAMPLE		TESTING
Approximate Elevation (m)	Depth (m)	Symbol	Description	Number	Sample Type	Moisture Content (%) 20 40 60 80
358.1	0.0		Ground Surface			
			FILL mixture of topsoil, sand and silt, some gravel, occasional asphalt debris and boulders, loose, brown, damp			
	0.5					
357.2			SAND gravelly, trace silt, compact, brown, damp	1	G	•
356.9	1.0					
			End of test pit at 1.2 m. No groundwater seepage observed.			
	1.5					
	2.0					

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Record of Exploration - Test Pit No. 2

Project No: 7052
Project: Parkinson Recreation Park Redevelopment
Client: City of Kelowna
Project Location: Kelowna, B.C.

Test Pit Location: Figure 7052-2
Excavation Contractor: Redline Bobcat Services Ltd.
Excavation Date: December 13, 2024
Excavation Method: mini excavator

SUBSURFACE PROFILE				SAMPLE		TESTING
Approximate Elevation (m)	Depth (m)	Symbol	Description	Number	Sample Type	Moisture Content (%) 20 40 60 80
357.9	0.0		Ground Surface			
357.7			TOPSOIL			
357.4			FILL pitrun sand, trace silt, occasional cobbles, compact, brown, damp			
	0.5		FILL silt, some clay, trace sand, trace gravel, compact, grey, damp			
357.0				1	G	•
	1.0		End of test pit at 0.9 m. No groundwater seepage observed.			
	1.5					
	2.0					

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Record of Exploration - Test Pit No. 3

Project No: 7052
Project: Parkinson Recreation Park Redevelopment
Client: City of Kelowna
Project Location: Kelowna, B.C.

Test Pit Location: Figure 7052-2
Excavation Contractor: Redline Bobcat Services Ltd.
Excavation Date: December 13, 2024
Excavation Method: mini excavator

SUBSURFACE PROFILE				SAMPLE		TESTING
Approximate Elevation (m)	Depth (m)	Symbol	Description	Number	Sample Type	Moisture Content (%) 20 40 60 80
357.9	0.0		Ground Surface			
357.7			TOPSOIL			
			FILL pitrun sand, trace silt, compact, brown, damp			
	0.5			1	G	•
357.2						
357.0			FILL silt, sandy, some gravel, compact, grey, damp			
	1.0		SILT AND SAND trace organics, compact, grey, damp			
356.7				2	G	•
			End of test pit at 1.2 m. No groundwater seepage observed.			
	1.5					
	2.0					

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Record of Exploration - Test Pit No. 4

Project No: 7052
Project: Parkinson Recreation Park Redevelopment
Client: City of Kelowna
Project Location: Kelowna, B.C.

Test Pit Location: Figure 7052-2
Excavation Contractor: Redline Bobcat Services Ltd.
Excavation Date: December 13, 2024
Excavation Method: mini excavator

SUBSURFACE PROFILE				SAMPLE		TESTING
Approximate Elevation (m)	Depth (m)	Symbol	Description	Number	Sample Type	Moisture Content (%) 20 40 60 80
357.2	0.0		Ground Surface			
357.1			TOPSOIL			
356.6	0.5		FILL pitrun sand, trace silt, compact, brown, damp			
356.3			FILL mixture of silt, sand, and gravel, trace cobble, compact, grey, damp			
356.2	1.0		SAND AND SILT - compact, grey, damp	1	G	•
			End of test pit at 1.0 m. No groundwater seepage observed.			
	1.5					
	2.0					

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Record of Exploration - Test Pit No. 5

Project No: 7052
Project: Parkinson Recreation Park Redevelopment
Client: City of Kelowna
Project Location: Kelowna, B.C.

Test Pit Location: Figure 7052-2
Excavation Contractor: Redline Bobcat Services Ltd.
Excavation Date: December 13, 2024
Excavation Method: mini excavator

SUBSURFACE PROFILE				SAMPLE		TESTING
Approximate Elevation (m)	Depth (m)	Symbol	Description	Number	Sample Type	Moisture Content (%) 20 40 60 80
357.4	0.0		Ground Surface			
357.3			TOPSOIL			
357.0			FILL pitrun sand, trace silt, compact, brown, damp			
356.5	0.5		FILL sand and silt, some gravel, compact, grey, damp			
356.4	1.0		SAND AND SILT - compact, grey, wet			
			End of test pit at 1.0 m. No groundwater seepage observed.			
	1.5					
	2.0					

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Consulting Geotechnical and Materials Engineers

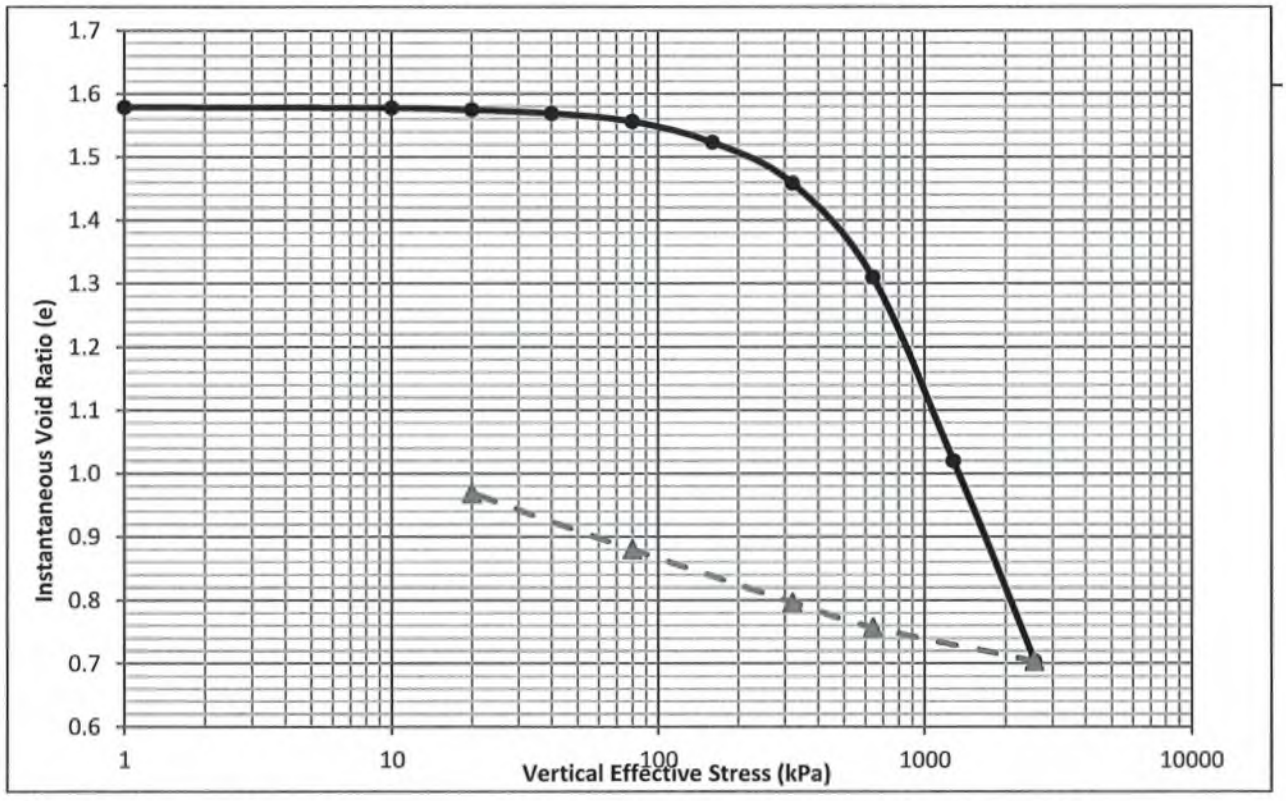
One-Dimensional Consolidation Properties of Soils

ASTM D2435 - Method B

Project:	Parkinson Recreation Park Redevelopment	**Project No:**	7052
Client:	City of Kelowna	**Sample Date:**	30-Jul-2024
Location:	Kelowna, B.C.	**Tested By:**	SV
Sample:	Borehole 7, Sample 17, Depth 9.4 m	**Test Date:**	6-Aug-2024

Soil Description: highly plastic clay
Soil Preparation Process: undisturbed sample taken directly from thin-walled shelby tube
Test Equipment: Wykeham Farrance Consolidometer Model No. 24001 - #1
Water Source: Tap Water

Initial Moisture Content	60.1%	**In situ Effective Stress, σ':**	92 kPa
Liquid Limit:	87	**Preconsolidation Pressure, σ'_p:**	440 kPa
Plastic Limit:	28	**Approximate Specific Gravity, G_s:**	2.7
Plasticity Index:	59	**Initial Void Ratio e_0:**	1.55



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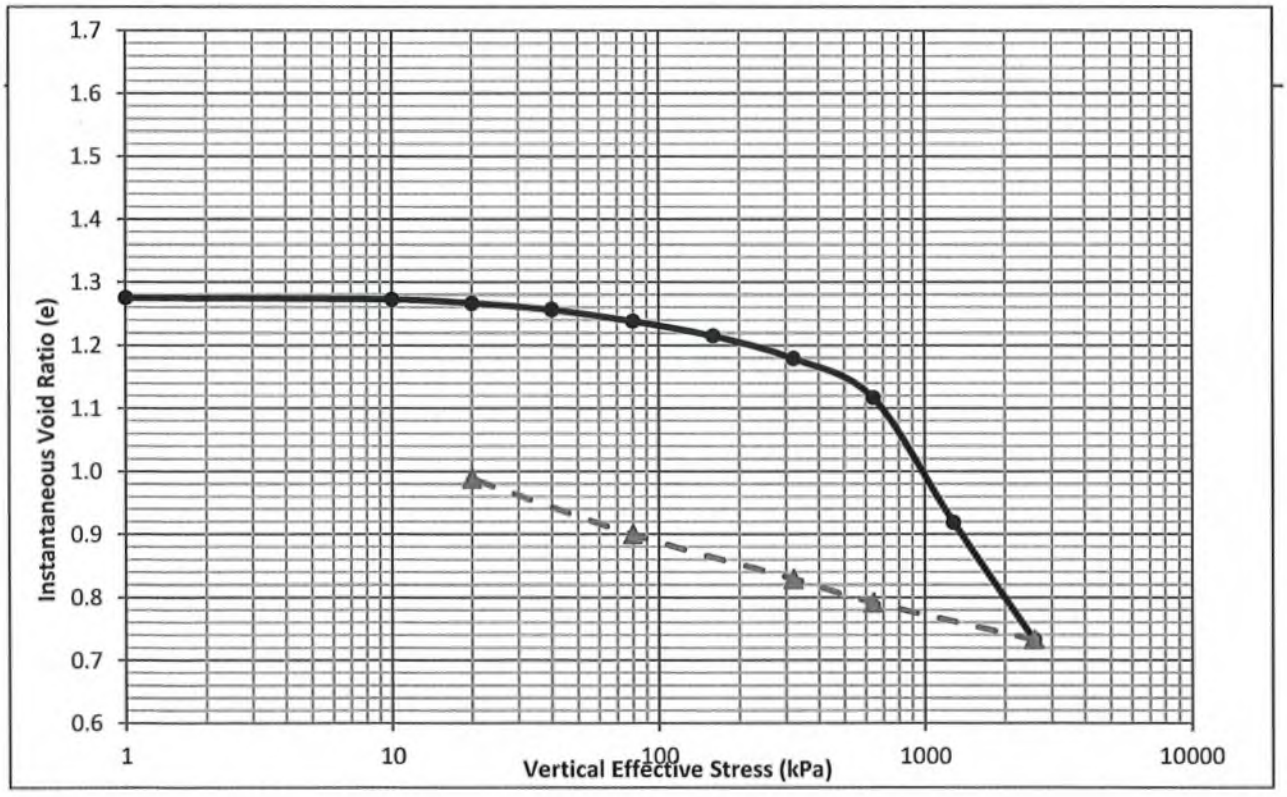
One-Dimensional Consolidation Properties of Soils

ASTM D2435 - Method B

Project:	Parkinson Recreation Park Redevelopment	**Project No:**	7052
Client:	City of Kelowna	**Sample Date:**	30-Jul-2024
Location:	Kelowna, B.C.	**Tested By:**	SV
Sample:	Borehole 7, Sample 21, Depth 15.3 m	**Test Date:**	6-Aug-2024

Soil Description: highly plastic clay
Soil Preparation Process: undisturbed sample taken directly from thin-walled shelby tube
Test Equipment: Wykeham Farrance Consolidometer Model No. 24001 - #2
Water Source: Tap Water

Initial Moisture Content	48.9%	**In situ Effective Stress, σ':**	140 kPa
Liquid Limit:	72	**Preconsolidation Pressure, σ'_p:**	580 kPa
Plastic Limit:	28	**Approximate Specific Gravity, G_s:**	2.7
Plasticity Index:	44	**Initial Void Ratio e_0:**	1.22



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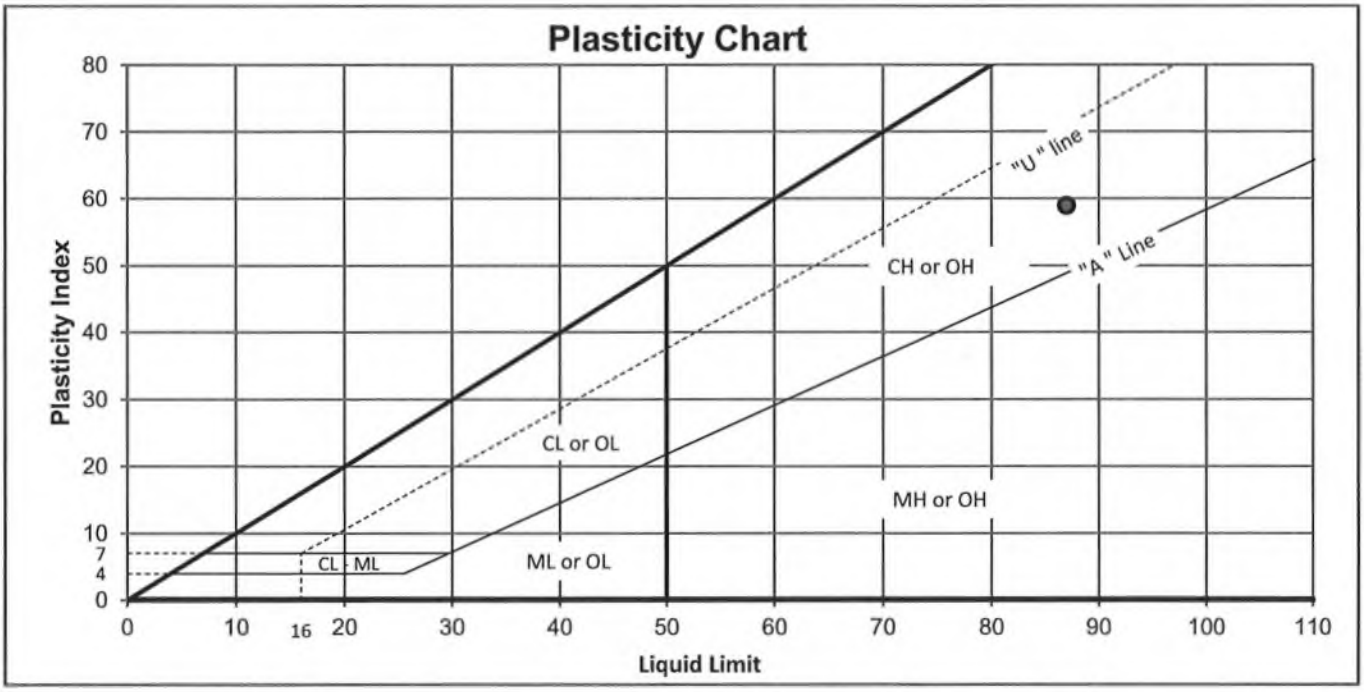
ATTERBERG LIQUID LIMIT AND PLASTIC LIMIT DETERMINATION

ASTM D4318

Project: Parkinson Recreation Park Redevelopment
Project No: 7052
Client: City of Kelowna
Date Sampled: July 30, 2024
Location: Kelowna, B.C.
Sampled By: AC
Sample: Borehole 7, Sample 17, Depth 9.3 m

Sample Preparation: Wet preparation method
Test Equipment: Liquid Limit - mechanical device, multi-point method, plastic grooving tool
Plastic Limit - hand rolled

