



HABITAT ENHANCEMENT PROGRAM: MAPLEWOOD MARINE RESTORATION PROJECT

PROJECT DESCRIPTION

Submitted to:

**Vancouver Fraser Port Authority
Project and Environmental Review**
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- Attachment 1 60% Design Report & Design Drawings (July 2018)
- Attachment 2 Key Milestones (July 2018)
- Attachment 3 Ecological Conditions Report (July 2018)
- Attachment 4 Phase I & II Environmental Site Assessments (July 2018)
- Attachment 5 Maplewood Sediment Characterization Report (July 2018)
- Attachment 6 Archaeological Overview Assessment and Preliminary Field Reconnaissance (July 2018)
- Attachment 7 Noise Assessment (July 2018)
- Attachment 8 Construction Environmental Management Plan (July 2018)
- Attachment 9 Public Consultation and Stakeholder Engagement Plan (July 2018)
- Attachment 10 Aboriginal Consultation Plan (July 2018)

List of Acronyms

APEC	Area of Potential Environmental Concern
CEMP	Construction Environmental Management Plan
CEP	Centerm Expansion Project
CD	Chart Datum
D ₅₀	Average (Median) Diameter
DAS	Disposal at Sea
ECCC	Environment and Climate Change Canada
EPP	Environmental Protection Plan
DFO	Fisheries and Oceans Canada
DNV	District of North Vancouver
HEP	Habitat Enhancement Program
ILP	Inlailawatash Limited Partnership
MFCA	Maplewood Flats Conservation Area
MMRP	Maplewood Marine Restoration Project
PCMP	Post-Construction Monitoring Plan
PER	Project and Environmental Review
VEC	Valued Ecosystem Component
VFPA	Vancouver Fraser Port Authority
VSC	Valued Social Component

List of Abbreviations

Project	Maplewood Marine Restoration Project
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1.0 Introduction

The Maplewood Marine Restoration Project (MMRP, or the “Project”) is a habitat enhancement project proposed by the Vancouver Fraser Port Authority (VFPA) Habitat Enhancement Program (HEP). HEP is a VFPA program whose goal is to balance a healthy environment with infrastructure development opportunities. HEP creates and enhances fish and wildlife habitat for habitat banking purposes, use as offsetting for port infrastructure projects, or a combination of both. The Project lies within VFPA jurisdiction on the north shore of Burrard Inlet, approximately two kilometres east of the Ironworkers Memorial Bridge (**Figure 1-1**).

