OceanWest Phase 5 Works

Wetland Remediation and Offsetting Plan

Prepared for:

EDI Environmental Dynamics Inc.
301 George Street
Prince George, BC, V2L 1R4

February 23, 2024

Prepared by:

Ecofish Research Ltd.

ECOFISH RESEARCH

Published by Ecofish Research Ltd., 600 Comox Rd., Courtenay, B.C., V9N 3P6

For inquiries contact: Technical Lead documentcontrol@ecofishresearch.com 250-334-3042

Citation:

Wright, N., T. Innes, N. Nahirnick, P. Li, H. Wright, and A. Smith. 2024. OceanWest Phase 5 Wetland Remediation and Offsetting Plan. Consultant's report prepared for EDI Environmental Dynamics Inc. by Ecofish Research Ltd., February 23, 2024.

Certification: *Certified - stamped version on file.*

Senior Reviewers:

Andy Smith, M.Sc., R.P.Bio. No. 3220

Project Director, Senior Terrestrial Ecologist, Wildlife Biologist

Nicole Wright, Ph.D., P.Geo., PWS No. 2704

Senior Hydrologist and Wetland Scientist, Project Director

Technical Leads:

Nicole Wright, Ph.D., Ph.D., P.Geo., PWS No. 2704

Senior Hydrologist and Wetland Scientist/Project Director

Tyler Innes, M.Sc., R.P.Bio. No. 2136

Senior Ecologist

Disclaimer:

This report was prepared by Ecofish Research Ltd. for the account of EDI Environmental Dynamics Inc. The material in it reflects the best judgement of Ecofish Research Ltd. in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, is the responsibility of such third parties. Ecofish Research Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions, based on this report. This numbered report is a controlled document. Any reproductions of this report are uncontrolled and may not be the most recent revision.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF MAPS

LIST OF APPENDICES

1. INTRODUCTION

This Wetland Remediation and Offsetting Plan (the Plan) describes the recommended works and activities that are to be implemented by Weyerhaeuser Company Limited (Weyerhaeuser) to satisfy a provincial Order issued under Section 92(2) of the *Water Sustainability Act* (WSA). The Plan is intended to remediate impacts to Stream 14 Wetland and to offset impacts to the Raven Haven Creek Wetland (collectively, "the Wetlands"), associated with Phase 5 of Weyerhaeuser's OceanWest mixed-use development project in Ucluelet, British Columbia (the Project). The Plan is based on a substantially revised Phase 5 layout and, as such, has been prepared by Ecofish Research Ltd. (Ecofish), in collaboration with the Project team, which includes staff from Weyerhaeuser, Newcastle Engineering Ltd. (Newcastle), and EDI Environmental Dynamics Inc. (EDI). Furthermore, the Plan has been prepared in consideration of written correspondence and direction from provincial staff overseeing this file, and in accordance with the BC Environmental Mitigation Policy (BC MOE 2014).

2. BACKGROUND

2.1. Project Overview and Regulatory Context

OceanWest is a 340-acre comprehensive development approved by the District of Ucluelet in a Master Development Agreement in 2006. Four phases of streets and residential and commercial development have been completed over the past 18 years. Phase 5 is a residential subdivision of 33 lots (the property; Map 1), which included the extensions of Marine Drive and Forbes Road to complete an important roadway link for access and emergency services to Peninsula Road in accordance with the Official Community Plan.

Construction of the Phase 5 subdivision, which began in March of 2021 with a Section 11 Notification in place, included clearing, grubbing, and preliminary earthworks of the right-of-way for the extension of Forbes Road to Marine Drive. This activity disturbed what has now been identified by Ecofish as 1,143 m^2 of the Wetlands.

Due to concerns that wetlands have been disturbed by construction activities between Forbes Road and Marine Drive, the Ministry of Water, Land, and Resource Stewardship (the Ministry) had issued an Order under the WSA, requiring a wetland assessment and remediation plan be prepared by an appropriate Qualified Environmental Professional (QEP). On October 21, 2022, Weyerhaeuser submitted a Wetland Assessment and Remediation Plan prepared by Ecofish (Wright *et al.* 2022) to comply with the Order.