Natural Moisture Content:	**56%**
Estimated % retained on 0.425 mm sieve:	**0%**
Liquid Limit:	**87**
Plastic Limit:	**28**
Plasticity Index:	**59**
USCS Classification:	**CH**



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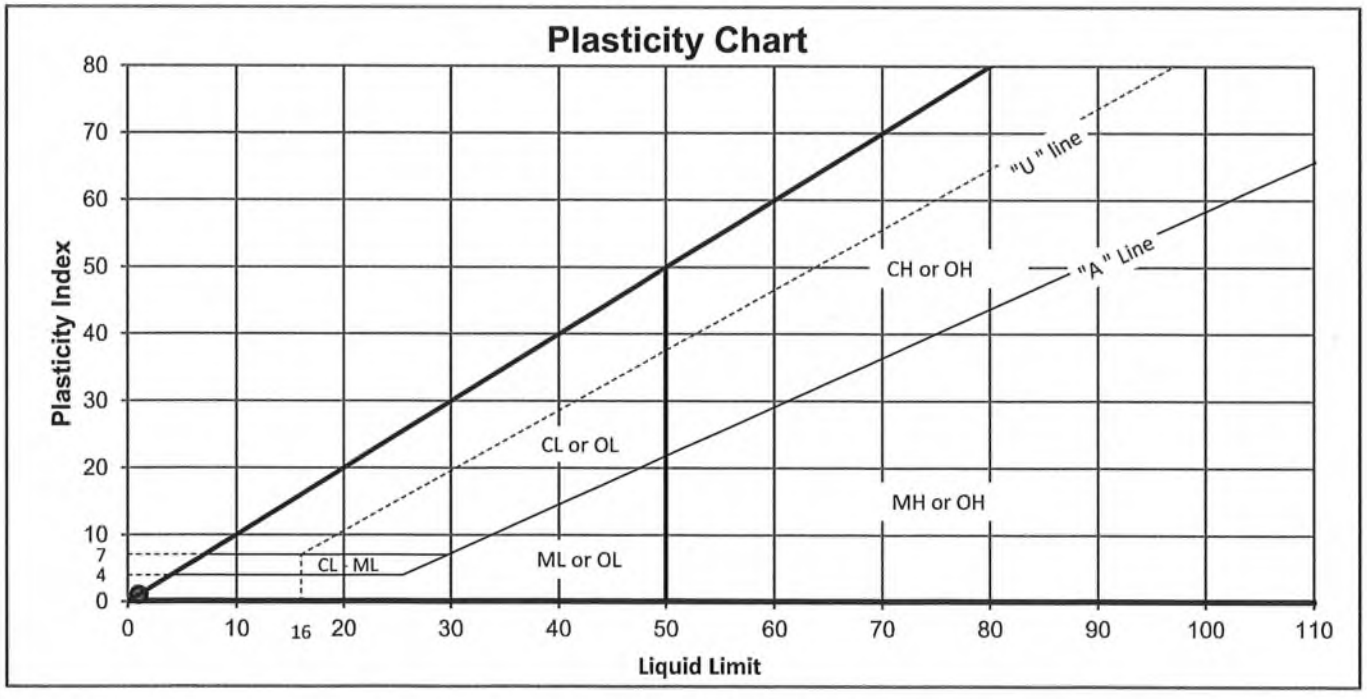
ATTERBERG LIQUID LIMIT AND PLASTIC LIMIT DETERMINATION

ASTM D4318

Project: Parkinson Recreation Park Redevelopment
Project No: 7052
Client: City of Kelowna
Date Sampled: July 30, 2024
Location: Kelowna, B.C.
Sampled By: AC
Sample: Borehole 7, Sample 18, Depth 11.3 m

Sample Preparation: Wet preparation method
Test Equipment: Liquid Limit - mechanical device, multi-point method, plastic grooving tool
Plastic Limit - hand rolled

Natural Moisture Content:	**24%**
Estimated % retained on 0.425 mm sieve:	**0%**
Liquid Limit:	**-**
Plastic Limit:	**-**
Plasticity Index:	**Non-Plastic**



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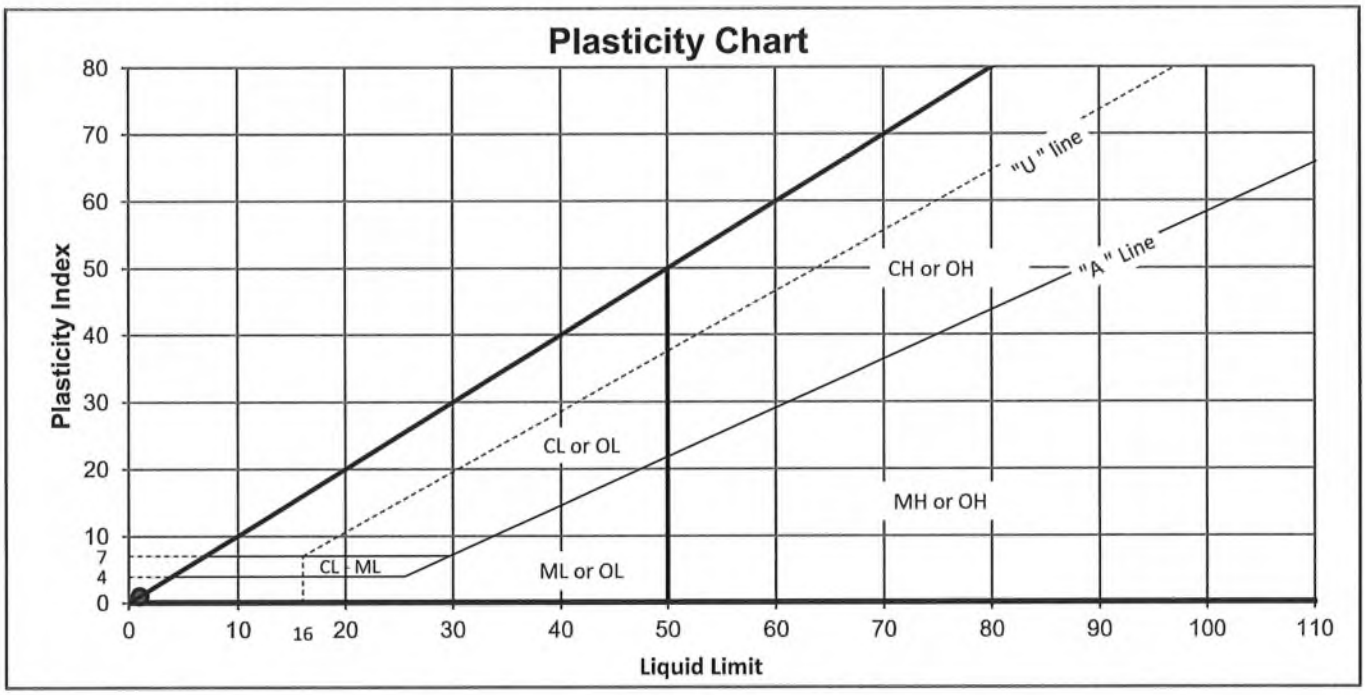
ATTERBERG LIQUID LIMIT AND PLASTIC LIMIT DETERMINATION

ASTM D4318

Project: Parkinson Recreation Park Redevelopment
Project No: 7052
Client: City of Kelowna
Date Sampled: July 30, 2024
Location: Kelowna, B.C.
Sampled By: AC
Sample: Borehole 7, Sample 19, Depth 12.3 m

Sample Preparation: Wet preparation method
Test Equipment: Liquid Limit - mechanical device, multi-point method, plastic grooving tool
Plastic Limit - hand rolled

Natural Moisture Content:	**34%**
Estimated % retained on 0.425 mm sieve:	**0%**
Liquid Limit:	**-**
Plastic Limit:	**-**
Plasticity Index:	**Non-Plastic**



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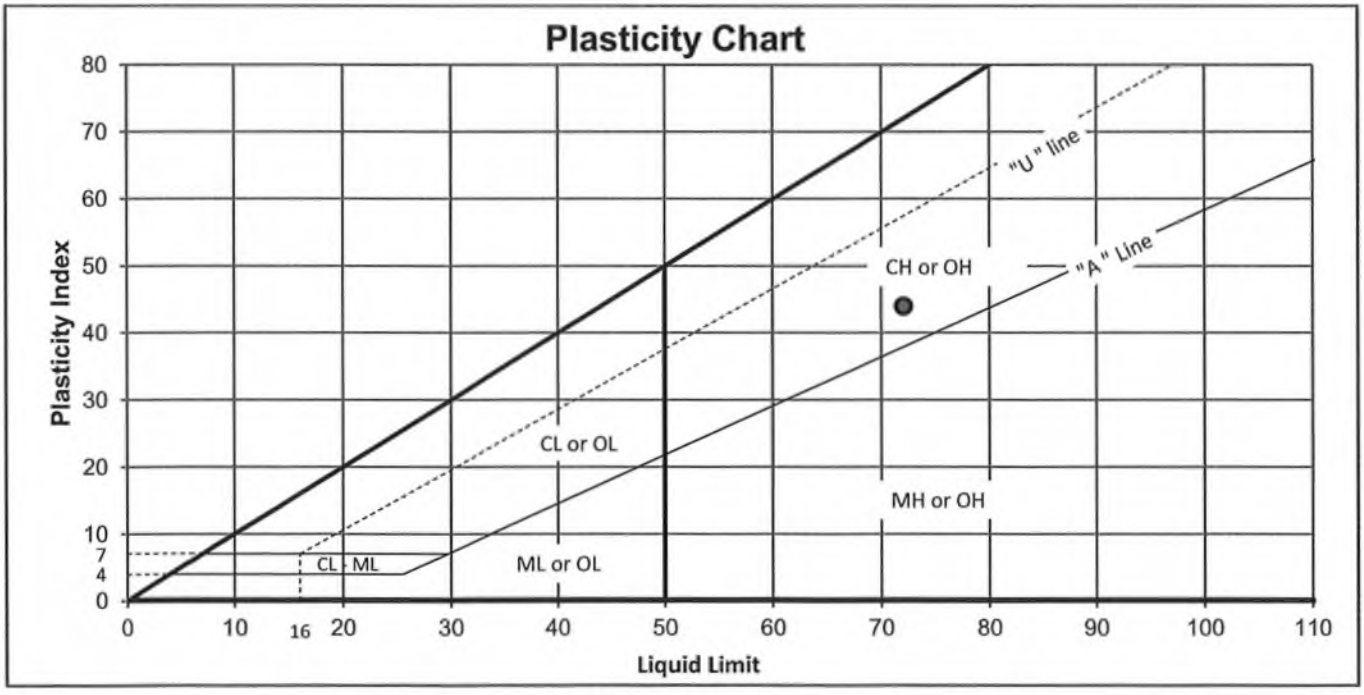
ATTERBERG LIQUID LIMIT AND PLASTIC LIMIT DETERMINATION

ASTM D4318

Project: Parkinson Recreation Park Redevelopment
Project No: 7052
Client: City of Kelowna
Date Sampled: July 30, 2024
Location: Kelowna, B.C.
Sampled By: RCS
Sample: Borehole 7, Sample 21, Depth 15.3 m

Sample Preparation: Wet preparation method
Test Equipment: Liquid Limit - mechanical device, multi-point method, plastic grooving tool
Plastic Limit - hand rolled

Natural Moisture Content:	**49%**
Estimated % retained on 0.425 mm sieve:	**0%**
Liquid Limit:	**72**
Plastic Limit:	**28**
Plasticity Index:	**44**
USCS Classification:	**CH**



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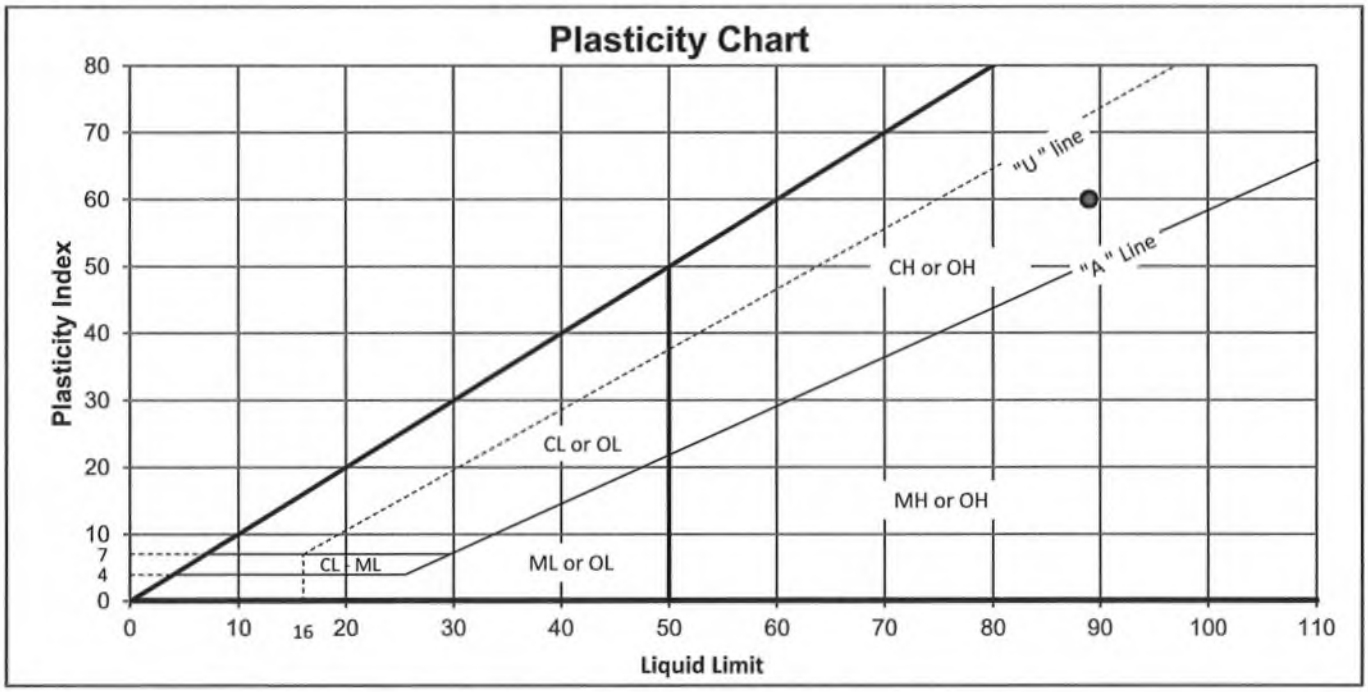
ATTERBERG LIQUID LIMIT AND PLASTIC LIMIT DETERMINATION

ASTM D4318

Project: Parkinson Recreation Park Redevelopment
Project No: 7052
Client: City of Kelowna
Date Sampled: July 31, 2024
Location: Kelowna, B.C.
Sampled By: AC
Sample: Borehole 7, Sample 22, Depth 16.5 m

Sample Preparation: Wet preparation method
Test Equipment: Liquid Limit - mechanical device, multi-point method, plastic grooving tool
Plastic Limit - hand rolled

Natural Moisture Content:	**52%**
Estimated % retained on 0.425 mm sieve:	**0%**
Liquid Limit:	**89**
Plastic Limit:	**29**
Plasticity Index:	**60**
USCS Classification:	**CH**



