NAITO ENVIRONMENTAL

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November 6, 2012

Our File: **403-05-01**

Burton Marine Pile Driving Inc.
1609 Munson Road
Kelowna, BC V1W 2G8
Attention: Mr. Kevin Hanson

Re: **Lot C, Sec. 29, Tp. 23, ODYD, Plan KAP91304, 3274 Shayler Road, Kelowna, BC – Environmental Assessment of Proposed Dock**

Dear Mr. Hanson:

As requested, the following environmental assessment of a dock proposed on Okanagan Lake off of Shayler Road in Kelowna, BC has been revised to reflect a changed dock design.

BACKGROUND

The previous owner of Lot C, 3274 Shayler Road in the City of Kelowna, BC had proposed to install a dock on Okanagan Lake at that address (Figure 1). Because the proposed dock location is located within a short section of red zone (very important for shore spawning kokanee) between sections of black zone (critical area) (Figure 2) under the Okanagan Region Large Lakes Foreshore Protocol (OLLP), an environmental assessment of the proposed project was conducted by Naito Environmental to enable Ministry of Forests, Lands and Natural Resource Operations (MFLNRO) to adjudicate the project application. The property now has a new owner who requires a more substantial dock than originally designed to accommodate a larger boat. Burton Marine Pile Driving Inc. of Kelowna, BC has designed a larger dock to meet the greater moorage requirements, and requested that Naito Environmental revise the original environmental assessment to reflect the design changes.

PROPOSED WORKS

The proposed 33.0 m long dock will begin with an 11.4 m long × 1.5 m wide walkway of composite or non-treated wood decking extending out from the Okanagan Lake high water mark (HWM) (343.0 m elevation), followed by a 13.1 m long × 1.5 m wide aluminum bridge with ThruFlow™ Dynamic Component decking over the shore spawning habitat. The bridge will connect to a 3.0 × 8.5 m deck of composite or non-treated wood that will have two 9.8 m long fingers, 1.5 m and 3.0 m wide, with a boat lift in between. The dock will be supported on 26 piles, including four for the boat lift. The piles are likely to be 20 cm (8") diameter steel piles.

...2

As required in red zones, the dock will be no less than 0.5 m above HWM. Dock components will be 9 m from the north property boundary and more than 14 m from the south property boundary.

A dock on the adjacent lot to the north (3270 Shayler Road) with a similar aluminum bridge over the spawning habitat is shown in Photo 1.

The dock installation will be conducted from a floating barge and is expected to take place during the next timing window of June 1-September 30 in 2013.

METHODS

I conducted a site visit on August 10, 2012 to assess site conditions from shore, by wading, and using a float tube. Investigations included a depth profile along the dock alignment, and suitability of the substrate for shore-spawning by kokanee (*Oncorhynchus nerka*) and mountain whitefish (*Prosopium williamsoni*). Depth measurements were taken with a 2.3 m depth stick and then marked depth rope along a 50 m fiberglass tape anchored at the high water mark (HWM). Spawning suitability was assessed primarily by substrate type and water depth. Lake surface elevation on the survey date was 342.23 m asl[1]. The HWM elevation of 343.0 m was located by using a clinometer to sight horizontally at 0.77 m above the lake surface.

The BC Conservation Data Centre website was checked for any mapped occurrences of species or ecosystems at risk in the project vicinity.

In addition to this assessment report, a QP (Qualified Professional) Checklist for Foreshore Works has been completed as per the OLLP and is attached as Appendix 1.

FISH SPECIES

Twenty-four fish species (Table 1) have reportedly been observed or are potentially present in Okanagan Lake, including ten species defined as freshwater game fish[2]. The 24 fish species include 22 species listed on the Ministry of Environment website[3], plus smallmouth bass (*Micropterus dolomieui*) which have been introduced into Skaha Lake and may now be present in Okanagan Lake, and lake chub (*Couesius plumbeus*) whose distribution in British Columbia includes the Okanagan region[4].

If the habitat preferences of fish species potentially present in Okanagan Lake were known for all life stages and seasons, these could be used to assess the likelihood that each species might utilize the project site as well as shed light on the potential impacts of the proposed dock on each species. However, there are many data gaps, and much of the information for some species (e.g., mountain whitefish, burbot) is from streams and rivers, with unknown applicability to lake

[1] Real-time hydrometric data for Okanagan Lake at Kelowna, Station 08NM083. Environment Canada http://www.wateroffice.ec.gc.ca/text_search/search_e.html?search_by=p&region=BC
[2] Freshwater Fishing Regulations Synopsis 2011-2013. Ministry of Forests, Lands and Natural Resource
[3] Fisheries Inventory Data Queries. http://a100.gov.bc.ca/pub/fidq/main.do/ Accessed on August 18, 2012.
[4] The Freshwater Fishes of British Columbia. G.C. Carl, W.A. Clemens, and C.C. Lindsey. 1977. p. 122.

habitats. In addition, fish are adaptable creatures and there is wide variation in reported habitat utilization information. Suffice it to say that many fish species likely utilize the habitat at the proposed dock site. However, the species of greatest management concern is kokanee, which have been subject to intensive stock re-building efforts, including preservation of shore spawning habitat, since the Okanagan Lake population crashed in the 1990s.

Table 1. Names and estimated relative abundance in Okanagan Lake of twenty-four fish species reportedly observed or potentially present.