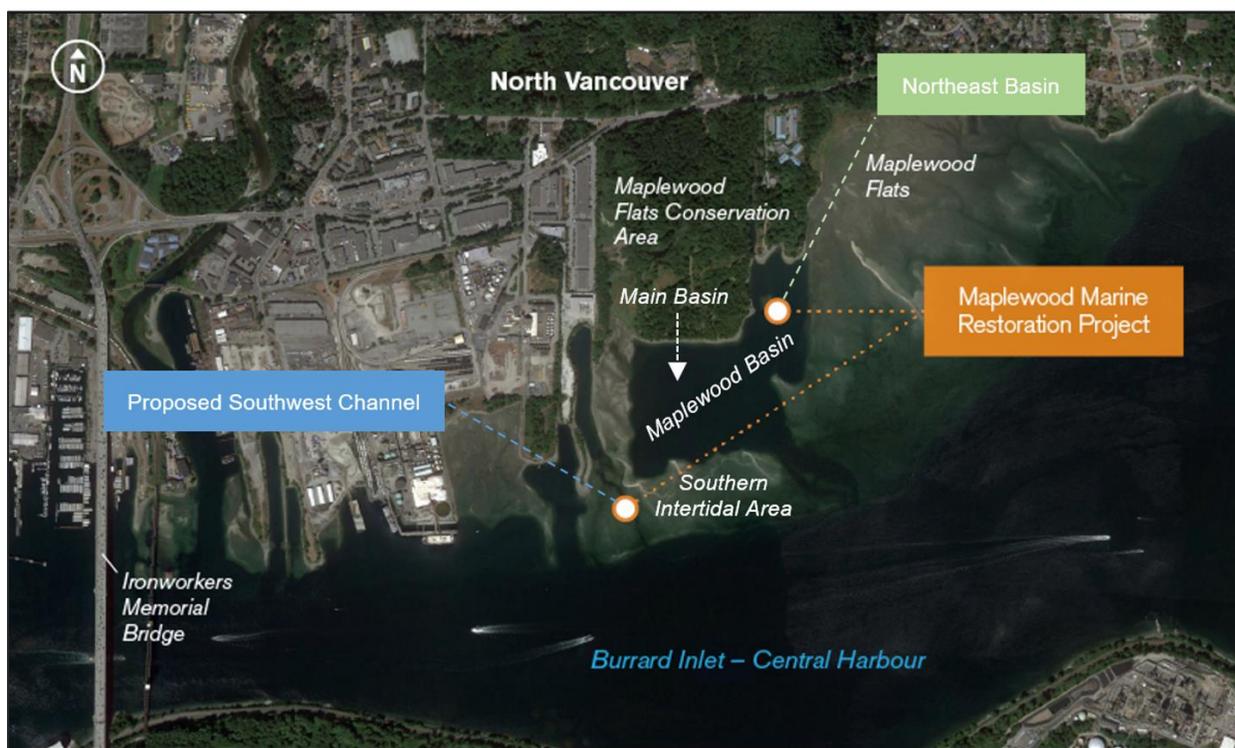


Figure 1-1 Overview of the Project Area

VFPA is proposing to use MMRP as a fisheries habitat offsetting site for the proposed Centerm Expansion Project (CEP) in Vancouver Harbour. In developing MMRP, a surplus of enhanced habitat will be created, in excess of the requirements anticipated to offset the CEP residual *serious harm* to fish. This additional habitat is being proposed for deposit into VFPA’s Habitat Bank. Habitat proposed for deposit into VFPA’s Habitat Bank will be deposited in accordance with the 2012 working agreement between VFPA and Fisheries and Oceans Canada (DFO) entitled “Working Agreement Concerning Procedures for Development and Operation of the Port Metro Vancouver Habitat Bank”. This agreement acknowledges the mutual benefits of a habitat bank to both parties, while also providing guidelines for the establishment of habitat enhancement sites. Habitat enhancement sites under this program are developed in agreement between both parties.

As part of the overall Project objectives, all habitats created by the Project have been designed to synergistically provide broad fish habitat benefits within the Maplewood Basin, and site selection was informed by input from Aboriginal groups. The Maplewood Basin consists of the previously dredged area of Maplewood Flats, encompassing the Northeast Basin and Main Basin (**Figure 1-1**).

The Project lies within a marine tidal basin up to nine metres deep (the Northeast Basin) and an intertidal area to the south of the Maplewood Basin (the Southern Intertidal Area; **Figure 1-1**). The Maplewood Basin was dredged in the 1940s to support gravel extraction and was later used as a log storage facility. The Project is anticipated to enhance approximately seven hectares of low-value marine habitat into higher-value marine habitat for fish, birds, and other wildlife. Proposed habitat enhancements include a tidal channel, subtidal rock reef habitat, eelgrass habitat, and intertidal flat habitat. Design drawings for the Project, showing the locations and details of the proposed habitat types, are included in the 60% Design Report (**Attachment 1**).

A preliminary application meeting for this Project was undertaken with VFPA's Project and Environmental Review (PER) team in November 2017, when the Project was confirmed as requiring a Category C review. A Project Permit Application Submission Requirements checklist (PER No. 17-278) was also issued based on a preliminary review of the information provided. This Project Description, and the supporting documents included as attachments, has been prepared as part of the online "Project Permit Application Form for Category C & D Reviews" to facilitate a full project review process. A table of key milestones and deliverables relating to the Project has been included for reference in **Attachment 2**. Further details, and Project updates to supplement this application will be provided as the design, consultation and engagement processes advance in 2018 and early 2019.

2.0 Proponent Information

VFPA's Project team, including AECOM, Hemmera Envirochem Inc., and Kirk & Co. Consulting Ltd., comprises engineering, environmental, and engagement and consultation specialists who are working to manage and undertake activities associated with the design, permitting, construction, and monitoring of the Project. Key contacts for the Project have been provided in the PER permit application form submitted with this Project Description.

3.0 Project Location and Ownership

The Project lies within VFPA jurisdiction on the north shore of Burrard Inlet, approximately two kilometres east of the Ironworkers Memorial Bridge (**Figure 1-1**). The Project is immediately south of the Maplewood Flats Conservation Area (MFCA), which is under VFPA jurisdiction but is leased and managed by Environment and Climate Change Canada and the Wild Bird Trust of British Columbia. The Pacific Environmental Science Centre is located immediately north of the Project site and a salt water intake pipe for the facility traverses under the flats immediately east of the Northeast Basin (**Figure 3-1**). This pipe will not be affected by construction of the Project.

The Project site covers approximately seven hectares and consists of two distinct areas: the Northeast Basin area, centered at approximately 49°18'10" N and 123°00'05" W; and, the proposed Southwest Channel area (in the Southern Intertidal Area), centered at approximately 49°17'55" N and 123°00'25" W (**Figure 3-1**).

The Project falls primarily within the boundaries of a waterlot owned by VFPA and within VFPA's navigational jurisdiction. A small portion of the Project also falls within a District of North Vancouver (DNV) parcel for the Victor Street road end (Parcel Identifier: 016-018-591, Lot I, Ref Plan 2659), located at the western edge of the Northeast Basin. VFPA is currently negotiating a land use agreement (e.g., a license) with DNV which will be in place prior to construction of the Project.



Figure 3-1 Project Site Location and Layout

4.0 Site History

In the late 1800s, tidal flats bordered the northern shore of Burrard Inlet's Central Harbour providing productive habitat for waterfowl, fish, and shellfish. Logging in upland areas of Maplewood began around the turn of the 20th century. Over a period of almost 100 years, logging, land "reclamation" and industry shaped the upland and intertidal portions of the area (PMV 1998). A review of historic aerial photographs suggest that Maplewood Basin was dredged between the 1940s and 1960s, and it has largely remained in its present form since that time (**Attachment 3: Appendix A**). The dredged areas were formerly utilized for log sorting and storage operations (in the early 1940s to early 1980s), and gravel extraction operations via barge (in the early 1940s to 1961). The partial infilling of dredged areas between 1969 and 1979 on the north side of the Maplewood Basin, resulted in the reinstatement of upland areas that were used for a wide range of industrial operations until the late-1980s (PMV 1998).