The Ministry reviewed the recommendations within the Wetland Assessment and Remediation Plan and requested a wetland offsetting plan for the Project. In March 2023, Ecofish completed a desktop and field assessment of the property (within Weyerhaeuser owned lands at and near the Phase 5 subdivision) to identify suitable sites to offset wetland function loss through creation of new and/or enhanced wetland areas. The assessment was followed by development of a conceptual design brief for offsetting the loss of 1,143 m^2 of wetland habitat and associated functions at the Property

(Wright *et al.* 2023). The conceptual design was developed to support offsetting a larger area (1,576 m^2) of wetland disturbance associated with completion of Forbes Road. The conceptual design brief was submitted to the Ministry for review in June 2023. The Plan was developed in consideration of the Ministry's feedback on the conceptual design brief, which included a request to reconsider the alignment of Forbes Road to avoid further disturbance to Stream 14 Wetland and to restore the wetland and its riparian buffer.

2.2. Wetland Extent and Functions

Table 1 is a summary of the estimated area of the Wetlands that existed prior to Forbes Road construction activities, and the estimated intact (undisturbed) and impacted (from Phase 5 Project activities) wetland areas, including those areas currently disturbed but that will be remediated as part of this Plan. A third wetland, approximately 302 m^2 in area and located adjacent to Marine Drive, was identified during the original Wetland Assessment (Wright *et al.* 2022) but will not be disturbed by the current Phase 5 development, nor will a fourth wetland, Stream 3 Wetland, which is located outside of the Phase 5 boundary (Map 1).

The Wetlands are classified as coniferous treed swamps, with a mix of slope and flat basin forms (NWWG 1997). The ecological communities of these wetlands most resemble Western redcedar – Western hemlock – Skunk cabbage swamps (*Thuja plicata – Tsuga heterophylla – Lysichiton americanus*; Ws54; Mackenzie and Moran 2004), though slough sledge (*Carex obnupta*) was more abundant than skunk cabbage at all sites (Wright *et al.* 2022). The Wetlands provide habitat for amphibians, songbirds, and small and large mammals. The Wetlands also maintain streamflow during dry periods and improve water quality by filtering sediment and pollutants; this latter function may be a more important function of the Wetlands as the Property becomes populated.

Table 1. Estimated total area of wetlands on the Property before Phase 5 construction, and estimated area of intact and disturbed portions of these wetlands.

Site	Wetland Area Prior to Phase 5 Activities (m^2)	Intact Wetland Area (m^2)	Impacted Wetland Area (m^2)
Raven Haven Creek Wetland	2,330	1,936	394
Stream 14 Wetland	1,921	1,172	749
Marine Drive Wetland	302	302	-
Total Areas	4,553	3,410	1,143

3. AVOIDANCE, MINIMIZATION, AND COMPENSATION MEASURES

This section describes the specific measures proposed to avoid, minimize, remediate, and offset the loss of wetland and riparian functions. Map 1 provides a visual of the Plan, with specific areas labelled and referred to in the following mitigation components.

3.1. Wetland Avoidance

Wetland avoidance was the highest priority and was achieved by revising the site plan to avoid further disturbance to Stream 14 Wetland and any future disturbance to Stream 3 Wetland. Forbes Road will be constructed to the west of Stream 14 Wetland, and construction of Marine Drive will be terminated 100 m short of the Phase 5 boundary to provide adequate flexibility for the future extension of Marine Drive to avoid Stream 3 Wetland and its 15-m riparian setback (Label 23 and 24 in Map 1).

3.2. Minimization of Wetland Disturbance

To minimize potential future disturbance to the Wetlands, riparian setbacks (referred to hereafter as buffers) will be established. Some riparian buffers have been previously disturbed and will be remediated, while others, where remediation is unavoidable, will be offset through wetland construction or riparian protection.