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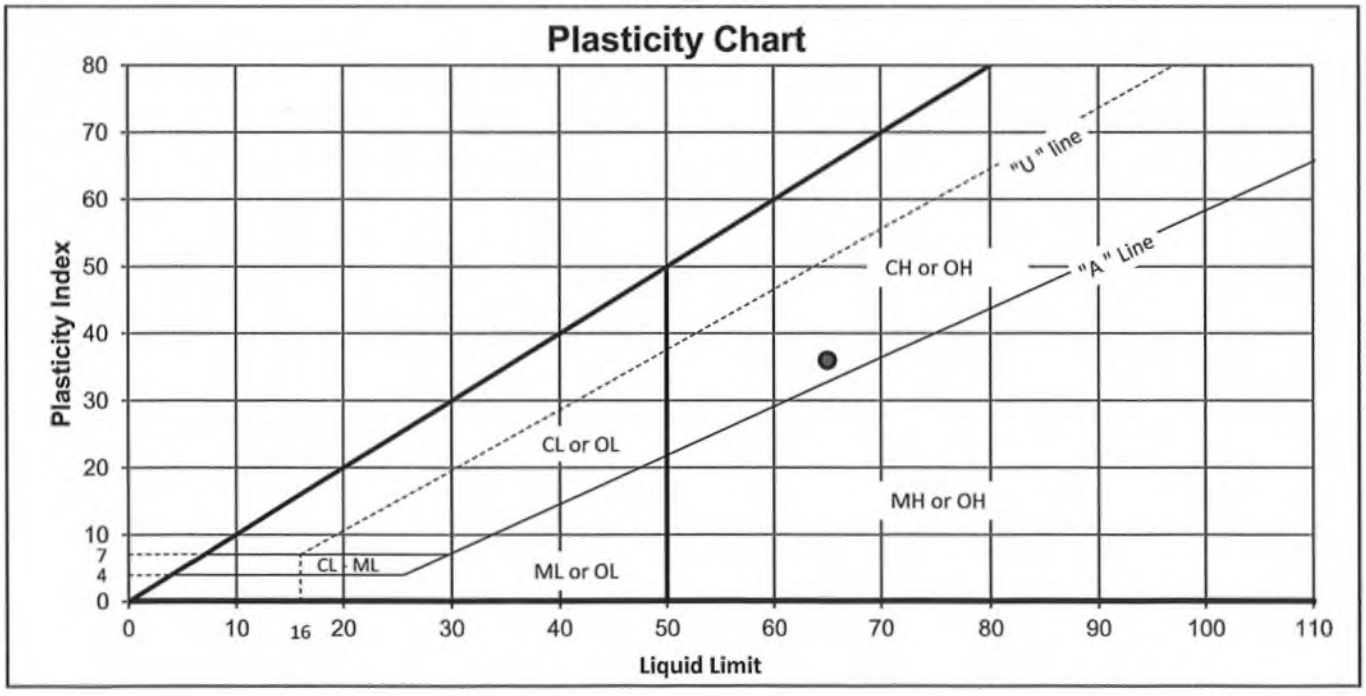
ATTERBERG LIQUID LIMIT AND PLASTIC LIMIT DETERMINATION

ASTM D4318

Project: Parkinson Recreation Park Redevelopment
Project No: 7052
Client: City of Kelowna
Date Sampled: July 30, 2024
Location: Kelowna, B.C.
Sampled By: AC
Sample: Borehole 7, Sample 24, Depth 19.8 m

Sample Preparation: Wet preparation method
Test Equipment: Liquid Limit - mechanical device, multi-point method, plastic grooving tool
Plastic Limit - hand rolled

Natural Moisture Content:	**42%**
Estimated % retained on 0.425 mm sieve:	**0%**
Liquid Limit:	**65**
Plastic Limit:	**29**
Plasticity Index:	**36**
USCS Classification:	**CH**



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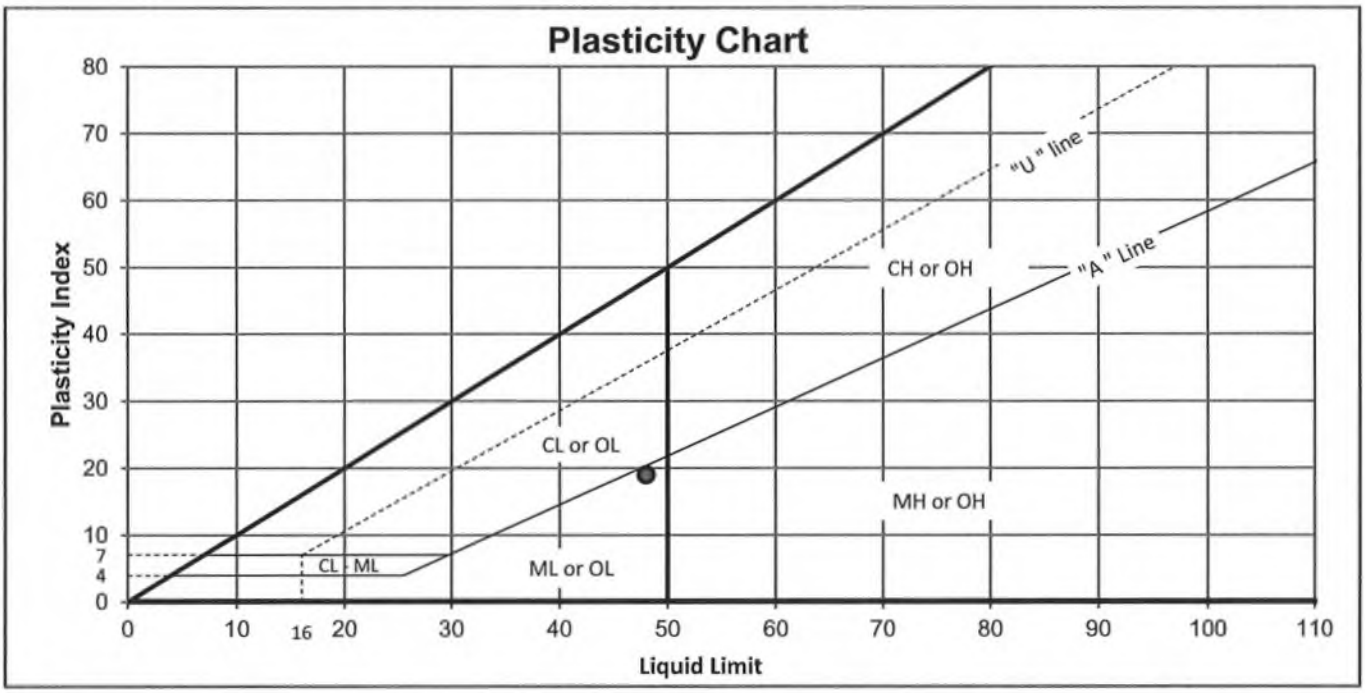
ATTERBERG LIQUID LIMIT AND PLASTIC LIMIT DETERMINATION

ASTM D4318

Project: Parkinson Recreation Park Redevelopment
Project No: 7052
Client: City of Kelowna
Date Sampled: July 30, 2024
Location: Kelowna, B.C.
Sampled By: AC
Sample: Borehole 7, Sample 25, Depth 21.6 m

Sample Preparation: Wet preparation method
Test Equipment: Liquid Limit - mechanical device, multi-point method, plastic grooving tool
Plastic Limit - hand rolled

Natural Moisture Content:	**47%**
Estimated % retained on 0.425 mm sieve:	**0%**
Liquid Limit:	**48**
Plastic Limit:	**29**
Plasticity Index:	**19**
USCS Classification:	**ML**



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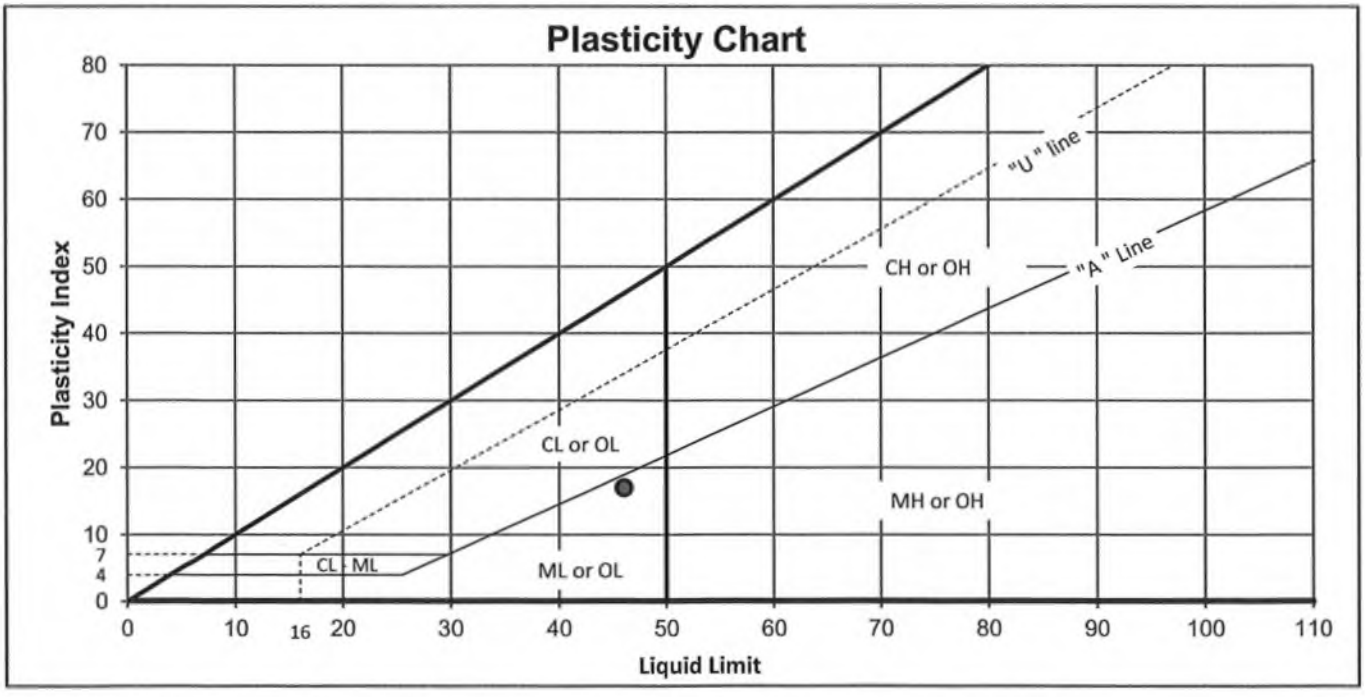
ATTERBERG LIQUID LIMIT AND PLASTIC LIMIT DETERMINATION

ASTM D4318

Project: Parkinson Recreation Park Redevelopment
Project No: 7052
Client: City of Kelowna
Date Sampled: July 30, 2024
Location: Kelowna, B.C.
Sampled By: AC
Sample: Borehole 7, Sample 28, Depth 24.5 m

Sample Preparation: Wet preparation method
Test Equipment: Liquid Limit - mechanical device, multi-point method, plastic grooving tool
Plastic Limit - hand rolled

Natural Moisture Content:	**40%**
Estimated % retained on 0.425 mm sieve:	**0%**
Liquid Limit:	**46**
Plastic Limit:	**29**
Plasticity Index:	**17**
USCS Classification:	**ML**



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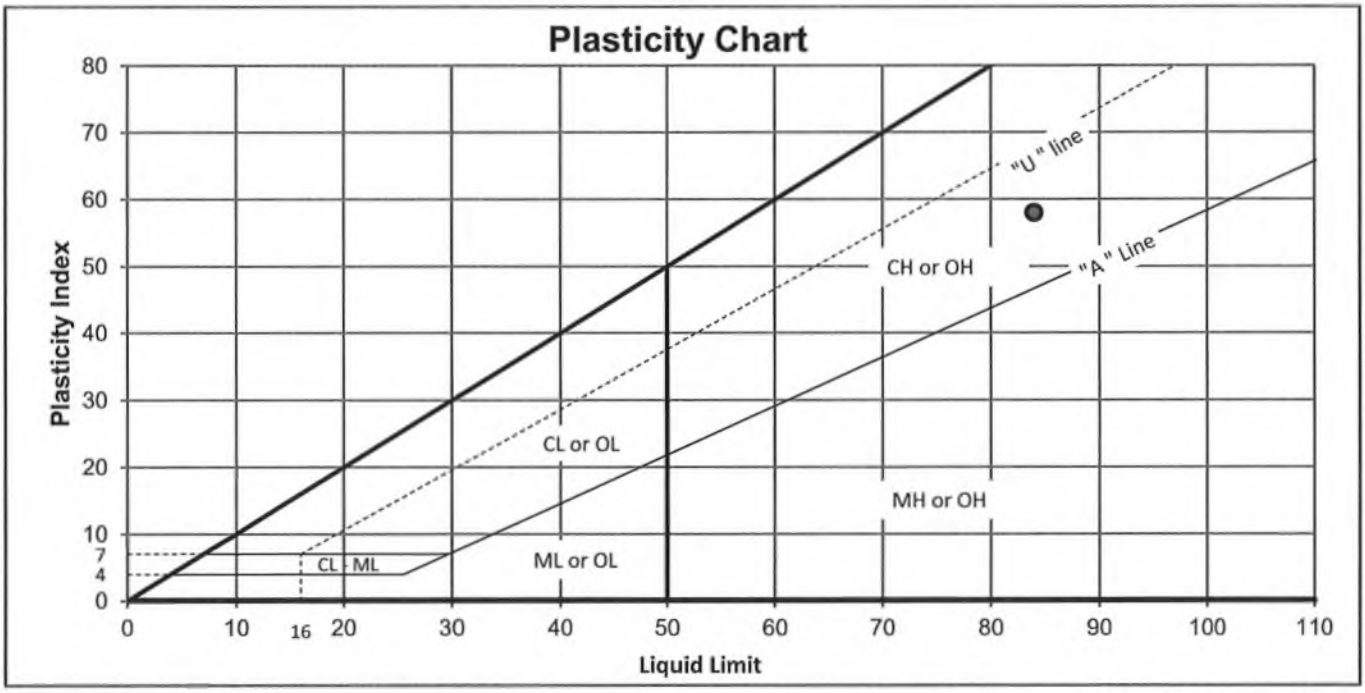
ATTERBERG LIQUID LIMIT AND PLASTIC LIMIT DETERMINATION

ASTM D4318

Project: Parkinson Recreation Park Redevelopment
Project No: 7052
Client: City of Kelowna
Date Sampled: July 31, 2024
Location: Kelowna, B.C.
Sampled By: AC
Sample: Borehole 8, Sample 5, Depth 5.2 m

Sample Preparation: Dry preparation method
Test Equipment: Liquid Limit - mechanical device, multi-point method, plastic grooving tool
Plastic Limit - hand rolled

Natural Moisture Content:	**53%**
Estimated % retained on 0.425 mm sieve:	**0%**
Liquid Limit:	**84**
Plastic Limit:	**26**
Plasticity Index:	**58**
USCS Classification:	**CH**



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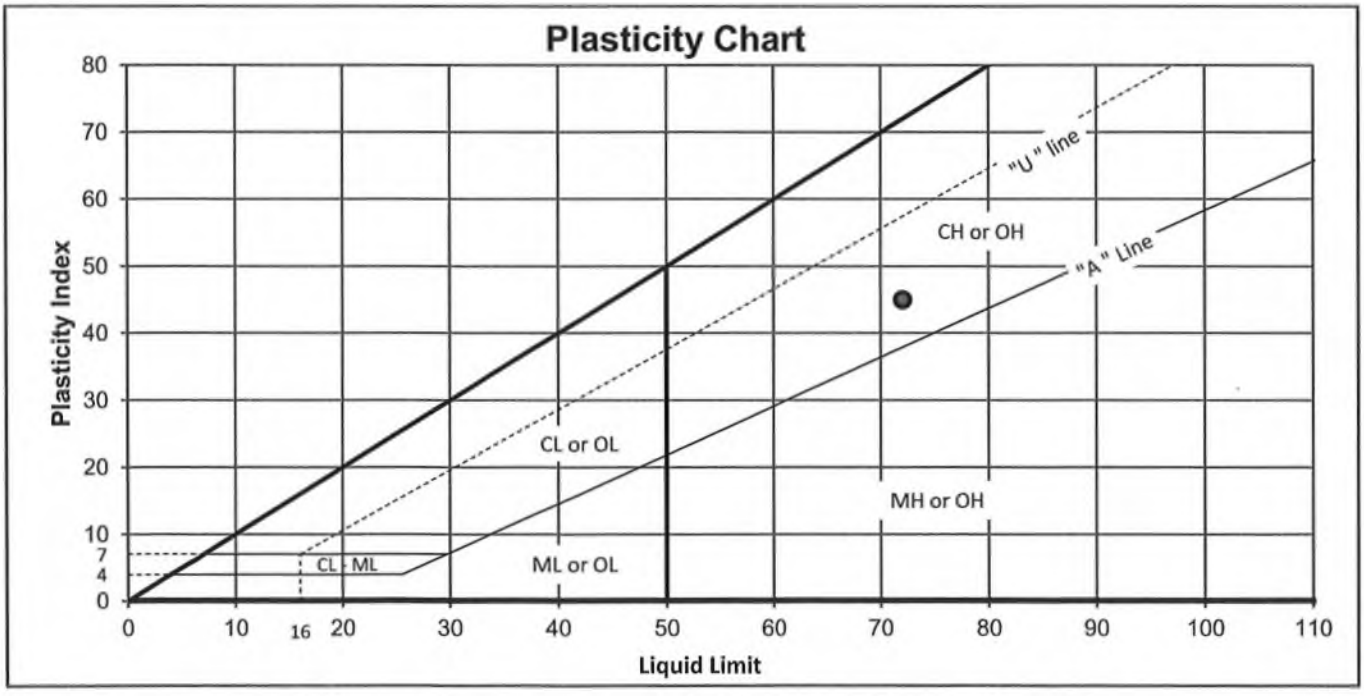
ATTERBERG LIQUID LIMIT AND PLASTIC LIMIT DETERMINATION

