APPENDIX Y

Biophysical Survey (R2)

FIBRECO

Fibreco Export Terminal Enhancement
Permit Application Document

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June 30, 2016
File: 315-004.01

Fibreco Export Inc.
1209 McKeen Avenue
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Attn: Glenn Dempster

Dear Mr. Dempster,

Re: Fibreco Terminal Enhancement Project, North Vancouver Biophysical Survey – Terrestrial Habitat Assessment

1.0 INTRODUCTION

Fibreco Export Inc. (Fibreco) retained Hemmera Envirochem Inc. (Hemmera) to conduct a biophysical survey as part of their Terminal Enhancement Project in North Vancouver. The assessment is required by Vancouver Fraser Port Authority (VFPA) under the Project and Environmental Review (PER) to support the application submission requirements for the Fibreco Terminal Enhancement Project (the Project).

The scope of the biophysical assessment was to survey habitat value for terrestrial resources (wildlife and vegetation), to determine the potential for at-risk species to be negatively impacted by the Project, and to provide mitigation measures. The surveys took place at the location of the rail jetty modification component of the Project (the Project site).

This Work was performed in accordance with Professional Services Agreement between Hemmera and Fibreco, dated May 19, 2016 (Contract). This Report has been prepared by Hemmera, based on fieldwork conducted by Hemmera, for sole benefit and use by insert client name. In performing this Work, Hemmera has relied in good faith on information provided by others, and has assumed that the information provided by those individuals is both complete and accurate. This Work was performed to current industry standard practice for similar environmental work, within the relevant jurisdiction and same locale. The findings presented herein should be considered within the context of the scope of work and project terms of reference; further, the findings are time sensitive and are considered valid only at the time the Report was produced. The conclusions and recommendations contained in this Report are based upon the applicable guidelines, regulations, and legislation existing at the time the Report was produced; any changes in the regulatory regime may alter the conclusions and/or recommendations.

2.0 TERRESTRIAL RESOURCES

2.1 METHODS

Numerous species of vegetation and wildlife have the potential to use the Burrard Inlet and surrounding habitats within the Project site. Methods used to determine potential wildlife and vegetation species occurring in the ecological study area included:

- Species at risk occurrences through iMap BC;
- On-line databases:
  - BC Conservation Data Centre (CDC)
  - Committee on the Status of Endangered Wildlife in Canada (COSEWIC)
  - Wildlife Trees Stewardship (WiTS)
  - eFauna
  - eFlora,); and
- Background documents (Pojar, Klinka, and Demarchi 1991, Green and Klinka 1994).

2.1.1 Species at Risk

Information related to the potential for provincially or federally listed species at risk to be present within the Project site was gathered from:

- Species at risk occurrences through iMap BC;
- On-line databases (BC CDC, COSEWIC, eFlora); and
- Review of available ortho-imagery (Google Earth) to determine habitat types and quality.

The desktop-based searches for species at risk occurrences was expanded to a radius of one kilometer (km), measured from the centre of the Project site. This 1 km radius area is considered sufficiently large enough to capture recorded occurrences of species at risk, especially mobile species (such as birds) and plant species that may have expanded their range since last detection.

2.2 DATABASE SEARCH RESULTS

2.2.1 At-risk Plants

A search of the BC CDC (2016) returned seven at-risk plant species with potential to occur on the Project site, only one of which, streambank lupine (*Lupinus rivularis*) is a listed species under the federal *Species at Risk Act* (SARA) (**Table 1**). No critical habitat was identified as occurring on the Project site (EC 2016).

A review of iMap BC (2016) and eFlora (2016) did not produce any records of at-risk plants occurring within 1 km of the Project site.

Table 1 Potential At-risk Plants Occurring on the Project Site

Scientific Name	Common Name	COSEWIC[1]	BC List[2]	SARA[3]
Claytonia perfoliata ssp. *intermontana*	miner's-lettuce	--	Red	--
Eleocharis parvula	small spike-rush	--	Blue	--
Hypericum scouleri ssp. *nortoniae*	western St. John's-wort	--	Blue	--
Juncus oxymeris	pointed rush	--	Blue	--
Lupinus rivularis	streambank lupine	E (Nov 2002)	Red	1-E (Jan 2005)
Malaxis brachypoda	white adder's-mouth orchid	--	Blue	--
Montia chamissoi	Chamisso's montia	--	Red	--

Note: [1] COSEWIC listing: E = Endangered, T = Threatened, SC = Special Concern, C = Common; DD = data deficient, 1 = Schedule 1, -- = no listing
[2] BC List: Red = Species that are extirpated, endangered, or threatened; Blue = Species of special concern; Yellow = species and ecological communities that are secure.
[3] SARA listing: 1 = schedule 1, 3 = schedule 3, E = Endangered, T = Threatened, SC = Special Concern, -- = no listing

2.2.2 At-risk Wildlife

A search of the BC CDC (2016) produced a list of 18 species at risk with potential to occur on the Project site (**Table 2**), seven of which are federally listed under SARA. Based on data available from iMap BC (2016) and eFauna (2016) no known occurrences of species at risk are found within 1 km of Project site, however a great blue heron was observed foraging at the time of the assessment.

Table 2 Species at Risk with Potential to Occur on Site

Scientific Name	Common Name	COSEWIC[1]	BC List[2]	SARA[3]
Acipenser medirostris	Green Sturgeon	SC (Nov 2013)	Red	1-SC (Aug 2006)
Aeronautes saxatalis	White-throated Swift	--	Blue	--
Anaxyrus boreas	Western Toad	SC (Nov 2012)	Blue	1-SC (Jan 2005)
Ardea herodias fannini	Great Blue Heron, *fannini* subspecies	SC (Mar 2008)	Blue	1-SC (Feb 2010)
Botaurus lentiginosus	American Bittern	--	Blue	--
Buteo lagopus	Rough-legged Hawk	NAR (May 1995)	Blue	--
Butorides virescens	Green Heron	--	Blue	--
Contopus cooperi	Olive-sided Flycatcher	T (Nov 2007)	Blue	1-T (Feb 2010)
Corynorhinus townsendii	Townsend's Big-eared Bat	--	Blue	--
Cypseloides niger	Black Swift	E (May 2015)	Blue	--
Hirundo rustica	Barn Swallow	T (May 2011)	Blue	--

Scientific Name	Common Name	COSEWIC[1]	BC List[2]	SARA[3]
Hydroprogne caspia	Caspian Tern	NAR (May 1999)	Blue	--
Myotis keenii	Keen's Myotis	DD (Nov 2003)	Blue	3 (Mar 2005)
Nycticorax nycticorax	Black-crowned Night-heron	--	Red	--
Patagioenas fasciata	Band-tailed Pigeon	SC (Nov 2008)	Blue	1-SC (Feb 2011)
Phalacrocorax auritus	Double-crested Cormorant	NAR (May 1978)	Blue	--
Progne subis	Purple Martin	--	Blue	--
Tyto alba	Barn Owl	T (Nov 2010)	Red	1-SC (Jun 2003)

Note: [1] COSEWIC listing: E = Endangered, T = Threatened, SC = Special Concern, C = Common; DD = data deficient, 1 = Schedule 1, NAR = Not At Risk, -- = no listing
[2] BC List: Red = Species that are extirpated, endangered, or threatened; Blue = Species of special concern; Yellow = species and ecological communities that are secure.
[3] SARA listing: 1 = schedule 1, 3 = schedule 3, E = Endangered, T = Threatened, SC = Special Concern, -- = no listing

2.3 EXISTING CONDITIONS

2.3.1 Vegetation

A site reconnaissance assessment of existing conditions and habitat was conducted on May 9, 2016 between 1 and 3 pm. Weather was mainly clear and temperature was 15.3 degrees Celsius.

The Project site is located in an industrial area on the north shore of Burrard Inlet between 1st and 2nd narrows. It is located in the Coastal Western Hemlock Dry Maritime (CWHdm) biogeoclimatic zone, which occurs at low elevations in the Lower Mainland, and is characterized by dry, warm summers and mild winters (Green and Klinka 1994).

Industrial activities, pavement, and vehicle movements prevent the establishment of vegetation on the Project site. Vegetation on the Project site within the footprint of construction is characteristic of disturbed, industrial areas. Three small black cottonwood trees (*Populus balsamifera*) with a diameter at breast height (DBH) less than 20 cm, are located along the east edge of the jetty, and the remaining vegetation is comprised of shrubs and herbaceous species.

During the site visit, a list of plant species occurring on the rip-rap banks adjacent to the foreshore was created. There are few native species occurring in the Project site, and most are invasive, non-native, or noxious species (**Table 3**).

Table 3 Plant Species Recorded on Site

Latin Name	Common Name	Status*
Buddleia davidii	Butterfly bush	Invasive
Cymbalaria muralis	Ivy-leaved toadflax	Non-native
Cytisus scoparius	Scotch broom	Invasive
Epliobium latifolium	Fireweed	Native
Fallopia japonica	Japanese knotweed	Noxious
Lactuca muralis	Wall-lettuce	Native
Linaria purpurea	Purple toadflax	Non-native
Polystichum munitum	Sword fern	Native
Populus balsamifera	Black cottonwood	Native
Prunus sp.	Cherry sp.	Non-native
Rhododendron sp.	Rhododendron	Non-native
Rubus armeniacus	Himalayan blackberry	Invasive
Rumex acetosella	Sheep sorrel	Invasive
Senecio jacobaea	Tansy ragwort	Noxious
Sorbus sitchensis	Sitka mountain-ash	Native
Tsuga heterophylla	Western hemlock	Native

Note: * Native: naturally occurring in British Columbia
Non-native: not naturally occurring. May be introduced or ornamental. Non-invasive.
Invasive: not naturally occurring. May have negative impacts on natural ecosystems or habitats.
Noxious: not naturally occurring. Designated as noxious under the BC *Weed Control Act*

Substrates are predominately imported fill, with rip-rap banks adjacent to the foreshore, with no native soils present. Vegetation is restricted to pockets within the rip-rap and isolated patches along the edges of the Project site (**Photos 1** to **3**). No natural ecosystems exist within the Project footprint.

Photo 1 Rip-rap and vegetation looking south at Project site rail jetty modification area, east side

Photo 2 Rip-rap and vegetation looking south at Project site rail jetty modification area, west side

Photo 3 Japanese knotweed on west side of Site

2.3.2 Wildlife

Wildlife on the Project site is restricted to common bird species that are tolerant of disturbed and industrial areas. Species noted on site included rock dove (pigeon) (*Columba livia*), gulls (*Larus* sp.), and house sparrow (*Passer domesticus*). A great blue heron (*Ardea herodias* sp. *fannini*) was observed foraging in the intertidal, and a pelagic cormorant (*Phalacrocorax pelagicus*) was observed basking on the pilings in Burrard Inlet. The assessment area is unlikely to provide significant terrestrial wildlife habitat value.

No nests were observed and no nesting behaviour was noted in the development area. No habitat exists to support species at risk. No nesting habitat for great blue heron is present on site.

The conveyor structures, small trees and shrubs on site may support nesting birds, however these areas are exposed to the elements and to disturbance through machinery, and do not represent high-quality nesting habitat.

3.0 IMPACT ASSESSMENT

Based on the results of the desktop and field assessments, while the development of the proposed Project will result in removal of some native and non-native vegetation, it is not expected to have an impact on wildlife or vegetation resources, including species at risk. Therefore, a vegetation plan, including replacement planting, is not required as noted in the PER application submission requirements. Furthermore, as no raptor nests were observed, no mitigation is required.

3.1 MITIGATION MEASURES AND MONITORING

If trees and the conveyor systems are to be removed during the breeding bird window, March 15 – August 15, a pre-construction nest clearing survey conducted by a Qualified Environmental Professional (QEP) should be undertaken to ensure no birds are nesting in the area. If active nests of species protected by the *Migratory Birds Convention Act* are encountered during the nest survey, no-disturbance buffers will be flagged by the QEP. No activity will be permitted within this buffer while the nest is active and occupied. The nest will be monitored by the QEP until birds have fledged and the nest is confirmed to be inactive.

The presence of a noxious plant species (Japanese knotweed) in the Project site will require mitigation. The following measures should be undertaken to ensure that the plant is not spread to uninfested areas:

- Do not mow knotweed. Use mechanical control, such as hand pruners and shovels to remove plants;
- Remove stems and roots by hand;
- Do not compost. Dispose of all plant parts and soil containing roots in waste containers to be taken to a municipal waste facility;
- Clean machinery and equipment thoroughly after use;
- Do not drive vehicles or machinery through areas where knotweed is present

4.0 CONCLUSION

The proposed Fibreco Terminal Enhancement Project will have negligible impacts to terrestrial wildlife and vegetation. The Project area is predominately comprised of disturbed, low-quality habitats and invasive, noxious, and non-native vegetation. Potential impacts include disturbance to nesting birds during breeding season and spread of noxious plant species to other locations. A QEP will conduct a pre-construction nest survey prior to activity on the site, and with implementation of mitigation measures will prevent spread of noxious Japanese knotweed to other locations on and off the Project site.