- A 15 m riparian buffer will be established between Raven Haven Wetland and the adjacent lot 87 (Label 6 on Map 1).
- A buffer of between 7 m and 10 m will be established between Stream 14 and the adjacent lots 81 and 82 (Label 16 on Map 1). This buffer is less than the Ministry requested 15-m setback due to the topography of the land. The wetland buffer extends 2 to 3 m vertically up a steep rock slope that will remain intact post-construction, and therefore meets the objective of providing a functional wetland buffer.
- A 3 m to 15 m buffer will be re-established to the north, west, and south of Stream 14 Wetland (Label 10 on Map 1). These buffer areas were previously disturbed during clearing for planned construction of Forbes Road and will be reclaimed. Where it is not feasible to extend the riparian buffer to 15 m on the north and west sides of Stream 14 Wetland, due to road requirements for the Project (Label 15 on Map 1), the loss of function will be offset, in part, by wetland habitat creation at a ratio of 1:1 (described in Section 3.3).
- Phase 5 construction activities caused no disturbance to the riparian areas of Stream 14 Wetland or Marine Drive Wetland beyond the approximate boundaries of what had previously been disturbed during the construction of Marine Drive between 2005 and 2010 (Labels 22 and 11 on Map 1, totaling 1,244 m^2). Such Marine Drive construction work was conducted prior to the WSA revisions (and before Phase 5 of the Project) and therefore should not require offsetting as part of this Project. Nevertheless, the functions associated with the 2005 to 2010 disturbance will be offset through the Stream 2 riparian protection (Label 18 on Map 1; described in Section 3.3) and riparian buffer protection (Label 2 and 25 on Map 1) of the Offsetting Wetland.

Stream 2 and 14 and all wetlands and their buffers will be designated as Park and are not overlapped by housing lots. Signs will be posted in these areas to notify the public of these ecologically sensitive areas and split cedar fences will be erected to prevent disturbance.

In addition to establishing protective buffers, other measures will be taken to reduce and control construction-related effects on wetland functions, including:

- Adhering to the Project's Environmental Management Plan (EMP; EDI 2020), which includes measures for erosion and sediment control to manage surface water and avoid sedimentation in adjacent vegetation communities during construction.
- Adhering to the Project's Wetland Management Plan (Appendix C in Wright *et al.*, 2022), which includes clearly delineating (flagging) wetland buffers prior to site preparation to keep clearing activities within the designated Project footprint.
- Remediating, through reclamation and/or restoration, any temporarily disturbed riparian areas as soon as practicable. Existing soils and plants that will be removed during construction will be incorporated in reclaimed/restored areas, where appropriate and technically feasible.
- Removing invasive species that have been discovered on site, as soon as possible.

3.3. Wetland Compensation

The area of wetland loss associated with the Project is 1,143 m^2, with a further loss of 2,590 m^2 of wetland riparian buffers. The associated loss of wetland and riparian functions will be compensated for through wetland restoration and creation, wetland riparian buffer reclamation and protection, and stream riparian protection, as summarized in Table 2 and described below.

- Remediation of the disturbance to Stream 14 Wetland and its riparian buffer through approximately 1,721 m^2 of restoration that includes all the disturbed Stream 14 Wetland area (749 m^2; Label 13 on Map 1) and reclamation of a portion of its riparian buffer (973 m^2; Label 10 on Map 1).
- Offsetting the loss of approximately 394 m^2 of Raven Haven Wetland (Label 8 on Map 1) and a portion of the reduced riparian buffer of Stream 14 Wetland (Label 15 on Map 1) through the creation of 888 m^2 of wetland (Label 1 on Map 1). The remaining portion of Stream 14 Wetland riparian buffer and the Raven Haven Wetland riparian buffer (Label 5 on Map 1) that will be/has been lost due to construction of Forbes Road will be offset through the establishment of a 15-m riparian buffer around the newly created wetland offsetting site with a total area of 2,630 m^2. The riparian buffer will surround the Offsetting Site (Label 2 on Map 1), except where the buffer overlaps with, and extends beyond, the 5-m Stream 14 setback (Label 3 and 4 on Map 1). To avoid double counting protection areas, an area between Stream 14 and north of the Offsetting Site (Label 25 on Map 1) has been proposed for protection; this protection area equals the area of overlap between the Stream 14 setback and the Offsetting Site (and includes the area labelled "4" on Map 1).

- Protection of Stream 2 and its riparian area to offset the loss of a portion of Stream 14 Wetland and Marine Drive Wetland riparian buffer caused by the construction of Marine Drive prior to implementation of the Project.
    - Stream 2, located in the northeast section of the property (Map 1), had no previously assigned setback because past investigations by EDI found no surface water connection between Stream 2 on the property and the sections downstream of the property. The riparian area for this headwater provides similar water quality, hydrologic, and habitat functions as the Raven Haven Creek Wetland (Wright *et al.* 2022). Development on the slopes buffering Stream 2 is likely to impact the functions of the riparian area. To maintain riparian functions and protect the stream headwaters and to offset for losses to wetland riparian areas, a 1,010 m^2 area around Stream 2 will be designated as Park for future protection (Label 18 on Map 1).
- Development and implementation of a wetland monitoring program (Section 6) to document the performance of compensatory wetlands and provide adaptive management strategies to improve effectiveness, if required.