ASTM D4318

Project: Parkinson Recreation Park Redevelopment
Project No: 7052
Client: City of Kelowna
Date Sampled: July 31, 2024
Location: Kelowna, B.C.
Sampled By: AC
Sample: Borehole 9, Sample 6, Depth 6.7 m

Sample Preparation: Wet preparation method
Test Equipment: Liquid Limit - mechanical device, multi-point method, plastic grooving tool
Plastic Limit - hand rolled

Natural Moisture Content:	**49%**
Estimated % retained on 0.425 mm sieve:	**0%**
Liquid Limit:	**72**
Plastic Limit:	**27**
Plasticity Index:	**45**
USCS Classification:	**CH**



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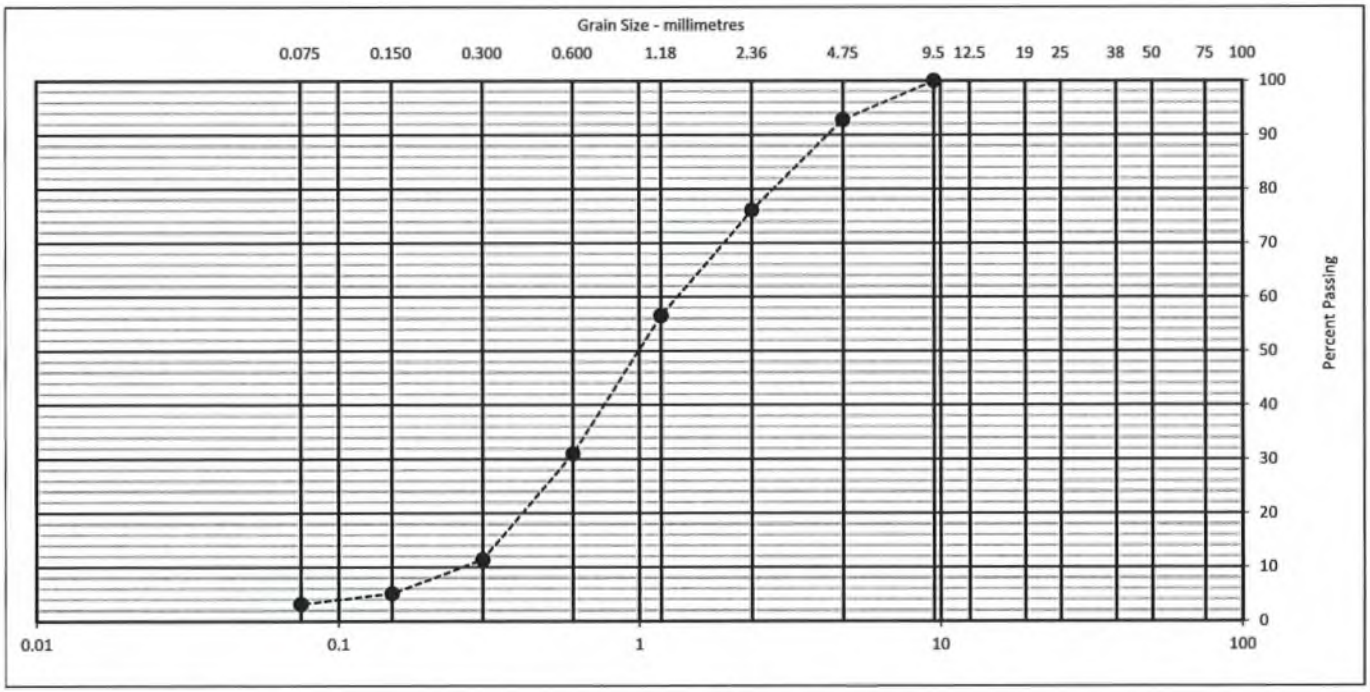
GRAIN SIZE DISTRIBUTION

ASTM C136, C117

Project: Parkinson Recreation Park Redevelopment
Project No: 7052
Client: City of Kelowna
Date Sampled: 30-Jul-2024
Location: Kelowna, B.C.
Sampled By: AC
Sample: Borehole 7, Sample 2, Depth 0.6 m
Material: Fill - sand, trace gravel, trace silt

Sieve (mm)	Percent Passing	Sieve (mm)	Percent Passing
300		12.5	
200		9.5	100
150		4.75	92.8
100		2.36	76.1
75		1.18	56.5
50		0.600	31.0
38		0.300	11.4
25		0.150	5.1
19		0.075	3.2



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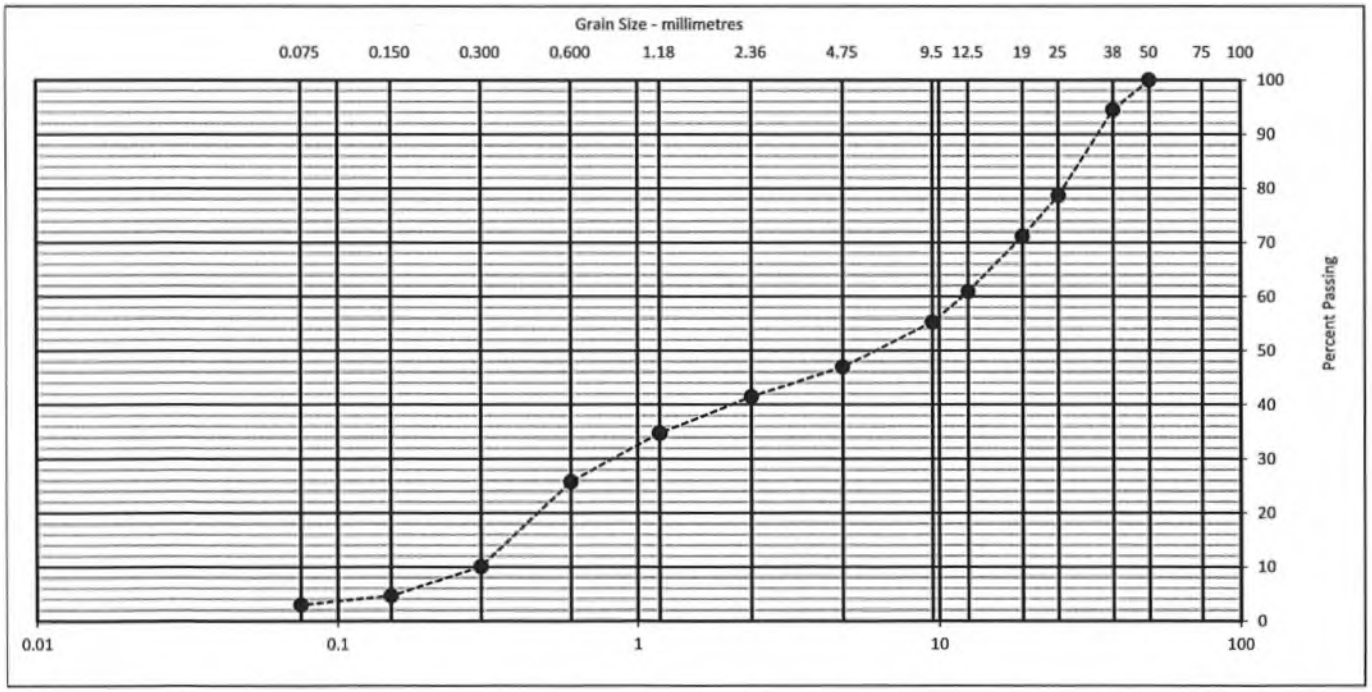
GRAIN SIZE DISTRIBUTION

ASTM C136, C117

Project: Parkinson Recreation Park Redevelopment
Project No: 7052
Client: City of Kelowna
Date Sampled: 30-Jul-2024
Location: Kelowna, B.C.
Sampled By: AC
Sample: Borehole 7, Sample 8, Depth 4.3 m
Material: Gravel and Sand, trace silt

Sieve (mm)	Percent Passing	Sieve (mm)	Percent Passing
300		12.5	60.9
200		9.5	55.3
150		4.75	47.0
100		2.36	41.5
75		1.18	34.8
50	100	0.600	25.8
38	94.5	0.300	10.1
25	78.7	0.150	4.7
19	71.2	0.075	3.0



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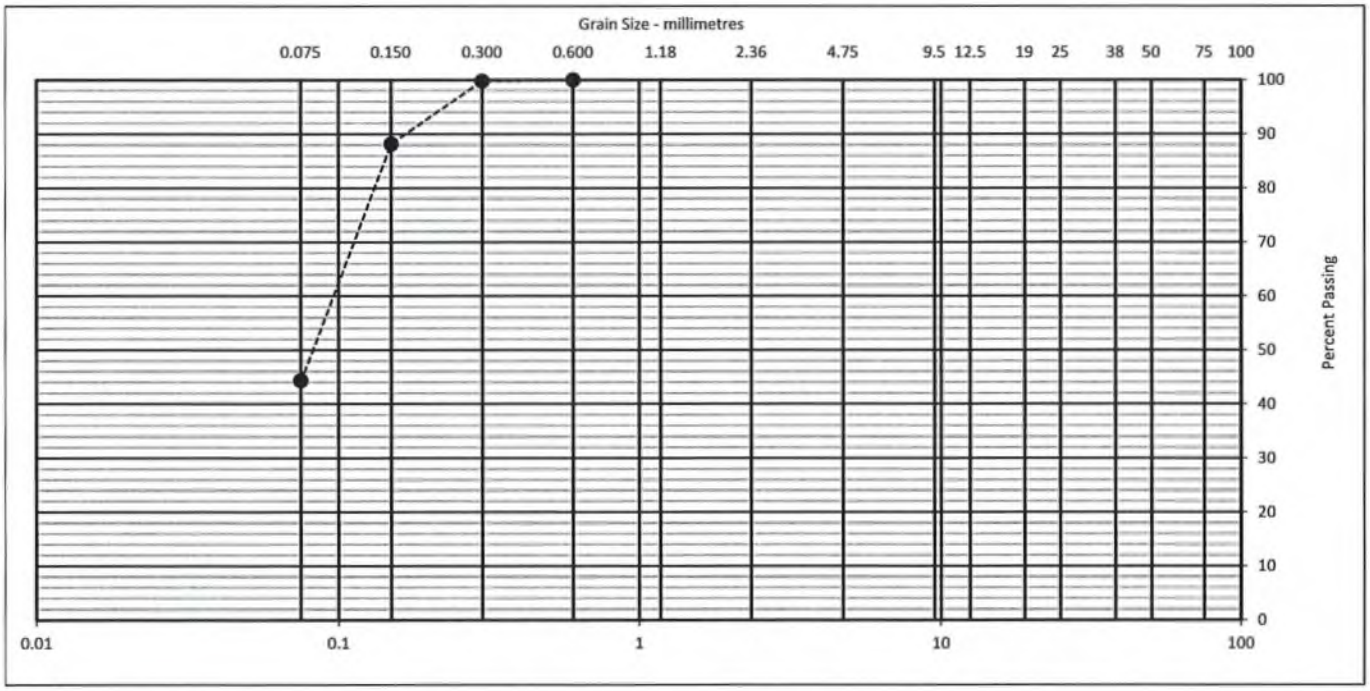
GRAIN SIZE DISTRIBUTION

ASTM C136, C117

Project: Parkinson Recreation Park Redevelopment
Project No: 7052
Client: City of Kelowna
Date Sampled: 30-Jul-2024
Location: Kelowna, B.C.
Sampled By: AC
Sample: Borehole 7, Sample 11, Depth 5.6 m
Material: Sand and Silt

Sieve (mm)	Percent Passing	Sieve (mm)	Percent Passing
300		12.5	
200		9.5	
150		4.75	
100		2.36	
75		1.18	
50		0.600	100
38		0.300	99.8
25		0.150	88.2
19		0.075	44.3



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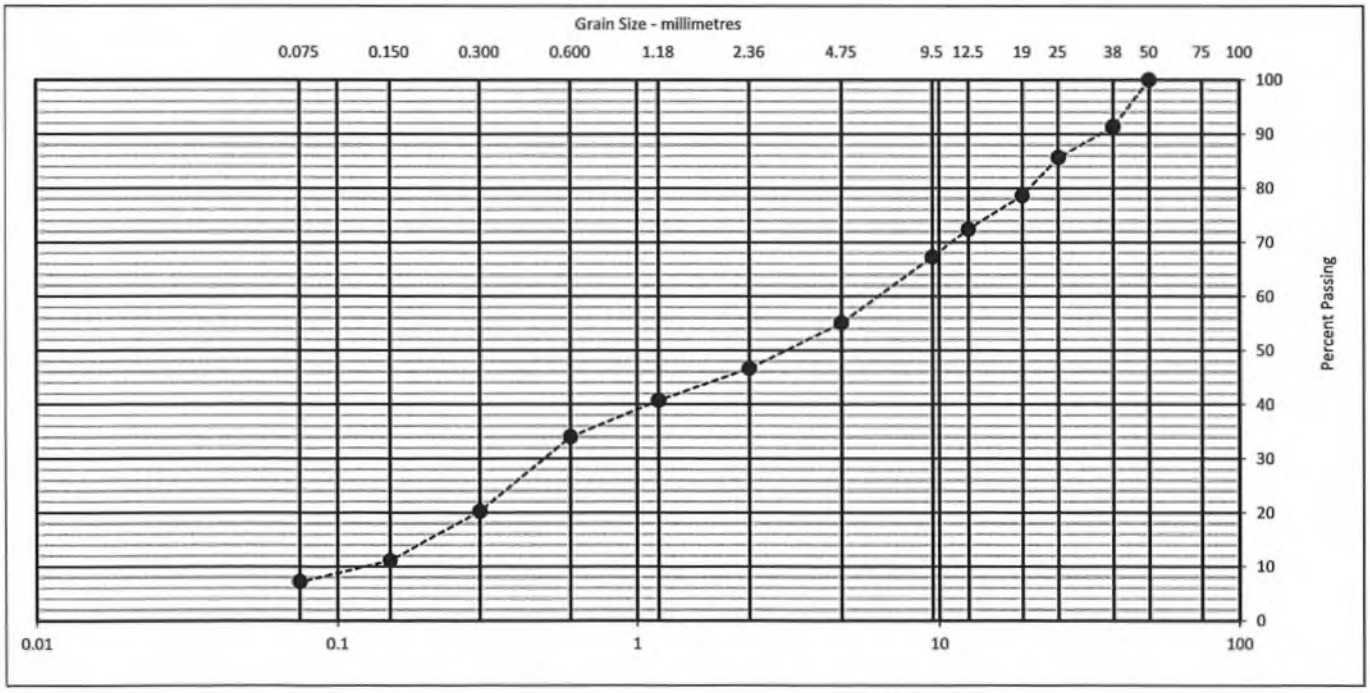
GRAIN SIZE DISTRIBUTION

ASTM C136, C117

Project: Parkinson Recreation Park Redevelopment
Project No: 7052
Client: City of Kelowna
Date Sampled: 31-Jul-2024
Location: Kelowna, B.C.
Sampled By: AC
Sample: Borehole 8, Sample 3, Depth 2.1 m
Material: Sand and Gravel, trace silt

Sieve (mm)	Percent Passing	Sieve (mm)	Percent Passing
300		12.5	72.4
200		9.5	67.3
150		4.75	55.1
100		2.36	46.7
75		1.18	40.8
50	100	0.600	34.0
38	91.3	0.300	20.2
25	85.7	0.150	11.1
19	78.6	0.075	7.2