Common Name	Scientific Name	Relative Abundance	Comments
kokanee	Oncorhynchus nerka	high	
rainbow trout	O. mykiss	moderate	
westslope cutthroat trout	O. clarki lewisi	nil?	introduced; unknown if present
eastern brook trout	Salvelinus fontinalis	low	non-indigenous
lake trout	S. namaycush	low	non-indigenous
burbot	Lota lota	moderate	
lake whitefish	Coregonus clupeaformis	high	non-indigenous
mountain whitefish	Prosopium williamsoni	high	
pygmy whitefish	Prosopium coulteri	nil?	unknown if present
smallmouth bass	Micropterus dolomieui	low	suspected recent addition to fauna
yellow perch	Perca flavescens	moderate	non-indigenous
pumpkinseed	Lepomis gibbosus	unknown	non-indigenous
carp	Cyprinus carpio	high	non-indigenous
northern pikeminnow	Ptychocheilus oregonensis	high	
lake chub	Couesius plumbeus	unknown	can be abundant where found
peamouth	*Mylocheilus caurinus*	high	
chiselmouth	*Acrocheilus alutaceus*	unknown	unknown if present
leopard dace	Rhinichthys falcatus	unknown	prefers streams
longnose dace	Rhinichthys cataractae	unknown	prefers streams
redside shiner	Richardsonius balteatus	high	
largescale sucker	Catostomus macrocheilus	high	
longnose sucker	Catostomus catostomus	high	
prickly sculpin	Cottus asper	high	
slimy sculpin	*Cottus cognatus*	unknown	prefers streams

Preferred kokanee spawning substrate at Bertram Creek Park in Kelowna is described as hand-sized (17.2 cm), sub-angular, platy and cobble material on the surface, with size decreasing rapidly beneath to an average of 2.5 cm overlaying a silt layer at depth of 7-23 cm (average 15.4 cm) below the surface of the substrate[5]. The significant feature is the existence of interstitial spaces in the rock substrate that allow kokanee eggs to settle into the crevices where they are protected from predators and wave action. This author believes that the importance of platy material is that it is less likely to become embedded in fine material than round cobbles due to being more easily shifted by wave action.

HABITAT CONDITIONS

The dock location is on a relatively undeveloped shoreline (Photos 1, 2) of rounded, broken rock, with a shoal sloping at 11-12% to a dropoff into deeper water around 25 m out from HWM (Figure 3). Depth measurements are provided in Appendix 2. Lake-bottom substrate is broken or sub-angular rock out to the 341.6 m elevation, then rounded cobble 7-20 cm in diameter (Photo 3) between 341.6 m and 340.4 m, transitioning to larger cobble and boulder up to 45 cm diameter resting on sand out to 338.3 m and mainly sand beyond that. No aquatic vegetation was observed.

The best spawning substrate appears to occur between approximately 341.3 m and 340.4 m elevation (13.5 m to 22 m from HWM), as there are some interstices in the rocks. Elsewhere, the surface material is either too fine or else is resting on fine gravel and/or sand, leaving little opportunity for eggs to settle into cracks or spaces.

The lake surface elevation that typically exists in October during kokanee shore spawning activity is around 341.6 m asl[6], and depth of spawning at a preferred Okanagan Lake kokanee spawning area (Bertram Creek Park in Kelowna) was generally 0.5±0.25 m with the greatest frequency in 0.25-0.5 m deep water[7]. Conservatively allowing for spawning between water depths of 0.10 m and 1.0 m, the shore spawning depth zone lies between approximately the 341.5 m and 340.6 m elevations that occur between approximately 11 m and 21 m from the HWM, while the good quality substrate lies between 341.3 m and 340.4 m (13.5 m and 22 m from HWM). The overlap between good substrate and favourable depth lies between 341.3 m and 340.6 m, corresponding to approximately 13 m and 21 m from HWM. The elevations of 341.5 m and 340.4 m (11 m and 22 m from HWM) encompass all of the favourable depth and substrate zones.

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[5] Peter Dill, A study of shore-spawning kokanee salmon (*Oncorhynchus nerka*) incubation and emergence, Okanagan Lake – 1996 brood. Pages 258-274 in Okanagan Lake Action Plan Year 1 (1996-97) and Year 2 (1997-98) Report by Ken Ashley and eighteen others.

[6] Environment Canada, real-time hydrometric data for Okanagan Lake at Kelowna, Station 08NM083 http://www.wateroffice.ec.gc.ca/text_search/search_e.html?search_by=p&region=BC

[7] Peter Dill, A study of shore-spawning kokanee salmon (*Oncorhynchus nerka*) at Bertram Creek Park, Okanagan Lake – Fall, 1997. Pages 236-257 in Okanagan Lake Action Plan Year 1 (1996-97) and Year 2 (1997-98). Report by Ken Ashley and eighteen others.

The proposed dock location is in a narrow band of red zone between adjacent black zones (Figure 2). The red zone along the shoreline is bound by UTM coordinates 324271 m E 5539590 m N on the north side and 324216 m E 5539519 m N on the south side. Coordinates of the proposed dock origin are 324262 E 5539562 N.

Consistent with the red zone designation, the substrate conditions appear to provide good but not excellent quality kokanee shore spawning habitat due to the rounded cobbles (versus platy material) and presence of fine gravel and/or sand immediately under the surface layer in some areas.