We have appreciated the opportunity of working with you on this Project and trust that this report is satisfactory to your requirements. Please feel free to contact the undersigned regarding any questions or further information that you may require.

Sincerely,
Hemmera Envirochem Inc.

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5.0 REFERENCES

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February 27, 2017
File: 315-006.08

Fibreco Export Inc.
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Attn: Glenn Dempster, Project Manager

Dear Glenn,

Re: Fibreco Terminal Enhancement Project, North Vancouver: Marine Habitat Assessment – Biophysical Survey (Revision 2)

1.0 INTRODUCTION

Fibreco Export Inc. (Fibreco) retained Hemmera to conduct a marine biophysical survey in support of environmental review for their Terminal Enhancement Project. This letter report presents the results of a habitat assessment for the marine environment for the area contained within the Project Site, in accordance with the information requirements of the Vancouver Fraser Port Authority (VFPA) Project and Environmental Review Process. The marine biophysical study area included the intertidal and subtidal portions of the VFPA leased area located adjacent to the southern boundary of the Fibreco terminal (see site location drawing in application document).

This Work was performed in accordance with Professional Services Agreement between Hemmera Envirochem Inc. (Hemmera) and Fibreco Export Inc., dated May 19, 2016 (Contract). This Report has been prepared by Hemmera, based on fieldwork conducted by Hemmera, for sole benefit and use by Fibreco Export Inc. In performing this Work, Hemmera has relied in good faith on information provided by others, and has assumed that the information provided by those individuals is both complete and accurate. This Work was performed to current industry standard practice for similar environmental work, within the relevant jurisdiction and same locale. The findings presented herein should be considered within the context of the scope of work and project terms of reference; further, the findings are time sensitive and are considered valid only at the time the Report was produced. The conclusions and recommendations contained in this Report are based upon the applicable guidelines, regulations, and legislation existing at the time the Report was produced; any changes in the regulatory regime may alter the conclusions and/or recommendations.

1.1 PROJECT OVERVIEW AND DESCRIPTION

Proposed works associated with the Terminal Enhancement project that have the potential to affect the marine environment include:

- Repair to approximately 30 linear metres of shoreline;
- The addition of 2 mooring dolphins and 2 berthing dolphins; and,
- Maintenance dredging.

An existing rip-rap protected shoreline on the south-western portion of the site, requires repair. The shoreline to be modified is characterized by boulder rip-rap and reinforced concrete slabs. The foreshore is steeply sloped (30-60%) rising from the mid-intertidal zone to above the High-Water Mark (HWM). The footprint of the proposed rip-rap repairs encompasses approximately 30 linear metres along the southwest shoreline and extends approximately eight to ten metres from the top of bank to the toe of slope (to the south). The proposed repairs are not anticipated to affect the toe of the slope and the slope will be restored to its design incline (see detailed rip-rap design in **Attachment A**).

Proposed upgrades to the berthing terminal will include the addition of 2 mooring dolphins, 1 located to the east and 1 located to the west of the existing terminal. There will be 4 piles added, 2 adjacent to each of the mooring dolphins. Additionally, 2 berthing dolphins are proposed to be located at each end of the ship loader (see berthing dock plan for details in engineer drawings section of the application).

The project will also require maintenance dredging at the berth face to return the terminal berth to the original design depth of approximately - 13.5 metres chart datum (CD), dredging approximately 3,741 m^3 of material.

2.0 EXISTING CONDITIONS

2.1 METHODS

To determine potential marine species occurring in the Project site a site survey was conducted on May 9, 2016 and a desktop review of the following databases was conducted:

- Sensitive Habitat Inventory and Mapping (SHIM);
- iMapBC;
- BC Coastal Resource Information Management System (CRIMS database);
- British Columbia Marine Ecological Classification (BCMEC) system;
- BC Conservation Data Centre (CDC) Species and Ecosystem Explorer;
- Published and unpublished government reports, including previous environmental assessments; and
- Background documents (Kozloff 1983, Ricketts et al. 1985).

2.1.1 Species at Risk

Information related to the potential for federally or provincially listed species at risk to be present within the Project site was gathered from:

- Review of known species at risk and invasive species occurrences through iMap BC; and
- On-line databases (BC CDC, COSEWIC, eFauna).

The desktop-based searches for species at risk occurrences was expanded to a radius of one kilometer (km), measured from the centre of the Project site. This 1 km radius area is considered sufficiently large enough to capture recorded occurrences of species at risk.

2.1.2 Onsite Survey

A subtidal survey and habitat assessment was conducted on June 9th and 10th, 2015. The subtidal survey was guided by DFOs Marine Foreshore Environmental Assessment Procedures document. The results were summarized in a report submitted to VFPA as partial fulfilment for the waterlot lease renewal (Lease No. V-4437 (01)). A final copy of this report is provided as **Attachment B**.

An intertidal survey was conducted on May 9, 2016, covering the area around the perimeter of the jetty area proposed for modification. A visual inspection of the foreshore was conducted along the length of the proposed area of modification. Aquatic life associated with the hard substrate were documented. Photographs of the intertidal community were taken throughout the intertidal zone, including the large concrete blocks at the base of the jetty (**Attachment C**).

2.2 RESULTS

2.2.1 Database Results

A search of the BC Conservation Data Centre (BC CDC 2016) returned eleven at-risk marine species with potential to occur on the Project site (**Table 1**). A review of iMap BC did not produce any records of at-risk intertidal marine species occurring within 1 km of the Project site.

Table 1 At-risk Marine Species with Potential to Occur at the Project Site

Scientific Name	Common Name	COSEWIC[1]	BC List[2]	SARA[3]
Eschrichtius robustus	Grey whale	SC (2004)	Blue	1-SC (2005)
Megaptera novaeangliae	Humpback whale	SC(2011)	Blue	1-SC (2014)
Orcinus orca	Killer whale (Northeast Pacific southern resident population)	E (2008)	Red	1-E (2003)
Orcinus orca	Killer whale (West Coast transient population)	T (2008)	Red	1-T (2003)
Eumetopias jubatus	Stellar sea lion	SC (2013)	Blue	1-SC (2005)
Phocoena vomerina	Harbour porpoise	SC (2016)	Blue	1-SC (2005)
Acipenser medirostris	green sturgeon	SC (1987)	Red	1-SC (2006)
Oncorhynchus clarkii	cutthroat trout, *clarkii* subspecies	Not listed	Blue	Not listed
Salvelinus confluentus	bull trout	SC (2012)	Blue	Not listed
Haliotis kamtschatkana	Northern abalone	T (2000)	Red	1-T (2003)
Ostrea conchaphila	Olympia oyster	SC (2011)	Blue	1-SC (2003)

Note: [1] COSEWIC listing: E = Endangered, T = Threatened, SC = Special Concern, C = Common; DD = data deficient, 1 = Schedule 1, -- = no listing
[2] BC List: Red = Species that are extirpated, endangered, or threatened; Blue = Species of special concern; Yellow = species and ecological communities that are secure.
[3] SARA listing: 1 = schedule 1, 3 = schedule 3, E = Endangered, T = Threatened, SC = Special Concern, -- = no listing

2.2.2 Survey Results

No sensitive habitats were observed in the subtidal; occurrence and distribution of subtidal habitats at the Project site are presented **Attachment B**. Subtidal habitats are characterized by soft sediments with low productivity.

The intertidal survey was undertaken between 13:00 and 14:00 at a tide height of 0.75 m CD. Weather was mainly clear and temperature was 15.3^{o} C. The intertidal area within the Project construction footprint is characteristic of armoured shorelines. The high intertidal is dominated by barnacles (~90% coverage) with sparse marine vegetation occurring in bands that correspond to tidal height. Three large cement blocks are located at the toe of the slope where rip –rap substrate transitions to soft sediments intermixed with cobble and bivalve shell debris. Marine species at the Site are predominately associated with hard substrates and were observed on the rip-rap, cement blocks (**Photos 1** to **6**).

A list of marine species occurring in the intertidal zone in the Project site is presented in **Table 2**.

Table 2 Marine Species Observed during Intertidal Survey

Latin Name	Common Name
Ulva sp.	Sea lettuce
Fucus gardneri	Rockweed
Mastocarpus papillatus	Turkish washcloth
Saccharina latissima	Sugar kelp
Balanus glandula	Acorn barnacle
Littorina sp.	Periwinkle
Mytilus trossulus	Blue mussel

3.0 EFFECTS ASSESSMENT

The proposed Terminal Enhancement Project includes reinforcing existing shoreline armouring and repairing deteriorating reinforced concrete structures. Proposed jetty modifications will not result in an increase to the existing footprint in the intertidal zone (**Attachment A**). Additional hard structured habitats will replace existing hard structured habitats which provide attachment sites for marine species commonly observed in the intertidal zone at the Project site. As the proposed works are on a south facing slope, increased shading will not result from the project.

The proposed installation of dolphins and piles will occur in deep water with soft sediment habitats. This low productivity habitat is abundant throughout the harbour. New piles will provide increased physical structure for algae, encrusting invertebrates, motile invertebrates and fish. Pile driving planned to take place in water should follow the recommendations in the “Best Management Practices for Pile Driving and Related Operations – BC Marine and Pile Driving Contractors Association – March 2003”.

For installation of concrete piles (>24 in diameter) visual surveys and hydrophone monitoring by qualified environmental professionals should be conducted to monitor sound pressure exceedances of 30 kPa or for the unlikely event that a fish kill or disturbance to marine life is observed.

Maintenance dredging will return the berth to its original design depth of -13.5 m CD. The bulk of dredge materials is anticipated to consist of wood waste material with some fine-grained sediment (**Attachment B**). Specifics of treatment and disposal of these materials is presented in the dredge plan attached to this application. The deeper soft sediment habitat is abundant and considered to have low productivity.

Based on the results of the desktop and field assessments, the proposed Project is not expected to permanently affect marine habitats or species. Site conditions within the assessment area are not considered conducive to the presence of federally listed (schedule 1) or provincially listed (BCDC red and blue listed) species at risk.

3.1 MITIGATION MEASURES AND ENVIRONMENTAL MONITORING

The proposed guidelines and recommendations presented in this section are intended to address potential effects to fish and fish habitat and quality that may result from the proposed Fibreco jetty modifications. The recommendations presented below are intended to be used as a guide to mitigate potential effects to marine habitat and water quality.

3.1.1 Recommended Strategies for Project Planning to Mitigate Impacts

A Construction Environmental Management Plan (CEMP) should be prepared that includes mitigation strategies, best management practices, and environmental monitoring expectations, including;

- An appropriate, up-to-date spill prevention, containment, and cleanup contingency plan including an appropriate on-site spill response kit for hydrocarbon products (e.g., fuel, oil, hydraulic fluid, lubricants), and all other deleterious substances that may be used in association with the Project,
- A response plan that is to be implemented immediately in the event of a sediment release or spill of a deleterious substance.
- Plan to minimize or avoid in-water work where practical.
- Use as much of the current site, reducing potential footprint expansion to reduce disturbance below the high water mark.
- All construction, operation or maintenance activities below the HWM should be timed to occur within reduced risk work windows, in order to avoid or limit adverse effects to CRA fishery species and forage fish during sensitive life history phases (e.g., reproduction, migration). Burrard Inlet is located within DFO Fisheries Management Area 28. Nearshore marine activities in this area may be conducted during these times:
    - Summer Window: N/A.
    - Winter Window: August 16 - February 28.
- To address the potential for harm associated with works outside the least-risk work windows, in-water activities should be monitored by a qualified environmental monitor.
- DFO will be notified a minimum of 10 days prior to commencement of the works.

3.1.2 Concrete Pile Installation

Works should be conducted in adherence to the “Best Management Practices for Pile Driving and Related Operations – BC Marine and Pile Driving Contractors Association” (MPDCA 2003).

The Project requires the installation of concrete piles, to minimize impacts to the marine environment associated with pile driving and installation the following specific mitigation measures are recommended:

- Visual and hydrophone monitoring of the impact on fish and marine mammals by the sound waves emitted will be required.

