Existing Ecological Conditions at Proposed New Brighton Park Habitat Enhancement Project PMV Habitat Enhancement Program

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HEMMERA

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1.0 INTRODUCTION

The proposed New Brighton Park Habitat Enhancement Project (the Project) in the City of Vancouver, B.C., is being considered as a potential project under Port Metro Vancouver's (PMV's) Habitat Enhancement Program (HEP) in collaboration with the Vancouver Board of Parks and Recreation (VBPR). Project planning is being undertaken in accordance with the "Working Agreement Concerning Procedures for Development and Operation of the Port Metro Vancouver Habitat Bank" (2012) between Fisheries and Oceans Canada (DFO) and PMV.

The objective of this assessment was to document the existing ecological habitats and potential species use of the proposed New Brighton Park Habitat Enhancement Site (the Site) adjacent to the south shore of Burrard Inlet. General ecosystem conditions and occurrences of species of management concern will inform Project design and construction mitigation at the site.

1.1 RATIONALE

As part of the Habitat Enhancement Program, PMV is applying a landscape approach to identifying potential sites where the productivity of fish and wildlife habitat can be increased, existing habitat can be enhanced to increase its productivity, or degraded habitat can be restored to benefit fish and wildlife species that utilize the lower Fraser River estuary and Burrard Inlet.

The Project is located within the "Fraser Estuary, Boundary Bay, Burrard Inlet, Fraser and North Arms" Geographic Service Area (GSA). In Burrard Inlet, between the Ironworkers Memorial Bridge and the Lions' Gate Bridge, less than 10% of the shoreline has not been subject to industrialization and urbanization (Stantec Consulting Ltd. 2009). The shoreline of New Brighton Park and the upland areas include shoreline protection features and foreshore fill so although it is not industrialized, it is not a true "natural" area. This makes it an excellent candidate for habitat restoration and enhancement. PMV is placing a priority on fish habitat enhancement and marsh restoration when seeking restoration and enhancement opportunities in this GSA. Site selection for this Project was based on factors including need, habitat productivity, site location, feasibility and cost, sustainable habitat creation, ownership and tenure, and consideration towards First Nations and communities.

The site has been selected based on its potential to benefit a broad range of fish and wildlife species and increase the overall ecological function. The proposed Project would restore and enhance a historically filled foreshore and upland area to provide high-value habitat for fish, birds and other wildlife.

The creation of a tidal wetland feature would also improve habitat in the Burrard Inlet for juvenile salmon rearing. The potential inclusion of rocky reefs for the establishment of bull kelp could also help to support several species of seaweed and rockfish and increase marine productivity in the area.

Information considered during preparation of this report included:

- A review of current and historical aerial photographs.
- Field reconnaissance information (2015).
- Desktop study and background research.

2.0 PROJECT LOCATION

The New Brighton Park Habitat Enhancement Project is located in the City of Vancouver, B.C. The proposed enhancement site is located along the south shore of Burrard Inlet, in the Inner Harbour, west of the Ironworkers Memorial Bridge and Second Narrows (**Figure 1** and **Figure 2**) and adjacent to the Viterra Cascadia Terminal (to the east) and Hastings Park (to the south).

Figure 1 New Brighton Park Project Site – Regional Setting

Figure 2 New Brighton Park Project Site – Site Location

3.0 PROPOSED HABITAT ENHANCEMENT PROJECT

3.1 SITE HISTORY

Previously known as Hastings Townsite, British Royal Engineers surveyed the location of New Brighton Park into lots in 1863. This was the location of the first post office, customs office, and Canadian Pacific Railway office established in the City of Vancouver (**Photo 1**). An aerial photograph review indicates that the middle and northern ends of the proposed Project site were likely filled at various stages during the mid-1900s, which contributed to the loss of valuable fish habitat (**Appendix A: Historic Aerial Photographs**). Historical uses of the site prior to its development into a municipal park were primarily for lumber-related industries, particularly shingle manufacturing (Keystone Environmental Ltd 1997*a*, *b*).

Infilling of the shoreline ceased around the early 1970's (**Appendix A**). However, wave-related erosion along the eastern portion of the park prompted shoreline stabilization works by Kerr Wood Leidal and Raincoast Applied Ecology in 2006-2007. The project included stabilizing the backshore with large boulders for armouring and bioengineered banks (using Hooker's willow (*Salix hookeriana*), wattle and geotextile soil wrap; **Photo 2**), and the re-working of rip rap groynes. To improve the marine riparian habitat value of the site, native dune grass (*Lymus mollis*) benches were created at the seaward toe of the stabilized banks (**Photo 2**) and on the tops of the groynes. Dune grass and large-leaved lupine (*Lupinus polyphyllous*) meadows were created at the tops of some banks, and riparian shrub (thimbleberry (*Rubus parviflorus*), Nootka rose (*Rosa nutkana*), snowberry (*Symphoricarpus albus*), red flowering currant (*Ribes sanguineum*), and mock-orange (*Philadelphus lewisii*)) and tree (black cottonwood (*Populus trichocarpa*) habitats were created along the tops of the stabilized banks.

As part of the Hastings Park / PNE Master Plan released in 2011, the City of Vancouver proposed an ecological corridor connecting the "Sanctuary Pond," constructed in the park in 1999, to the waterfront through New Brighton Park (**Figure 3**). These plans include daylighting of Renfrew Creek and connecting it to a newly established salt marsh at Burrard Inlet, with pedestrian and bicycle pathways facilitating public access (Phillips Farevaag Smallenberg 2011). In 2013, the first leg of daylighting a portion of Renfrew Creek and connecting it with Hastings Park was completed, establishing Creekway Park (**Figure 3**).

Photo 1 View of New Brighton in the Early 1900's, Looking East

Photo 2 Completed Shoreline Stabilization with Dune Grass Bench in Foreground Bioengineered and Boulder Banks in Background (facing west)

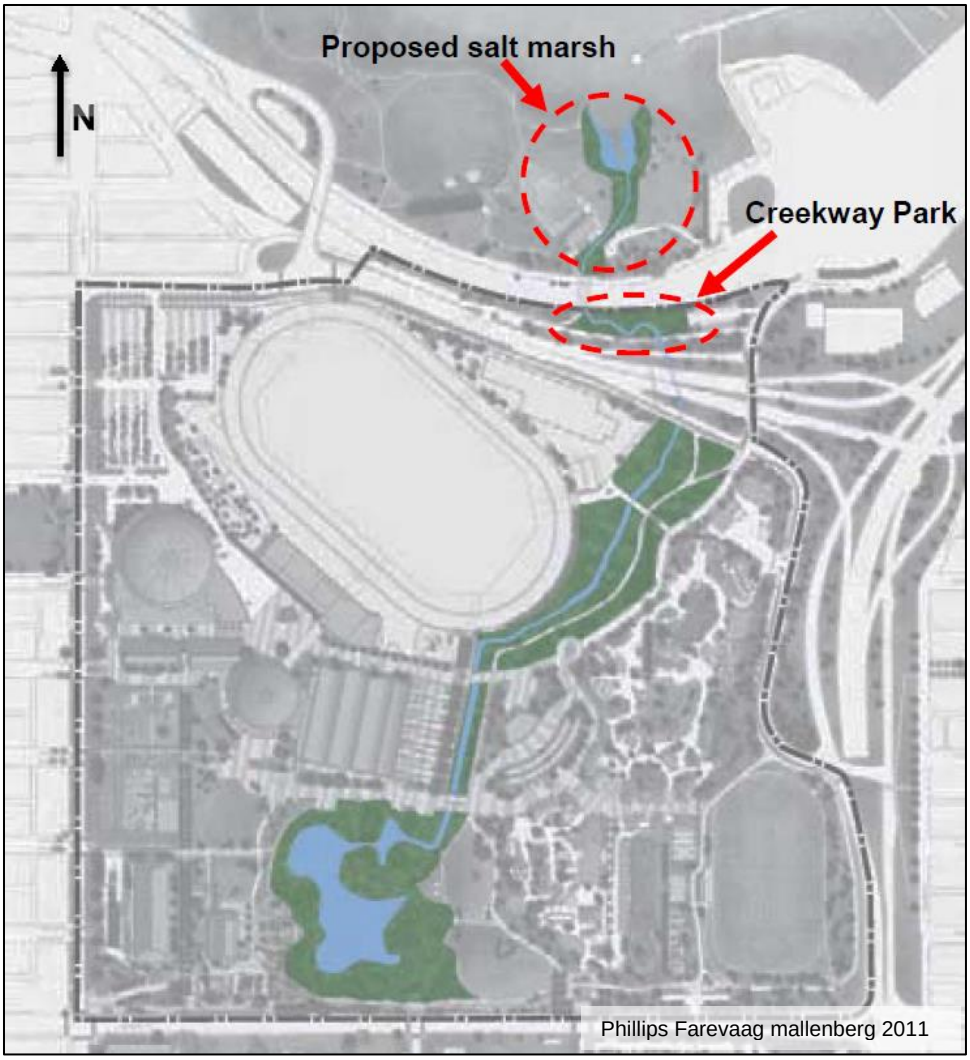

Figure 3 Proposed Ecological Corridor Connecting Hastings Park Sanctuary to New Brighton Park

3.2 PROPOSED WORKS

PMV is working with the VBPR to explore the restoration of habitat in New Brighton Park. The proposed project is consistent with the City's Hasting Park / PNE Master Plan and the objectives of PMV's HEP, and could support the restoration of Renfrew Creek as part of the revitalization of Hastings Park.

The proposed project is in the conceptual design stage and may include the restoration and enhancement of approximately 25,000 m^2 (2.5 ha) of intertidal, subtidal, instream and riparian habitats. Project components could include the creation of a tidal wetland with a marsh component, the construction of subtidal rocky reefs, enhancement of marine riparian habitat, and the creation of streamside habitat at the southern end of the park. The design is expected to maintain access to the shoreline and provide environmental education opportunities.