There are no mapped occurrences of elements tracked by the Conservation Data Centre within at least 3 km of the proposed dock site. No mussels were detected during the field survey, and the red-listed Rocky Mountain Ridged Mussel (*Gonidia angulata*) is not expected to occur in the vicinity of the dock site due to the rocky substrate. This mussel species utilizes "gravel to fine mud with the presence of at least some fine material", and preferred habitat is usually less than 3 m deep[8].

Riparian vegetation at the dock site consists primarily of black cottonwood (*Populus trichocarpa*) saplings, with other species including Ponderosa pine (*Pinus ponderosa*), Douglas-fir (*Pseudotsuga menziesii*), Saskatoon (*Amelanchier alnifolia*), and Oregon grape (*Mahonia aquifolium*) (Photos 1, 2, 5). There is vegetation typical of the Ponderosa pine-Bunchgrass BEC (Biogeoclimatic Ecosystem Classification) Zone on the adjacent hillside (Photo 5).

The subject property lies within Segment 87 on Mapsheet 22 of the Okanagan Lake Foreshore Inventory and Mapping (FIM)[9]. Foreshore inventory data for this segment are as follows:

Shore Type/Land Use	Cliff/Bluff/Rural
Level of Impact	Low
Habitat Index Rating	Very High
Wildlife/Plant	No grebe or rare plants
SEI	100% core, 0% corridor, 0% other, 0% buffer, 49% N/A
Fisheries Information	no staging, no migration, no salmon spawning stream, no mussel presence
Juvenile Rearing	Moderate
Kokanee Spawning	59% black zone, 36% red zone, 2% yellow zone, 2% no colour

[8] COSEWIC Assessment and Status Report on the Rocky Mountain Ridged Mussel in Canada. 2003. Ottawa. http://dsp-psd.pwgsc.gc.ca/Collection/CW69-14-370-2004E.pdf

[9]. Foreshore Inventory and Mapping/Aquatic Habitat Index. Okanagan Lake: A compilation of North, South, and Central Okanagan Lake. 2011. Prepared for Okanagan Collaborative Conservation Program by Ecoscape Environmental Consultants Ltd., Kelowna, BC. February.

IMPACT ASSESSMENT

The primary concern with the proposed works is impacts on shore spawning and incubation by kokanee (*Oncorhynchus nerka*) and, to a lesser extent, mountain whitefish (*Prosopium williamsoni*). Consistent with the red zone designation, the shore spawning habitat quality at this particular location appears good but not excellent.

Environmental impacts of the proposed dock are anticipated to be minimal for reasons that include the following:

- the full spanning bridge will result in no piles in potential kokanee shore spawning habitat;
- the bridge portion over potential spawning area will be surfaced with light penetrating material;
- the dock will be a minimum of 0.5 m above the high water level;
- the dock walkway and bridge will be only 1.5 m wide;
- the dock and fingers at the end of the bridge are over water that meets or exceeds a depth of 1.5 m at low water level;
- assuming 26 steel piles with 20 cm diameter, the combined pile footprint area will be only 0.8 m^2;
- pile installation creates very little disturbance and suspended sediment;
- the work will be conducted within the timing window of June 1-September 30 for a site greater than 0.5 km from a known spawning stream and with kokanee shore spawning habitat nearby;
- the work will be conducted from a floating barge, so no shore access will be necessary; and
- no species at risk other than kokanee are known to occur at the project site.

Riparian impacts will consist of the loss of approximately four (4) cottonwood saplings.

IMPACT MITIGATION PLAN

Riparian

To address the minor disturbance of riparian vegetation, six (6) black cottonwood saplings of minimum 2 gallon pot size should be planted in understocked areas along the shoreline in the same elevation range as existing cottonwood plants. The planted cottonwoods should be marked with flagging and have their locations noted on a sketch map in relation to permanent features (e.g., the new dock) for ease of locating them when assessing future plant survival.

In-Lake Work

Due to the location of the work site in a known kokanee spawning area, the dock installation contractor must employ the following impact mitigation measures during construction:

- measures to protect fish and fish habitat listed in the Department of Fisheries and Oceans Operational Statement for Dock and Boathouse Construction in Freshwater Systems[10] should be adhered to where practical;
- the Integrated Land Management Bureau Thompson Okanagan Private Moorage Guidelines[11] should be adhered to throughout the design, construction, and operation of the proposed dock;
- complete construction within the in-lake timing window of June 1-September 30;
- keep all machinery clean and free of leaks, excess oil, grease, invasive species, and noxious weeds;
- have a containment system surrounding engines or other sources of fuel and oil with sufficient capacity to capture the entire amount of a potential leak of these fluids;
- have available on-site a spill kit suitable for containing and capturing a fuel or hydraulic fluid spill.

In addition, due to the higher than usual number of piles required for this larger dock, it is strongly recommended that 20 cm diameter steel piles be used instead of the standard 40 cm wood piles to reduce both the footprint and cross-sectional area of the piles. Steel piles would have a footprint area of approximately 0.8 m^2 versus 3.3 m^2 for wood piles, while steel piles would have a cross-sectional width of 5.2 m versus 10.4 m for wood piles. The greater cross-sectional width of wood piles increases the possibility of interference with wave action that is believed to help maintain shore spawning habitat quality.

Any changes to the preceding mitigation measures will require prior agreement from the environmental monitor.