- If during pile installation the sound pressure exceeds 30 kPa or in the unlikely event that a fish kill or disturbance to marine life is observed, works will stop immediately and appropriate mitigation measures including deployment of a bubble curtain over the full length of the wetted pile will be implemented. If fish kills or disturbance to marine life is observed despite implementation of appropriate mitigation measures, the works will stop immediately and the methods will be reviewed and corrected (MPDCA 2003).

3.1.3 Recommended Strategies to Mitigate Impacts to Fish and Fish Habitat

The following mitigation measures should be followed to minimize the potential impacts to fish and fish habitat that may result from construction activities related to pile installation:

- All debris and deleterious substances generated by demolition and construction associated with the project shall be appropriately contained in the immediate work area, collected, and appropriately disposed of in accordance with all applicable legislation, guidelines, and best management practices.
- Appropriate sediment control measures, including use of silt curtains if necessary, should be in place during pile driving construction.
- Plan activities near water such that materials such as paint, primers, blasting abrasives, rust solvents, degreasers, grout, poured concrete or other chemicals do not enter the watercourse.
- Ensure that building material used in a watercourse has been handled and treated in a manner to prevent the release or leaching of substances into the water that may be deleterious to fish.
- Remove all construction materials from site upon project completion
- Nearshore subtidal work (pile driving by barge) will take place during high tides to prevent propeller scour of sensitive habitats.
- If barge spuds are required to ground in sensitive habitat, an assessment of the spud grounding area will be conducted prior to deployment via Scuba, drop cam or other similar sensing method to locate area areas of least sensitivity.
- Barges will not be allowed to ground during pile driving or other support work.
- Offloading of equipment will take place at designated barge landing sites or via the BC ferry.

These mitigation measures will eliminate residual effects to fish and fish habitat.

3.1.4 Recommended Strategies relating to Mitigation of Adverse Effects on Water Quality

Activities related to construction work will require the use of machinery that uses fuels, lubricating oils, and hydraulic fluids and materials that would be considered deleterious if they enter fish bearing waters. The following measures can be implemented to protect water quality:

- DFO's "Guidelines to Protect Fish and Fish Habitat from Treated Wood Used in Aquatic Environments in the Pacific Region" (Hutton and Samis 2000) should guide the selection and use of pressure treated materials incorporated into project design.

- Site isolation measures (e.g., silt boom or silt curtain) for containing suspended sediment where in-water work is required (e.g., dredging).
- Use skilled operators to perform dredging efficiently and reduce handling time.
- All machinery working in the nearshore must be cleaned in advance and free of contaminants and be in good working condition and a spill kit should be maintained on site in case of spills.
- Equipment shall be in good operating condition to minimize losses of hydraulic fluids, lubricants or fuels. This will include regular inspections of fuel and hydraulic lines.
- Petroleum product storage, transfer points and refuelling facilities for machines shall be at accepted locations at least 30m from freshwater or 30m from the HWM of marine environment.
- Fuelling and servicing of equipment and refilling small field containers is to be carried out at least 30 meters from any waterbody. No refuelling of equipment shall occur in the beach area.
- All machinery containing fuel shall be within secondary containment (e.g. generators, pumps) as well as small fuel containers such as jerry cans.
- All spills to ground and water, regardless of volume, must be reported to BCFS's representative immediately.
- The work site and equipment (e.g. excavator, barge) must have emergency spill kits (pads, sorbent booms, etc.) available. The kits shall be suitable for the quantities and types of material stored at the site, and shall contain sufficient materials to contain any leaks from cables that is accidentally damaged or cut.
- Foam material should be encapsulated so it cannot break up and be released into water.
- Any concrete work should follow the "Guide to the Code of Practice for the BC Concrete and Concrete Products Industry – Version 6", particularly Chapter 7 – Authorized Discharge: Effluent and Surface and Marine Water Quality (Millennium EMS Solutions Ltd. 1993).

With the implementation of these mitigation measures this project is not likely to result in adverse residual effects to water quality.

4.0 SUMMARY AND CONCLUSIONS

The assessment requires that proposed projects avoid causing significant adverse impacts to aquatic habitat proximate to the Project Site. Modification to an existing jetty, berth dock upgrades, and maintenance dredging are proposed as part of the Terminal Enhancement Project. The existing jetty foreshore is comprised of rip-rap and reinforced concrete slabs. Land based placement of new rip-rap to stabilize the bank will occur within the existing footprint and will not negatively affect existing habitat; replacing habitat like for like. The modification will likely increase the slope of the foreshore to a maximum of 1:1, but as it is located on a south aspect there will be no increase in shading.

Upgrades to the berthing dock include the addition of new dolphins and piles that will provide additional structural habitat for fish and sessile invertebrates. The small footprint within soft sediment habitats will be mitigated by the additional structural complexity in the water column and the increased surface area for

sessile invertebrates and marine vegetation for attachment. Implementation of the mitigation measures as described in this biophysical assessment will ensure that no adverse residual effects to environmental resources are likely to result from this Project.

Proposed maintenance dredging will result in the removal of woodwaste and fine grained sediments. Woodwaste can negatively affect habitat physical structure, and result in acute or long term sediment toxicity. The increased depth resulting from dredging will not result in a change the photic conditions or existing ecological processes as the depth increase is not significant. The resulting sediment seafloor will likely be colonized quickly by infaunal species.

Avoidance of potential impacts to fish will be provided through the application of well-established mitigation measures. The experience and expertise of the construction crew will contribute to the avoidance of significant adverse impacts.

We have appreciated the opportunity of working with you on this project and trust that this report is satisfactory to your requirements. Please feel free to contact the undersigned regarding any questions or further information that you may require.

Report prepared by:
Hemmera Envirochem Inc.

Scott Toews, M.Sc., R.P.Bio.
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Scott Northrup, R.P.Bio., P.Biol.
Project Director
snorthrup@hemmera.com

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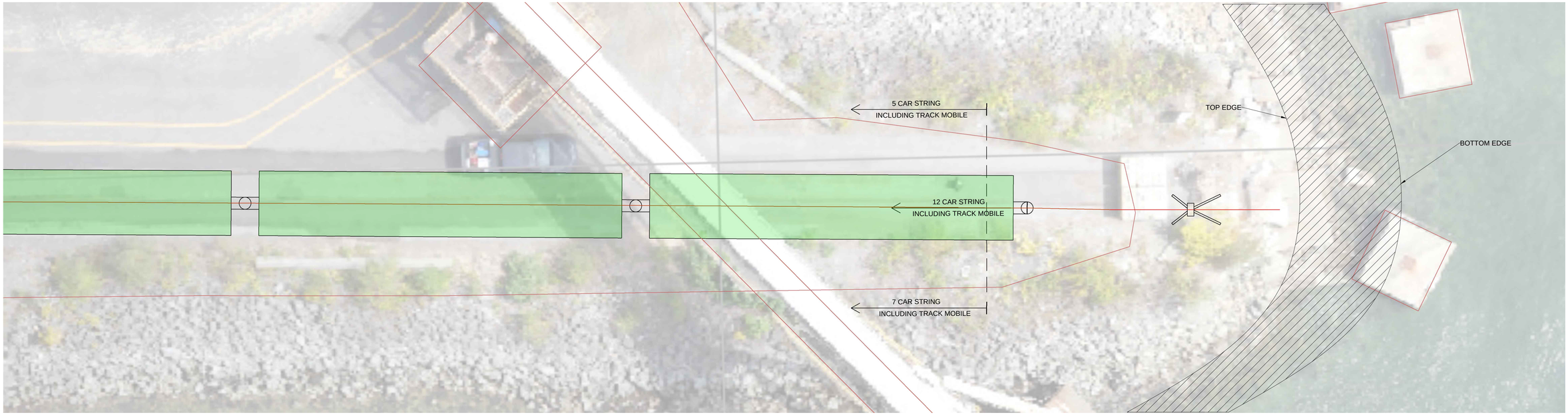
ATTACHMENT A

Jetty Modification Plan



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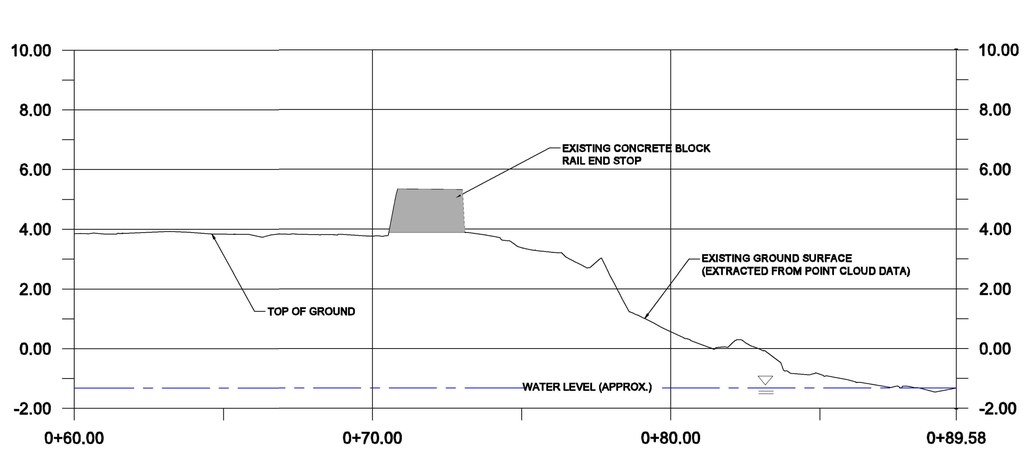
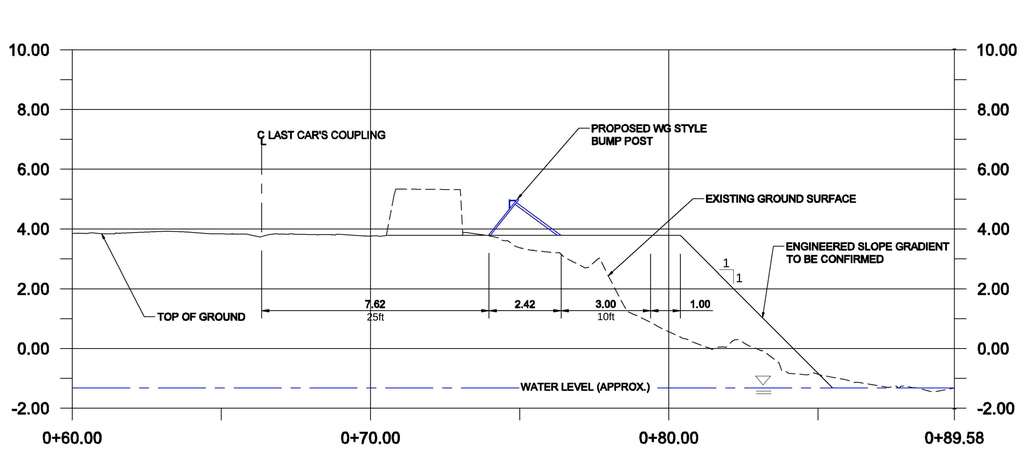


EXISTING GROUND PROFILE
SCALE 1:100



PROPOSED GROUND PROFILE
SCALE 1:100

PRELIMINARY
DATE: Wednesday, September 30, 2015, 3:40 PM

REF.	DRAWING NUMBER	DRAWING TITLE
A	346935-SURVEY-HMM-OPTION-2	TOPOGRAPHIC SURVEY FOR FIBRECO

REFERENCE DRAWINGS

LEGEND:

ENGINEER STAMP:

No.	DESCRIPTION	DWN	CHK	APP	YY/MM/DD
A	FOR INFORMATION	HT	SR	JS	15/09/30

REVISIONS

BAR SCALE: 1 m 0 1:100 5 m

DWG SCALE (ANSI D 22" x 34"): 1:100

Hatch Mott MacDonald

CLIENT: FIBRECO

DESIGNED BY:	H. TOEWS	15/09/30	ENG. CHECK:	S. RIDDICK	15/09/30
DRAWN BY:	H. TOEWS	15/09/30	APPROVED BY:	J. SUTCLIFFE	15/09/30

STATUS: FOR INFORMATION

CLIENT REFERENCE DRAWING No. -

FIBRECO TERMINAL EXPANSION PROJECT
PHASE I
JETTY MODIFICATION
PLAN & PROFILE

PROJECT/DWG No: 346963-RW-100-S0-4000

REV No. A

ATTACHMENT B

Biophysical Assessment, PMV Water Lot Lease

Biophysical Assessment
Wood Products Terminal Facility
PMV Water Lot Lease Area

Prepared for:
Fibreco Export Inc.
1209 McKeen Avenue
North Vancouver, BC V7P 3H9

Prepared by:
Hemmera
18th Floor, 4730 Kingsway
Burnaby, BC V5H 0C6

File: 315-006.04
February 2017

HEMMERA

Hemmera Envirochem Inc.
18th Floor, 4730 Kingsway
Burnaby, BC V5H 0C6
T: 604.669.0424
F: 604.669.0430
hemmera.com

February 27, 2017
File: 315-006.04

Fibreco Export Inc.
1209 McKeen Avenue
North Vancouver, BC V7P 3H9

Attn: Glenn Dempster

Dear Glenn,

Re: Biophysical Assessment – PMV Water Lot Lease

Hemmera is pleased to provide you with this final report entitled "Biophysical Assessment – PMV Water Lot Lease". We look forward to working with you on this project and trust that this report meets your requirements. Please feel free to contact the undersigned by phone or email regarding any questions or further information that you may require.