4.0 EXISTING BIOPHYSICAL CONDITIONS

Information related to the existing biophysical conditions of the Project Site was obtained from the following sources:

- Online Sensitive Habitat Inventory and Mapping (SHIM 2013);
- 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);
- Online iMap database (iMap 2015);
- Aerial photographs (Port Metro Vancouver 2015); and
- Site visits and field studies including subtidal survey, terrestrial/vegetation survey, and bird observations (Hemmera and GL Williams and Associates 2015).

4.1 GENERAL SITE DESCRIPTION

The Project Site falls within the Dry Maritime Coastal Western Hemlock (CWHdm) biogeoclimatic subzone (**Figure 4**; SHIM 2013, Government of B.C. 2012). The CWHdm subzone occurs at lower elevations (0-650 m), and is typified by warm, relatively dry summers and moist, mild winters with little snowfall (Green and Klinka 1994). The mean annual temperatures in the CWH zone range from 5.2 to 10.5°C, with mean annual precipitation ranging from 1000 to 4400mm (Pojar et al 1991).

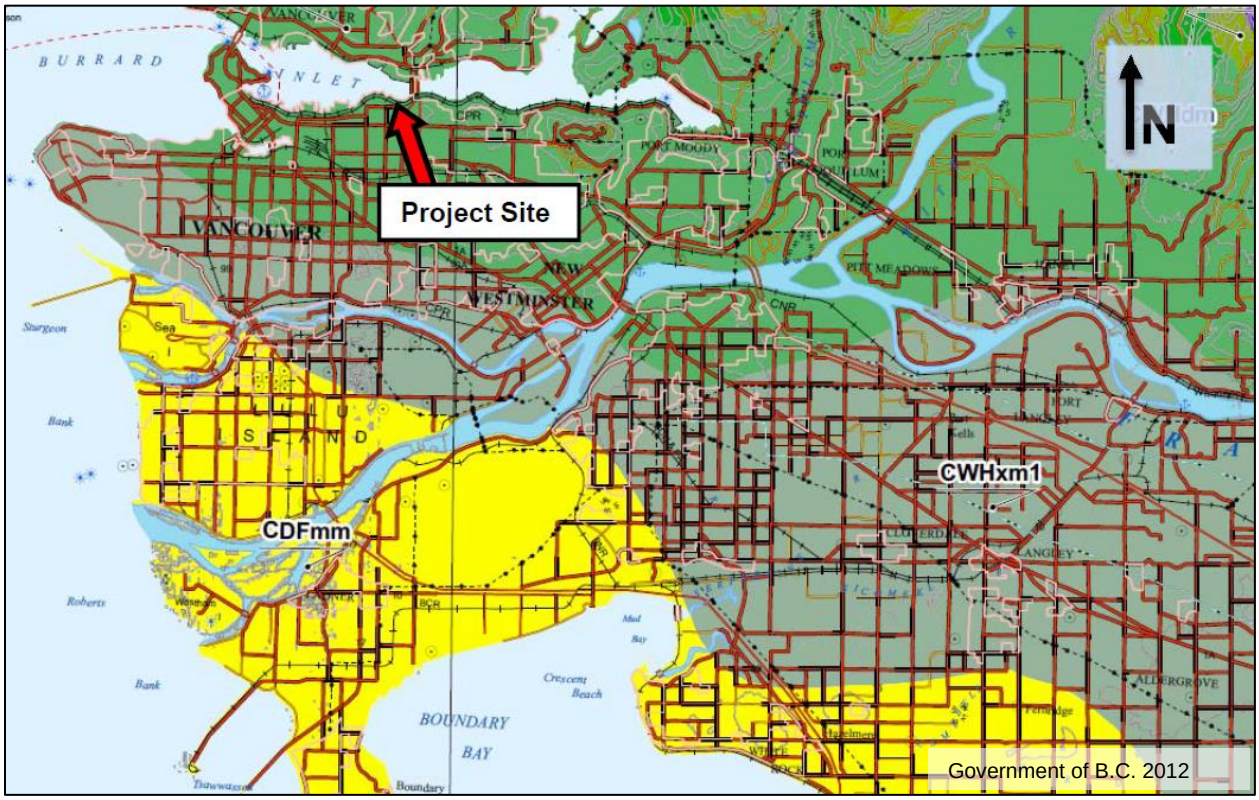

Figure 4 Biogeoclimatic Subzones of Metro Vancouver with Project Site

4.2 FIELD ASSESSMENT METHODS

4.2.1 Backshore and Intertidal Survey

A backshore and intertidal biophysical assessment was conducted in the eastern portion of New Brighton Park during the low tide cycle on May 6, 2015 (**Figure 5**). Substrate type and relative composition were described visually using a generalized Wentworth-based scale (Wentworth 1922; **Table A**) (**Appendix B: GL Williams and Associates Memorandum**).

Wildlife observations were generated during two one-hour point count surveys during the early morning hours of May 4 and May 7, 2015. The same assessment area as the biophysical survey was used (**Figure 5**).

Table A Biophysical Assessment 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.

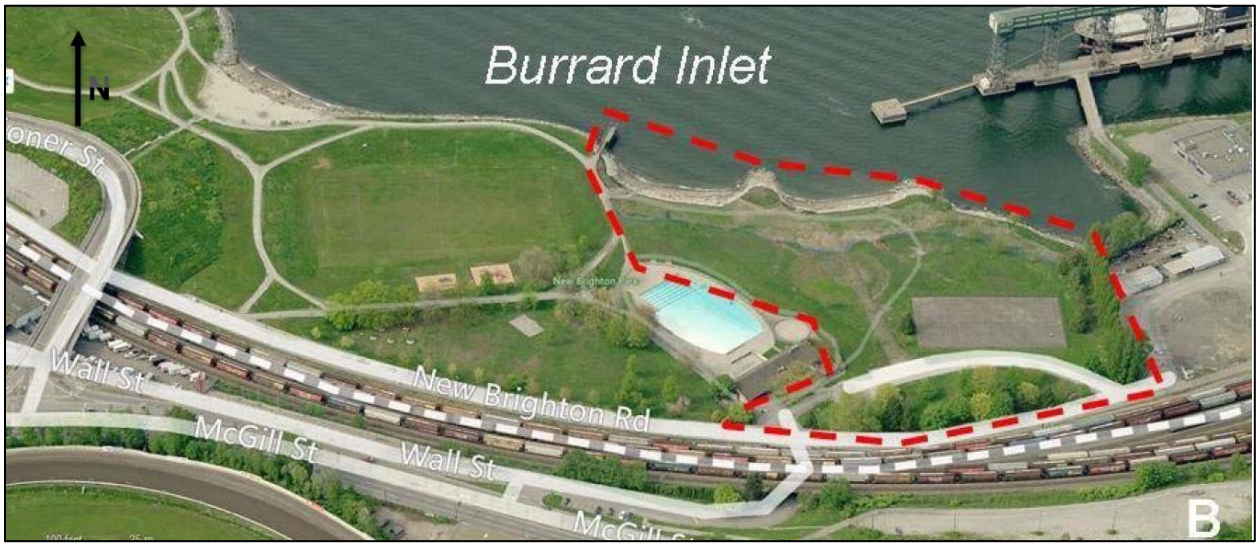

Figure 5 Backshore and Intertidal Biophysical Assessment Area

4.2.2 Subtidal Survey

Atek Hydrographic Surveys Ltd. collected nearshore bathymetric data at New Brighton Park on April 22nd 2015 and provided a 1 meter resolution digital elevation surface of the seafloor (**Figure 6**). These data were then used to produce derived products, including depth contours and seafloor rugosity maps. Rugosity is a measure of three dimensional roughness of the seafloor and can be used to characterize seafloor habitats. Rugosity can be used to distinguish between more complex areas, high-relief rocky habitat, and less complex areas such as low-relief gravel and sand habitats.

A Worksafe BC certified dive team conducted a detailed biophysical survey in the nearshore subtidal zone, on April 30th 2015, following the DFO Marine Foreshore Environmental Assessment Procedure (DFO unpublished). Three transects were established perpendicular to the waterline within the Site (**Figure 7**). The start and end of each transect were recorded with a Garmin GPS and underwater video was recorded using a high definition GoPro camera. All fish observed were recorded by the lead diver

while travelling to the deepest portion of the dive, while laying a measuring tape to the estimated Site boundary, or between 30 m and 40 m from the high-high water level (HHWL). The HHWL in Vancouver Harbour is approximately five metres above chart datum (m CD). For each transect survey a 1 x 1 m area was sampled at 5 m intervals along the transect line. Within each 1 m^2 area sampled the diver recorded: transect position, depth, substrate type, vegetation cover, sessile invertebrate cover, mobile invertebrate density and fish density. Transects were established in two areas at the park. Transects one and two were located along the west edge (western area) of the park boundaries with a separation of approximately 50 m between them. Transect three was located at the eastern edge (eastern area) of the park at the off leash dog park. In order to characterize the larger site as a whole, two random swim surveys were conducted at the west and east ends of the park boundary, in addition to the transect surveys (**Figure 7**). The path of the random swim surveys was recorded from a small vessel, which followed the divers at a safe distance while recording the path using a Garmin GPS. Random swim surveys are considered a semi-quantitative assessment and in this case, provided approximate information on the habitats and species of interest within the proposed site.

Dive survey data were used to guide biophysical mapping of the nearshore area. Substrate types, changes or breaks in species community, dominant vegetation, and other notable features (e.g. outfalls, cables, etc.) were recorded. As with the intertidal assessment, substrate type and relative composition were described visually using a generalized Wentworth-based scale (Wentworth 1922; **Table A**).