Environmental Monitoring

Due to the sensitivity of the site (proximity to kokanee shore spawning), a qualified environmental professional (QEP) acting as an environmental monitor should meet on-site with the pile installation contractor prior to start of work and be present during the dock construction long enough to confirm that these activities present minimal risk to environmental values.

[10] Available at http://www.pac.dfo-mpo.gc.ca/habitat/os-eo/dock-quais-eng.htm
[11] Effective Date: September 2009. Document field: ilmb pm guidelines final september 2009

CONCLUSIONS

If the proposed dock at 3274 Shayler Court is constructed observing applicable best management practices and employing the mitigation measures prescribed in the foregoing report, no harmful alteration, disruption or destruction (HADD) of natural features, functions and conditions that support fish life processes is anticipated. Even though the default risk rating for a dock in a red zone is H (high) according to the OLLP, I believe that the proposed dock will not have negative impact on shore spawning kokanee or habitat.

I trust that this report will meet your needs. Please contact me if you have any questions or require further information.

Sincerely yours,
NAITO ENVIRONMENTAL

Gerry Naito

Gerry Naito, RPBio
Senior Biologist/Principal

COLLEGE OF APPLIED BIOLOGY
Nov 6/12
Gerry J. Naito
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R.P. Bio #708
CAB

Attachments:
Figure 1. Location of Lot C 3274 Shayler Road, Kelowna, BC
Figure 2. Location of proposed dock in relation to habitat colour zones
Figure 3: Plan view of proposed dock
Figure 4: Section view of proposed dock
Appendix 1. Photo Pages (2 pages × 3 photos)
Appendix 2. QP Checklist for Foreshore Works
Appendix 3. Depth measurements and substrate observations

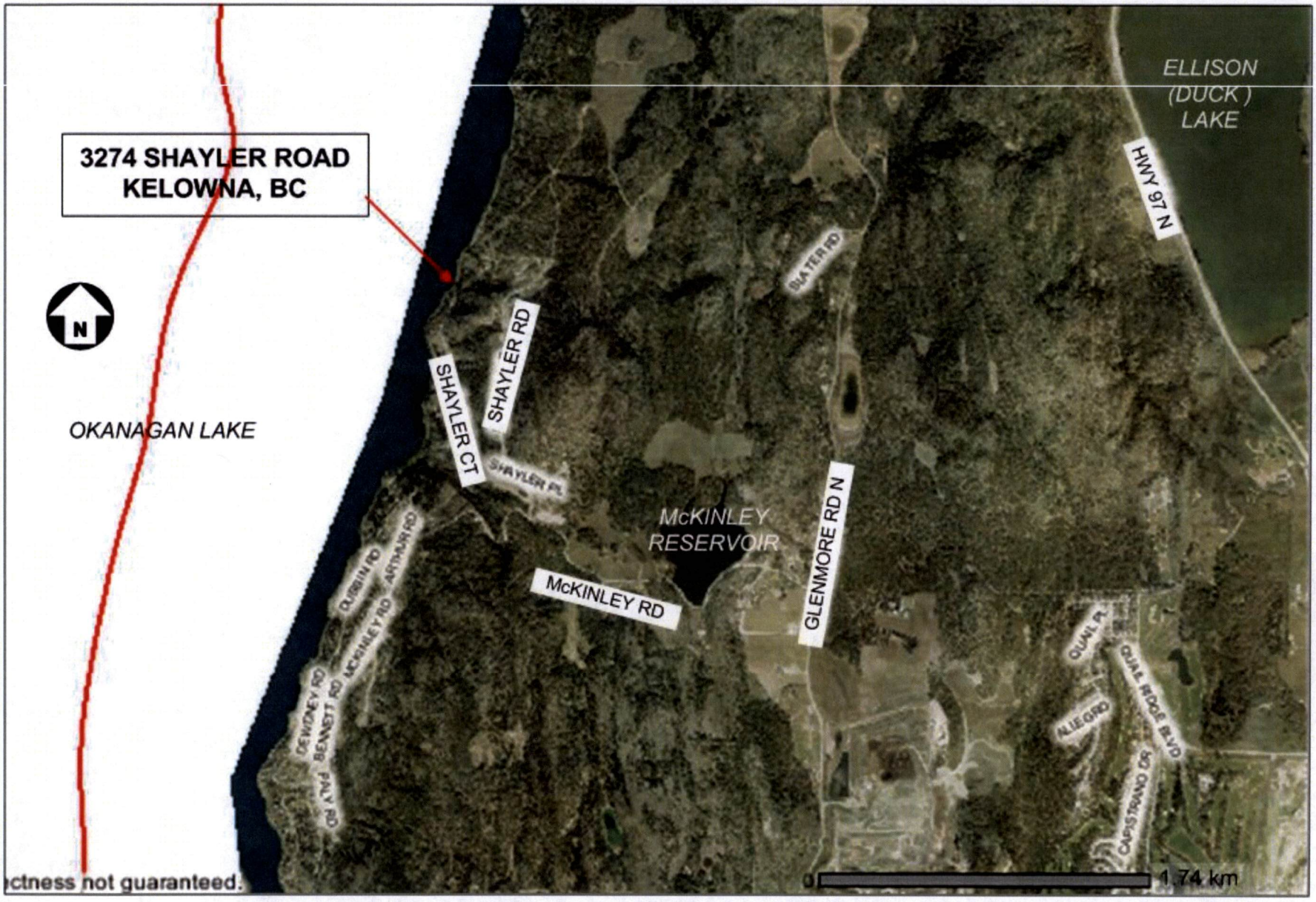


Figure 1. Location of Lot C 3274 Shayler Road, Kelowna, BC.