As a result of previous industrial use and the habitat alteration that occurred at the Project site, the Northeast Basin is considered to provide low value habitat with low diversity and abundance of marine life. The Northeast Basin is relatively deep (up to approximately -9.0 m chart datum (CD)) and is unlikely to support eelgrass or productive shallow subtidal or intertidal flat habitat without physical modification.

5.0 Rationale

VFPA is proposing to use MMRP as a fisheries habitat offsetting site for the proposed CEP in Vancouver Harbour. Site selection was informed by input from Aboriginal groups. The location chosen for this Project is one of a number of different locations that the VFPA HEP team has identified within the broader Geographic Service Area (i.e., "Fraser Estuary, Boundary Bay, Burrard Inlet, Fraser and North Arms") where existing habitat can be enhanced to increase its productive capacity or where degraded areas can be restored to benefit fish and wildlife species. As part of the overall Project objectives, all habitats created by the Project have been designed to synergistically provide broad fish habitat benefits within the Maplewood Basin.

The Project is located in the Central Harbour region of Burrard Inlet, which is an important migratory, rearing and spawning area for fish, including ecologically and economically important salmonids (*Oncorhynchus* spp.). It is also located within an important migratory bird corridor and an internationally recognized Important Bird Area. However, Burrard Inlet is highly industrialized and is bordered by large urban areas within the Metro Vancouver Regional District (including Vancouver, Burnaby, West Vancouver, North Vancouver, DNV and Port Moody). Due to urbanization and industrialization pressures on the inlet, much of the shoreline in Burrard Inlet has been altered leading to loss of valuable fish and wildlife habitat (Stantec 2009).

Prior to development and dredging in the area, Maplewood Flats was reported to support significant eelgrass and kelp bed habitats (KWL 2017). It was also an important shellfish harvesting site for First Nations (KWL 2017). Creation of high value intertidal and shallow subtidal fish and wildlife habitats with this Project are anticipated to improve the overall productivity of the Central Harbour and Burrard Inlet, and provide high-quality habitat for a variety of fish, bird and wildlife species.

An assessment of Burrard Inlet shorelines was conducted for the Burrard Inlet Environmental Action Program in 2009 which recommended that habitat enhancement projects focus on areas where important marine organisms, including migrating salmon and waterfowl, are most likely to utilize habitat (e.g., during outmigration) (Stantec 2009). In particular, the Central Harbour region of Burrard Inlet was highlighted as an area where enhancements would provide high potential to contribute to juvenile salmon survival (Stantec 2009).

This Project will result in the creation of high-value intertidal habitat (i.e., intertidal flats) and shallow subtidal habitat (i.e., eelgrass and rock reefs). The Project is anticipated to improve the overall productivity of the Central Harbour region in Burrard Inlet, and will provide high quality habitat for a variety of fish, bird and wildlife species that utilize the inlet.

Biophysical assessments conducted at the Project site in 2017 (**Attachment 3: Appendix B**), indicate that the Northeast Basin provides relatively low-value habitat for fish and wildlife. Alteration of existing habitat will be required to create the Southwest Channel. Creation of the channel is anticipated to increase tidal flushing of the Main and Northeast basins and provide rock reef habitat for the benefit of fish and wildlife.

The design team for this Project, which includes appropriately qualified engineers, coastal geomorphologists, professional biologists and an eelgrass specialist, anticipate that these works will provide long-term benefits to ecosystem productivity at this location.

6.0 Existing Site Conditions

The following section provides a short summary of the current conditions at the Project site (**Photo 6-1**). Additional detailed information pertaining to the current site conditions is provided in the 60% Design Report (**Attachment 1**) and the Ecological Conditions Report (**Attachment 3**).



Photo 6-1 Existing Conditions at the Project Site (April 2018)

As a result of historic dredging activities (see **Section 4.0**), the Northeast Basin lies in a relatively protected subtidal basin. The seafloor of the Northeast Basin is comprised primarily of fine sediment with accumulations of some wood waste throughout the basin. The Northeast Basin is bordered by intertidal habitats, comprised of coarse and fine gravel, with some areas of sand.

The Southern Intertidal Area currently consists of a low elevation intertidal area located between the Main Basin (immediately to the north) and the main navigation channel of Burrard Inlet (to the south; **Figure 3-1**). This intertidal area consists of a mixture of cobble, pebble, sand and shell debris.

7.0 Existing Habitat Values

The following section provides a short summary of the fish and wildlife habitat values at the Project site. More detailed information regarding habitat values at the Project site is available in the Ecological Conditions Report (**Attachment 3**).

The overall abundance of vegetation in the Northeast Basin is low with species abundance largely classified as sparse or rare. However, some vegetation (including sugar kelp (*Saccharina latissima*), rockweed (*Fucus gardneri*), Turkish washcloth (*Mastocarpus papillatus*), and iodine seaweed (*Prionitis lyallii*)) has been observed at the Project site where coarse substrates provide adequate areas for attachment. In the Southern Intertidal Area, Turkish washcloth was observed amongst cobbles and sand, and sea lettuce (*Ulva fenestrata*) was observed in large patches along the eastern and outer shorelines at mid-intertidal elevations.

Existing conditions at the Project site would support habitat for fish species found in Burrard Inlet. For example, existing intertidal flat habitats may be used by flatfish, while some existing patches of kelp can be used by lingcod (*Ophiodon elongatus*), and rockfish (*Sebastes* sp.), and the nearby eelgrass areas to the southeast of the Project site can be utilized by juvenile herring (*Clupea pallasii*) and juvenile salmonids.