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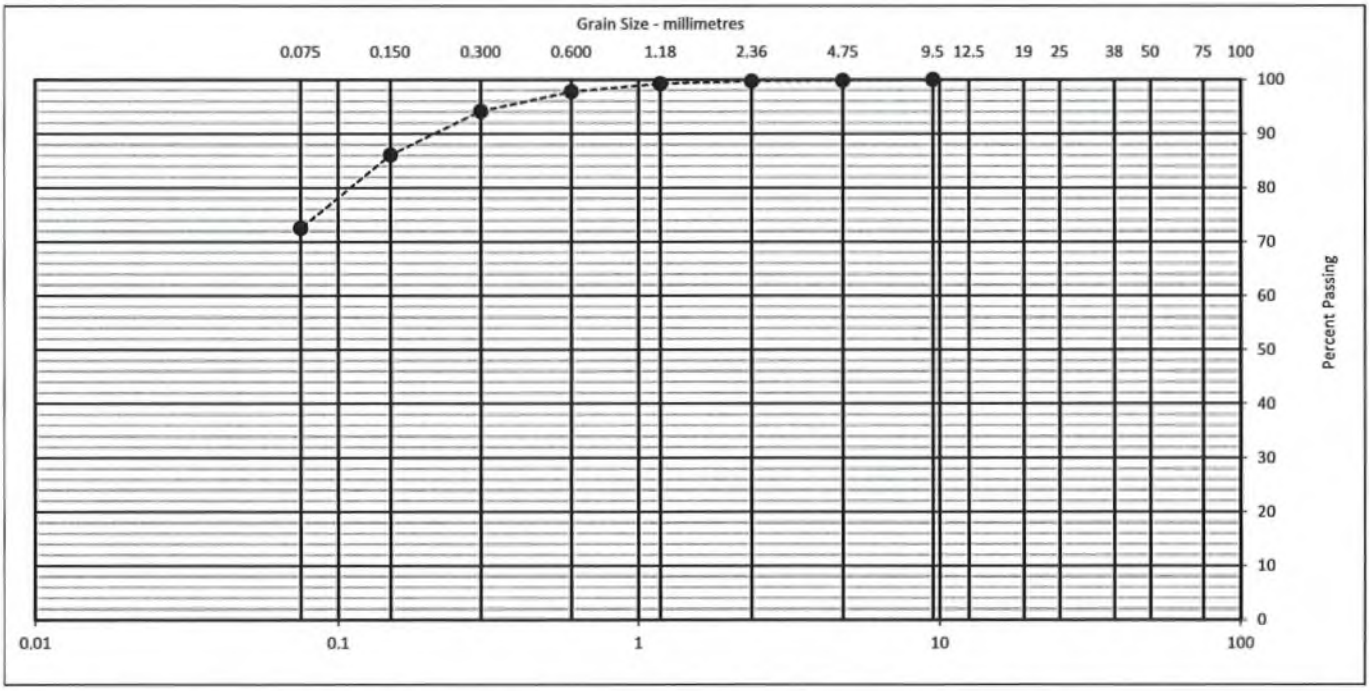
GRAIN SIZE DISTRIBUTION

ASTM C136, C117

Project: Parkinson Recreation Park Redevelopment
Project No: 7052
Client: City of Kelowna
Date Sampled: 01-Aug-2024
Location: Kelowna, B.C.
Sampled By: AC
Sample: Borehole 13, Sample 2, Depth 0.9 m
Material: Silt, sandy

Sieve (mm)	Percent Passing	Sieve (mm)	Percent Passing
300		12.5	
200		9.5	100
150		4.75	99.9
100		2.36	99.7
75		1.18	99.3
50		0.600	97.8
38		0.300	94.1
25		0.150	86.1
19		0.075	72.6



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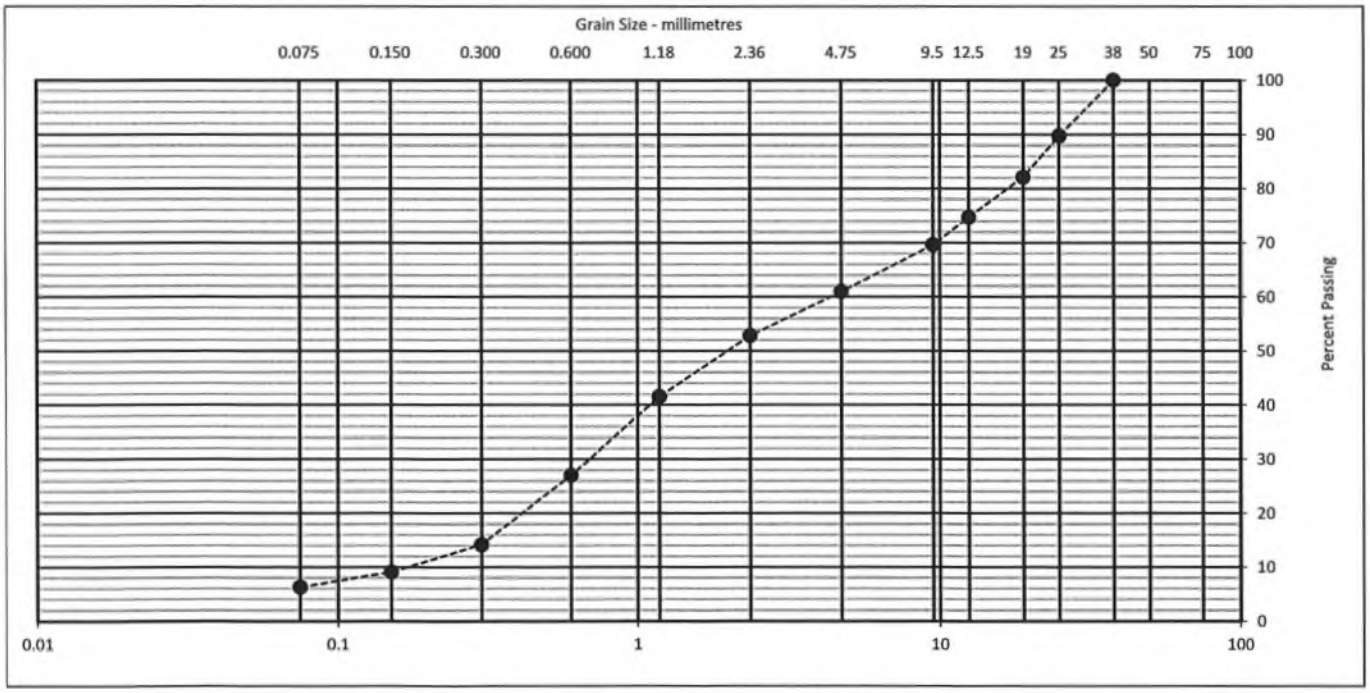
GRAIN SIZE DISTRIBUTION

ASTM C136, C117

Project: Parkinson Recreation Park Redevelopment
Project No: 7052
Client: City of Kelowna
Date Sampled: 31-Jul-2024
Location: Kelowna, B.C.
Sampled By: AC
Sample: Borehole 18, Sample 1, Depth 0.3 m
Material: Fill - sand and gravel, trace silt

Sieve (mm)	Percent Passing	Sieve (mm)	Percent Passing
300		12.5	74.7
200		9.5	69.6
150		4.75	61.0
100		2.36	52.9
75		1.18	41.6
50		0.600	27.0
38	100	0.300	14.2
25	89.8	0.150	9.1
19	82.1	0.075	6.3



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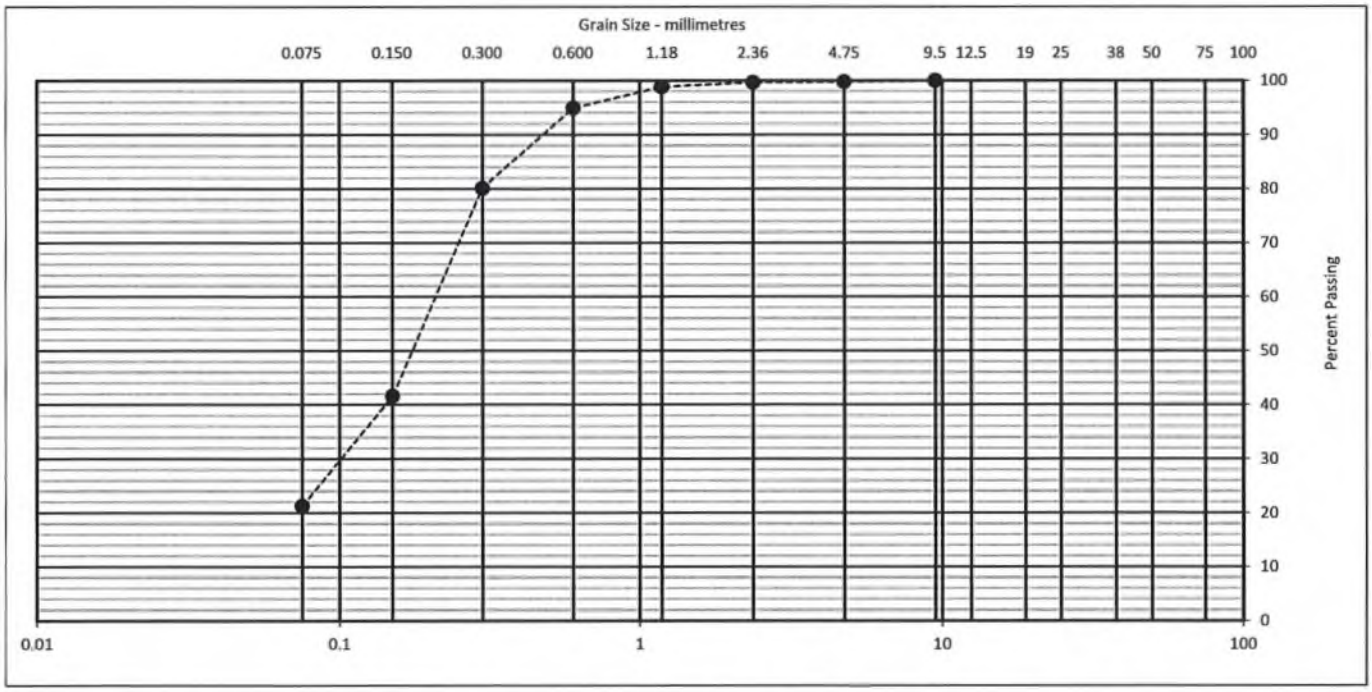
GRAIN SIZE DISTRIBUTION

ASTM C136, C117

Project: Parkinson Recreation Park Redevelopment
Project No: 7052
Client: City of Kelowna
Date Sampled: 31-Jul-2024
Location: Kelowna, B.C.
Sampled By: AC
Sample: Borehole 18, Sample 2, Depth 1.1 m
Material: Sand, silty

Sieve (mm)	Percent Passing	Sieve (mm)	Percent Passing
300		12.5	
200		9.5	100
150		4.75	99.8
100		2.36	99.7
75		1.18	98.9
50		0.600	94.9
38		0.300	80.1
25		0.150	41.6
19		0.075	21.3



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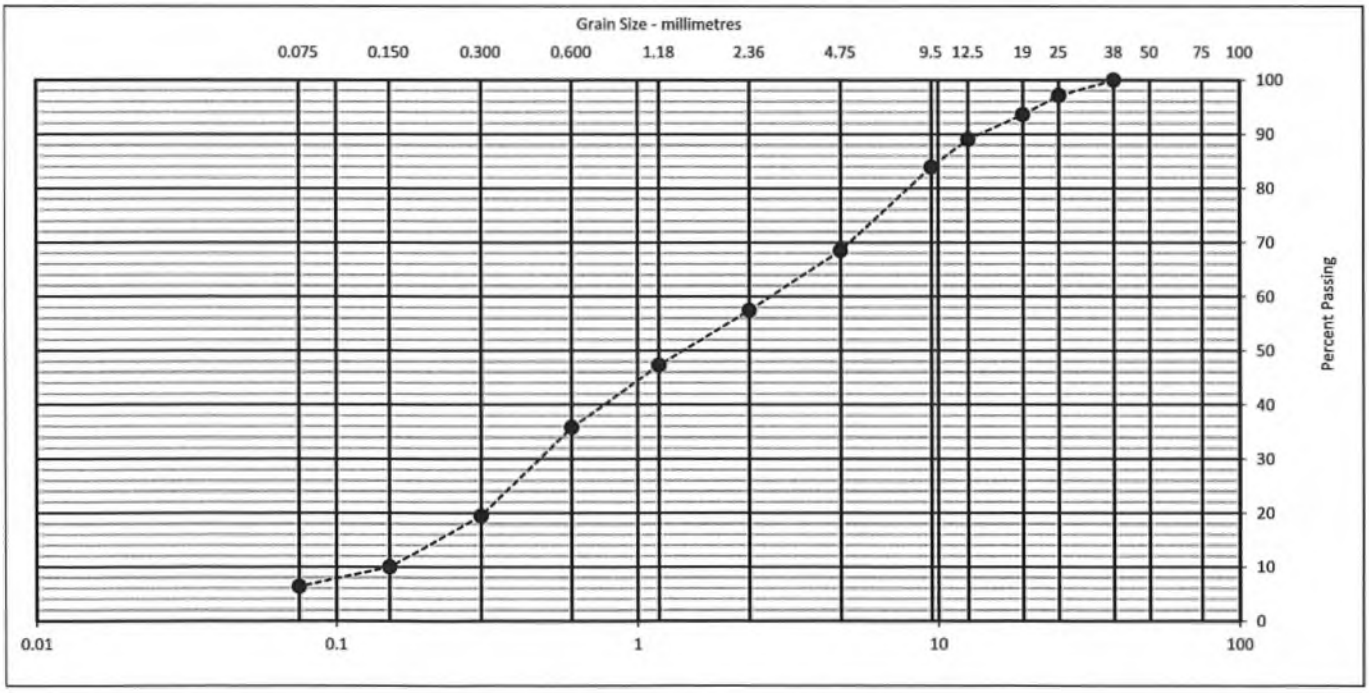
GRAIN SIZE DISTRIBUTION

ASTM C136, C117

Project: Parkinson Recreation Park Redevelopment
Project No: 7052
Client: City of Kelowna
Date Sampled: 31-Jul-2024
Location: Kelowna, B.C.
Sampled By: AC
Sample: Borehole 19, Sample 2, Depth 0.9 m
Material: Sand, gravelly, trace silt

Sieve (mm)	Percent Passing	Sieve (mm)	Percent Passing
300		12.5	89.1
200		9.5	83.9
150		4.75	68.5
100		2.36	57.4
75		1.18	47.3
50		0.600	35.8
38	100	0.300	19.5
25	97.2	0.150	10.0
19	93.6	0.075	6.4



Analytical Results

Sub-Matrix: **Soil**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method/Lab	LOR	Unit	Client sample ID	7052 BH 7-6 @ 2.6m	7052 BH 7-16 @ 8.2m	----	----	----
					Client sampling date / time	30-Jul-2024 00:00	30-Jul-2024 00:00	----	----	----
						KS2403444-001	KS2403444-002	--------	--------	--------
						Result	Result	---	---	---
Physical Tests										
Moisture	----	E144/WT	0.25	%		17.4	36.0	----	----	----
pH, saturated paste	----	E114/CG	0.10	pH units		4.73 RRV	9.07 RRV	----	----	----
% Saturation	----	E141/CG	1.0	%		33.4	210	----	----	----
Inorganics										
Sulfate, total, ion content	14808-79-8	E246.SO4/CG	0.050	%		0.065	<0.050	----	----	----
Sulfides, acid volatile	----	E396-L/WT	0.20	mg/kg		<0.24	<0.31	----	----	----
Sulfate, soluble ion content	14808-79-8	E246A.SO4/CG	0.05	%		NR	NR	----	----	----
Saturated Paste Extractables										
Oxidation-reduction potential [ORP]	----	E126/CG	0.10	mV		262	123	----	----	----
Resistivity	----	E131/CG	1.0	ohm cm		2090	6870	----	----	----

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

APPENDIX

Record of Exploration - Borehole No. 1

Project No: 6662
Project: Kelowna Community Campus
Client: City of Kelowna
Project Location: Kelowna, B.C.

Borehole Location: Figure 6662-2
Drilling Contractor: Mud Bay Drilling Ltd.
Drilling Date: November 12, 2020
Sampler Size: 150 mm diameter solid stem

SUBSURFACE PROFILE				SAMPLE		TESTING					
Elevation (m)	Depth (m)	Symbol	Description	Number	Sample Type	SPT N Value	% Recovery	qu (kPa), p.p. disturbed	SDS Cone Penetration blows/0.3m ▲ 20 40 60 80 ▲	Moisture Content (%) ● 20 40 60 80 ●	Standpipe Data
356.1	0		Ground Surface								
			TURF							Standpipe Data 0.9 m - 20nov2020	
354.6	1		SILT AND SAND compact, brown, damp to wet								
	2		SAND AND GRAVEL trace silt, compact to dense, brown, wet	1		35	50			●	
	3										
	4			2						●	
351.1	5		SAND silty, loose to compact, grey, wet								
350.0	6		CLAY silty, highly plastic, stiff, grey, moist to wet	3				150		●	
348.5	7										
	8		End of borehole at 7.6 m								
	9										
	10										
	11										
	12										
	13										
	14										
	15										
	16										

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2250 - 11th Avenue
Vernon, B.C. V1T 7X8
Ph. (250) 542-0377 Fax. (250) 542-1220
Email: fletcherpaine@shawlink.ca

Record of Exploration - Borehole No. 2

Project No: 6662
Project: Kelowna Community Campus
Client: City of Kelowna
Project Location: Kelowna, B.C.