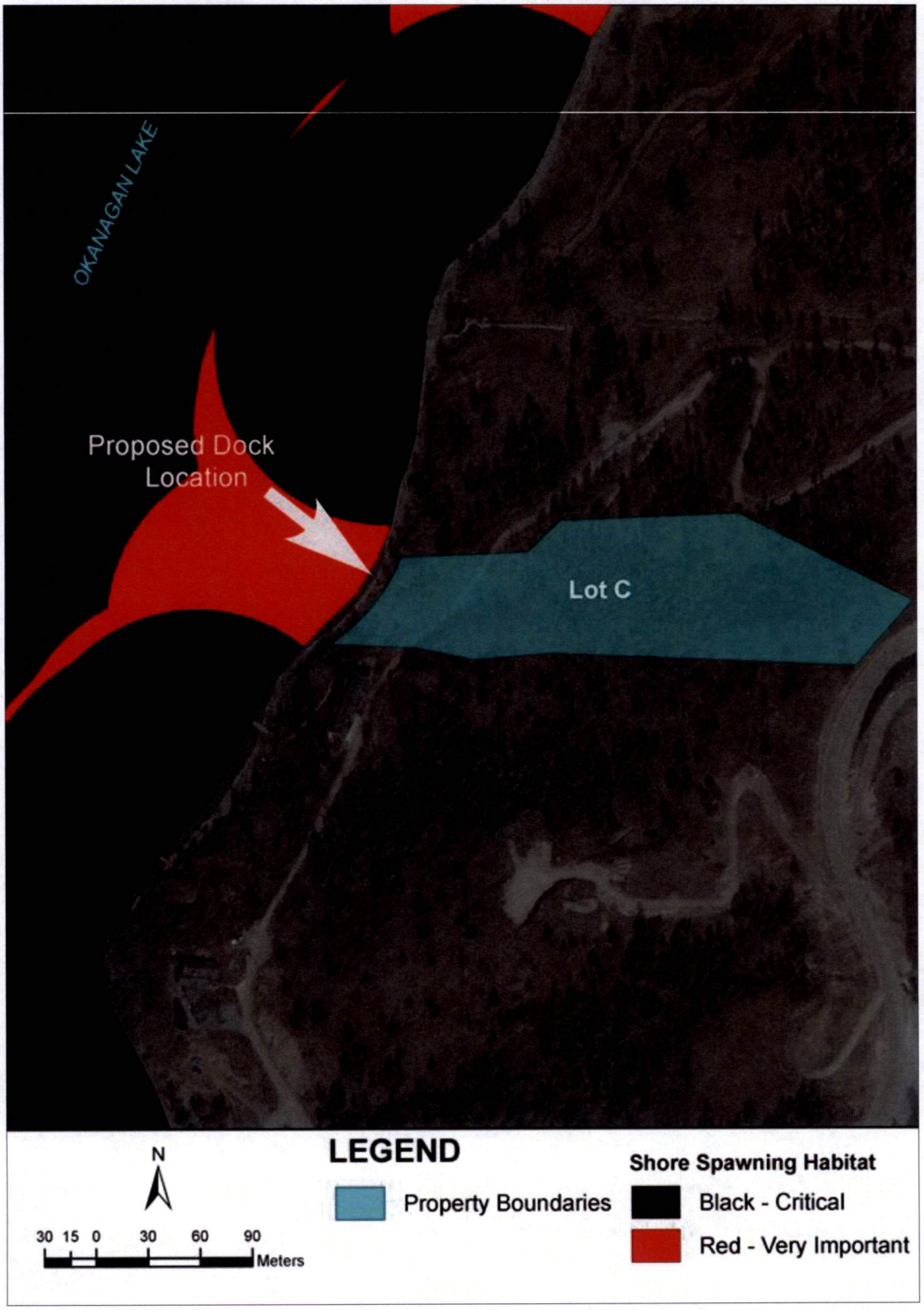
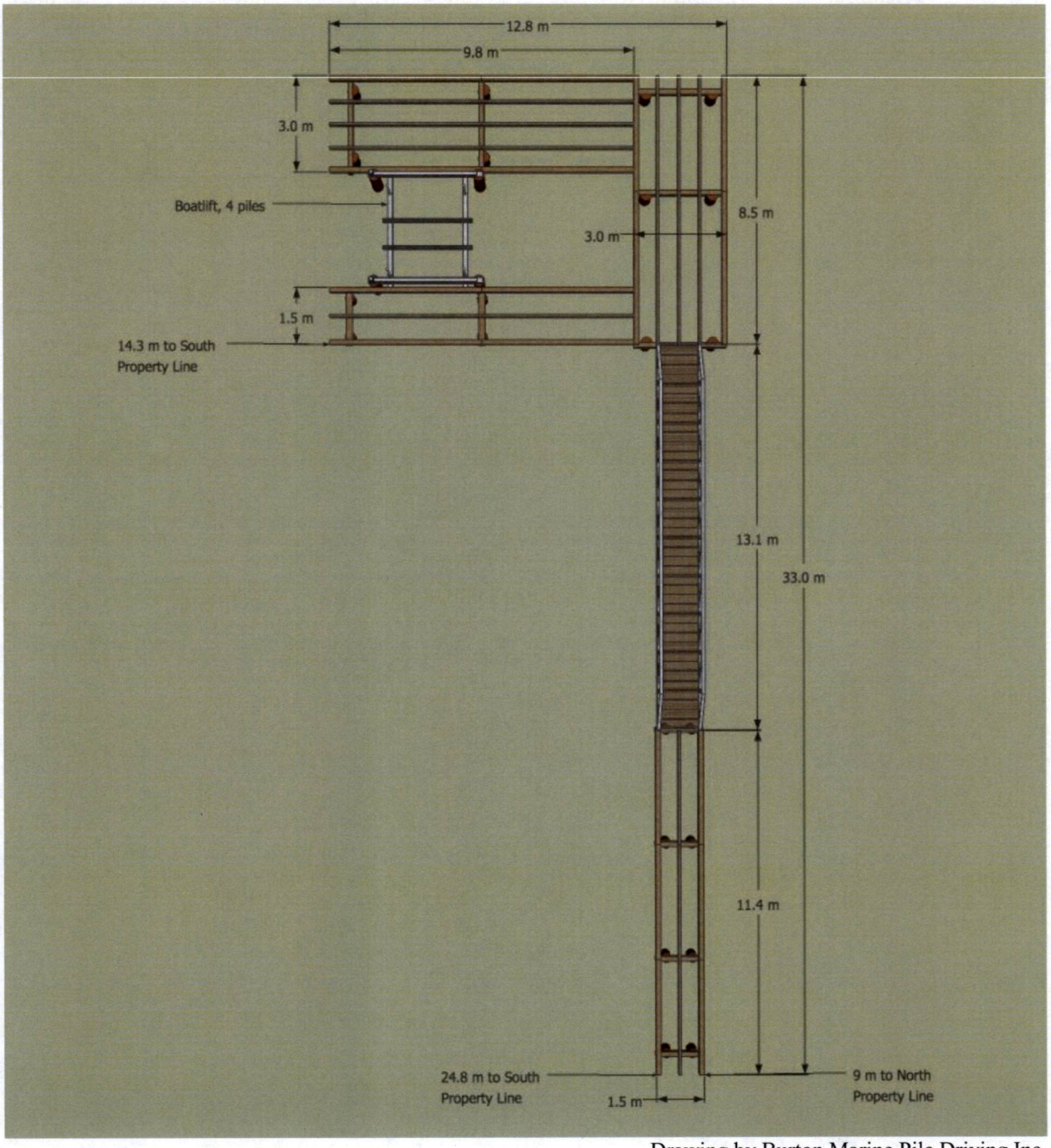