Regards,
Hemmera Envirochem Inc.

James Slogan, M.Sc, PhD, R.P.Bio.
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EXECUTIVE SUMMARY

Hemmera Envirochem Inc. (“Hemmera”) was retained by Fibreco Export Inc. (Fibreco) to conduct a General Biophysical Assessment for the Wood Products Terminal Facility Lease Property (the “Site”) located east of the Lions Gate Bridge, in the District of North Vancouver, BC. The Site is located along the north shore of Burrard Inlet’s Inner Harbour near the First Narrows. The Site extends approximately 150 m in length along the foreshore and is approximately 300 m at its widest point. This assessment is intended to describe intertidal and subtidal biophysical conditions, habitat values and potential fish and wildlife species use.

Burrard Inlet is located south of the Site, the foreshore continues to the east and west of the Site. A shipyard has been located adjacent to the Site since as early as 1965. The Site is bordered to the north, east, and west by a multi-use industrial area.

The overall condition of the biophysical environment within the Site was typical of an urban marine environment. A band of kelps and algae was the only Valued Ecosystem Component (VEC) identified in the low intertidal and subtidal zones. Algal communities have the potential to support spawning fish such as rock fish and small demersal species. Valued ecosystem components in the shallow subtidal zone also included clam beds, and Dungeness crab. However, there were large areas of accumulated wood waste in close proximity to the two marine loading facilities (i.e. barge ramp and ship berth) on the Site. These areas were characterized as having relatively little marine life, and provide very low habitat value to the Site. No species at risk (SAR) were identified on-Site.

This Executive Summary is not intended to be a “stand-alone” document, but a summary of findings as described in the following report. It is intended to be used in conjunction with the scope of services and limitations described therein.

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1.0 INTRODUCTION

Fibreco Export Inc. (Fibreco) has retained Hemmera to conduct a biophysical assessment in support of a foreshore lease renewal at its Wood Products Terminal Facility (the Site) along the North Shore of Vancouver's Inner Harbour (**Figure 1**). The objectives of this assessment were to document: 1) existing biophysical conditions, 2) habitat features that support valued fish and wildlife, 3) observed and potential occurrences of fish and wildlife species at the Site, including species at risk, and 4) the distribution of wood waste across the Site. Information to complete the biophysical assessment was collected through:

- A desktop study and background research;
- A review of current aerial photographs; and,
- An intertidal and subtidal survey completed in June, 2015.

2.0 PROJECT LOCATION

Fibreco's woodchip loading facility is located at 1209 McKeen Avenue in the City of North Vancouver, BC (**Figure 1**). The proposed project site (the Site) is located along the north shore of Burrard Inlet, in Vancouver's Inner Harbour, west of the Lions Gate Bridge and First Narrows (**Figure 1**, **Figure 2**) and adjacent to the Seaspan's Burrard Drydock (to the east) and Lafarge (to the west). Coordinates for the centre of the survey area are: 492020 E 5461863 N.

Figure 1 Fibreco Project Site – Regional Setting

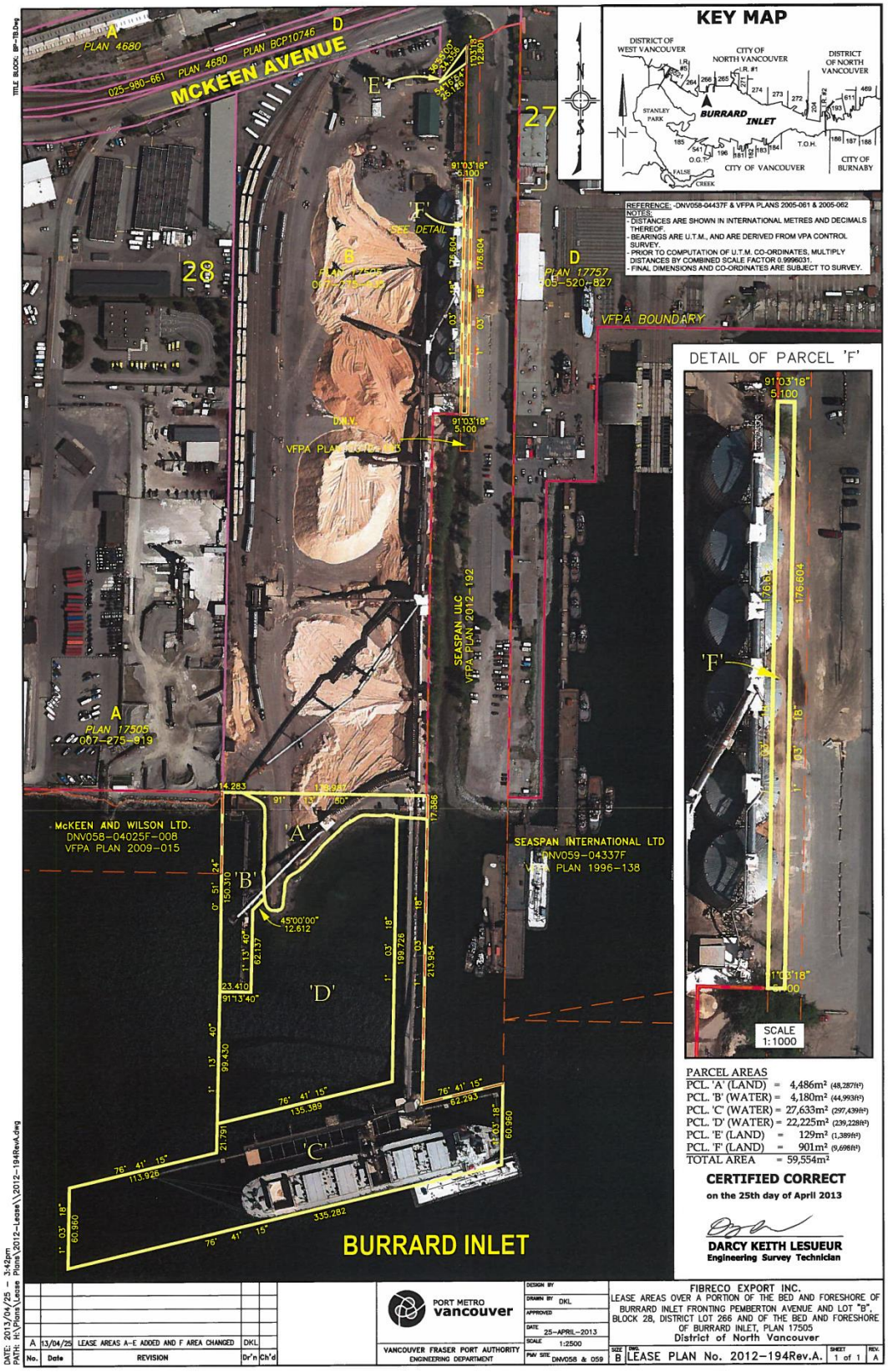

Figure 2 Fibreco Wood Products Terminal Site with Lease Areas Delineated

3.0 SITE DESCRIPTION

3.1 SITE HISTORY

The Fibreco wood products terminal facility covers an area of 9.3 ha with a 5.8 ha leased water lot (**Figure 2**). The water lot is leased from Port Metro Vancouver to accommodate the shipping berth and barge loading. The site was historically within the high water mark and was filled in the 1960s and 1970s. In 1979, Fibreco constructed a wood chip storage and shipping terminal facility that is serviced by truck, rail and barge transportation.

Currently, the terminal is one of the largest and most modern wood chip and wood pellet handling facilities in the world, with an annual capacity of approximately five million tonnes. A barge loading facility is located at the western edge of the property extending approximately 100 m for wood chip loading (Photo 1). A second loading vessel loading facility is located at the ship berth, offshore from the facility. The current ship berth can accommodate vessels up to 210 m long with 12.5 m draught and is serviced with a conveyor and ship loader to facilitate wood product loading of approximately 70 vessels per year.

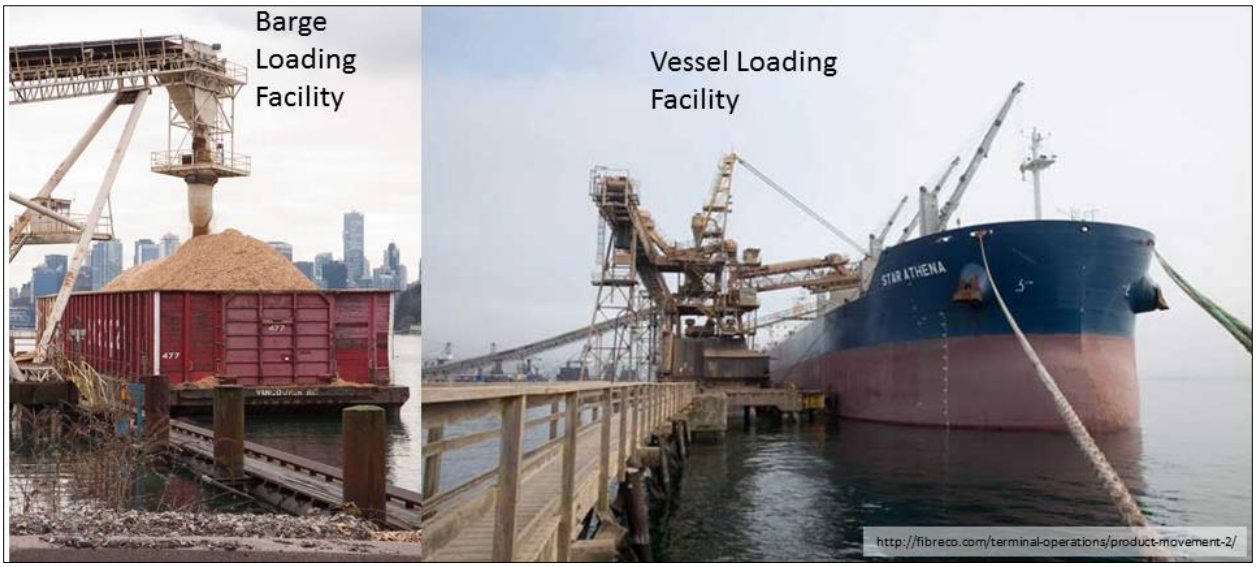

Photo 1 Barge Loading Facility and Vessel Loading Facility

4.0 EXISTING BIOPHYSICAL CONDITIONS

Background information related to the existing biophysical conditions of the Site was obtained from the following sources:

- Online Sensitive Habitat Inventory and Mapping (SHIM);
- Online Fraser River Estuary Management Program (FREMP) and Burrard Inlet Environmental Action Program (BIEAP) Habitat Atlas (FREMP 2015);
- Online Fisheries Information Summary System (FISS 2015);
- Online E-Fauna B.C. database (Klinkenberg 2015);
- Online B.C. Species and Ecosystems Explorer (B.C. Ministry of Environment 2015); and,
- Online iMap database (iMap 2015)

4.1 SITE ASSESSMENT METHODS

A subtidal biophysical assessment was conducted at the Site on June 9th and 10th, 2015. The survey design was based on criteria outlined in *Standard methods for sampling resources and habitats in coastal subtidal regions of British Columbia* (Robinson et al. 1996), with transects set between 50 m and 150 m apart with the goal of describing the biophysical conditions of the Site. Six transects were established using marked lead lines and georeferenced positions for the start and end points of each transect. Divers used a high definition video camera and slates to record observations of all highly mobile fish and invertebrate species during the first pass along the transect line. During the return swim, a 1 X 1 m area was visually assessed in detail every 10 m for gauge depth, substrate type, percent cover of vegetation, and densities of invertebrates and fish. Survey data is summarized in **Table 1**, **on Figures 3 and 4**, plus in **Appendix A**. Established transects (T1-T6) are depicted on **Figure 3** and depth profiles for the transects are displayed on **Figure 4**.