While a variety of crustaceans, molluscs, anemones and sea stars were observed in the Northeast Basin, the results of the biophysical surveys suggest that densities are low and that the Northeast Basin provides low quality habitat for finfish and macroinvertebrate species. The Southern Intertidal Area sustains sessile invertebrates such as sea stars, barnacles, bay mussels (*Mytilus trossulus*), clams (e.g., *Macoma* sp.) and Pacific oysters (*Crassostrea gigas*).

8.0 Proposed Works

The following is a summary of the proposed construction work associated with the Project. More detailed information regarding construction methodology is provided in the 60% Design Report for the Project (**Attachment 1**).

The Project proposes to create three habitat types: subtidal rock reef habitat, eelgrass habitat, and intertidal flat habitat (**Figure 8-1**). Dredging, material placement and slope protection work will be required to create the three habitat types.



Figure 8-1 Proposed Habitat Enhancements at the Project Site

Habitat in the Northeast Basin will be created by beneficially using approximately 87,000 m³ of dredge material from the Southern Intertidal Area (resulting from the creation of the proposed Southwest Channel), and approximately 95,000 m³ of imported clean fill material, to raise the elevation of the existing substrate. Fraser River sand, or a suitable clean alternate (e.g., approved Sechelt sand), is proposed as the additional fill material. This imported material is anticipated to be placed over the dredge material from the Southwest Channel to form the upper sediment layer in the Northeast Basin.

The newly created intertidal flat habitat and shallow subtidal eelgrass habitat in the Northeast Basin (**Figure 8-1**) will be located between approximately +2.0 m and -2.0 m CD. Construction of a rock dyke is required to contain the fill material needed to establish the intertidal and shallow subtidal areas in the Northeast Basin. Subtidal rock reef habitat south of the rock dyke, at the southernmost end of the Northeast Basin (**Figure 8-1**), will be constructed by placing appropriately sized rock material between approximately -3.0 m and -4.0 m CD. The rock reef habitat will be constructed using rock of varying diameter, with an average (median) diameter (D_{50}) of approximately 600 mm. A total of approximately 8,500 m³ of rock material is anticipated to be placed in the Northeast Basin.

Rock reef habitat will also be created in the Southern Intertidal Area (**Figure 8-1**) following dredging of the Southwest Channel. The Southwest Channel will improve tidal flushing in the Maplewood Basin and enhance nutrient transport, improve water quality, reduce siltation of marine vegetation, and facilitate suspension and distribution of eggs and larvae of pelagic spawning fish and invertebrates, including marine vegetation spores. A total of approximately 14,000 m³ of rock material will be placed in the Southwest Channel, both along the base of the channel to function as subtidal rock reef habitat, and along the side slopes of the excavated Southwest Channel to protect against scour from tidal currents as well as to function as rock reef habitat. The rocks along the side slopes will have a D_{50} of approximately 500 mm, and the rocks on the base of the channel will have a D_{50} of approximately 600 mm. The rock in the Southwest Channel will be placed between approximately +2.0 m and -4.0 m CD.

Barge-mounted construction equipment will be required to cross over the shallow Southern Intertidal Area during a high tide before the start of dredging. It is anticipated that the Southwest Channel will be dredged using a barge-mounted clam-shell dredge. To facilitate placement of material from the Southwest Channel into the Northeast Basin, it is anticipated that dredging will start from the inner (i.e., northeastern) end of the channel to avoid transporting and potentially grounding loaded, or partially-loaded, scows on the shallow Southern Intertidal Area. Once the Southwest Channel is dredged to design grade (i.e., -4.0 m CD), it is anticipated that loaded material scows will be able to enter/exit the Project site during low tides (utilizing the Southwest Channel). Construction methodology details will be refined as the Project advances to a procurement-ready stage.

Following construction, stabilization, and a final survey of the eelgrass bed location, native common eelgrass (*Zostera marina*) will be transplanted from suitable donor beds into the Northeast Basin.

9.0 Design Development and Criteria

Detailed design information and design criteria is included in the 60% Design Report (**Attachment 1**). As part of the geomorphological assessment (a component of the Project's design development), coastal modelling assessed changes to tidal flushing in the Maplewood Basin, sediment transport during dredging and deposition, and the long-term stability of the proposed intertidal and subtidal habitats.

Sediment transport modelling for dredging and infilling operations indicated that the concentrations of total suspended solids will be limited and restricted to the dredge and infilling areas, with minimal anticipated effects to surrounding areas. Modelling of the long-term stability of the Northeast Basin and Southwest Channel habitats suggest no significant erosion, indicating that the proposed habitat will be stable. Geotechnical information (also included in **Attachment 1**) supports the assumptions and conclusions regarding the long-term stability of the Northeast Basin and Southwest Channel habitats.

10.0 Post-Construction Monitoring

During the post-construction phase, the Project will be subject to the relevant terms and conditions associated with the anticipated CEP *Fisheries Act* Authorization, the Habitat Bank working agreement between VFPA and DFO, as well as any applicable conditions of other permits and approvals.

To assess the achievement of biological objectives at the Project site, a formal monitoring program will commence towards the end of the first growing season after the habitat construction and transplant works (e.g., transplanting of eelgrass) have been completed. Post-construction monitoring will be undertaken in accordance with the CEP *Fisheries Act* Authorization (for the offsetting habitat) and will be undertaken in alignment with the Post-Construction Monitoring Plan (PCMP) for VFPA's HEP. The PCMP is a working document, which was developed with DFO's input and feedback. The PCMP outlines protocols for assessing various habitat types, including intertidal flat, eelgrass and subtidal reef habitat.