Figure by Framework Environmental Consulting, Vernon, BC

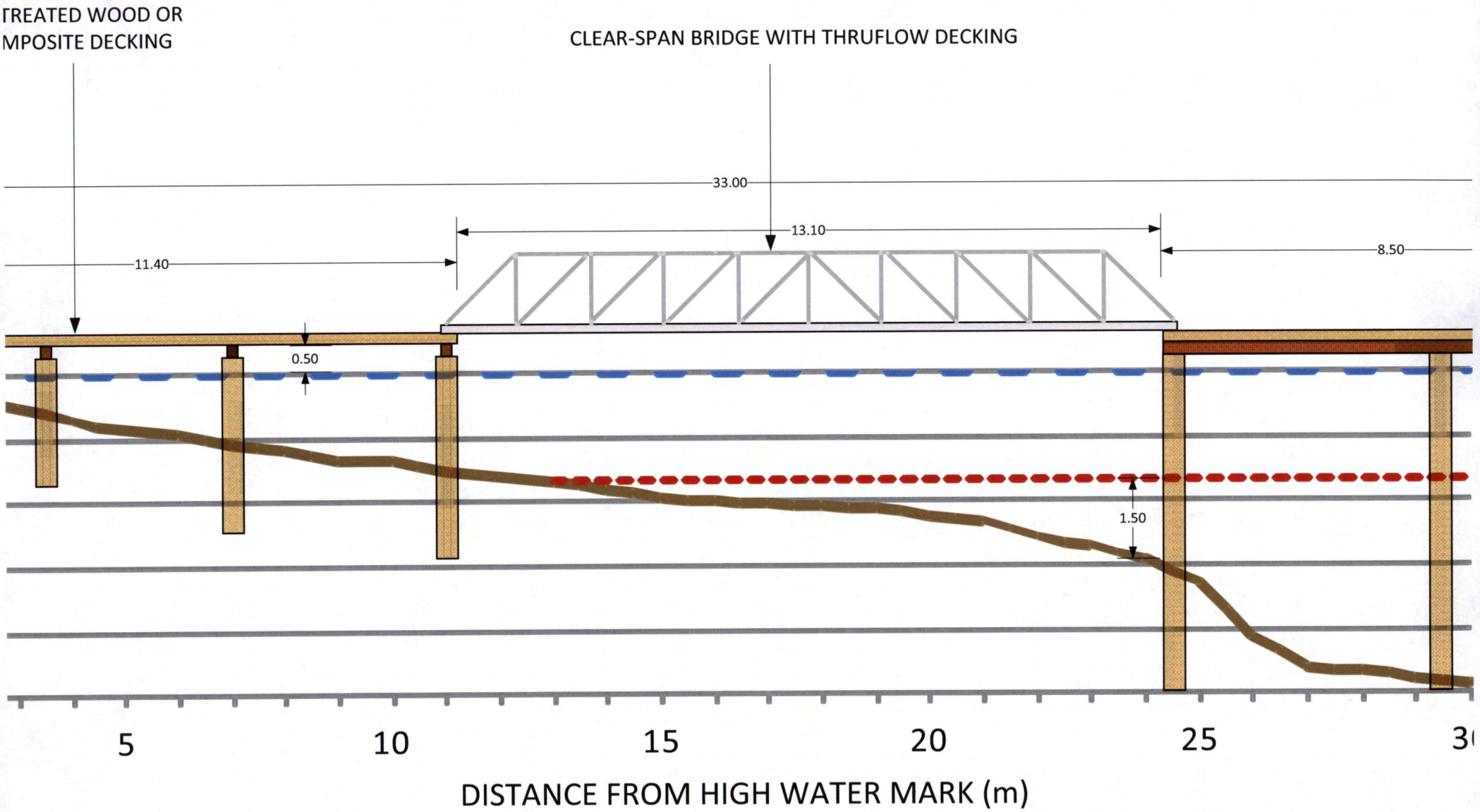
Figure 2. Location of proposed dock at Lot C 3274 Shayler Road, Kelowna, BC, in relation to habitat colour zones.