Figure 6 Subtidal Dive Survey Transect Locations

4.3 PHYSICAL CHARACTERISTICS

The upland park area is relatively flat, sloping up to an overpass at New Brighton Road near the southern bounds of the park. Organic soil, covered with grass and the occasional landscaped tree, is interspersed with gravel pathways and an access road to New Brighton Pool (**Figure 7**, **Photo 3**; **Appendix B**). A section of the newly enhanced Renfrew Creek (**Section 3.1**) at Creekway Park is located along the southern edge of New Brighton Road. The Creekway Park water feature receives water flow from stormwater in the Hastings Park catchment. This section of the water feature consists of a series of weirs to retain storm water. Flows in the cobble lined stream channel were low during the biophysical assessment. The stream channel follows a steep gradient to a corrugated steel half arch culvert that discharges into a storm drain on the north side of the New Brighton Road overpass. From this location, the stormwater is culverted under the park and discharges through a wooden outlet into the intertidal beach in Burrard Inlet (**Figure 7**; **Appendix B**).

Burrard Inlet is an industrial port that is heavily developed with armoured slopes, bulkheads and ship loading facilities, which reduces fish and wildlife habitat values. Due to prior shoreline stabilization and creation of marine riparian habitat (**Section 3.1**), the shoreline of the proposed enhancement area consists primarily of large boulders and elevated dune grass benches (**Figure 7**, **Photo 4** and **Photo 5**).

Three moderately sloping intertidal beaches, separated by two rock groynes, run along the waterfront in the eastern portion of New Brighton Park. The Burrard Inlet Environmental Action Program (BIEAP) Atlas characterizes intertidal substrate types along Burrard Inlet. According to the atlas, the intertidal beaches at the eastern end of the park are comprised of cobble, fine gravel, and sand with some boulder (**Figure 8**; FREMP 2015). This characterization was confirmed during the biophysical assessment (**Figure 7**, **Photo 4**; **Appendix B**). Tides along New Brighton Park are semi diurnal and the tidal range exceeds 5 m (**Appendix B**, **Table 1**; **Figure 9**).

SCUBA survey results (west and east) characterized the sediment types present in the nearshore area (**Figure 10**). To the west, the deeper subtidal zone (9 m – 5 m) is characterized by coarser sediments (cobble to gravel). The shallower portions were predominantly rip rap, which is described as boulders (from 5 m depths and shallower). There was a greater proportion of boulder habitat along the west side of the park. The eastern transect followed a shallower grade, typical of a coarse sediment beach (sand, gravel, cobble, and shell debris). The shallow grade resulted in a longer transect than was required to survey the western transects. At depth (4 m), substrate was primarily comprised of a gravel, sand, and shell debris mix, which transitioned into coarser materials (cobble and larger shell debris) at approximately 0 m CD (**Photo 6**, **Appendix C: Hemmera Biophysical Assessment: Dive Survey Results**). The random swim survey at the west end indicated that the nearshore was made up of large sediment (boulder), while a mix of cobble, gravel, and sand sediment was observed in areas deeper than approximately 4 m CD. The random swim survey at the east end of the site determined the presence of softer sediments, gravel, and sand, mixed with cobbles.

Figure 7 New Brighton Park Biophysical Map

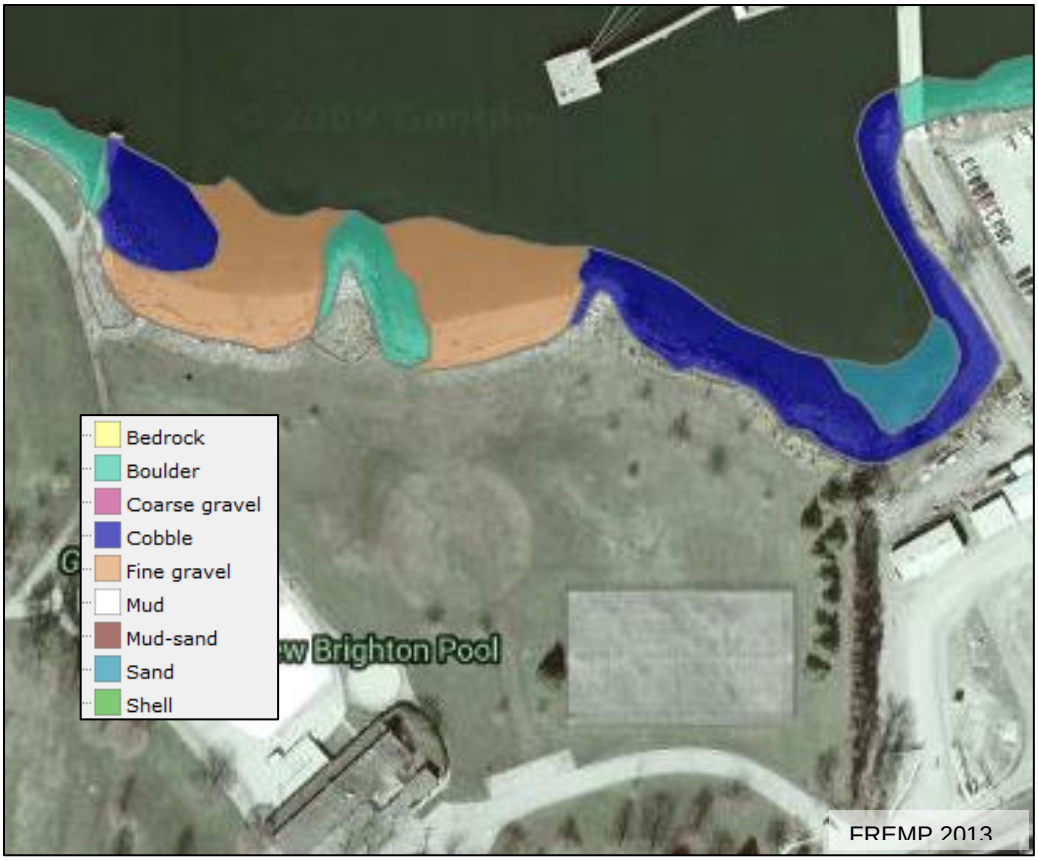

Figure 8 Physical Substrate of the Intertidal Habitat Surrounding the Project Site

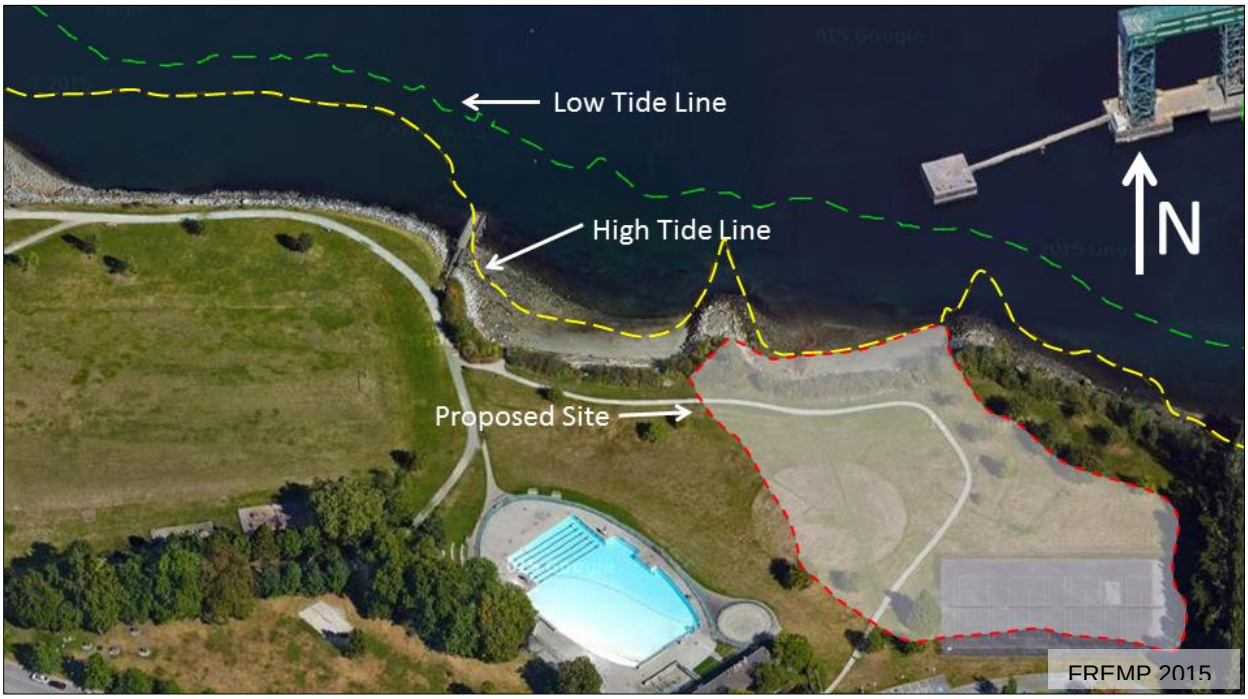

Figure 9 High and Low Tides Lines at the Project Site

Figure 10 New Brighton Park Biophysical Subtidal Map

Photo 3 Upland Habitat at New Brighton Park Looking East

Photo 4 Rock Groynes Separating Scalloped Intertidal Beaches with Varying Substrates and Boulder Banks Looking East

Photo 5 Dune grass Bench Created with Boulders and Sand Fill below Riparian Shrub Backshore Habitat

Photo 6 Gravel, Cobble, Shell Debris Sediment Nearshore of Intertidal Beach from Transect 3

4.4 HABITAT VALUES

4.4.1 Fish and Wildlife Habitat

The upland portions of the proposed Project Site consists of an urban park with a maintained lawn which provides few habitat opportunities (**Appendix B**). A band (3-5 m) of native riparian habitat was present along the shoreline and included a number of shrubs and trees and a few narrow dune grass benches (**Appendix B**). The low intertidal and shallow subtidal habitats sustained a diverse array of algal species, including kelp.