Figure 3 Biophysical Transect Locations at the Fibreco Site

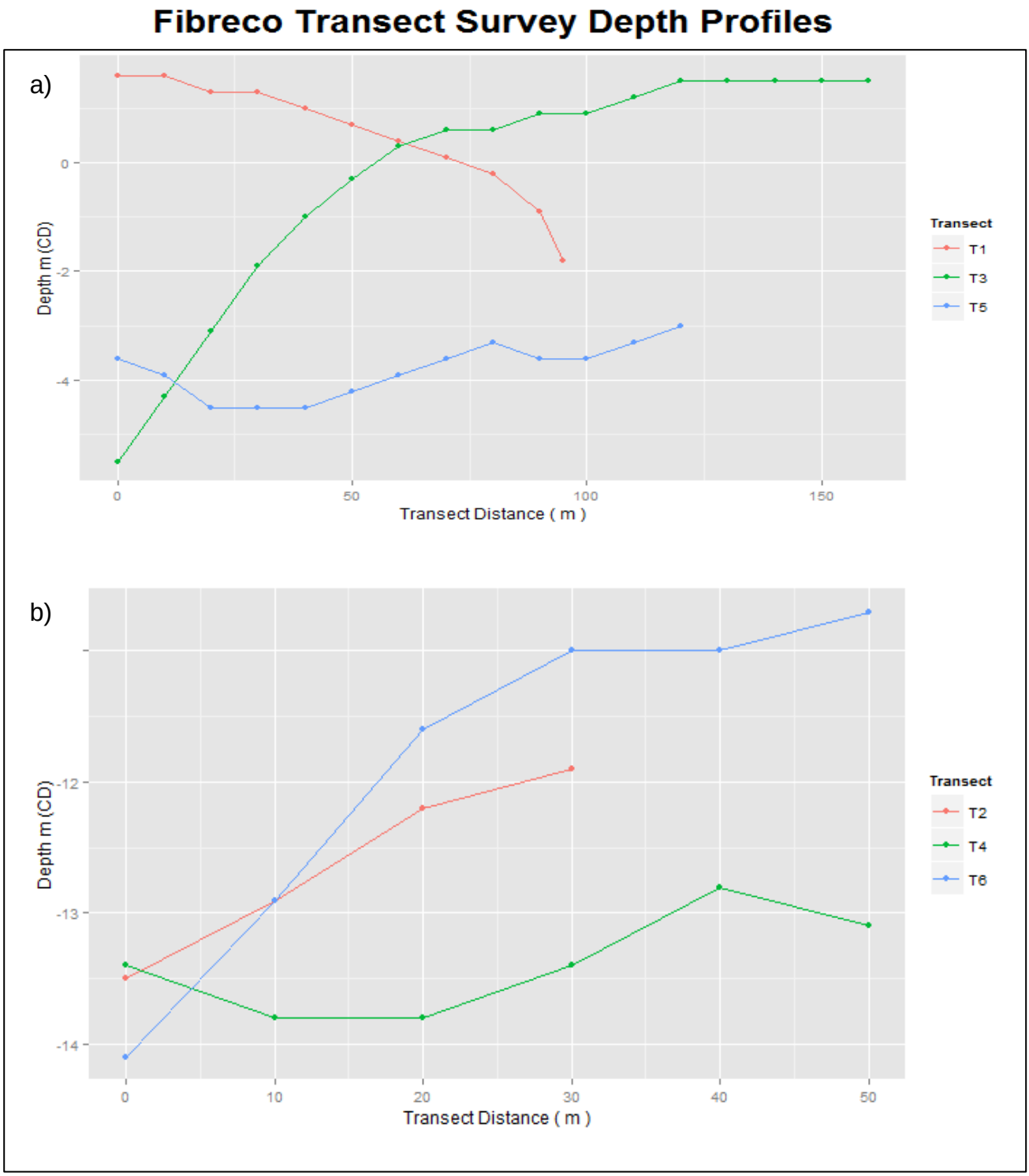

Figure 4 Depth Profiles for the Subtidal Transects a) shallow transects b) deep transects

Table 1 Intertidal and Subtidal Survey Information

Transect	Description	Chart Depth (m)
T1	Western Inside Ship Berth	1.6 m to -1.5m
T2	Eastern Deep Transect	-12 m to -13.5 m
T3	Eastern Inside Ship Berth	1.5 m to -5.5 m
T4	Parallel Ship Berth Deep	-12.8 m to -13.8 m
T5	Barge Loading Facility	-3 m to -4.5 m
T6	Western Deep	-10.7 m to 14.1 m

Substrate type and relative composition were described visually using a generalized Wentworth-based scale (Wentworth 1922) (**Table 2**).

Table 2 Substrate Classification

Substrate Type	Size Range (Diameter)
Bedrock/ Boulder	>256 mm
Cobble	64 – 256 mm
Gravel	2 – 64 mm
Sand	0.06 – 2 mm
Silt/Clay/Mud	<0.06 mm
Other*	-

Note: *Substrates can also include anthropogenic structures, debris and shell hash etc., all of which were characterized under "substrate – other" during field sampling.

Water depth was determined relative to the divers depth gauge (gd) and converted to chart datum (CD) as determined from predicted tides for Vancouver harbour generated by:

http://tbone.biol.sc.edu/tide/tideshow.cgi?site=Vancouver%2C+British+Columbia+%282%29.

Depths below chart datum are designated as minus (- m CD) for this report.

4.2 GENERAL SITE DESCRIPTION

The Project Site falls within the Georgia Depression Ecoprovince (**Figure 5**). Within the ecoprovince, the site overlaps with the Fraser Lowland Ecosection component of the Lower Mainland Ecoregion and the Strait of Georgia Ecosection within the Georgia-Puget Basin Ecoregion (Demarchi 1992). In the lowest portion of the Fraser Delta the dry Coastal Douglas-fir Zone occurs, inland the very dry maritime subzone of the Coastal Western Hemlock occurs, which gives way to the dry maritime subzone of the Coastal Western Hemlock zone on the highest areas. The marine environment is dominated by the Fraser River estuary, as well as intertidal and nearshore zones and an epipelagic zone that occurs within the Burrard Inlet.

Figure 5 Georgia Depression Ecoprovince

4.3 PHYSICAL ENVIRONMENT

4.3.1 Sediment

Burrard Inlet is heavily industrialized with armoured slopes, bulkheads and ship loading facilities, which reduces fish and wildlife habitat values. The north shore of the Vancouver inner harbour, between First Narrows and Second Narrows consists of predominantly purpose-built shoreline with significant industrial activities with approximately 111 wharfs and piers covering 1,878 m^2 (Stantec 2009). The upland area of the Site is an active industrial area with minimal habitat values, except a thin marine riparian area extending approximately 300 m along the east side of the property and some vegetation on the south facing foreshore. The Project Site is composed of purpose-built habitat with rip rap armoured banks (**Figure 6**).

The Site features a pile-supported transfer conveyor system extending approximately 200 m offshore to the ship berth structure. The ship berth structure is composed of a series of pile supported dolphins with a moveable ship loader, which extends approximately 270 m parallel to shore. A second loading facility composed of a dock and conveyor barge loader extending approximately 100 m parallel to the shore on the west side of the property and adjacent to an existing rail jetty.

Inside the ship berth, the central area of the Site is relatively low sloping (approximately 10° slope), consisting of unconsolidated substrate of mainly gravel, sand, and shell, mixed with some cobble (**Figure 7**). This contrasts the sloping soft substrate areas south of the ship berth, which approach a 20° slope along the perimeter of the Site.

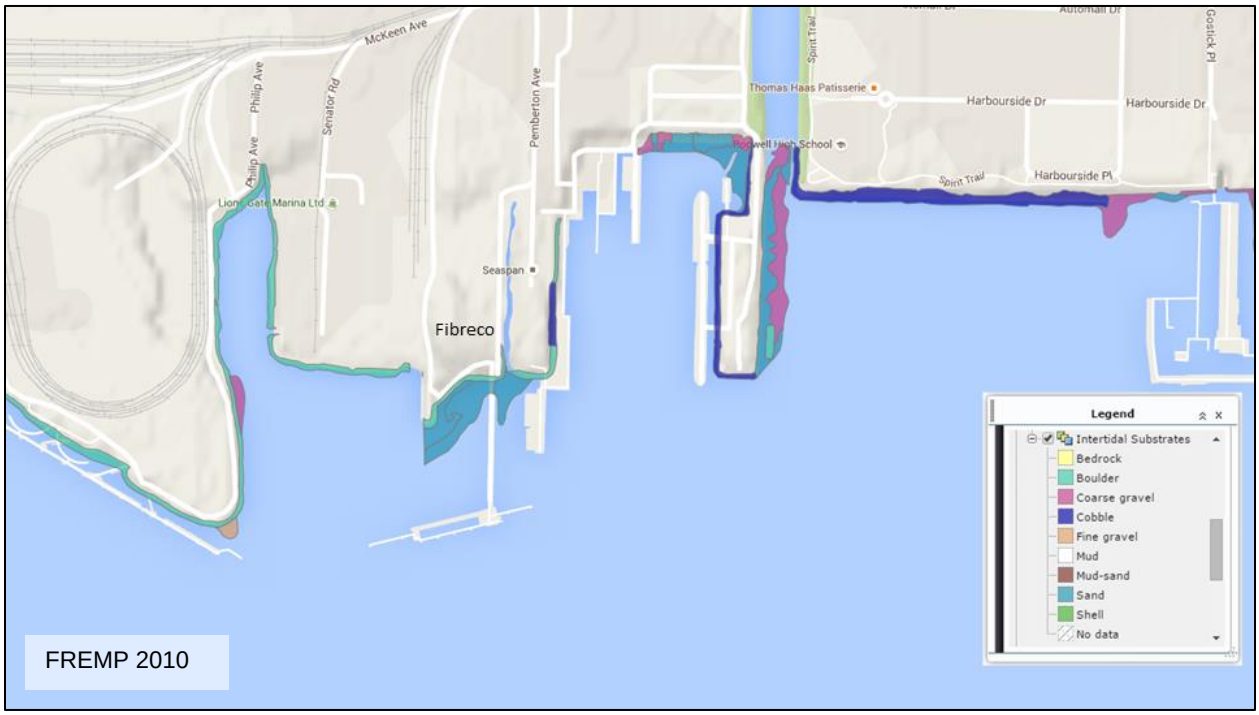

Figure 6 Physical Substrate of the Intertidal Habitat Surrounding the Site

Figure 7 Biophysical Survey of Substrates and Wood Waste

4.3.2 Wood Waste

Wood waste was observed in isolated areas across the Site, but the majority of the intertidal and subtidal areas surveyed are free of wood waste. There was no accumulation of wood waste observed along transects T1 and T3, located in the central portion of the Site (**Figures 8 and 9**). This area, shoreward of the ship berth, had only minor fragments of wood waste with no areas of accumulation observed (**Photo 2, Appendix A**). South of the ship berth, along transects T2, T4, and T6, significant areas of wood waste accumulation were observed (**Photo 3, Appendix A**). The wood waste south of the ship berth was patchy and less consistent, narrowing in extent and observed mainly along the western transects (**Figure 9**, **Appendix A**). Accumulation in this area varied between large areas with 100% cover and > 30 cm depth, to areas with less than 100% cover of wood waste mixed with gravel and sand (**Photo 4**). Wood waste accumulation was most prevalent along the northern half of transect T5, where significant amounts of wood waste (100% cover, > 30 cm depth, **Photo 5**) were observed and bacterial mats covered some areas indicating hypoxic conditions.