Drawing by Burton Marine Pile Driving Inc.

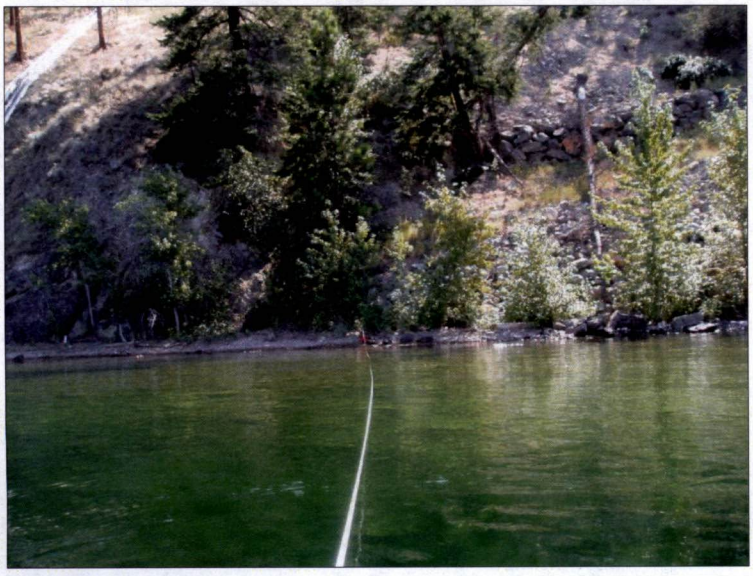
Figure 3. Plan view of dock proposed for 3274 Shayler Road.

. SECTION VIEW OF PROPOSED DOCK AT 3274 SHAYLER ROAD, KELOWNA, BC.



ROAD, KELOWNA, BC

	Looking north at a dock with bridge similar to that proposed for Lot C 3274 Shayler Road, Kelowna, BC. Aug 10/12
	Looking north along shoreline from proposed dock location.
	Looking south along shoreline from proposed dock location. Aug 10/12

	Cobble and sub-angular rock substrate just below 341.6 m elevation along proposed dock alignment. Aug 10/12
	Looking out from shore along proposed dock alignment. Aug 10/12
	Looking in toward shore along proposed dock alignment. Aug 10/12

APPENDIX 2. Qualified Professional Checklist for Foreshore Works - Okanagan LLP

Project Name: **New Dock at 3274 Shayler Road, Kelowna, BC** Date: November 6, 2012

NOTE: The items in this checklist apply to the site of works and the surrounding area.

* The explanation column is mandatory.

Have you …		**Yes**	**No**	**N/A**	**Explain**
1.0 SITE SURVEY					
1.1 reviewed existing fish, emergent vegetation, SAR & habitat mapping data, including:	a) Conservation Data Centre (CDC)?	X			no known occurrences of SAR
	b) local MOE (Ecosystem Staff)?	X			no known SAR; kokanee spawning is main concern as site is in a red zone between black zones
	c) Foreshore Inventory Mapping?	X			information not at fine enough scale
	d) Sensitive Ecosystem Inventory?	X			sensitive ecosystems of coniferous woodland and sparsely vegetated (e.g., rocky outcrop) not affected by dock
1.2 conducted any inventories to confirm presence/absence of fish, emergent vegetation and SAR or their habitats on site?		X			fish species presence known; no emergent vegetation or SAR identified (refer to assessment report)
1.3 confirmed environmentally sensitive features or ecosystems on the site? (*only if the upland is within an environmental development permit area*)			X		upland studies conducted by Ecoscape Environmental Consultants for proposed tram on adjacent lot north
1.4 evaluated and described local soil and foreshore substrate?		X			refer to assessment report
1.5 assessed potential changes to local shoreline and stream mouth accretion/erosion dynamics? (*only required for marina, infill and erosion protection works*)		X			dock not anticipated to affect shoreline accretion/erosion