4.4.2 Vegetation

Vegetation in the upland area consists mostly of a maintained lawn (**Appendix B Table 2**) interspersed with some native western red cedar (*Thuja plicata*) and Douglas-fir (*Pseudotsuga menziesii*). A row of Lombardy poplar (*Populus nigra*) are present along the eastern border of the park with an understory of snowberry (*Symphoricarpos albus*) and invasive Himalayan blackberry (*Rubus armeniacus*) and Scotch broom (*Cytisus scoparius*). The overpass of New Brighton Road, bordering the south side of the park, was covered with invasive English ivy (*Hedera helix*; **Appendix B**).

The riparian shrub and tree habitat bordering the shoreline bank (above HWM) consisted of native species, many of which were planted during shoreline stabilization works in 2006-2007 (**Section 3.1**; **Photo 7**). A full list of native shrub species is presented in **Appendix B Table 2**. Black cottonwood (*Populus balsamifera*) and red alder (*Alnus rubra*) were interspersed in this band of habitat. Several narrow dune grass benches were observed during the biophysical assessment (**Photo 5**).

The BIEAP Atlas (2010) characterized marine vegetation in the intertidal habitat along Burrard Inlet. According to the atlas, the low intertidal area is characterized by a band of bull kelp (*Nereocystis luetkeana*) (**Figure 11**; FREMP 2013). A detailed vegetation inventory has not been undertaken; however, the biophysical assessment confirmed the presence of bull kelp and also documented sugar kelp (*Saccharina latissima*), splendid iridescent seaweed (*Mazzaella splendens*), sea lettuce (*Ulva lactuca*) and the invasive wireweed (*Sarguassum muticum*; **Photo 8**). Vegetation in mid to high intertidal zones included rockweed (*Fucus garneri*) with some Turkish washcloth (*Mastocarpus papillatus*) and sea lettuce. A detailed list of intertidal vegetation is presented in **Appendix B.**

The subtidal marine assemblages observed within the Site are typical of those commonly occurring on hard substrates in Vancouver Harbour (Morris 2001, FREMP 2013, **Appendix C: Table C1)**. The shallow subtidal zone with coarse sediments was characterized by a mix of brown kelp species including: bull kelp, seersucker kelp (*Costa costaria*), and sugar kelp (**Photo 9**).Other common algal species including: splendid iridescent seaweed, rockweed, sea lettuce, red bladed and red filamentous species were also present within the subtidal zone. The western area transects were dominated by kelp forest species and smaller red and green algal communities (**Photo 10**). In all transects, deeper subtidal areas were

dominated by coarse gravel and cobble substrates with minimal opportunistic kelp and algae. Common species in the deeper sand and gravel zone included red filamentous and red blade algae. The eastern area had less algal coverage as the benthic habitat lacked large coarse sediments and there was less rocky surface. Bull kelps and smaller opportunistic algae are valued ecosystem components and were observed within the shallow subtidal zone. The shallow subtidal zone was dominated by grass kelp (*Ulva intestinalis*) (**Photo 11**).

Photo 7 Riparian Shrub and Tree Habitat along the Shoreline Bank at New Brighton Park

Figure 11 Marine Vegetation at the Project Site is Characterized by Bull Kelp

Photo 8 Marine Vegetation and Invertebrates in Low Intertidal Zone

Photo 9 Marine Vegetation and Fish in Shallow Subtidal Zone at the Western Edge of the Park from Western Random Swim

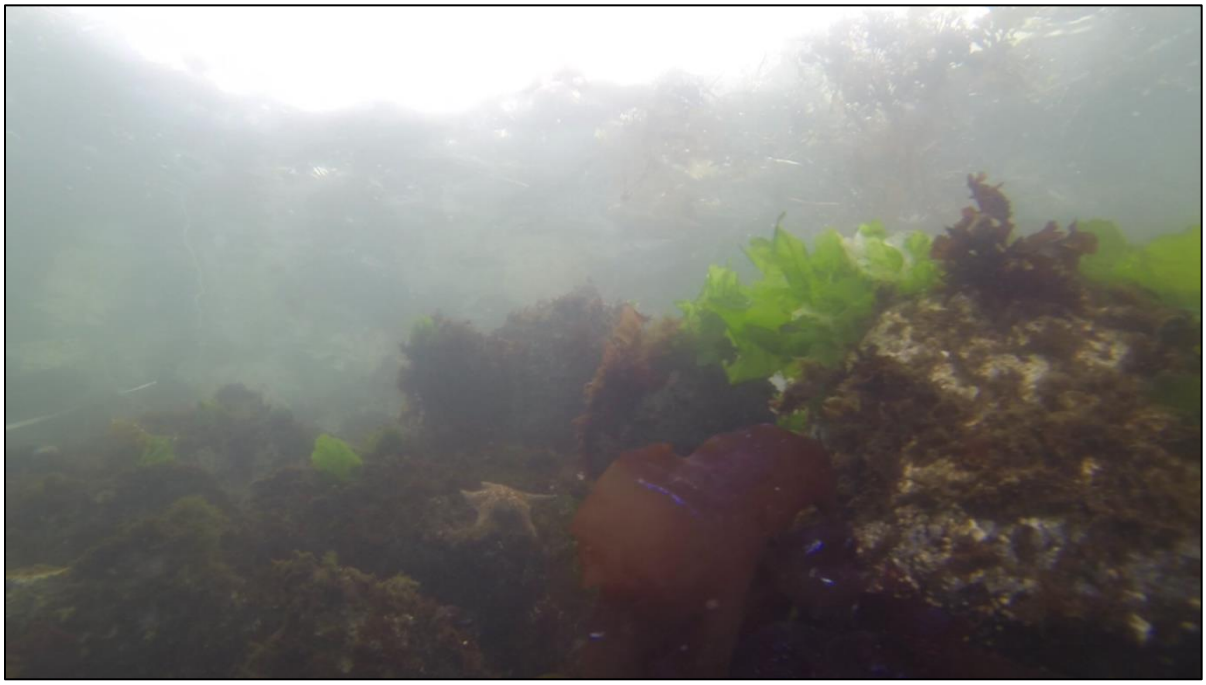

Photo 10 Marine Vegetation in Shallow Subtidal Zone Transect 2 (West side of Park)

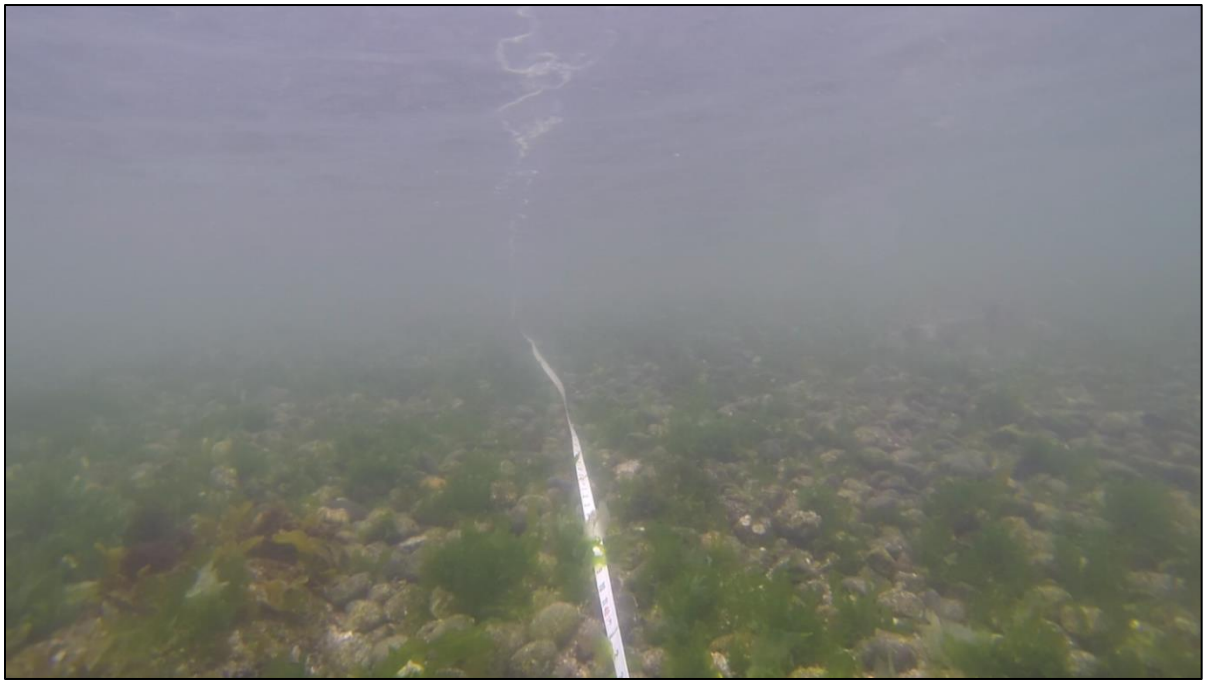

Photo 11 Marine Vegetation in Shallow Subtidal Zone at Transect 3 (East side of Park)

A search of the online B.C. Species and Ecosystems Explorer database indicated that upwards of 100 at-risk vegetation species potentially occur in the CWH zone; however, there are no known rare vegetation occurrences at or near the park (B.C. Ministry of Environment 2013).

4.5 FISH AND INVERTEBRATES

4.5.1 Fish Species

Burrard Inlet encompasses approximately 11,300 ha which consists of six sub-areas: Outer Harbour and English Bay, False Creek, the Inner Harbour, the Central Harbour, Indian Arm and Port Moody Arm (Georgia Strait Alliance 2003). While the amount of high quality fish habitat is limited by urban and industrialization, Burrard Inlet is known to host a diversity of fish species.