It is anticipated that the application of rigorous design criteria, proper oversight and supervision during both construction and post-construction monitoring will contribute towards success of the Project. In the unlikely event that the Project objectives are not achieved, and the Project site is not functioning as intended, follow-up measures may be required. Remedial measures may, for instance, include additional eelgrass transplanting.

11.0 Environmental Site Assessments

Desktop and field assessments were undertaken to identify upland areas of potential environmental concern adjacent to the Project site. The Phase I report (included as an appendix in **Attachment 4**) indicated that there were five areas of potential environmental concern (APECs) in the upland areas adjacent to the Project site.

In April 2018, a Limited Phase II Environmental Site Assessment was undertaken in the upland areas adjacent to the Project site to determine if groundwater flow from the upland APECs was transporting potential contaminants of concern to the Northeast Basin. Groundwater samples taken from the APECs during the assessment met the Canadian Council of Ministers of the Environment Canadian Water Quality Guidelines for the Protection of Aquatic Life (marine). The report concluded that the APECs on the upland property do not pose a risk to the Project (**Attachment 4**).

12.0 Sediment Characterization and Assessment

Additional sediment will be required to raise the elevation of the existing substrate in the Northeast Basin to suitable levels for establishment of the proposed high-value habitats. Sediment is proposed to be sourced from dredging undertaken in the Southern Intertidal Area for creation of the Southwest Channel. Additional sediment may be sourced from routine maintenance dredging operations in the navigation channel of the South Arm of the Fraser River (i.e., Fraser River sands). More than two million cubic metres of sand and silt are removed from the navigation channel as part of routine maintenance dredging operations on an annual basis.

Sampling of sediments in the Southwest Channel and Northeast Basin was undertaken in April 2018 to analyze and characterize the physical and chemical suitability of the sediments for beneficial use. Available physical and chemical data for the Fraser River sands were also analyzed to support the Project in the event that Fraser River sands are used for construction of the Northeast Basin habitats. The results of the analyses suggest that the sediment quality of the Southwest Channel material and Fraser River sands is relatively predictable and meets the necessary sediment quality criteria for beneficial use in local projects, such as the MMRP. The detailed analyses of the proposed source materials have been included in the Maplewood Source Sediment Characterization Report included in **Attachment 5**. An application will be submitted to the Environment and Climate Change Canada (ECCC) Disposal at Sea (DAS) Program requesting that the Project be exempted from the requirement for a DAS permit, as the Project will involve the beneficial use of dredged sediments to create habitat. A DAS exemption is anticipated to be received from ECCC DAS in 2018.

13.0 Archaeological Assessments

An Archaeological Overview Assessment and a Preliminary Field Reconnaissance (**Attachment 6**) were undertaken by Inlailawatash Limited Partnership (ILP) in May 2018 to determine archaeological potential within, or near, the Project site. ILP concluded that the proposed works within the Northeast Basin and Southwest Channel have a low potential to affect unknown archaeological resources. ILP identified one archaeological site (a fishweir) outside of the Project boundary that may be vulnerable to the in-filling activities in the Northeast Basin. ILP provided archeological resource management recommendations for the Project. With implementation of these management recommendations, there is low potential to negatively affect archaeological resource. Further details are provided in **Attachment 6**.

14.0 Noise Assessment

The Project site is located near to shipping areas in Burrard Inlet, the Ironworkers Memorial Bridge, and industrial operations along the Central Harbour shoreline, where ambient noise levels can be classified as moderately high. The Project is located relatively far away (greater than 500 m) from residential areas. In general, construction activities associated with the Project are anticipated to create moderate noise levels, resulting from operation of marine-based equipment and machinery (e.g., derricks, empty scows, tugboats, workboats, etc.). No high-energy impulsive noises (e.g., from pile driving) are proposed, or are anticipated to occur, as part of the Project.

The Project is anticipated to require high tides for equipment to access the Project site, and to avoid grounding equipment in marine habitat. Suitable high tides occur outside standard regular work hours (i.e., Monday to Saturday between 7:00 am and 8:00 pm, excluding holidays). To complete the marine construction work associated with the Project, and in as short a duration possible, it is proposed that construction be completed based on 24-hour operation (if required). Completion of the marine works based on 24-hour operation will reduce the overall duration of the work program, thus reducing the potential for noise disturbance, and ensure the works are completed in the most efficient manner by taking advantage of optimal tides.

Noise will be generated during the construction phase of the Project. However, only minimal noise is anticipated to be associated with the post-construction monitoring phase (e.g., boat access to facilitate dive surveys of the Project site). A preliminary assessment of how construction of the Project may affect noise levels was undertaken in accordance with VFPA guidelines (PMV 2015a) and is included in **Attachment 7**.

15.0 Schedule

Construction of the Project is forecast to begin in late summer/early fall 2019 with an anticipated construction period of approximately eight months. The majority of the construction work is scheduled to occur during the appropriate least-risk timing windows for Burrard Inlet. The least-risk timing window to mitigate risk of negative effects to juvenile salmonids is August 16th to February 28th. However, due to the potential material settlement time required for sediment placement in the Northeast Basin, material placement may extend beyond the end of the least-risk timing window (e.g., post-February 28th). Any work outside the window would occur with appropriate mitigation in place. Planting of donor eelgrass stock is expected to occur during the following summer (i.e., summer 2020 or 2021, pending construction completion). The Project construction schedule will be refined as the Project advances to a procurement-ready stage.