Borehole Location: Figure 6662-2
Drilling Contractor: Mud Bay Drilling Ltd.
Drilling Date: November 12, 2020
Sampler Size: 200 mm diameter hollow stem

SUBSURFACE PROFILE				SAMPLE		TESTING					
Elevation (m)	Depth (m)	Symbol	Description	Number	Sample Type	SPT N Value	% Recovery	qu (kPa), p.p. disturbed	SDS Cone Penetration blows/0.3m ▲ 20 40 60 80 ▲	Moisture Content (%) ● 20 40 60 80 ●	Standpipe Data
357.2	0		Ground Surface								
356.6			TURF	1						Standpipe Data 1.7 m - 20nov2020	
	1		FILL sand and gravel, some silt, compact to dense, brown, damp	2							
355.7				3		36	60				
	2		SILT sandy, compact, brown, damp								
	3		SAND AND GRAVEL trace silt, compact to dense, brown, wet	4		22	40				
352.6	4										
	5		SAND fine to medium grained, trace silt, compact to dense, grey, wet	5		14	50				
	6			6		32	80				
	7			7		27	50				
348.1	8										
	9		CLAY silty, highly plastic, stiff, grey, moist to wet	8		10	50				
	10										
	11										
	12			9		11	80				
	13										
	14										
	15										
341.4				10		10	80				
	16		End of borehole at 15.8 m								

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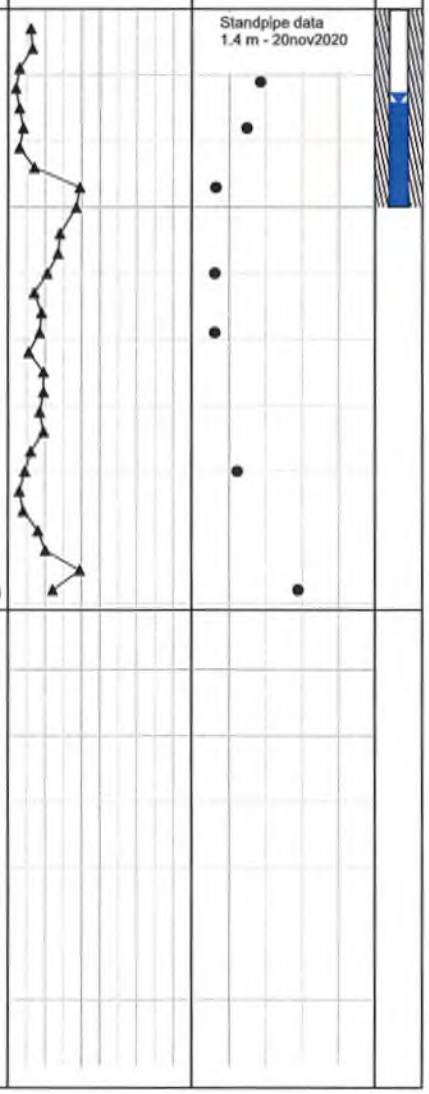
Email: fletcherpaine@shawlink.ca

Record of Exploration - Borehole No. 3

Project No: 6662
Project: Kelowna Community Campus
Client: City of Kelowna
Project Location: Kelowna, B.C.

Borehole Location: Figure 6662-2
Drilling Contractor: Mud Bay Drilling Ltd.
Drilling Date: November 13, 2020
Sampler Size: 150 mm diameter solid stem

Elevation (m)	Depth (m)	Description	Number	Sample Type	SPT N Value	% Recovery	qu (kPa), p.p. disturbed
358.5	0	Ground Surface					
357.7	0	TURF					
	1	FILL mixture of silt, sand, trace gravel, trace topsoil, loose to compact, brown, damp	1				
356.4	2		2				
	2	SILT sandy, loose, brown, damp to wet	3				
	3	SAND AND GRAVEL trace silt, compact to dense, brown, wet					
	4		4				
	5		5				
352.4	6						
	7	SAND silty, loose, grey, wet	6				
350.6	8						
349.4	9	CLAY silty, highly plastic, stiff, grey, moist to wet	7				190
	9	End of borehole at 9.1 m					
	10						
	11						
	12						
	13						
	14						
	15						
	16						



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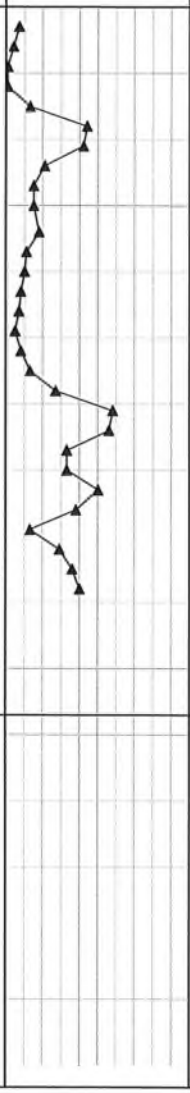
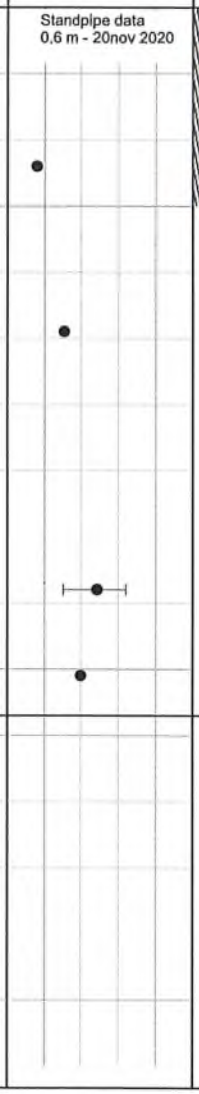
Record of Exploration - Borehole No. 4

Project No: 6662
Project: Kelowna Community Campus
Client: City of Kelowna
Project Location: Kelowna, B.C.

Borehole Location: Figure 6662-2
Drilling Contractor: Mud Bay Drilling Ltd.
Drilling Date: November 13, 2020
Sampler Size: 150 mm diameter solid stem

Elevation (m)	Depth (m)	Description	Number	Sample Type	SPT N Value	% Recovery	qu (kPa), p.p. disturbed
356.0	0	Ground Surface					
	0	TURF					
	1	SILT sandy, very loose, brown, damp to wet	1				
354.5		150 mm thick peat seam at 0.9 m					
	2	SAND AND GRAVEL trace silt, compact to dense, brown, wet	2				
	3						
351.7	4						
	5	SAND silty, loose, grey, wet	3				
350.5							
	6	SAND AND GRAVEL trace silt, compact to dense, grey, wet					
	7						
347.8	8						
	9	CLAY silty, trace fine sand, highly plastic, stiff, grey, moist to wet	4				150
	10		5				160
345.3							
	11	End of borehole at 10.7 m					
	12						
	13						
	14						
	15						
	16						





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Record of Exploration - Borehole No. 5

Project No: 6662
Project: Kelowna Community Campus
Client: City of Kelowna
Project Location: Kelowna, B.C.

Borehole Location: Figure 6662-2
Drilling Contractor: Mud Bay Drilling Ltd.
Drilling Date: October 25, 2021
Sampler Size: 200 mm diameter hollow stem

SUBSURFACE PROFILE				SAMPLE		TESTING					
Elevation (m)	Depth (m)	Symbol	Description	Number	Sample Type	SPT N Value	% Recovery	qu (kPa), p.p. disturbed	SDS Cone Penetration blows/0.3m ▲ 20 40 60 80 ▲	Moisture Content (%) ● 20 40 60 80 ●	Standpipe Data
358.5	0		Ground Surface								
	0		TURF								Standpipe Data 1.2 m - 03nov2021
357.3	1		FILL mixture of sand, gravel, some silt, compact, brown, damp	1		12	30				
	2		SAND some silt, compact, grey, damp to wet								
354.8	3			2		12	50				
	4		GRAVEL AND SAND trace silt, compact, brown, wet								
	5			3		31	30				
352.6	6		SAND fine to medium grained, trace to some silt, compact to dense, grey, wet	4		13	50				
	7										
	8			5		15	40				
	9			6		26	40				
	10		silt content decreasing at 9.0 m								
	11										
	12			7		46	50				
	13										
	14										
	15										
342.7				8		43	0				
	16		End of borehole at 15.8 m								

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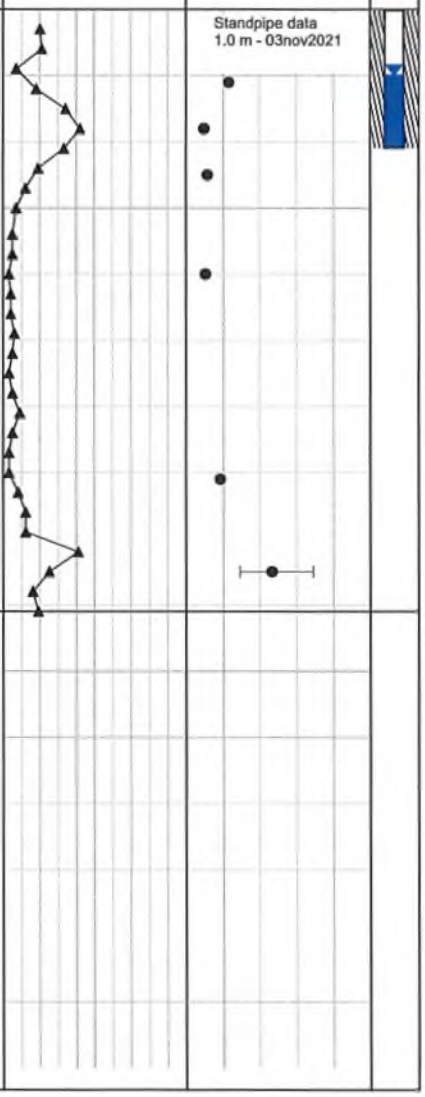
Record of Exploration - Borehole No. 6

Project No: 6662
Project: Kelowna Community Campus
Client: City of Kelowna
Project Location: Kelowna, B.C.

Borehole Location: Figure 6662-2
Drilling Contractor: Mud Bay Drilling Ltd.
Drilling Date: October 25, 2021
Sampler Size: 150 mm diameter solid stem

Elevation (m)	Depth (m)	Description	Number	Sample Type	SPT N Value	% Recovery	qu (kPa), p.p. disturbed	SDS Cone Penetration blows/0.3m (20 40 60 80)	Moisture Content (%) (20 40 60 80)	Standpipe Data
358.3	0	Ground Surface								
		TURF								
357.4	1	FILL sand, some silt, trace gravel, trace topsoil, loose to compact, brown, damp	1							
	2		2							
		SAND some silt, compact, grey, wet	3							
	3									
		GRAVEL AND SAND trace silt to some silt, very loose to dense, grey, wet	4							
	4									
	5									
352.4	6	SAND silty, trace clay, very loose, grey, wet								
350.9	7		5							
		CLAY some silt, highly plastic, stiff, grey, moist to wet								
	8		6				160			
349.2	9									
		End of borehole at 9.1 m								
	10									
	11									
	12									
	13									
	14									
	15									
	16									



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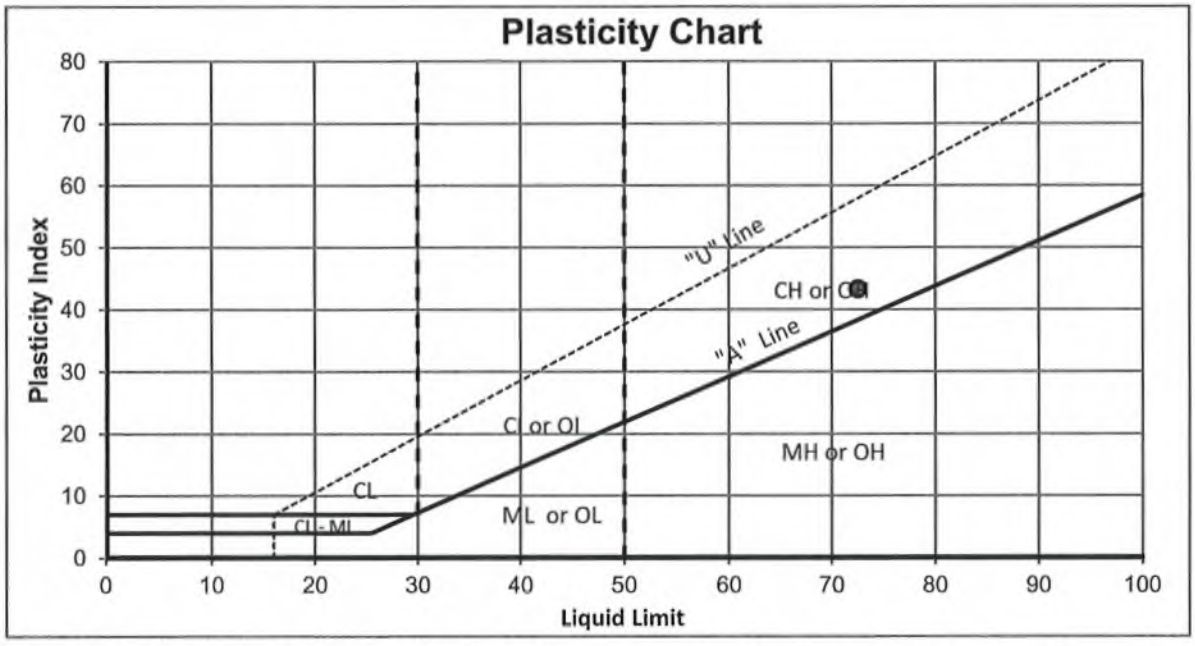
ATTERBERG LIQUID LIMIT AND PLASTIC LIMIT DETERMINATION

ASTM D 4318

Project: Kelowna Community Campus
Project No: 6662
Client: City of Kelowna
Date Sampled: 12-Nov-2020
Location: Kelowna, B.C.
Sampled By: RCS
Sample: Borehole 2, Sample 8, Depth 9.1 m

Sample Preparation: Wet preparation method
Test Equipment: Liquid Limit - mechanical device, multi-point method, plastic grooving tool
Plastic Limit - hand rolled

Natural Moisture Content:	**56%**	
Estimated % retained on 0.425 mm sieve:	**0%**	
Liquid Limit:	**73**	
Plastic Limit:	**29**	
Plasticity Index:	**43**	
USCS Classification:	**CH**	Inorganic clays of high plasticity



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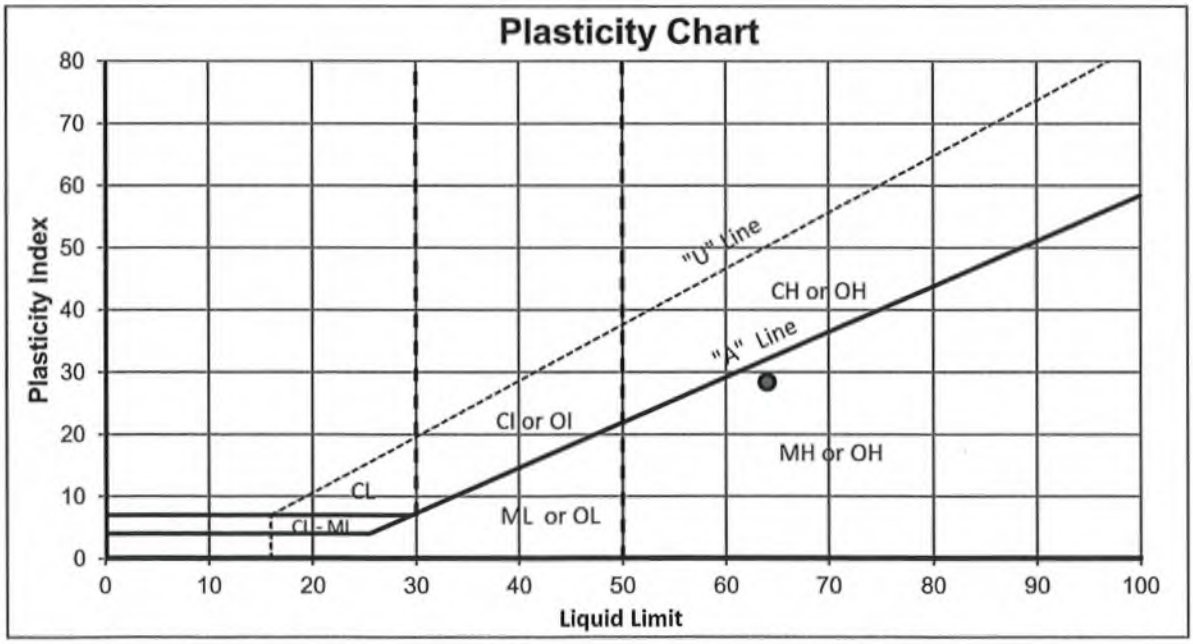
ATTERBERG LIQUID LIMIT AND PLASTIC LIMIT DETERMINATION