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). Historically, Renfrew Creek ran from south of hasting's park down to the shoreline of Burrard Inlet through the proposed project area; however, this is now classified as a lost stream as it was culverted and is no longer fish bearing (FREMP 2015).

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 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 Project Site, which sustains a variety of substrate and marine vegetation could include habitat for some of these species. Fish species observed during the subtidal surveys included tube snouts (*Aulorhynchus flavidus*) (**Photo 12**), lingcod (**Photo 13**), kelp perch (*Brachyistius frenatus*) (**Photo 9**), striped perch (*Embiotoca lateralis*), Blackeyed goby (*Rhinogobiops nicholsii*), and copper rockfish (*Sebastes caurinus*) (see **Appendix C** for a full list of species). The sandy gravel habitats characteristic of the deeper subtidal and habitats off the beaches provide habitat for flatfish species such as English sole, speckled sanddab (*Citharichthys stigmaeus*), and starry flounder.

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 B**.

Although it was included in **Table B**, 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.

Cutthroat trout and anadromous bull trout would be likely to utilize the present vegetated habitat offered at the Project Site, including kelp areas and eelgrass habitat.

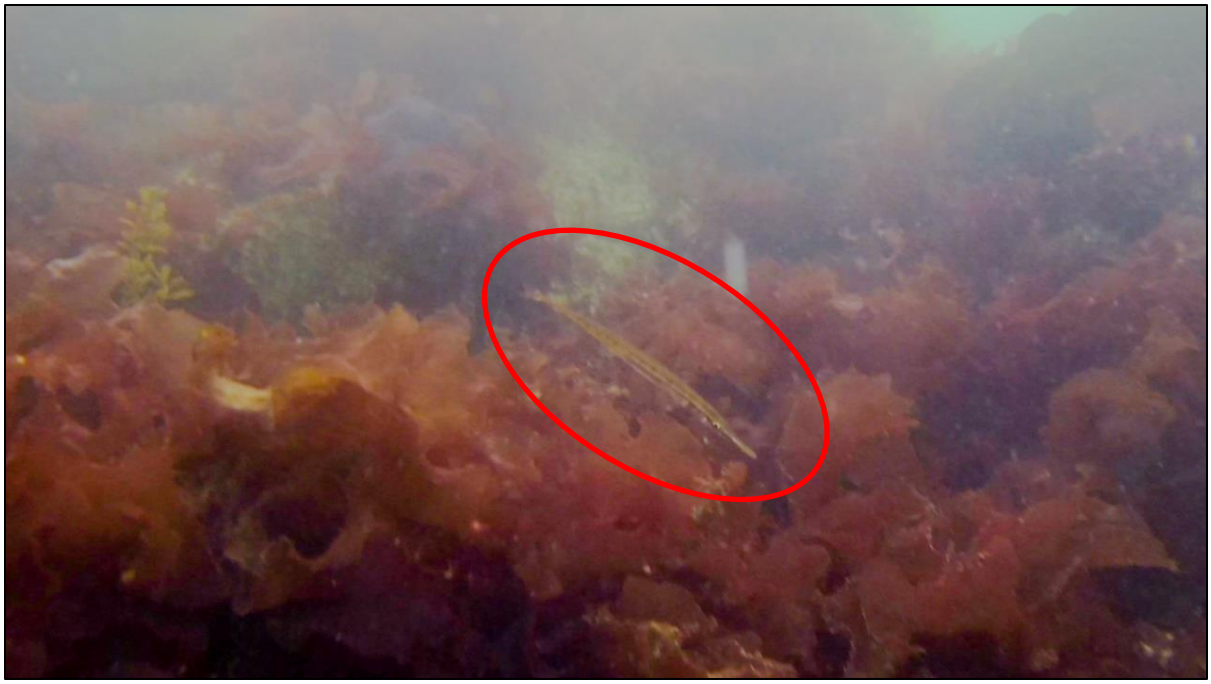

Photo 12 Tubesnout in Shallow Subtidal Zone at the Western Random Swim

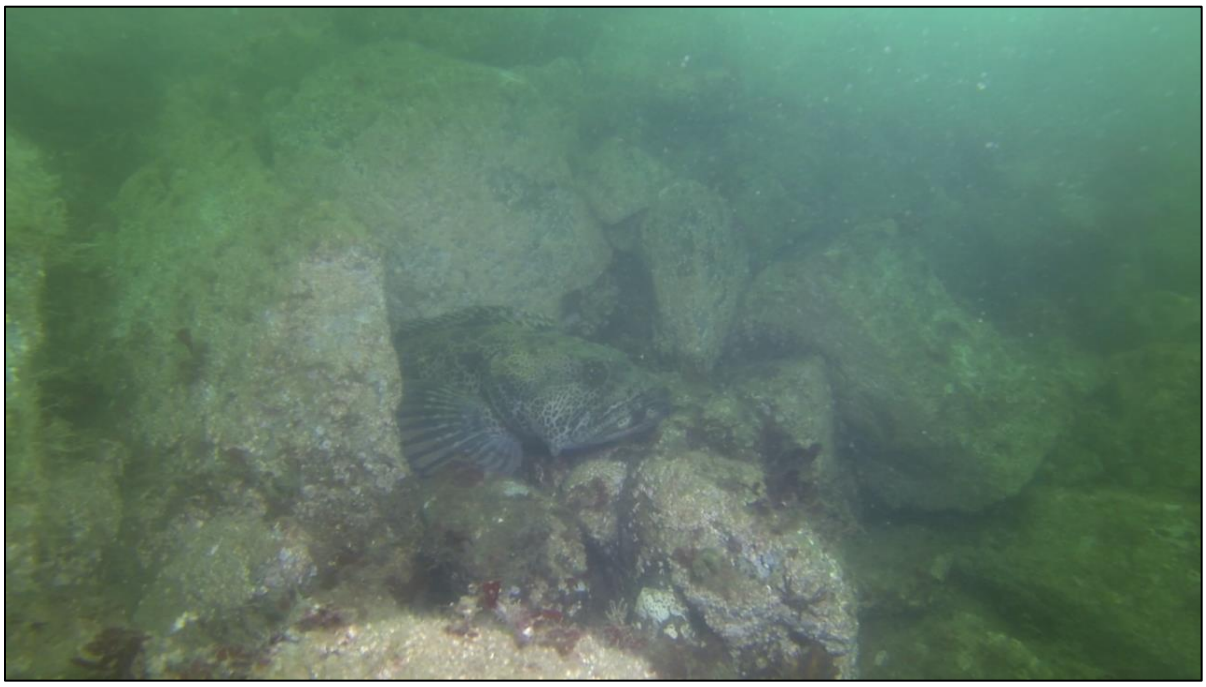

Photo 13 Lingcod in Shallow Subtidal Zone at the Western Random Swim

Table B 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 could use the Project Site as they are primarily observed in marine waters off the B.C. coast. Green sturgeon are not known to breed in Canadian waters
Oncorhynchus clarkii clarkii	cutthroat trout, *clarkii* subspecies	Blue	Not listed	Not listed	May forage in shallow shoreline areas in Burrard Inlet near 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

4.5.2 Invertebrate Species

A detailed inventory of invertebrates in the intertidal zone was not undertaken during the biophysical survey; however, a wide variety of invertebrates were observed in the low intertidal zone. These included: ochre sea stars (*Pisaster ochraceus*), leather stars (*Dermasterias imbricata*), and a red rock crab (*Cancer productus*; **Photo 8)**. The mid to high intertidal zone was dominated by barnacles on large substrates (**Appendix B**).

Invertebrate species observed during the subtidal transects included Dungeness crab (*Metacarcinus magister*), red rock crab, leather star, sea cucumbers (*Parastichopus californicus*, *Cucumaria miniata*), and ochre sea star (see **Appendix C** for a full list of species). Invertebrates were abundant in the kelp zone and included Dungeness crab, red rock crab, and ochre star (**Photo14**, **Photo 15**, **Photo 16**). In the deeper subtidal sand and gravel zone bivalve shells were abundant suggesting a large presence of horse clams (*Tresus* sp.) (**Photos 6**). Dungeness crab and red rock crabs were abundant. Horse clam beds and Dungeness crab are valued ecosystem components and were observed within the shallow subtidal zone of the Site.