16.0 Effects Assessment Overview and Mitigation

Valued ecosystem components (VECs) or valued social components (VSCs) that could potentially be adversely affected by the proposed works include:

- Soils and sediments;
- Surface water and water bodies;
- Aquatic species and habitat;
- Vegetation;
- Wildlife and habitat;
- Invasive species;
- Current land use;
- Archaeology
- Navigation and water use;
- Noise;
- Light;
- Air quality; and
- Safety.

Table 16-1 below summarizes proposed measures to mitigate adverse effects on each of these key VECs/VSCs. Based on the current design and construction methodology, a Construction Environmental Management Plan (CEMP) has been prepared with reference to VFPA's Project and Environmental Review Guidelines (PMV 2015*b*) and is included in **Attachment 8**. This CEMP outlines mitigation measures that are to be implemented by the Contractor throughout construction. However, once the Project is awarded, the selected Contractor will be responsible for developing a Project-specific Environmental Protection Plan (EPP) to avoid potential adverse environmental effects based on specific equipment and refined construction methodologies. The Contractor's EPP will be reviewed by VFPA's PER to confirm that it conforms to the requirements of the CEMP (**Attachment 8**) and any

conditions of regulatory approvals/permits. Throughout construction, the Contractor will ensure that all Project construction activities adhere to the CEMP and the Contractor’s EPP, in addition to regulatory requirements.

With implementation of these mitigation measures and application of appropriate best management practices, residual adverse effects are not likely to result from the proposed Project.

Table 16-1 Summary of Potential Effects and Mitigation Measures

VEC/VSC	Description and Potential Effects	Mitigation Measures*
Soils and sediments	<ul style="list-style-type: none"> • There is potential for the placement of fill material to result in temporary sedimentation effects to surrounding aquatic life. 	<ul style="list-style-type: none"> • See Section 4.3 in Attachment 8 for mitigation measures pertaining to “Sediment Control and Management”.
Surface water and water bodies	<ul style="list-style-type: none"> • There is potential for negative water quality effects to occur during construction (e.g., during fill placement). • There is potential for spills or equipment leaks to occur during construction. 	<ul style="list-style-type: none"> • See Section 4.3 and Section 4.4 in Attachment 8 for mitigation measures pertaining to “Sediment Control and Management” and “Machinery and Equipment”. • See Section 7.2 in Attachment 8 for mitigation measures pertaining to the “Spill Response Plan”.

VEC/VSC	Description and Potential Effects	Mitigation Measures*
<p>Aquatic species and habitat</p>	<ul style="list-style-type: none"> The Project site currently has existing aquatic habitat values and, although the Project will replace existing (lower value) fish habitat with higher value fish habitat, there is a risk of either direct (e.g., injury or mortality) or indirect (e.g., water quality) effects on aquatic species during in-water construction. 	<ul style="list-style-type: none"> The majority of construction work is scheduled to occur during the appropriate fisheries least-risk timing window. However, due to the potential material settlement time required for sediment placement in the Northeast Basin, material placement may extend beyond the end of the least-risk timing window (e.g., post-February 28th). Any work outside the window would occur with appropriate mitigation in place. See Section 4.7 in Attachment 8 for mitigation measures pertaining to "Aquatic Species and Habitat". Water quality effects will be mitigated with reference to Section 4.3 ("Sediment Control and Management") and Section 4.4 ("Machinery and Equipment") in Attachment 8.
<p>Vegetation</p>	<ul style="list-style-type: none"> There will be effects to marine vegetation in the sparsely covered sections of the Northeast Basin and Southern Intertidal Area. This could lead to loss of primary productivity at the Project site. 	<ul style="list-style-type: none"> The current coverage of marine intertidal and subtidal vegetation is relatively sparse. Upon completion of construction, primary productivity (e.g., from eelgrass and kelp) at the Project site is anticipated to be greater resulting in an overall "net gain" in the vegetation values at the Project site.

VEC/VSC	Description and Potential Effects	Mitigation Measures*
Wildlife and habitat	<ul style="list-style-type: none"> The Project site currently has existing wildlife habitat values (e.g., by providing foraging areas for waterbirds) and, although the Project is expected to benefit wildlife by replacing lower value aquatic habitat with higher value aquatic habitat, there is still a risk of disturbance to wildlife species during construction. 	<ul style="list-style-type: none"> To mitigate potential effects to nesting birds, the majority of the work is anticipated to occur outside the general nesting bird window (considered to fall between March 15th and August 15th of a given year). See Section 4.6 and Section 4.8 in Attachment 8 for mitigation measures pertaining to “Noise” and “Terrestrial Vegetation and Wildlife Management”.
Invasive Species	<ul style="list-style-type: none"> The spread of non-native species (e.g., Japanese eelgrass (<i>Zostera japonica</i>) and Japanese wireweed (<i>Sargassum muticum</i>)) could be promoted by construction of new habitat suitable for colonization. 	<ul style="list-style-type: none"> Following construction, native common eelgrass will be planted at the Project site. Post-construction monitoring will occur to assess the establishment and survival of planted eelgrass. Any identified deficiencies and/or invasive species concerns will be addressed through appropriate management measures. See Section 4.4 in Attachment 8 (Machinery and Equipment”) for mitigation measures to prevent the spread of invasive species.