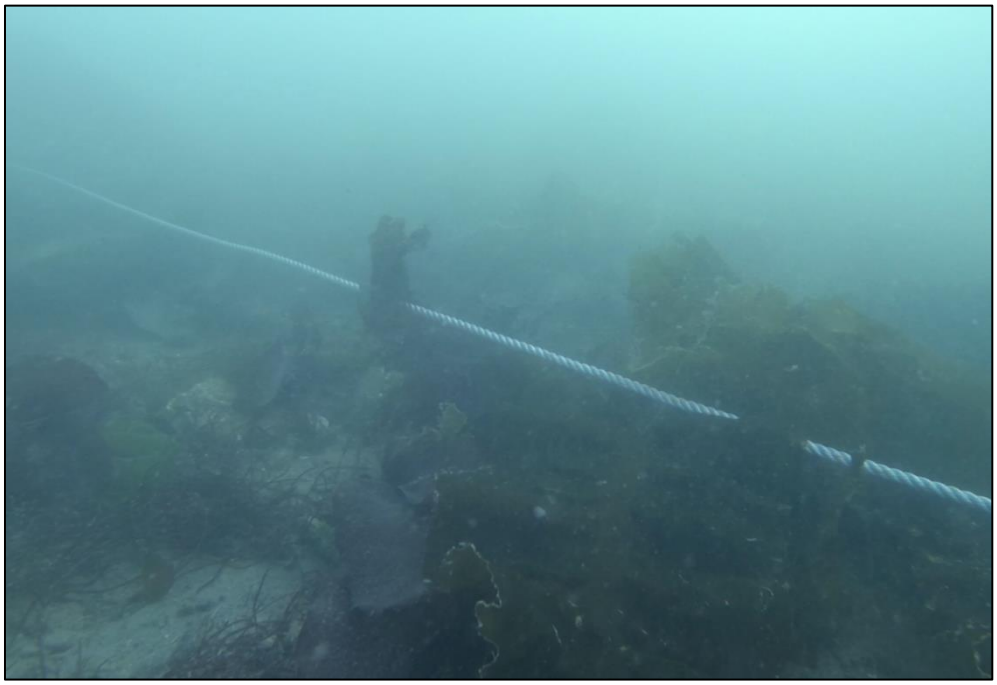

Photo 2 Algal and Kelp Cover Along Transect 3

Photo 3 Dense Wood Waste Observed Along Transect 2

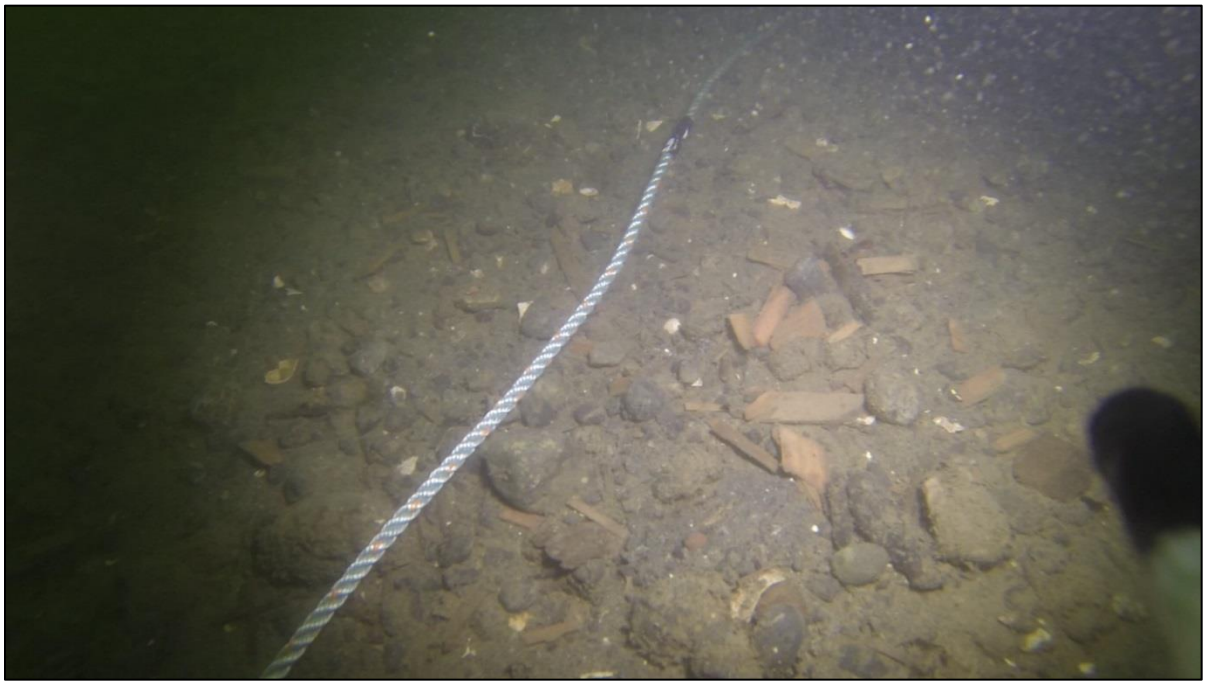

Photo 4 Wood Waste Mixed with Sediments Transect 4

Photo 5 Diver Testing Depth of Wood Waste at End of Transect 5

Figure 8 Observed and Predicted Wood Waste at the Site

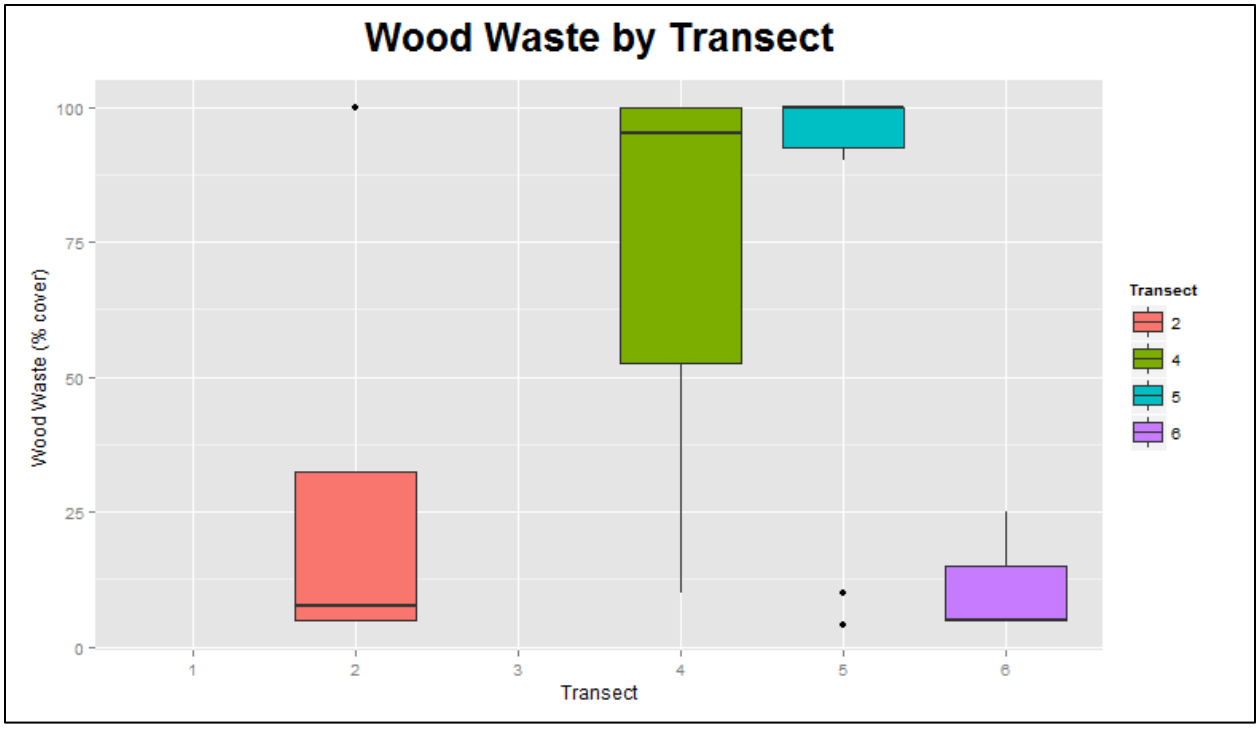

Figure 9 Percent Cover of Wood Waste by Transect

4.4 HABITAT VALUES

The Site is located in an industrialized area that does not support significant marine riparian vegetation. Most of the immediate backshore of the Site is paved or used for industrial storage and machinery. The intertidal and subtidal areas within the Site are typical of marine biota found within the Strait of Georgia in areas not influenced by regular deposition of silt or glacial till from large rivers. The intertidal zone is sloped and narrow, predominately consisting of rip rap slopes with some fringe vegetation.

4.4.1 Vegetation

The Georgia Depression supports vegetation with the longest growing season in British Columbia. Vegetation is dominated by the Western Hemlock Zone (Demarchi 2011). A survey of the forested upland was not conducted as part of this assessment. However, the upland area is highly industrialized and only disturbance tolerant species, such as black cottonwood (*Populus balsamifera ssp. trichocarpa*) were observed at the foreshore (**Photo 6**). There is also a thin marine riparian area extending approximately 300 m in length and 6 m to 10 m in width, along the east side of the property with no coniferous species present (**Photo 7**).

Photo 6 Riparian Area Along Southern Side of the Site (looking north along causeway)

Photo 7 Riparian Area Along Eastern Side of the Site (looking south)

The BIEAP Atlas (FREMP 2013) characterized marine vegetation in the intertidal habitat along Burrard Inlet. According to the atlas, the low intertidal area was characterized by a pocket of sea lettuce (*Ulva lactuca*) (**Figure 10**, FREMP 2013). A detailed biophysical assessment confirmed the presence of sea lettuce and documented rockweed (*Fucus distichus*), sugar kelp (*Saccharina latissima*), succulent seaweed (*Sarcodiotheca gaudichaudii*), and winged kelp (*Alaria marginata*) (**Appendix A**).

The subtidal marine assemblages observed within the Site are typical of hard substrates in Vancouver Harbour (Morris 2001, FREMP 2013, **Figure 11**, **Appendix A)**. Brown macroalgae was distributed throughout the inside transects (T1, T3), which were characterized by a mix of brown kelp species including: bull kelp (*Nereocystis luetkeana*), five-rib kelp (*Costa costaria*), and sugar kelp (**Photo 8**), along with other common algal species including splendid iridescent seaweed (*Mazzaella splendens*), rockweed, sea lettuce, unknown red bladed and red filamentous species. The algal community observed along Transect T5 was similar to the inside transects, but only in areas without wood waste. The deep water transects (T2, T4, T6) were devoid of algae with a few small samples of red algae observed.

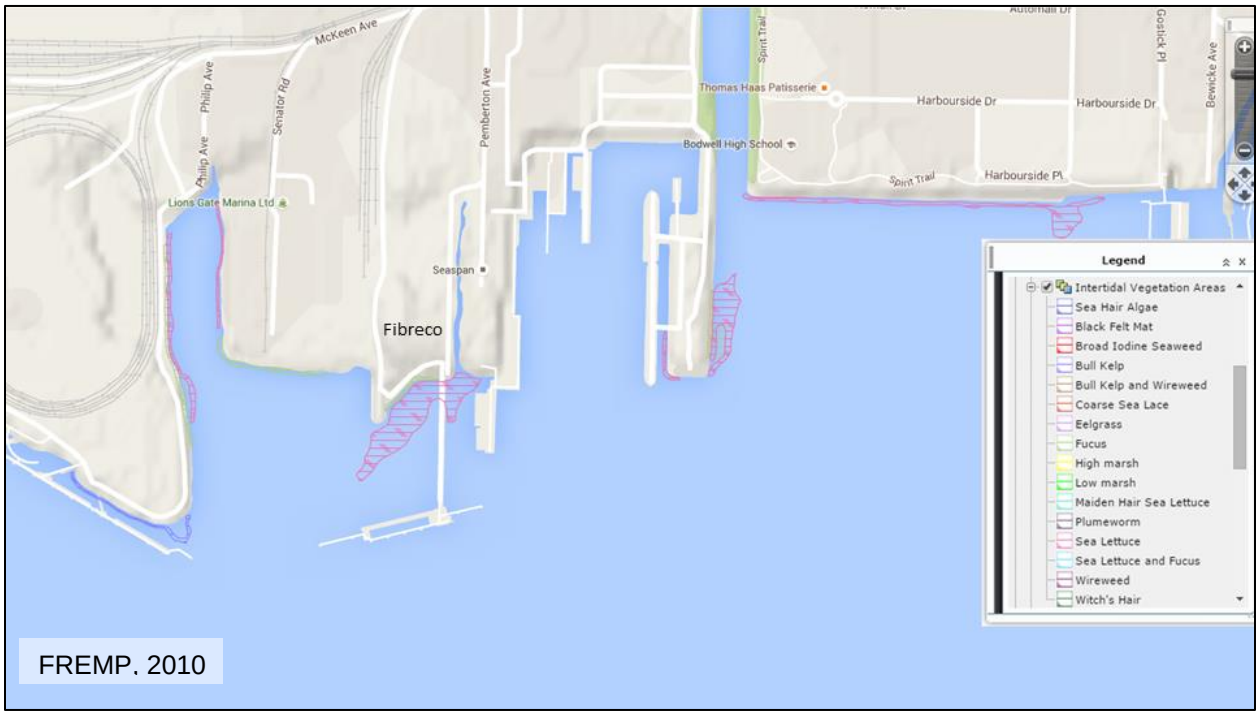

Figure 10 Pre-existing Marine Vegetation Characterized at the Project Site

Photo 8 Algal Community Along Inside Transect (T1)