ASTM D 4318

Project: Kelowna Community Campus
Project No: 6662
Client: City of Kelowna
Date Sampled: 12-Nov-2020
Location: Kelowna, B.C.
Sampled By: RCS
Sample: Borehole 4, Sample 4, Depth 8.5 m

Sample Preparation: Wet preparation method
Test Equipment: Liquid Limit - mechanical device, multi-point method, plastic grooving tool
Plastic Limit - hand rolled

Natural Moisture Content:	**49%**	
Estimated % retained on 0.425 mm sieve:	**0%**	
Liquid Limit:	**64**	
Plastic Limit:	**36**	
Plasticity Index:	**28**	
USCS Classification:	**MH**	Inorganic clayey silt of high plasticity



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ATTERBERG LIQUID LIMIT AND PLASTIC LIMIT DETERMINATION

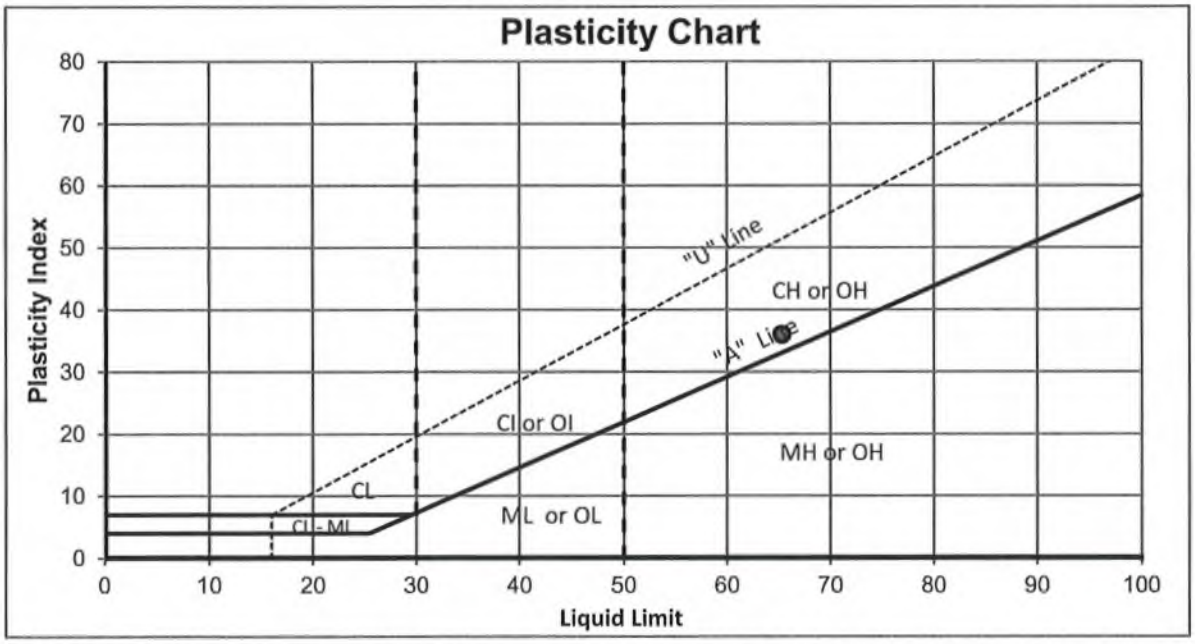
ASTM D 4318

Project: Kelowna Community Campus
Project No: 6662
Client: City of Kelowna
Date Sampled: 12-Nov-2020
Location: Kelowna, B.C.
Sampled By: RCS
Sample: Borehole 2, Sample 10, Depth 15.2 m

Sample Preparation: Wet preparation method
Test Equipment: Liquid Limit - mechanical device, multi-point method, plastic grooving tool
Plastic Limit - hand rolled

Natural Moisture Content:	**45%**
Estimated % retained on 0.425 mm sieve:	**0%**

Liquid Limit:	**65**	
Plastic Limit:	**29**	
Plasticity Index:	**36**	
USCS Classification:	**CH**	Inorganic clays of high plasticity



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ATTERBERG LIQUID LIMIT AND PLASTIC LIMIT DETERMINATION

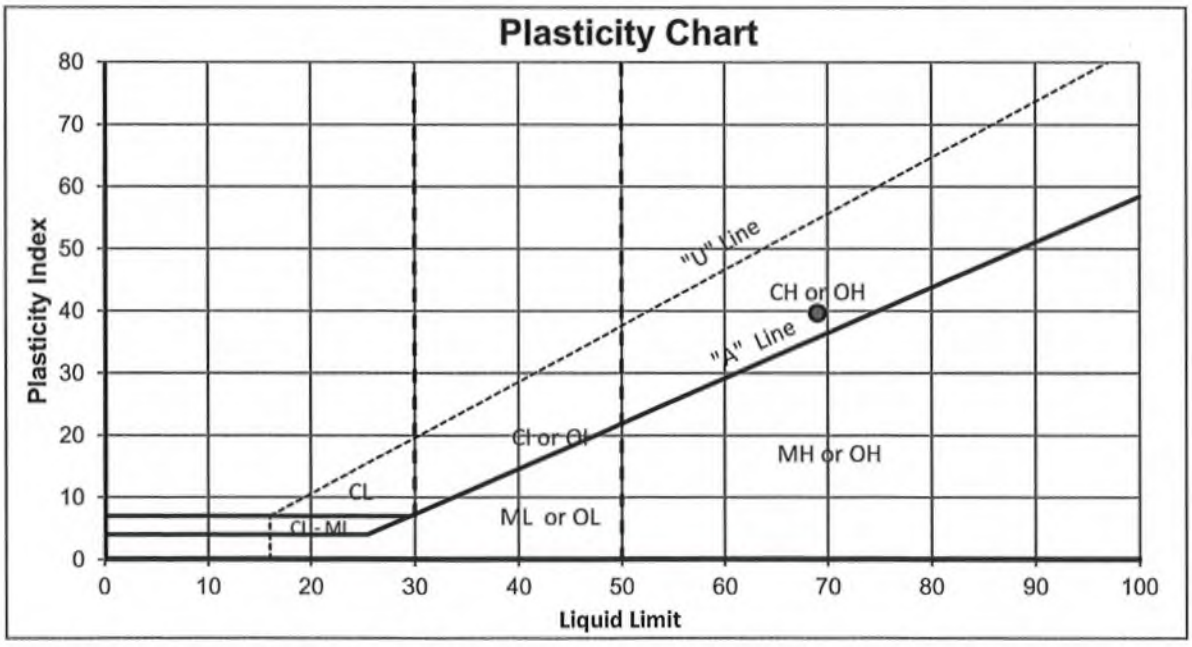
ASTM D 4318

Project: Kelowna Community Campus
Project No: 6662
Client: City of Kelowna
Date Sampled: 22-Oct-2021
Location: Kelowna, B.C.
Sampled By: RCS
Sample: Borehole 6, Sample 6, Depth 8.1 m

Sample Preparation: Wet preparation method
Test Equipment: Liquid Limit - mechanical device, multi-point method, plastic grooving tool
Plastic Limit - hand rolled

Natural Moisture Content:
Estimated % retained on 0.425 mm sieve: **0%**

Liquid Limit:	**69**	
Plastic Limit:	**29**	
Plasticity Index:	**40**	
USCS Classification:	**CH**	Inorganic clays of high plasticity



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GRAIN SIZE DISTRIBUTION

ASTM C136, C117

Project: Kelowna Community Campus

Project No: 6662

Client: City of Kelowna

Sample Date: 12-Nov-2020

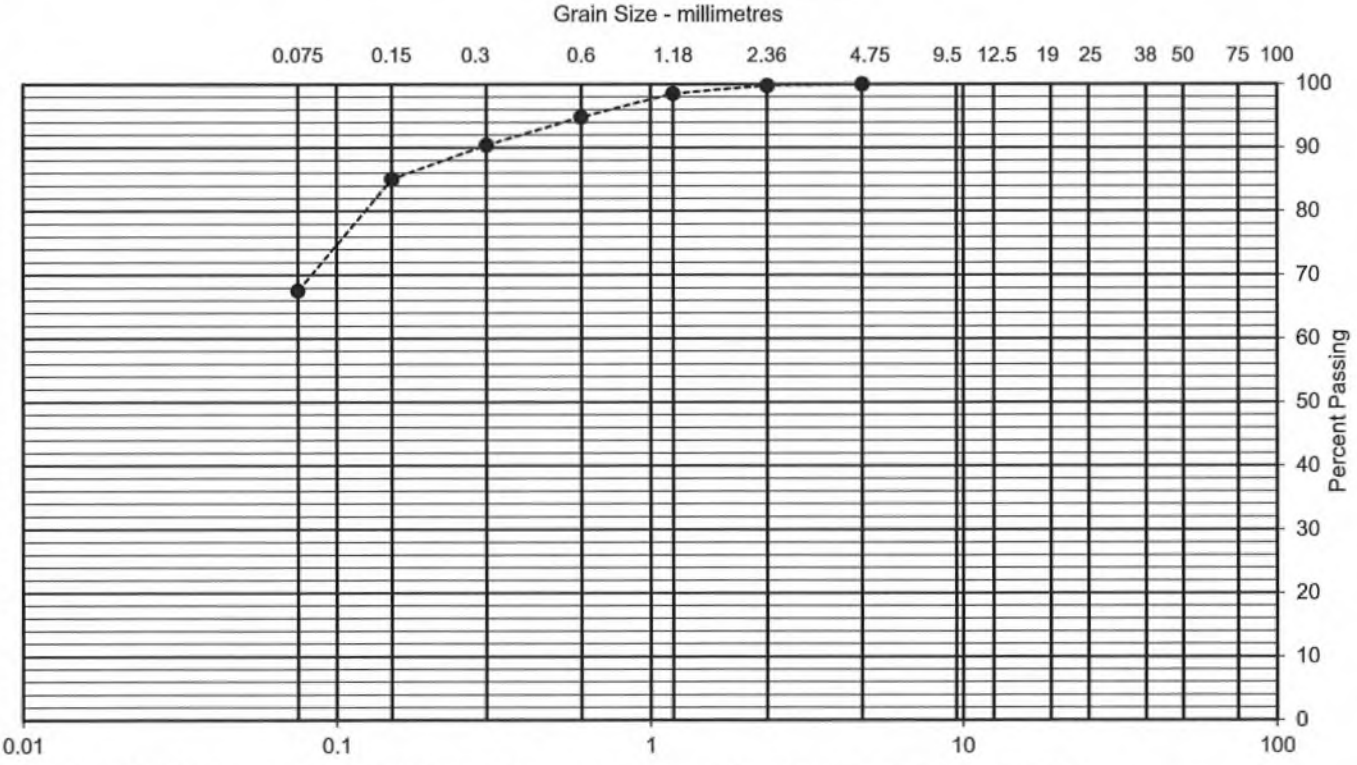
Location: Kelowna, B.C.

Sampled By: RCS

Material: Silt, sandy

Sample: Borehole 2, Sample 2, Depth 0.9 m

Wash Analysis			
Sieve (mm)	% Passing	Sieve (mm)	% Passing
150		9.50	
100		4.75	100
75		2.36	99.8
50		1.18	98.5
38.0		0.600	94.8
25.0		0.300	90.4
19.0		0.150	85.1
12.5		0.075	67.5



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GRAIN SIZE DISTRIBUTION

ASTM C136, C117

Project: Kelowna Community Campus

Project No: 6662

Client: City of Kelowna

Sample Date: 12-Nov-2020

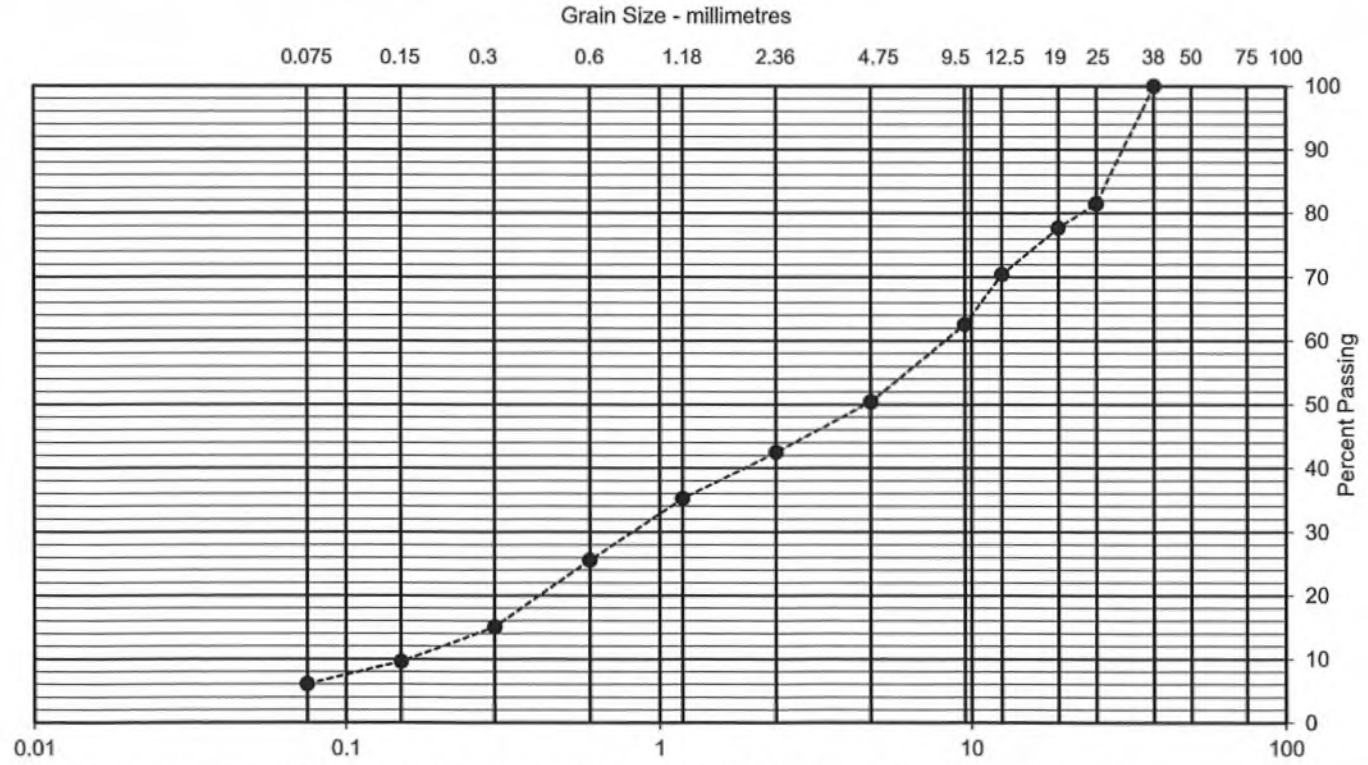
Location: Kelowna, B.C.