VEC/VSC	Description and Potential Effects	Mitigation Measures*
<p>Current Land Use</p>	<ul style="list-style-type: none"> • Construction activities could temporarily affect recreational activities (e.g., birding) in the upland MFCA, due to an increase in background noise. • Water-based recreational activities (e.g., kayaking) at the Project site and surrounding areas may be temporarily disrupted (e.g., during transit of construction vessels) during construction. 	<ul style="list-style-type: none"> • The Public Consultation and Stakeholder Engagement Plan (Attachment 9) will be implemented to reduce conflict with current and surrounding land uses. • See Section 4.6 in Attachment 8 for mitigation measures pertaining to “Noise”. • Construction activities will mainly overlap with fall and winter months when recreational use of the adjacent MFCA is anticipated to be lower than during the spring and summer months. • The Project site is a water lot that is largely owned by VFPA (with the exception of the small DNV parcel), and it consists of a relatively protected basin (the “Northeast Basin”) and intertidal area (the “Southern Intertidal Area”). These areas are not known to be popular recreational areas.
<p>Archaeology</p>	<ul style="list-style-type: none"> • Construction activities in the Northeast Basin and Southwest Channel have a low potential to affect unknown archaeological resources. • The in-filling of the Northeast Basin has the potential to affect one archaeological site outside of the Project boundary. 	<ul style="list-style-type: none"> • See Attachment 6 for the Archaeological Overview Assessment and Preliminary Field Reconnaissance. • See Section 4.9 in Attachment 8 for mitigation measures pertaining to “Archaeological Resources”. • Chance Find Procedures will be implemented by the Contractor.

VEC/VSC	Description and Potential Effects	Mitigation Measures*
<p>Navigation and water use</p>	<ul style="list-style-type: none"> • Construction activities, in particular access by construction machinery and equipment, could affect navigational activities in Burrard Inlet. • Adjacent water users (e.g., kayakers) could be temporarily affected by construction activities. 	<ul style="list-style-type: none"> • The Public Consultation and Stakeholder Engagement Plan (Attachment 9) will be implemented to reduce conflict with navigation and water use. • The Project will be reviewed by VFPA Marine Operations as the Project site is under VFPA Navigational Jurisdiction. The Project will comply with the <i>Navigation Protection Act</i> to minimize negative effects to boat traffic during the construction phase. • Proper communication and signage (see the design drawings in Attachment 1) will be applied, as required. • See Section 4.10 in Attachment 8 for mitigation measures pertaining to "Navigation".
<p>Noise</p>	<ul style="list-style-type: none"> • There is some risk for noise from heavy equipment to be heard by off-site users (e.g., at MFCA and residences near the Project site). • Construction-generated noises may affect fish and wildlife and result in temporary avoidance of affected habitats. 	<ul style="list-style-type: none"> • The nearest residences are situated greater than 500 m from the Project site. • To mitigate potential negative effects to fish and birds, the majority of work will be scheduled to occur during the least-risk timing window for fish, and is anticipated to mostly occur outside the general nesting bird window (considered to fall between March 15th and August 15th of a given year). • See Section 4.6 in Attachment 8 for mitigation measures pertaining to "Noise". • See Attachment 7 for the Noise Assessment Screening Worksheet and Noise Assessment Project Score.

VEC/VSC	Description and Potential Effects	Mitigation Measures*
Light	<ul style="list-style-type: none"> • There is potential for light generated during construction to affect fish and wildlife and result in temporary avoidance of affected habitats. 	<ul style="list-style-type: none"> • To mitigate potential negative effects (including light generation) to fish and birds, the majority of work is scheduled to occur during the least-risk timing window for fish, and is anticipated to mostly occur outside the general nesting bird window (considered to fall between March 15th and August 15th of a given year). • See Section 4.8 and 4.9 of Attachment 8 ("Aquatic Species and Habitat" and "Terrestrial Vegetation and Wildlife Management") for additional mitigation measures to avoid adverse effects on fish and wildlife.
Air Quality	<ul style="list-style-type: none"> • Use of construction machinery and equipment may result in a temporary, localized increase in air quality pollutants (e.g., from exhaust fumes). 	<ul style="list-style-type: none"> • See Section 4.5 in Attachment 8 for mitigation measures pertaining to "Air Quality".
Safety	<ul style="list-style-type: none"> • Construction activities with heavy equipment represent some health and safety risks, primarily to construction workers. 	<ul style="list-style-type: none"> • The Contractor will be responsible for developing an Occupational Health and Safety Plan which will include measures that comply with WorkSafe BC standards to ensure safe practices are implemented for the protection of workers and the public.
<p>* Note: Provided that these mitigation measures are properly implemented, it is anticipated that any notable residual adverse effects can be avoided.</p>		

17.0 Regulatory Considerations

The Project will meet applicable regulatory requirements and the Project team will obtain necessary permits and approvals prior to the initiation of construction on the Project. **Table 17-1** below summarizes the key anticipated permits, approvals and/or reviews that will need to be received or undertaken prior to construction. Note that obtaining other construction-related permits (e.g., scientific fish collection permits) will be the responsibility of the Contractor conducting the works and these have not been accounted for in **Table 17-1**.