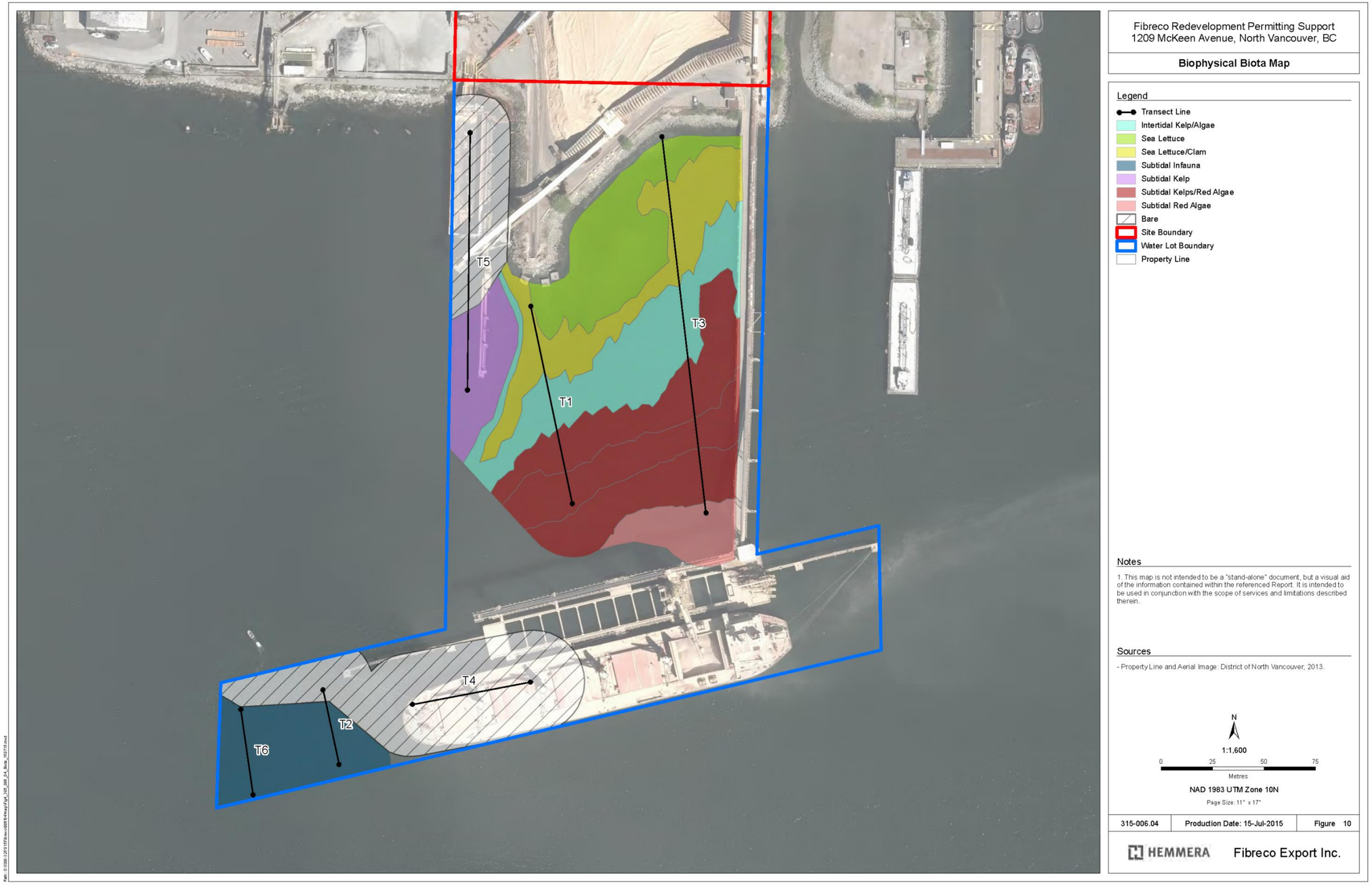

Figure 11 Biophysical Map of Subtidal Biota

4.4.2 Fishery Species

4.4.2.1 Fin fish

Burrard Inlet encompasses approximately 11,300 ha divided into six sub-areas: Outer Harbour and English Bay, False Creek, the Inner Harbour, the Central Harbour, Indian Arm and Port Moody Arm (Jacques Whitford, AXYS Ltd. 2008). While the amount of high quality fish habitat is limited by urban and industrialization, Burrard Inlet hosts a diversity of fish species (Haggarty 2001).

Juvenile salmon are abundant in nearshore habitats from early spring to fall, particularly chum (*Oncorhynchus keta*), chinook (*O. tshawytscha*) and, every second year, pink (*O. gorbuscha*) (Haggarty, 2001). Juvenile coho (*O. kisutch*), sockeye (*O. nerka*), steelhead (*O. mykiss)* and cutthroat trout (*Oncorhynchus clarki)* are also present, in lower abundances (Haggarty 2001). Adult salmon have been observed within 17 streams that flow into Burrard Inlet and are known to spawn in rivers on the north shore of the inlet, particularly in the Capilano and Seymour rivers that support salmon hatcheries (Haggarty 2001). McKay Creek, adjacent to the Site, is known to contain coho, chum, and steelhead (FISS 2013).

Approximately 63 other fish species occur in the nearshore areas of Burrard Inlet, including: Pacific herring (*Clupea pallasii)*, northern anchovy (*Engraulis mordax*), lingcod (*Ophiodon elongates)*, flatfish (English sole (*Parophrys vetulus*), starry flounder (*Platichthys stellatus*) and rock sole (*Lepidopsetta bilineata*)), Pacific staghorn sculpin (*Leptocottus armatus)*, shiner surfperch (*Cymatogaster aggregata*) and quillback rockfish (*Sebastes maliger*) (Haggarty, 2001). There are three Rockfish Conservation Areas (RCA's) in the eastern portions of Burrard Inlet, one of which (subarea 28-11) occurs a few kilometres east of the Site, adjacent to Maplewood Mudflats (DFO 2008).

The Site, which sustains a variety of substrate and marine vegetation would include habitat for some of these species. Fish species observed during the subtidal surveys included Kelp greenling (*Hexagrammos decagrammus*), English sole (*Parophrys vetulus*), speckled sanddab (*Citharichthys stigmaeus*), great sculpin (*Myoxocephalus polyacanthocephalus*) (**Photo 9**), and snake prickleback (*Lumpenus sagitta*). Juvenile salmonids have been observed at the Site within the last decade (D. Desjardin pers. com).

Fourteen listed marine and freshwater fish species occur in the CWH zone (B.C. Ministry of Environment 2013). Several of these have the potential to occur at or near the Project Site and are presented in **Table C**. Although it was included in **Table C**, green sturgeon (*Acipenser medirostris*) has a low likelihood of occurring near the Project Site. Very little is known about green sturgeon habitat use in Canada. Rearing and spawning by this anadromous species has not been recorded in Canada, although the species may forage along the marine coast of British Columbia.

Photo 9 Great Sculpin in Deep Subtidal T4

Table C Listed Fish Species with the Potential to Occur Near the Project Site (B.C. Ministry of Environment 2013)

Scientific Name	English Name	Provincial Listing[1]	SARA[2]	COSEWIC[3]	Comments
Acipenser medirostris	green sturgeon	Red	1-SC (2006)	SC (1987)	Habitat preferences are poorly understood, but it is unlikely these fish would use the Project Site as they are primarily observed in marine waters off the BC coast. Green sturgeon are not known to breed in Canadian waters.
Oncorhynchus clarkii clarkii	cutthroat trout, *clarkii* subspecies	Blue	Not listed	Not listed	May use nearshore habitats at the project site.
Salvelinus confluentus	bull trout	Blue	Not listed	SC (2012)	An anadromous fish that is present in Burrard inlet at certain times of the year.

Notes: [1] Red = Endangered or Threatened, Blue = Special Concern
[2] Schedule 1 = federal species at risk
[3] E = Endangered, T = Threatened, SC = Special Concern

4.4.2.2 Invertebrates

A detailed inventory of invertebrates in the intertidal zone was undertaken during the biophysical survey documenting a variety of invertebrates in the low intertidal zone. These included chitons, limpets, gaper clams (*Tresus spp.*), soft shelled clams (*Mya arenaria*), ochre sea stars (*Pisaster ochraceus*), leather stars (*Dermasterias imbricata*), periwinkle snails (*Littorina spp.*), Dungeness crab (*Metacarcinus magister*) and red rock crab (*Cancer productus*). The mid to high intertidal zone was dominated by barnacles (*Balanus* spp.) on hard substrates (**Appendix A**).

Invertebrate species observed during the subtidal transects included Dungeness crab (**Photo 10**), red rock crab (**Photo 11**), California sea cucumber (*Parastichopus californicus*), and intertidal bivalves (*Tresus* spp. and *Mya arenaria*). These species were abundant and commonly observed in the area between the ship berth and the south facing foreshore.

No listed invertebrate species at risk were observed in the intertidal zone during the biophysical assessment or subtidal zone during SCUBA surveys.

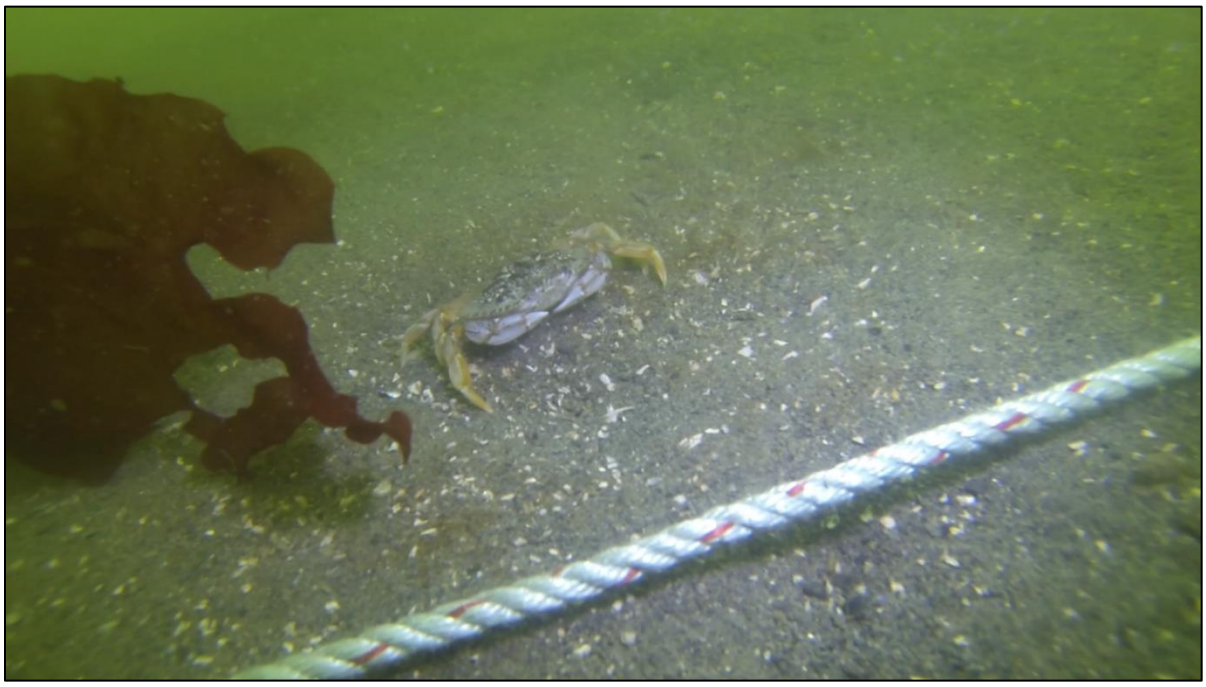

Photo 10 Dungeness Crab on sandy substrate at observed along Transect 1, June 9, 2015.