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

Photo 14 Dungeness Crab Buried in Fine Sediment East Random Swim Survey

Photo 15 Red Rock Crab in Shallow Subtidal Rocky Habitat Transects 1

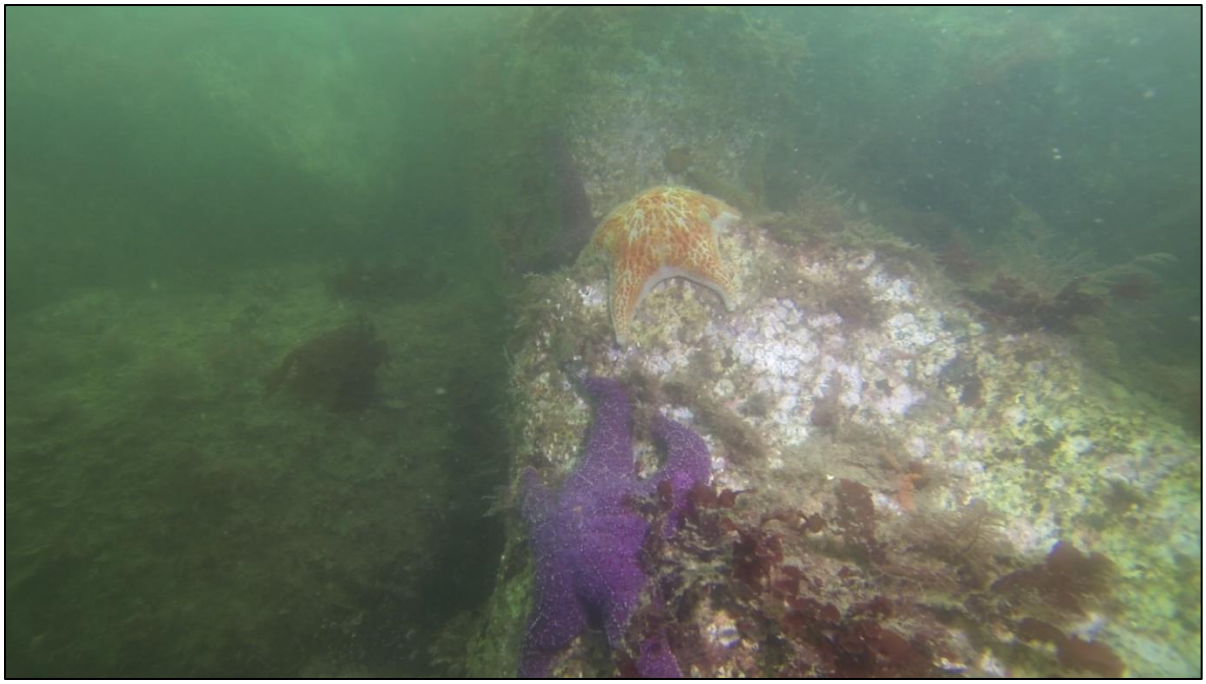

Photo 16 Ochre and Leather Sea Stars Feeding on Barnacles on Rocky Habitat Transect 2 (West side of Park)

4.6 WILDLIFE

Designated as an internationally recognized Important Bird Area (IBA), the Burrard Inlet is an important migratory bird corridor, providing essential habitat for significant concentrations of waterfowl species, such as Western grebe, Barrow's Goldeneye, and Surf Scoters (IBA Canada 2015). The Burrard Inlet and the surrounding shoreline also provides essential habitat for a variety of other bird species. Most of these species are waterbirds, such as loons, grebes, cormorants, geese, ducks, gulls, coots and alcids (Haggarty, 2001). However, birds of prey, such as osprey (*Pandion haliaetus*) and bald eagle (*Haliaeetus leucocephalus*), as well as marsh and shorebirds, including great blue heron (*Ardea herodias*), plovers and western sandpiper (*Erolia mauri*) (Haggarty, 2001) also utilize this habitat area.

Bird species noted during two 1-hour point count surveys are documented in **Table C**. Surveys were conducted during early morning periods that coincided with high tide. As a result, bird species utilizing the intertidal zone were also noted during the biophysical assessment and included a great blue heron (*Ardea herodias*) and northwestern crow (*Corvus caurinus*). No other wildlife species were noted during field assessments. A gyrfalcon (*Falco rusticolus*) has been repeatedly sighted on the Viterra Terminal adjacent to the east border of New Brighton Park, as recently as March 2015 (eBird 2015)

The most common marine mammal in Burrard Inlet is the harbour seal (*Phoca vitulina*), although grey whales (*Eschrichtius robustus*), Steller sea lions (*etopias jubatus*) and false killer whales (*Pseudorca crassidens*) are occasionally observed (Haggarty, 2001).

In the Metro Vancouver Regional District, 23 listed bird and 17 mammal wildlife species occur within the Coastal Western Hemlock zone (B.C. Ministry of Environment 2013). **Table D** indicates listed species that have the potential to occur at or near the proposed project site.

Table C Bird Species Observed Utilizing the Proposed Project Area and Nearshore Waters

Scientific Name	English Name	May-05-2015	May-07-2015
Water			
Larus glaucescens	Glaucous-winged gull	2	0
Phalacrocorax pelagicus	Pelagic Cormorant	1	3
Cepphus columba	Pigeon Guillemot	0	1
Viterra Caisson			
Phalacrocorax pelagicus	Pelagic Cormorant	1	0
Larus glaucescens	Glaucous-winged Gull	2	2
Branta canadensis	Canada Goose	0	2
Columba livia	Rock Dove	18	10
Riparian Tree/Shrub			
Melospiza melodia	Song Sparrow	2	1
Zonotrichia leucophrys	White Crowned Sparrow	1	1
Cardellina pusilla	Wilson's Warbler	1	1
Turdus migratorius	American Robin	2	0
Passerculus sandwichensis	Savanah Sparrow	1	0
Colaptes auratus	Northern Flicker	1	0
Streptopelia decaocto	Eurasian collared dove	2	25
Poecile atricapillus	Black-capped Chickadee	2	0
Psaltriparus minimus	American Bushtit	10	12
Vermivora celata	Orange Crowned Warbler	0	1
Passer domesticus	House Sparrow	0	1
Open Park			
Corvus caurinus	Northwestern crow	3	6
Overhead			
Columba livia	Rock Dove	10	14
Branta canadensis	Canada Goose	2	0
Spinus tristis	American Goldfinch	3	0
Tachycineta thalassina	Violet-green swallow	0	2
-	Swallow unknown sp	2	0
Larus glaucescens	Glaucous-winged gull	1	1
Hydroprogne caspia	Caspian Tern	0	2
Corvus caurinus	Northwestern crow	0	3
Phalacrocorax pelagicus	Pelagic Cormorant	0	1
Falco peregrinus	Peregrine Falcon	0	1

Table D Listed Wildlife Species of the Metro Vancouver CWH Zone with Potential to Occur at the Project Site

Scientific Name	English Name	Provincial Listing[1]	SARA[2]	COSEWIC[3]	Comments
Birds					
Falco rusticolus	Gyrfalcon	Blue	Not listed	NAR	Seen perching near Project Site
Asio flammeus	Short eared owl	Blue	1-SC (Jul 2012)	SC (Apr 2008)	
Ardea herodias fannini	Great blue heron, *fannini* subspecies	Blue	1-SC (Feb 2010)	SC (Mar 2008)	Seen foraging at the Project Site; no nesting colonies located at or near the Project Site.
Phalacrocorax auritus	Double-crested cormorant	Blue	Not listed	NAR (May 1978)	May over-winter near the Project Site; between foraging for fish on open water it often spends time perched on pilings and rocks.
Buteo lagopus	Rough-legged hawk	Blue	Not listed	NAR (May 1995)	May forage in marsh adjacent to the Project Site; this species forage over treeless areas including marshlands.
Hydroprogne caspia	Caspian tern	Blue	Not listed	NAR (May 1999)	May forage for fish at the Project Site.
Chordeiles minor	Common nighthawk	Yellow	1-T (Feb 2010)	T (Apr 2007)	May forage for insects over the Project Site.
Cypseloides niger	Black swift	Yellow	Not listed	E (May 2015)	May forage for insects at or near to the Project Site.
Falco peregrinus anatum	Peregrine falcon, *anatum* subspecies	Red	1-SC (Jun 2012)	SC (Apr 2007)	May forage for birds, bats and rodents within marsh habitat near the Project Site.
Hirundo rustica	Barn swallow	Blue	Not listed	T (May 2011)	Seen in marsh habitat near Project site; this species may nest under bridges near river banks and wetlands from which mud is collected to construct nests; forage over open areas such as water bodies.
Progne subis	Purple martin	Blue	Not listed	Not listed	Breeds in nest boxes adjacent to the Project Site; species feeds on flying insects, over marsh and mudflat habitat.
Mammals					
Myotis keenii	Keen's myotis	Blue	3 (Mar 2005)	DD (Nov 2003)	Likely found foraging insects over the Project Site.
Myotis lucifugus	Little brown myotis	Yellow	Not listed	E (Nov 2012)	Likely found foraging insects over the Project Site.
Eumetopias jubatus	Steller sea lion	Blue	1-SC (2005)	SC (2013)	May be found in subtidal marine habitat adjacent to Project Site

Source: B.C. Ministry of Environment 2013
Notes: [1] Red = Endangered or Threatened, Blue = Special Concern
[2] Schedule 1 = federal species at risk
[3] E = Endangered, T = Threatened, SC = Special Concern, NAR = Not at Risk, DD = Data Deficient

5.0 CONCLUSION

The proposed Project would focus on restoration and enhancement of a historically filled foreshore and upland area to provide high-value habitat for fish, birds and other wildlife. New Brighton Park is one of a few areas between First and Second Narrows in Burrard Inlet that have not been subject to development. The upland fill on former intertidal habitats and the shoreline erosion protection make it a prime candidate for fish and wildlife habitat restoration in Burrard Inlet. Creating and restoring habitat features important to fish and wildlife will add great value to the depleted habitats sustained by Burrard Inlet.

The potential creation of a tidal wetland feature and inclusion of a rock reef could contribute to the following ecological functions:

- Increasing marine primary productivity in Burrard Inlet;
- Supplementing the detritus based food web;
- Creating intertidal habitat for benthic and drift invertebrates that are important prey items for juvenile salmonids and other fishes;
- Providing intertidal and subtidal vegetation cover and refuge for juvenile salmonids prior to out-migration and rearing rockfish species;,
- Creating habitat for waterfowl feeding, nesting, loafing, and refuge; and
- Creating habitat for shorebird foraging.
- Increasing the overall habitat diversity of the New Brighton Park shoreline and the shoreline of Burrard Inlet by converting a primarily landscaped park to a tidal wetland feature;

With relatively few natural areas remaining in Burrard Inlet, and New Brighton Park having sustained a long history of foreshore fill and shoreline erosion protection, the proposed project represents an opportunity to add to the fish and wildlife habitat base between First and Second Narrows and increase habitat diversity and productivity for a variety of species. The proposed project will also serve as an attractive feature that will lend itself to public education focused on natural areas that benefit fish and wildlife.