A more detailed summary of the Project-related regulatory engagement that has been conducted to-date is included in the “Regulatory Considerations” section of the Key Milestones Table in **Attachment 2**.

Table 17-1 Summary of Permits/Approvals for the Project

Permit/Approval Description	Permitting or Approving Agency	Status
District of North Vancouver Licence Agreement	District of North Vancouver	Agreement anticipated to be in place by Q3 2018.
Supplementary Letters Patent	Transport Canada	Anticipated to be in place prior to construction commencement.
Project and Environmental Review Project Permit (Category C)	VFPA – Planning and Development	A formal review is requested with submission of this Project Review Application Package.
<i>Canadian Environmental Protection Act – Disposal at Sea Review</i>	Environment and Climate Change Canada – Disposal at Sea Program	Submission targeted for Q3 2018.
Centerm Expansion Project <i>Fisheries Act</i> Authorization	Fisheries and Oceans Canada	VFPA is proposing to use a portion of MMRP as a fisheries habitat offsetting site for the proposed CEP. Conditions of the CEP <i>Fisheries Act</i> Authorization may include requirements applicable to the construction of MMRP.
<i>Navigation Protection Act – Notice of Works</i>	Transport Canada – Navigation Protection Program	As the Project is located within VFPA jurisdiction, it is not anticipated that Transport Canada will play a role in the navigation permitting process.

17.1 Serious Harm Assessment

The Project Permit Application Submission Requirements checklist provided to VFPA HEP for this Project, includes a section entitled “Requirements and Considerations for a DFO Review”. VFPA HEP was advised to provide the following documents regarding the Project:

- *As the proposed Project involves alteration of habitat below the High Water Mark, VFPA requires a copy of the submitted request for review; and,*
- *Provide VFPA with a copy of the Letter of Advice from DFO or Fisheries Act Authorization or any other correspondence from DFO if applicable and anticipated before PER permit decision.*

For most HEP projects, VFPA HEP has not submitted Requests for Review to DFO to determine if serious harm will result from proposed works, as the habitat projects (by their nature) are designed to increase fisheries productivity. In addition, no projects to date have required a *Fisheries Act* Authorization. Instead, HEP has conducted assessments of serious harm, led by Qualified Environmental Professionals, to ensure that enhancement projects do not result in Serious Harm to fish, an acceptable approach for low risk projects.

For this Project, the *Fisheries Act* Authorization issued for the CEP will describe authorized works, undertakings and activities, and conditions related to offsetting that will include some proposed works for the MMRP (e.g., Northeast Basin enhancement). Therefore, a separate assessment of serious harm will not likely be required for the Project. Once the CEP *Fisheries Act* Authorization is executed, it will be provided to VFPA PER to satisfy the “Requirements and Considerations for DFO Review” for the MMRP.

18.0 Aboriginal Consultation

VFPA’s Aboriginal Consultation Program for the Project has been aimed at ensuring that all applicable legal, procedural and policy requirements are effectively addressed and to ensure that positive, productive, and lasting relationships are maintained between VFPA and Aboriginal groups. The VFPA Project team has structured, and is implementing, consultation with the objective of ensuring effective two-way communication and information sharing with Aboriginal groups. This will allow for potential Project-related benefits to be maximized, potential adverse effects to be minimized, and any legal obligations to be fully met. A detailed Aboriginal Consultation Plan has been included in **Attachment 10**. An Aboriginal Consultation Status Summary Report (including an Aboriginal Consultation Log) will be developed upon completion of Aboriginal consultation.

19.0 Communication and Engagement

The Project team has conducted preliminary engagement and will continue to engage and consult with stakeholders and the public, on the Project. Consultation is expected to include the following:

- The Project team will obtain public feedback on analysis, alternatives and/or decisions;
- The Project team will keep public and stakeholders informed, listen and acknowledge concerns and aspirations, and provide feedback on how public input influenced the decision. The Project team will seek feedback on drafts and proposals;
- A range of consultation and engagement methods will be used to maximize participation; and
- Input received during public consultation and engagement will be considered, along with technical information, input from Aboriginal groups, and other considerations, to inform project design.

A detailed Public Consultation and Stakeholder Engagement Plan for the Project is included in **Attachment 9**.

20.0 References

Kerr Wood Leidal Associated Ltd. (KWL). 2017. Burrard Inlet Action Plan: A science-based First Nations-led initiative to improve the health of the Burrard Inlet ecosystem by 2025. Prepared for Tsleil-Waututh Nation.

Port Metro Vancouver (PMV). 1998. Management Plan: Port of Vancouver Wildlife Conservation Area, Maplewood South, North Vancouver.

Port Metro Vancouver (PMV). 2015a. Project and Environmental Review Guidelines – Environmental Noise Assessment. Available at <https://www.portvancouver.com/wp-content/uploads/2015/05/PER-Noise-Assessment-Guidelines-FINAL-2015-07-09.pdf>.

Port Metro Vancouver (PMV). 2015b. Project and Environmental Review Guidelines – Construction Environmental Management Plan (CEMP). Accessed May 2018 <https://www.portvancouver.com/wp-content/uploads/2015/10/PER-Construction-Environmental-Management-Plan-CEMP-Guidelines-FINAL-2015-10-16.pdf>.

Stantec Consulting Ltd. (Stantec). 2009. Burrard Inlet Shoreline Change – Baseline Assessment: Final Report. Prepared for Burrard Inlet Environmental Action Program.