This Plan is expected to result in no net loss of wetland functions on the Property. The Plan will result in a net gain of 2,516 m^2 of wetland and riparian habitat area (Table 2)

The following sections provide site descriptions and prescriptions for wetland and wetland riparian buffer remediation (Sections 4) and wetland offsetting (Section 5), and recommended effectiveness monitoring requirements (Section 6).

Table 2. **Total area of wetland and wetland riparian buffer area loss, and proposed total area of wetland restoration and creation (offsetting), reclamation of wetland riparian buffer, and wetland and stream riparian habitat protection.**

Site	Impacted Wetland Area (m^2)	Reduced Wetland Buffer Area[1] (m^2)	Wetland Restoration and Creation Area (m^2)	Reclaimed Wetland Buffer Area (m^2)	Protection Area (m^2)	
					Wetland Buffer[2]	Stream 2 Park[3]
Raven Haven Creek Wetland	394	1,578	-	-	-	-
Stream 14 Wetland	749	1,013	749	973	-	-
Marine Drive Wetland	-	-	-	-	-	-
Wetland Offsetting Site	-	-	888	-	2,630	1,010
Total Areas	1,143	2,590	1,636	973	2,630	1,010
Total Losses[4]	-	3,733	-	-	-	-
Total Gains[5]	-	-	-	-	-	6,249

[1] Area of wetland riparian buffer less than the minimum 15 m setback requirement for wetlands on the Property; this area requires offsetting

[2] Protected 15 m riparian buffer around the Wetland Offsetting Site

[3] Protected area around Stream 2, between Lots 85 and 86; includes 204 m^2 of reduced Raven Haven Creek Wetland buffer area

[4] Impacted Wetland Area + Reduced Wetland Buffer Area

[5] Wetland Restoration and Creation Area + Reclaimed Wetland Buffer Area + Protection Areas

4. REMEDIATION SITES AND PRESCRIPTIONS

Remediation of impacts caused by clearing Stream 14 Wetland and its riparian buffer will be completed through approximately 1,721 m^2 of restoration that includes all the disturbed Stream 14 Wetland area (749 m^2; Label 13 on Map 1) and reclamation of a portion of its riparian buffer (973 m^2; Label 10 on Map 1). Appendix A provides an overview of Stream 14 Wetland and Buffer remediation design, including a plan view, cross-section profiles, and a summary of the planting prescriptions and standards. Recommended construction timing is discussed in Section 6.3.

4.1. Site Descriptions

4.1.1. Stream 14 Wetland Restoration Site

Stream 14 Wetland is a 749 m^2 area lost through vegetation and soil removal, though some areas of developing soil have remained after clearing. Three general zones, including shallow open water in the northern portion, a shrub and herb dominated swamp in the central portion, and a shrubby swamp in the south portion, comprise the Stream 14 Wetland:

1. The shallow open water is approximately 200 m^2, with an open water pool and a sparse cover of common horsetail (*Equisetum arvense)*), slough sedge (*Carex obnupta*), Pacific soft rush (*Juncus effusus* ssp. *pacificus*), and cattail (*Typha latifolia*).
2. The shrub and herb dominated swamp is approximately 250 m^2, with a variety of scattered shrubs, herbs, and mosses, such as, evergreen huckleberry (*Vaccinium ovatum*), salmonberry (*Rubus spectabilis*), thimbleberry (*Rubus parviflorus*), deer fern (*Struthiopteris spicant*), slough sedge, and Pacific soft rush.
3. The shrubby swamp is approximately 300 m^2, located adjacent to Stream 14. The vegetation in this area is dominated by a thick cover of salmonberry with patches of evergreen huckleberry and slough sedge.

4.1.2. Stream 14 Wetland Buffer Reclamation Site

Stream 14 Wetland Buffer is a 973 m^2 area lost through vegetation and soil removal. It is made up of two general zones, including bedrock outcrops in the northern portion and a shrub and herb swamp community in the central and southern portions.