Sampled By: RCS

Material: Sand and Gravel, trace silt

Sample: Borehole 3, Sample 4, Depth 3.7 m

Wash Analysis			
Sieve (mm)	% Passing	Sieve (mm)	% Passing
150		9.50	62.6
100		4.75	50.4
75		2.36	42.5
50		1.18	35.3
38.0	100	0.600	25.6
25.0	81.5	0.300	15.1
19.0	77.7	0.150	9.6
12.5	70.4	0.075	6.1



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GRAIN SIZE DISTRIBUTION

ASTM C136, C117

Project: Kelowna Community Campus

Project No: 6662

Client: City of Kelowna

Sample Date: 13-Nov-2020

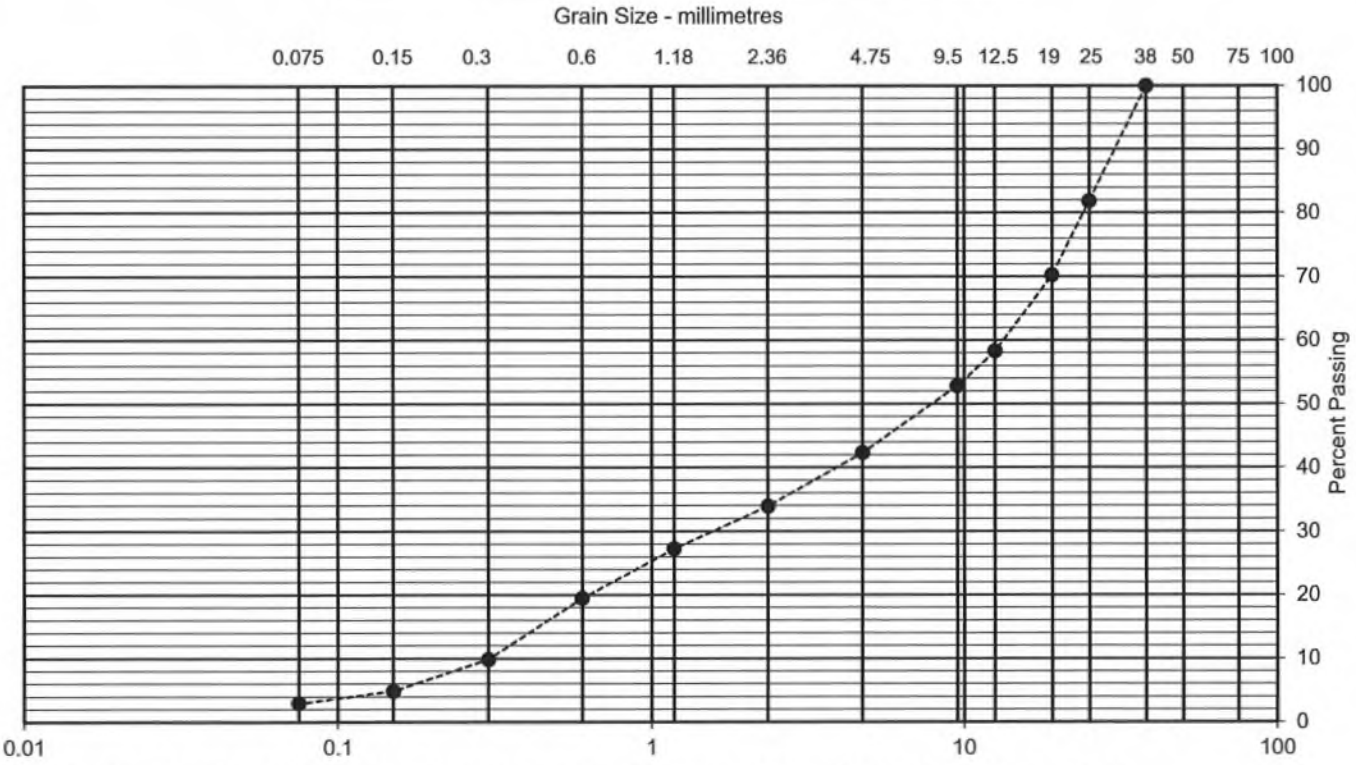
Location: Kelowna, B.C.

Sampled By: RCS

Material: Sand and Gravel, trace silt

Sample: Borehole 4, Sample 2, Depth 2.1 m

Wash Analysis			
Sieve (mm)	% Passing	Sieve (mm)	% Passing
150		9.50	52.8
100		4.75	42.3
75		2.36	33.9
50		1.18	27.2
38.0	100	0.600	19.5
25.0	81.9	0.300	9.8
19.0	70.2	0.150	4.9
12.5	58.3	0.075	3.0



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GRAIN SIZE DISTRIBUTION

ASTM C136, C117

Project: Kelowna Community Campus

Project No: 6662

Client: City of Kelowna

Sample Date: 22-Oct-2021

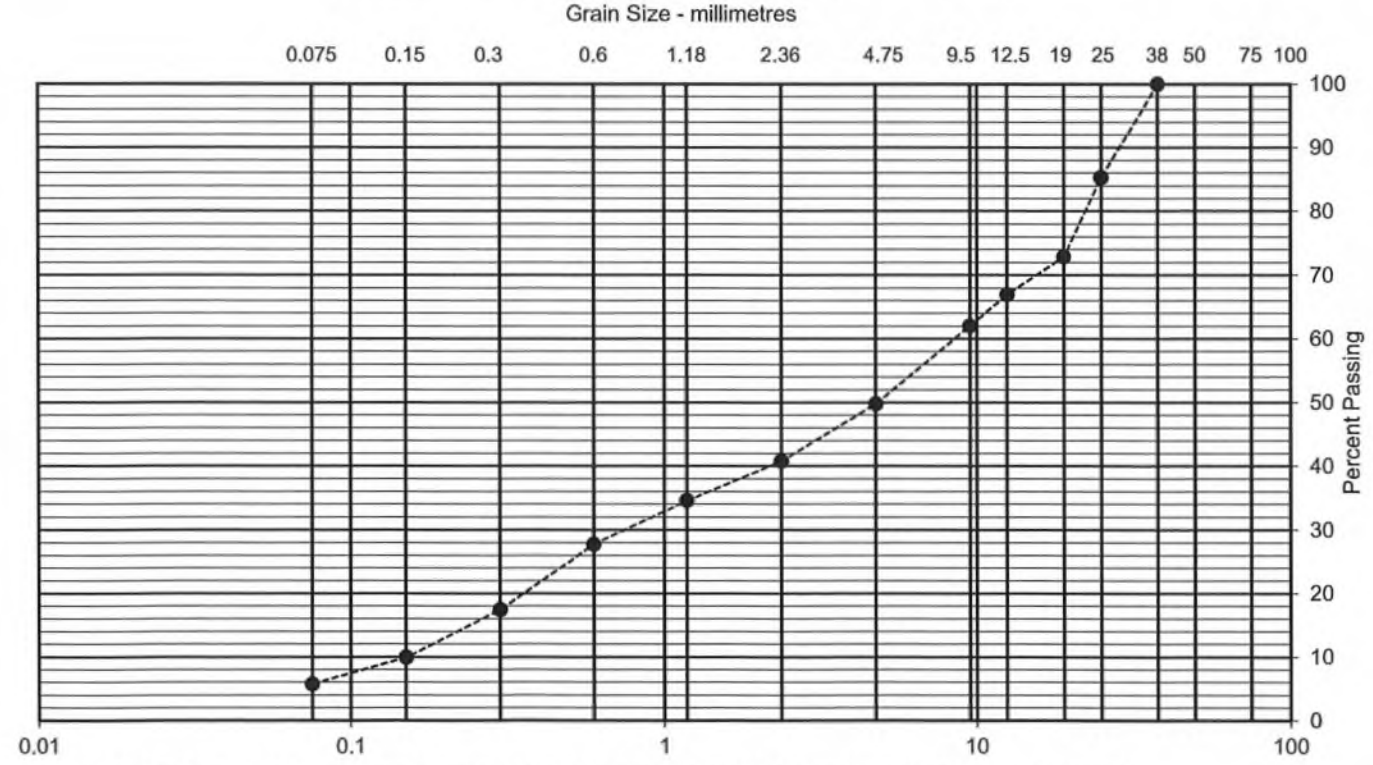
Location: Kelowna, B.C.

Sampled By: RCS

Material: Gravel and Sand, trace silt

Sample: Borehole 5, Sample 3, Depth 4.9 m

Wash Analysis			
Sieve (mm)	% Passing	Sieve (mm)	% Passing
150		9.50	62.0
100		4.75	49.8
75		2.36	40.8
50		1.18	34.6
38.0	100	0.600	27.7
25.0	85.3	0.300	17.4
19.0	72.9	0.150	9.9
12.5	67.0	0.075	5.7



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GRAIN SIZE DISTRIBUTION

ASTM C136, C117

Project: Kelowna Community Campus

Project No: 6662

Client: City of Kelowna

Sample Date: 22-Oct-2021

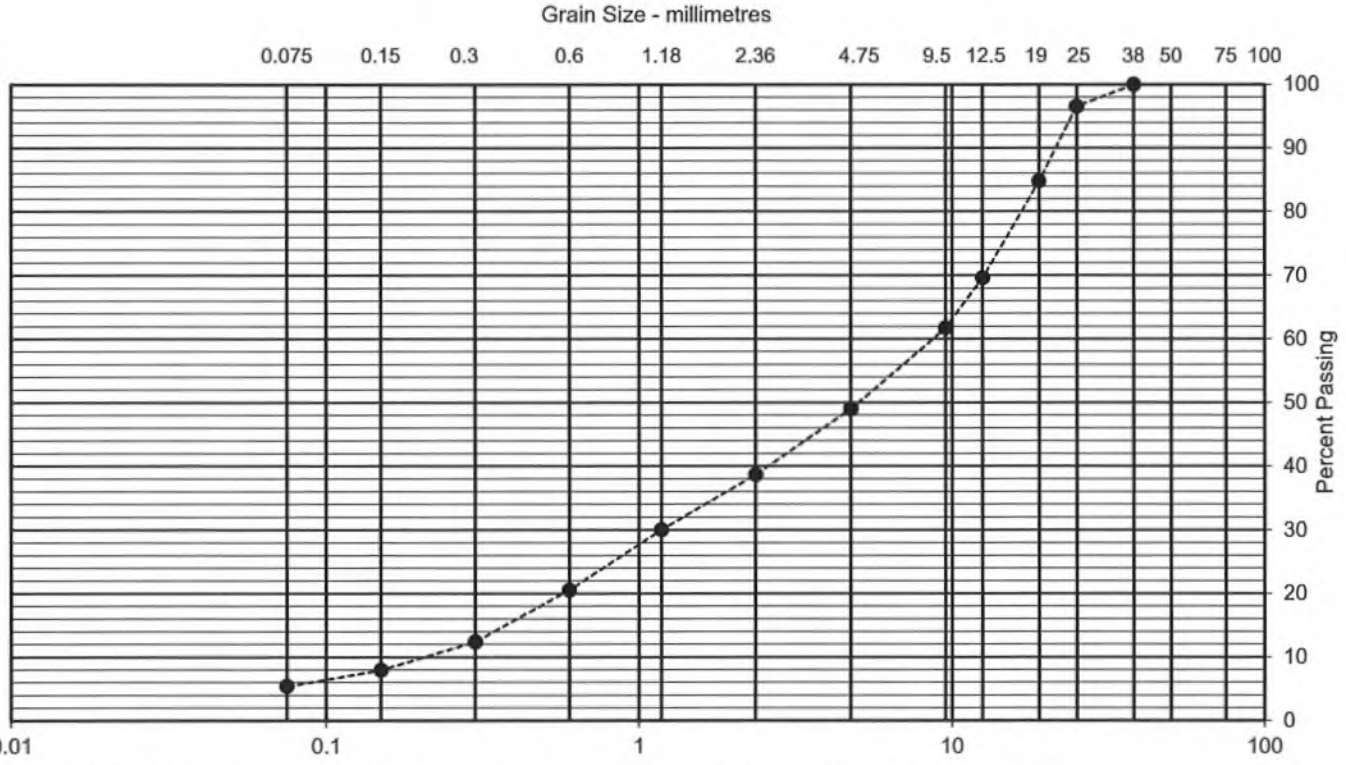
Location: Kelowna, B.C.

Sampled By: RCS

Material: Gravel and Sand, trace silt

Sample: Borehole 6, Sample 4, Depth 3.7 m

Wash Analysis			
Sieve (mm)	% Passing	Sieve (mm)	% Passing
150		9.50	61.7
100		4.75	49.0
75		2.36	38.7
50		1.18	30.1
38.0	100	0.600	20.5
25.0	96.6	0.300	12.4
19.0	84.8	0.150	8.0
12.5	69.6	0.075	5.4



TERMS OF ENGAGEMENT

1. General

Fletcher Paine Associates Ltd. (FPA) shall render its services to the Client for this project with that degree of care, skill and diligence normally provided in the performance of services for projects of a similar nature to that contemplated.

In rendering services to the Client, FPA may, at its discretion and at any stage, engage subconsultants to FPA to carry out its duties and responsibilities as set forth.

2. Compensation

Charges for the services rendered will be made in accordance with our Schedule of Fees in effect at the time the work is performed. All charges will be made in, and will be payable in, Canadian Dollars. Invoices will be due and payable on receipt without holdback. A monthly service charge will be applicable to invoices remaining unpaid after 30 days.

3. Notices

FPA will designate a project manager who shall be responsible for the project. The Client shall designate an authorized representative to act with respect to the project.

4. Termination

Either party may terminate this engagement with cause upon seven (7) days notice in writing. The Client shall forthwith pay for all services performed, including all expenses and other charges payable that are associated with obligations incurred by FPA for this project.

5. Environment and Pollution

The FPA field investigation, laboratory testing and engineering recommendations are not intended to address or evaluate pollution of soil or pollution of groundwater. When practical, FPA will cooperate with the Client's environmental consultant during the field work phase of the investigation.

6. Professional Responsibility

FPA will provide the standards of care, skill and diligence normally provided by a Professional Engineer in the performance of engineering services as contemplated for this project.

7. Limitations of Liability

FPA shall not be responsible for:

a) The failure of a Contractor to perform work in accordance with the relevant contract documents for the Project;

b) The design of, or defects in, equipment provided by or on behalf of the Client by others, for incorporation into the Project;

c) Any damage to subsurface structures or utilities; resulting from subsurface investigations for the Project;

d) Any cross-contamination of ground or groundwater resulting from subsurface investigations for the Project;

e) Any costs incurred for stopping the flow of artesian water from test holes in the event that such conditions are encountered during any field investigation for the Project;

f) Any decisions made by the Client in relation to the Project that are inconsistent with, or contrary to, the advice provided by FPA;

g) Any consequential loss, injury, or damages suffered by the Client, including but not limited to loss of use, loss of earnings, or business interruption;

h) The distribution of any document or report prepared for the Client by or on behalf of FPA for the Project without express authorization by FPA.

Notwithstanding anything to the contrary, the aggregate liability of FPA, including liability for professional negligence and fundamental breach of contract, shall be limited to the amount of Professional Liability insurance carried by FPA.

The Client's failure to accept the professional recommendations and advice of FPA with respect to the geotechnical conditions at the Project shall relieve FPA of and from any and all legal liability, whether in contract or in tort, to the Client for all manner of loss and damage accruing to the Client, including consequential loss and damage, which may arise out of the FPA services.

8. Personal Liability

The Client agrees that FPA's principals and employees have no personal liability to the Client in respect of a claim whether in contract, tort, and/or any other cause of action in law, and expressly agrees that it will bring no proceedings and take no action in any court of law against any of FPA's principals or employees in their personal capacities.

9. Third Party Liability

This report was prepared by FPA for the Client and the material presented in it reflects the opinions and judgements of FPA as based upon the information available at the time of its preparation. Any use(s) made of this report by a third party is/are the sole responsibility of such third parties. FPA will not accept any responsibility for damages suffered by any third party as a result of decisions made or actions taken that are ostensibly based upon this report. Any use or reliance upon this report by a third party must be authorized in writing by FPA

10. Documents

All of the Documents prepared by FPA in connection with the Project are instruments of service for the execution of the Work. FPA retains the property and copyright in those Documents, whether the Project is executed or not. These Documents may not be used on any other project without prior written agreement and remuneration.

11. Field Services

Where applicable, the field services recommended are the minimum necessary to ascertain that the Contractor's work is being carried out in general conformity with the intent of our recommendations. Any reduction from the level of services recommended will result in FPA providing qualified opinions regarding the adequacy of the work.

12. Confirmation of Professional Liability Insurance

As required by the Association of Professional Engineers and Geoscientists of British Columbia, it is required that our firm advise whether or not Professional Liability Insurance is held. It is also required that a space for you to acknowledge this information is provided. Accordingly, this notice serves to advise you that FPA carries professional liability insurance. If you wish to acknowledge receipt of this information please sign and return a copy of this form.