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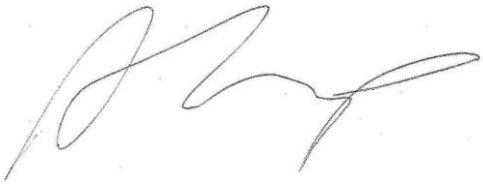

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7.0 STATEMENT OF LIMITATIONS

This report was prepared by Hemmera Envirochem Inc. (“Hemmera”), based on fieldwork and/or research conducted by Hemmera, for the sole benefit and exclusive use of Port Metro Vancouver. The material in it reflects Hemmera’s best judgment 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 practicing 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. 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 Port Metro Vancouver 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

Aerial Photography Review

New Brighton Park - Historical Aerial Overview


1963
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1969
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N
Around
1969


1978
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1979
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1986
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1993
N


1994
N


1999
N


2002
N


2011
N

APPENDIX B

GL Williams and Associates Memorandum

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MEMO

File No. : GW1501-03C

Date: May 25, 2015

To: Mikaela Davis, Hemmera

cc.: Charlotte Olson, Port Metro Vancouver
Scott Northrup, Hemmera

From: Gary Williams, Professional Wetland Scientist

Subject: New Brighton Habitat Enhancement Project Site Biophysical Survey

On May 6, 2015, Mikaela Davis, Hemmera, and I conducted a biophysical habitat assessment of the site that encompasses the eastern section of New Brighton Park east of the swimming pool (Figure 1). The site is currently used as an off-leash dog area with a circular pathway between New Brighton Road and the southern shore of Burrard Inlet. During the biophysical survey of the intertidal and backshore zones of the site, observations were recorded and documented with a Nikon D7000 SLR camera equipped with a 300 mm lens and spatial locations of habitat identified with a Garmin model 610 handheld GPS. This memo provides the results of the biophysical assessment conducted to provide pertinent data and information to guide design of value added fish and wildlife habitat. It was prepared to supplement a more comprehensive Ecological Conditions Report prepared by Hemmera.

Site Background:

Since European colonization in the mid-1880's, there has been considerable infilling along the shore of Burrard Inlet. The original shoreline was surveyed by the Royal Engineers in 1890 (Figure 2A). Shoreline change between 1930 and 2005 was documented using aerial photos (Figure 2B). Less than 10% of the natural shoreline between First and Second Narrows remains 'natural' and has not been developed for industrial or urbanized uses (BIEAP 2009). Within the study area, existing intertidal beach and vegetated backshore habitats occur within the historically filled area that comprises the eastern portion of New Brighton Park.

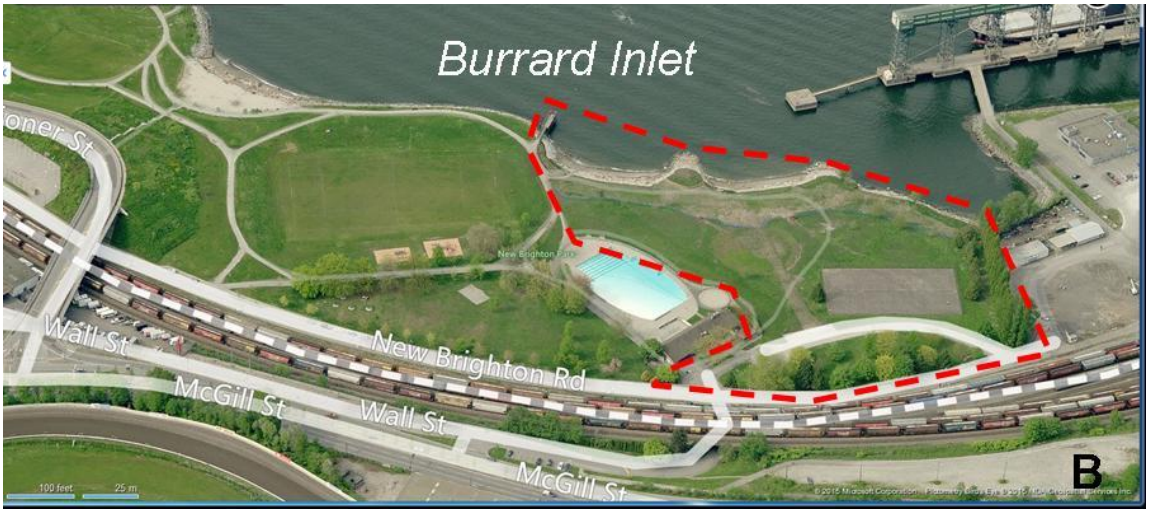

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Figure 1. New Brighton Park location (A, Google Earth) and extent of intertidal and backshore habitat biophysical survey (B, Bing Maps) conducted on May 6, 2015.

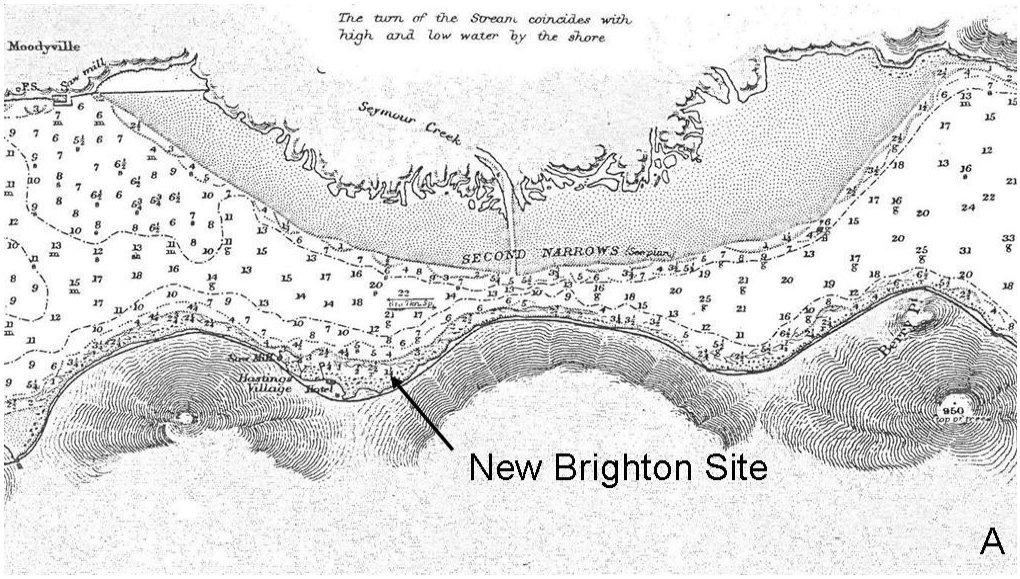

Figure 2. Royal Engineers chart prepared in 1890 (A) showing original shoreline of Burrard Inlet in vicinity of Second Narrows and shoreline change (B) between 1930 (●) and 2005 (●) modified from BIEAP (2009).

In the winter of 2006-2007, shoreline protection works were constructed within the New Brighton study site. The protection works consisted of extending the rock riprap groins and constructing upper bank protection using rock rip rap and live willow staking, and lower bank protection using sand filled berms planted with beach grass and lupine. The beach was re-contoured using sandy gravel, supplemented with cobble and boulder placements.

Description of Existing Habitats:

Tides at the New Brighton site are semi diurnal and the tidal range exceeds five metres (Table 1). The bathymetry in the vicinity of the study site is shown in Figure 3.

Table 1. Tidal water levels at the New Brighton Park site (CHS 2011).

Tidal Elevation	**Geodetic Datum** (m)	**Chart Datum** (m)
HHWLT (higher high water, large tide)	1.9	5.0
HHWMT (higher high water, mean tide)	1.3	4.4
MWL (mean water level)	0.0	3.1
LLMT (lower low tide, mean tide)	-2.0	1.1
LLWLT (lower low water, large tide)	-3.2	-0.1

Note: Chart datum (m) =geodetic datum (m) -3.1

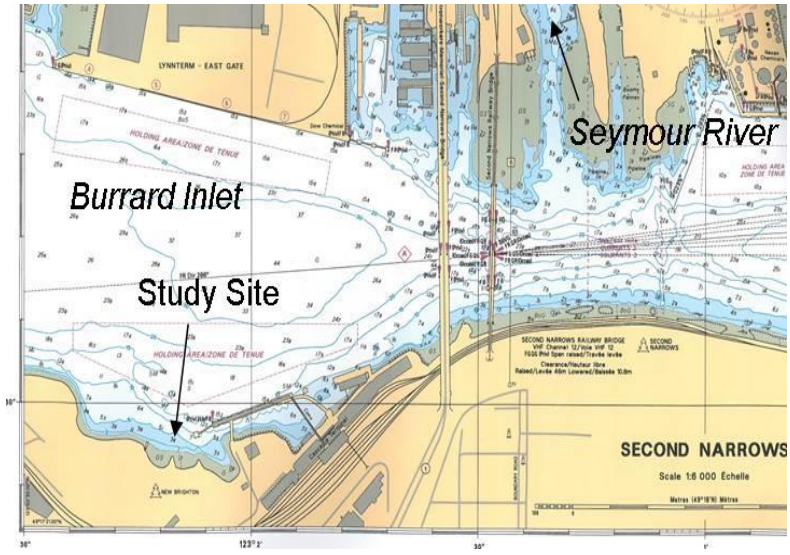

Figure 3. Marine chart showing bathymetry and navigation features in the vicinity of Second Narrows and New Brighton study site (CHS 2011).