Have you …		Yes	No	N/A	Explain
2.0 SITE DESIGN & RECOMMENDATIONS					
2.1 applied DFO's principal of 'no net loss'?	a) Redesign?	X			site-specific design to fully span potential spawning area
	b) Relocate?		X		single lot; habitat homogeneous
	c) Mitigation?	X			environmental monitoring; spill prevention and containment
	d) Compensation?		X		none required
2.2 followed the Habitat Officer's Terms and Conditions?		X			
2.3 followed all BMPs? If not, have you described in the EIA alternatives to BMPs that are being used (pg #)		X			
2.4 included measures to avoid or minimize impacts to aquatic and riparian habitat? (*in relation to existing or potential fish and SAR use*)		X			spill prevention and containment; minor riparian impact unavoidable
2.5 included measures to avoid or minimize impacts to any fish, emergent vegetation or SAR identified on the site?		X			construction during timing window; no emergent vegetation or SAR identified
2.6 applied the least risk timing windows?		X			work to be conducted during applicable timing window of June 1-Sept 30
2.7 minimized the footprint of the works?		X			steel piles recommended
2.8 considered one common lakeshore access on multiple lot sites?				X	site is single lot
2.9 maintained a 50 m lakeshore frontage between moorage structures on single lots?			X		lot frontage widths are less than 50 m
2.10 minimized access related disturbance from machinery/equipment?		X			barge access; water depth sufficient to avoid grounding
2.11 included measures to ensure no erosion or sediment releases result from proposed works?		X			environmental monitoring; pile installation is unlikely to release sediment (coarse substrate)

Have you …	Yes	No	N/A	Explain
3.0 MONITORING & REPORTING				
3.1 included provisions to ensure protective measures & BMPs are followed?	X			environmental monitoring at startup
3.2 included provisions for monitoring to ensure the completed works function as expected over time?		X		not deemed necessary
3.3 provided recommendations for any impacts from future maintenance?		X		none anticipated
3.4 considered long term water quality issues?	X			none anticipated
3.5 reported new SAR occurrences to MOE Ecosystem Staff and CDC using CDC Field Observation Forms			X	no new SAR occurrences
3.6 reported null data for rare plant species to MOE Ecosystem Staff **(Osoyoos Lake Only)**			X	not Osoyoos Lake
4.0 LEGISLATIVE REQUIREMENTS				
4.1 avoided a HADD?	X			no piles in spawning habitat
4.2 received a letter of advice or authorization from DFO if the works do cause a HADD?		X		no HADD
4.3 conducted a RAR assessment for upland works? If yes, list RAR assessment # and indicate if the RAR assessment included provisions for foreshore access		X		

This development activity is in the following zone: Black (Red) Yellow No Colour

The development activity risk is Very High (High) Moderate Low

I confirm that all information provided in this checklist is to the best of my professional knowledge true and complete.

Gerry Naito

Original signature of Qualified Professional

Gerry Naito

Printed Name of Qualified Professional

RPBio #708 (BC College of Applied Biology)

Professional Association #

November 6, 2012

Date

COLLEGE OF APPLIED BIOLOGY
NOV 6/12
Gerry J. Naito
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R.P. Bio #708
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APPENDIX 3. Depth measurements and substrate observations along proposed dock alignment.

McKinley Lot C Dock Assessment
Depth Profile - August 10, 2012

1.99	m	Water Station Gauge Reading at 1200 PDT
340.236	m	Add Correction for GSC datum
342.226	m	Okanagan Lake Water Level

Raw Distance (m)	Corrected Distance (m)	Depth (m)	Elevation (m	Comments
0	0		343	343.0 m elevation (Okanagan L. high water mark)
1				
2				
3				
4				
4.5	4.5	0.00	342.23	wetted edge
5	5	0.07	342.16	broken rock 5 cm
6	6	0.16	342.07	broken rock 5 cm
7	7	0.30	341.93	broken rock 6 cm
8	8	0.41	341.82	subangular rock 5-10 cm
9	9	0.56	341.67	subangular rock 5-10 cm
10	10	0.59	341.64	subangular rock 25 cm
11	11	0.73	341.50	cobble 7 cm on fine gravel
12	12	0.83	341.40	cobble 10-15 cm on fine gravel
13	13	0.91	341.32	cobble 10 cm on fine gravel - some interstices
14	14	1.03	341.20	cobble 10-15 cm on gravel
15	15	1.17	341.06	50:50 cobble 10 cm and gravel 2 cm
16	16	1.22	341.01	cobble 10 cm on gravel and sand
17	17	1.27	340.96	cobble 10-12 cm
18	18	1.29	340.94	cobble 10-15 cm on gravel
19	19	1.34	340.89	50:50 cobble gravel
20	20	1.45	340.78	cobble 10-120 cm - some interstices
21	21	1.56	340.67	cobble 10-120 cm - some interstices
22	22	1.82	340.41	cobble-boulder 10-35 cm
23	23	1.94	340.29	cobble-boulder 10-35 cm on sand
24	24	2.14	340.09	cobble-boulder 10-40 cm on sand
25	25	2.54	339.69	cobble-boulder 10-30 cm on sand
26	26	3.36	338.87	boulder 25-45 cm
27	27	3.84	338.39	boulder 25-40 cm on sand
28	28	3.89	338.34	sand, cobble
29	29	3.99	338.24	sand
30	30	4.10	338.13	sand