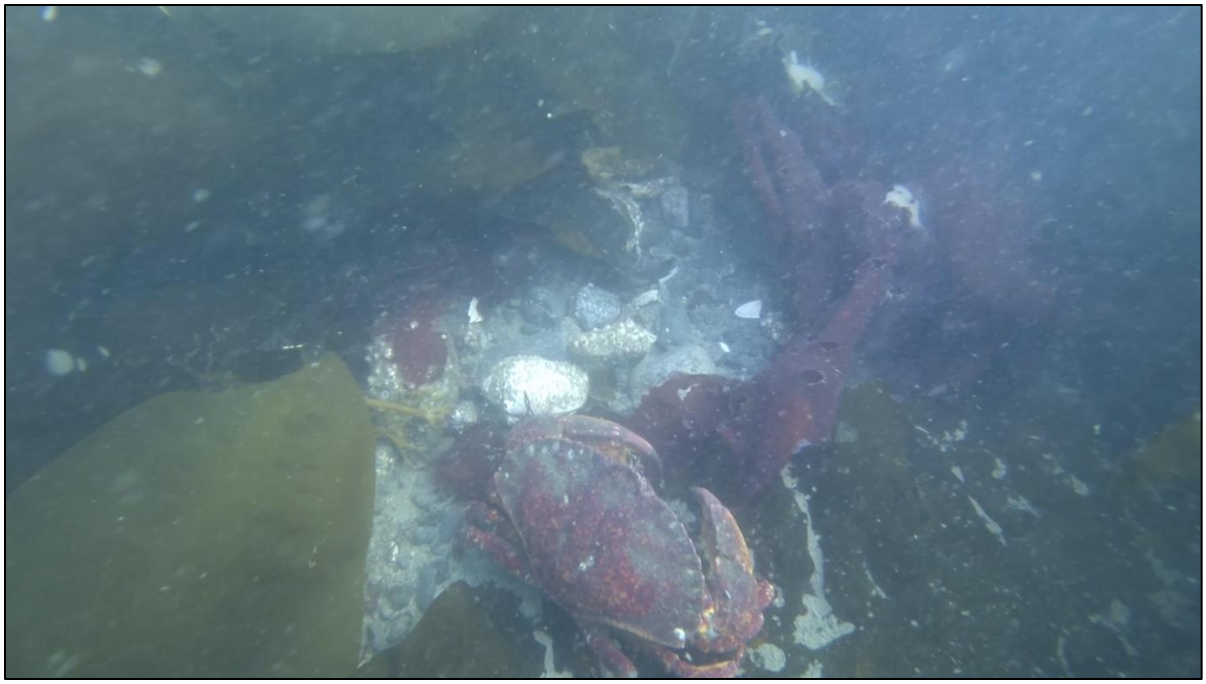

Photo 11 Red Rock Crab in gravel and sand substrate along Transect 1, June 9, 2015.

5.0 CONCLUSION AND RECOMMENDATIONS

The Fibreco Site sustains productive subtidal habitats in the nearshore, north of the ship berth, with large crabs and bivalves occurring within a diverse algal community. Mixed cobble and gravel substrates are likely driven by moderate current flow at the Site. Together, these variables help sustain subtidal productivity nearshore.

Wood waste was observed south west of the ship berth and adjacent to the barge loading area. Areas where wood waste were observed had depths greater than 30 cm (limit of measure) and low habitat value. Estimates of total extent of wood waste around the ship berth area were not fully delineated during the two-day survey.

We sincerely appreciate the opportunity to have assisted you with this project and if there are any questions, please do not hesitate to contact the undersigned by phone at 604.669.0424.

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7.0 STATEMENT OF LIMITATIONS

This report was prepared by Hemmera, based on fieldwork conducted by Hemmera, for the sole benefit and exclusive use of Fibreco Export Inc.. The material in it reflects Hemmera's best judgement in light of the information available to it at the time of preparing this Report. Any use that a third party makes of this Report, or any reliance on or decision made based on it, is the responsibility of such third parties. Hemmera accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken based on this Report.

Hemmera has performed the work as described above and made the findings and conclusions set out in this Report in a manner consistent with the level of care and skill normally exercised by members of the environmental science profession practising under similar conditions at the time the work was performed.

This Report represents a reasonable review of the information available to Hemmera within the established Scope, work schedule and budgetary constraints. It is possible that the levels of contamination or hazardous materials may vary across the Site, and hence currently unrecognized contamination or potentially hazardous materials may exist at the Site. No warranty, expressed or implied, is given concerning the presence or level of contamination on the Site, except as specifically noted in this Report. The conclusions and recommendations contained in this Report are based upon applicable legislation existing at the time the Report was drafted. Any changes in the legislation may alter the conclusions and/or recommendations contained in the Report. Regulatory implications discussed in this Report were based on the applicable legislation existing at the time this Report was written.

In preparing this Report, Hemmera has relied in good faith on information provided by others as noted in this Report, and has assumed that the information provided by those individuals is both factual and accurate. Hemmera accepts no responsibility for any deficiency, misstatement or inaccuracy in this Report resulting from the information provided by those individuals.

The liability of Hemmera to Fibreco Export Inc. shall be limited to injury or loss caused by the negligent acts of Hemmera. The total aggregate liability of Hemmera related to this agreement shall not exceed the lesser of the actual damages incurred, or the total fee of Hemmera for services rendered on this project.

APPENDIX A
Dive Survey Results

Appendix A
Fibreco Biophysical Assessment Survey Results

Dive:	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Distance:	0	10	20	30	40	50	60	70	80	90	95	0	10	20	30	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170
Depth m CD:	1.6	1.6	1.3	1.3	1.0	0.7	0.4	0.1	-0.2	-0.9	-1.8	-13.5	-12.9	-12.2	-11.9	-5.5	-4.3	-3.1	-1.9	-1.0	-0.3	0.3	0.6	0.6	0.9	0.9	1.2	1.5	1.5	1.5	1.5	1.5	1.5
Alaria marginata				5		5	10	10			5													10			15		25				
Beggatoa spp.																																	
Chondracanthus exasperatus			5						5										3							1							
Cladophora																																	
Constantinea subulifera																																	
Costa costaria					10						10							2															
Cryptopleura ruprechtiana																	7																
Desmerastia munda																								2									
Diatoms																					10			40									
Fucus distichus																																	
Laminaria bongardiana	50										5														20		5						
Mastocarpus papillatus																																	
Mazaella linearis																																	
Mazaella splendons										3																							
Nereocystis leutkeana																																	
Polyneura latissima																																	
Porphyra sp.																																	
Red blade																		10						3									
Red filamentous																2		5						2									
Saccharina bongardiana				5																													
Saccharina latissima			10		70	10	20	60		25									15		5	5	5							10			
Sarcodietheca gaudichaudii						15	5	10	10	10	5							15	10	5	2	10	3	10		20	5						
Sargassum muticum										2																	1		3				
Sparlinia pertusa																			3														
Ulva intestinalis																				1				5					3	2			
Ulva lactuca	10	35	60			1	5			5									1		2		10	15	5	6	5	10	5	5	35	5	40
Balanus glandula		5	40		70		20									5																	
Cancer productus	1	1														1		3								3		2					
Cucumaria miniata																																	
Dermasterias imbricata																																	
Evasterias troscheli								1																									
Macoma sp.																																	
Metacarcinus magister													1	1		1	1				1					1			2				
Metridium farcimen																	1																
Mya sp.																								18		10		7					
Myoxocephalus polyacanthocephalus																																	
Pagurus sp.																											1						
Pisaster ochracheus																		3															
Sole unknown							1																3										
Tresus sp.			2				4			2			2	2				2			2	7		6		3		3		5	2	2	
Snake Prickleback												1																					
English Sole																						2											
Sand dab																				1													
Tube snout																										1							
Bare																																	
Boulder																																	
Cobble				10			15		20									5	10								5						
Gravel	90	70	95	70	100	70	60	60	40	10	50	10	60	70		30	10	15	10					10		30	10	5	10	10	10	5	5
Sand	5	30	5	20		30	25	40	40	90	50	85	30	30		70	90	80	80	100	100	100	100	90	100	70	90	90	90	90	90	95	95
Silt																																	
Shell	5	5				5											2		5														
Wood waste												5	5	10	100																		
Notes																																	

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July 2015

Appendix A
Fibreco Biophysical Assessment Survey Results

Dive:	4	4	4	4	4	4	5	5	5	5	5	5	5	5	5	5	5	5	5	6	6	6	6	6	6
Distance:	0	10	20	30	40	50	0	10	20	30	40	50	60	70	80	90	100	110	120	0	10	20	30	40	50
Depth m CD:	-13.4	-13.8	-13.8	-13.4	-12.8	-13.1	-3.6	-3.9	-4.5	-4.5	-4.5	-4.2	-3.9	-3.6	-3.3	-3.6	-3.6	-3.3	-3.0	-14.1	-12.9	-11.6	-11.0	-11.0	-10.7
Alaria marginata								10																	
Beggatoa spp.													P	P		P		P							
Chondracanthus exasperatus																						2			
Cladophora																									
Constantinea subulifera																									
Costa costaria																									
Cryptopleura ruprechtiana																									
Desmerastia munda																									
Diatoms																									
Fucus distichus																									
Laminaria bongardiana							10																		
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Nereocystis leutkeana									10																
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Sarcodietheca gaudichaudii							5																		
Sargassum muticum																									
Sparlinia pertusa																									
Ulva intestinalis																									
Ulva lactuca							5		10	5	5	5	2		2										
Balanus glandula							70		70																
Cancer productus																									
Cucumaria miniata																									
Dermasterias imbricata																									
Evasterias troscheli																									
Macoma sp.																									
Metacarcinus magister								2	1	1			1			1									
Metridium farcimen																									
Mya sp.																									
Myoxocephalus polyacanthocephalus														1											
Pagurus sp.																									
Pisaster ochracheus								1	1					1										1	
Sole unknown												1										1			
Tresus sp.																						2			
Snake Prickleback																									
English Sole																									1
Sand dab											1													1	
Tube snout																									
Bare																									
Boulder																									
Cobble							40		10													5	5		
Gravel							50	100	80	60		50								40	20	15	15	10	5
Sand	50	85																		60	80	80	80	90	70
Silt										40		50													
Shell	10	5	10	5	5		10			5		5	10	5											
Wood waste	40	10	90	100	100	100			10	4	100	95	90	100	100	100	100	100	100				5	5	25
Notes			>30	>30	>30	>30																			

ATTACHMENT C

Photos

Photo 1: Rip-rap and foreshore looking west at Project Site rail jetty modification area, southeast side

Photo 2: Cement blocks and rip-rap looking north at Project site jetty modification area, south side

Photo 3: Shell and cobble foreshore looking south from rail jetty modification area towards ship loader, west side

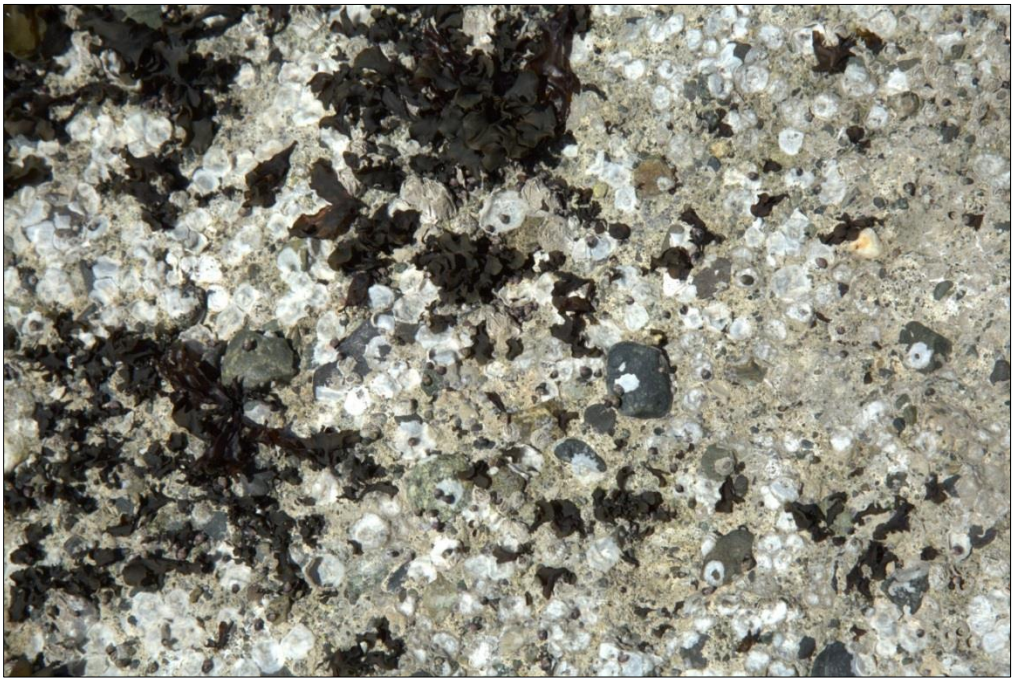

Photo 4: Turkish washcloth, acorn barnacles, and periwinkles on rip-rap of intertidal redevelopment area

Photo 5: Bivalve shell debris in the foreshore adjacent to the redevelopment Site

Photo 6: Large cement block at the base of rip-rap showing zonation of barnacles, rockweed, and Turkish washcloth, with sea lettuce on the cobble