The entire Burrard Inlet shoreline within the study area has been reconstructed for shoreline protection purposes, with large diameter rounded rock groins constructed to create three scalloped beach areas (Photo 1). The existing intertidal habitat consists of a wide, moderately sloping beach covered in unconsolidated cobble, gravel, and sand beach sloping up to an upper intertidal rock berm (Photo 2). A beach grass bench is situated just above the higher high water level and a band of native shrubs planted along the top of bank (Photo 3). At the western limit of the study area, a timber pile supported observation deck exists (Photo 4).

The stable, large diameter rock and cobble in the upper to mid-intertidal are colonized by a thick growth of rockweed, *Fucus gardneri*, associated with Turkish washcloth, *Mastocarpus papillatus*, sea lettuce, *Ulva lactuca*. (Photo 5). Barnacles dominate the upper to mid-intertidal invertebrate community (Photo 7).

Seaweed diversity increases in the lower intertidal with the presence of several kelp species (i.e. bull kelp, *Nereocystis luetkeana*; sugar kelp, *Laminaria saccharina*; Turkish towel, *Chondracanthus exasperatus*; wireweed, *Sargassum muticum* (Photo 6). A red rock crab, *Cancer productus*, and several species of sea stars were observed. A great blue heron was foraging in the kelp at low water (Photo 8).

The backshore vegetation above higher high water consists of a band of beach grass, *Leymus mollis*, planted within narrow rock bermed benches, and a 3-5 m band of native tree and shrubs, most of which appear to have been planted (Photo 9). The backshore and upland south of the shore consists of mowed lawn landscaped with native and exotic planted trees (Photo 10). A listing of the trees and shrubs recorded is shown in Table 2.

Table 2. Backshore vegetation (landscape trees and habitat plantings) observed in the New Brighton Park study area on May 4, 2015.

Backshore Vegetation	Common Name	Scientific Name
Trees:		
Exotic[1]	pin oak	*Querus palustris*
	California incense cedar	*Calocedrus decurrens*
	Halka honeylocust	*Gleditsia triacanthos*
	Lombardy poplar	*Populus nigra*
	maple	*Acer* spp.
	Crimean linden	*Tilia euchlora*
Native	western red cedar	*Thuja plicata*
	Douglas fir	*Pseudotsuga menziesii*
	black cottonwood	*Populus balsamifera*
	red alder	*Alnus rubra*
Shrubs	snowberry	*Symphoricarpos albus*
Native	Nookta rose	*Rosa nutkana*
	thimbleberry	*Rubus parviflorus*
	red-flowering currant	*Ribes sanguineum*
	mock orange	*Philadelphus lewisii*
	red-osier dogwood	*Cornus stolonifera*
	willow	*Salix* spp.
Invasive	Scotch broom	*Cytisus scoparius*
	Himalayan blackberry	*Rubus armeniacus*
	Japanese knotweed	*Polygonum cuspidata*
	English Ivy	*Hedera helix*
Herbaceous (habitat bench)	beach grass	*Leymus mollis*
	large-leaved lupine	*Lupiunus polyphyllus*

Notes: [1] Exotic trees were identified using the City of Vancouver Street Trees for New Brighton Road (http://data.vancouver.ca/datacatalogue/streetTrees.htm).

Along the eastern boundary of the property, shared with Viterra's Cascadia Terminal, a line of tall Lombardy poplar trees exist (Photo 11), with an understory of Himalayan blackberry and snowberry. Several cedar trees and a Douglas fir occur west of the line of poplar.

The upland lawn is relatively flat, but an area east of the swimming pool bounded by the paved access road and New Brighton Road has been landscaped with exotic trees, e.g. pin oak, Taija Japanese maple, Halka honeylocust, etc. (Photo 12). The wall along the New Brighton overpass is covered with English ivy.

A section of the daylighted Renfrew Creek flowing from Hastings Park is located along the southern edge or New Brighton Road. The reconstructed creek consists of a series of weirs to retain storm water (Photo 13), but at the time of the survey flows in the cobble lined stream channel below the weirs were low (Photo 14). The stream channel follows a steep gradient to a half steel culvert that empties into a storm drain on the north side of the New Brighton Road overpass (Photo 15). From this location the stream is culverted under the park until it discharges through a wooden culvert onto the intertidal beach on the shore of Burrard Inlet (Photo 16).

Comments on Restoration Potential:

The New Brighton Park site has been infilled and modified the natural tidal habitats and reduced fish and wildlife habitat. Excavating upland to create intertidal salt marsh and other marine habitats would improve the diversity and productivity for fish and wildlife in the Inner Harbour where over 90% of the shoreline has been developed.

Over 75 species of marine and anadromous fish have been recorded in Burrard Inlet (Renyard 1988). The New Brighton HEP project offers opportunities to restore several fish functions (e.g. feeding, refuge, rearing, and spawning) to the site. As well, approximately 320 bird species utilize Burrard inlet (IBA Canada Important Bird Areas, http://ibacanada.ca). Opportunities to increase the diversity and productivity of fish and wildlife habitat include subtidal placement of boulders to create subtidal kelp beds, constructing intertidal salt marsh, beaches and tidal channels, and planting backshore herbaceous and woody native vegetation.

The project could also include the completion of the daylighting of Renfrew Creek, which has been an objective of the Hastings Park/PNE Master Plan. Currently the creek restoration ends at the New Brighton Road overpass where intermittent stream flows are conveyed into Burrard Inlet through a flume and underground culvert. As part of the project, the stream channel could be daylighted to flow into the constructed habitat, but channel flows would likely be very low in summer and steep gradients south of New Brighton Road would be a constraint to salmonid migration to upstream habitat.

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Appendix – Shoreline Habitat Photos

Photo 1. Extended rounded rock groins separating scalloped intertidal beaches.

Photo 2. Boulder, cobble, gravel, and sand beach substrates.

Photo 3. Beac grass bench located below backshore shrubs.

Photo 4. Timber pile supported observation deck at the western limit of study area.

Photo 5. Luxuriant growth of macroalgae on large rounded rock installed for bank armouring.

Photo 6. Bull and sugar kelps colonizing rock substrate in the lower beach intertidal zone.

Photo 7. Barnacles colonizing stable rock in the intertidal zone.

Photo 8. Great blue heron foraging along the lower intertidal zone.

Photo 9. Planted native shrubs along top of bank.

Photo 10. Dog off-leash area with gravel pathway system through grass lawn and landscape trees.

Photo 11. Lombardy poplar and cedar trees along eastern border of study site.

Photo 12. Landscape trees planted in island between New Brighton Road and vehicle access to swimming pool.

Photo 13. Daylighted Renfrew Creek showing weir and cobble-gravel lined channel in Creekway Park.

Photo 14. Steep section of daylighted stream channel with minimal waterflow in May 2015.

Photo15. Aboveground flume transports flows from daylighted stream to underground culvert that discharges into Burrard Inlet.

Photo 16. Wooden culvert beach outlet of Renfrew Creek that discharges into Burrard Inlet.

APPENDIX C

Hemmera Biophysical Assessment:

Dive Survey Results

Appendix C

Hemmera Biophysical Assessment:Dive Survey Results

Appendix C. New Brighton Biophysical Assessment Survey Data.

Transect:	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**Video**
Quadrat:	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	
Distance:	**30**	**25**	**20**	**15**	**10**	**5**	**0**	**15**	**10**	**5**	**55**	**50**	**45**	**40**	**35**	**30**	**25**	**20**	**15**	
Depth m gauge:	**11.6**	**10.4**	**8.8**	**7.0**	**4.9**	**1.2**	**-0.9**	**6.4**	**4.3**	**1.2**	**7.0**	**6.1**	**4.9**	**3.7**	**2.7**	**1.5**	**1.2**	**0.6**	**0.3**	
Depth m CD:	8.9	7.7	6.1	4.3	2.2	(+)1.5	(+)3.6	3.6	1.5	(+)1.6	4.1	3.2	2.0	0.8	-0.2	-1.4	-1.7	-2.3	-3.6	
Alaria marginata																				Present
Chondracanthus exasperatus																				Present
Cladophora																		1	5	
Constantinea subulifera				1																
Costaria Costata											10									Present
Cryptopleura ruprechtiana																				Present
Desmerastia munda																				
Diatoms																				Present
Fucus distichus							40													Present
Hidebrandia				40																
Mastocarpus papillatus																				
Mazaella splendons						20				10										Present
Nereocystis leutkeana															5	5				Present
Porphyra																	5			
Red blade		1		15	10				20	50			5	5	5	10		10	15	Present
Red filamentous				5	70	40			40	30						15	5	15		Present
Saccharina latissima											5			35	10		5			Present
Ulva intestinalis																		5	10	Present
Ulva lactuca						5			10			5	1	10	10	15	5	5		Present
Balanus glandula	40	60	40	30	10	20	70	40	5	5	5	5	1		5		5	5		Present
Cancer productus						1										1				Present
Chiton unknown				4																Present
Cnemidocarpa finmarkiensis				1	1															
Cucumaria miniata																				Present
Dermasterias imbricata		1				1						1				1				Present
Evasterias troscheli	1	2																		
Hydroid sp.	40	40	5	5				20					5							Present
Lirularia spp.				3	2											3				
Hermisenda						1								1	1					
Metacarcinus magister											1		1			1				Present
Oregonia gracilus					1										1					Present
Parastichopus cal.	1	1																		Present
Pisaster ochracious				1	1	1									1					Present
Lepidogobius lepidus																				
Rhinogobiops nicholsii			1	1																
Citharichthys stigmaeus																				Present
Sculpin unkown											1									
Ophiodon elongatus																				Present
Sebastes caurinus																				Present
Aulorhynchus flavidus															1					Present
Bare	100		100					100												
Boulder/ bedrock				70	100	100	100		100	100										
Cobble	90	90	40					80							40	80	40	90	100	
Gravel			60	30				20			50	40						10		
Sand													90	90	60	15	60			
Silt																				
Shell											50	60	10	10		5				