1. The bedrock outcrops are approximately 500 m^2, with patches of remaining soil and sparsely distributed herbs and mosses, such as deer fern and juniper haircap moss (*Polytrichum juniperinum*).
2. The shrub and herb swamp community is approximately 473 m^2, with a variety of shrubs, herbs, and mosses, such as: evergreen huckleberry, salmonberry, thimbleberry, deer fern, juniper haircap moss, and crane's-bill moss (*Atrichum selwynii*). The shrub and herb community has areas of adequate soil development remaining.

4.2. General Prescriptions for Stream 14 Wetland Restoration and Reclamation Sites

The steps for site preparation and remediation of Stream 14 Wetland and Buffer are outlined below. Further details, including site design, are provided in Appendix A.

1. Remove all invasive plant species.

The first action for the restoration and reclamation of Stream 14 Wetland and Buffer is to remove any noxious invasive plant species infestations, according to the BC Weed Control Regulation (*Weed Control Act* 2011). Invasive plant species detected at site or along the adjacent roadsides shall be manually removed and disposed of at an approved site. Invasive plant infestations should not be mowed, and plant materials are not to be mixed into the existing soil. Any equipment arriving at site must be clean and free of soil and plant material to prevent the potential for the spread of invasive plant species. The use of chemical herbicides for control or management of invasive species will be avoided due to the proximity to waterbodies.

2. Salvage soil and plant materials, and add soil and woody debris where needed.

When clearing vegetation to the west of Stream 14 Wetland (for the extension of Forbes Road to Marine Drive), retain portions of soil, root mats with small trees, shrubs, herbs, mosses, and seed bank for use in the Stream 14 Wetland Restoration and Buffer Reclamation Sites. Stockpile salvaged soils for later use or simultaneously spread soils, root mats, and vegetation directly to Stream 14 Wetland and Buffer Sites where existing soils are less than 25 cm to save costs from importing purchased soil. However, existing natural vegetation that has already established should not be covered. Where soils are not adequately established, add topsoil to a 200 – 300 mm thickness in a rough or loose finished grade. Careful consideration of topsoil requirements will be made prior to purchase. Topsoil should be weed-free and consist of 'premium mix' or organically enriched soil with approximately 75% organic compost and 25% washed sand. Scatter coarse woody debris from cleared areas throughout the Stream 14 Wetland Restoration and Reclamation Buffer Sites.

3. Plant native species applicable to site conditions.

Plant nursery stock by hand following the General Planting Standards in Appendix A. At the Stream 14 Wetland Restoration Site, plant rushes in the shallow open water zone, and plant sedges, rushes, and skunk cabbage along the edges of the open water and in wet depressions or topographic hollows throughout the rest of the restoration site. At the Stream 14 Wetland Buffer Reclamation Site, plant nursery stock plugs on bedrock outcrops where soils may be thinner. Plant sedges, rushes, and skunk cabbage in wet depressions or hollows throughout the rest of the reclamation site. Distribute and plant all other tree, shrub, and herb stock throughout the rest of the restoration and reclamation sites.

Estimated plant densities and layout are provided in Appendix A. Not all nursery planting material will be required due to patches of existing vegetation present at the sites and the potential use of salvaged plants from construction of Forbes Road. Careful consideration of plant requirements will

be made prior to purchase, which will be completed after plant salvage from the adjacent road clearing site; any surplus nursery plants not used at these sites can be used for the Wetland Offsetting Site.

4. Implement site protection measures.

Prior to any clearing or movement of soils when constructing Forbes Road adjacent to Stream 14 Wetland and Buffer Sites, the contractor must implement erosion and sediment control measures as per the EMP to minimize sediment inputs to the wetland and its reclaimed buffer.

Assess risk of deer browse and identify whether any browse protection should be installed prior to planting. Seek to provide adequate browse protection to achieve 80% conifer survival. Provide browse protection on a minimum of 20% of planted conifers if high browse levels are observed at nearby sites.

Low split cedar fencing must be installed at the north and south edges of Stream 14 Wetland Restoration and Buffer Reclamation Sites at intersection points with Marine Drive and Forbes Road to discourage people and pets from entering the wetland remediation area. Installation of signs indicating that the area is a dedicated park for stream and wetland conservation could also help protect the sites from disturbance.

Seed native species by hand or handheld spreader at intersection points with Marine Drive and Forbes Road, following invasive species removal at these locations. Use a native seed mixture, such as 100% Native Roadside Riparian seed mix from Premier Pacific Seeds. The seeding rate must be 40–50 kg per hectare (Table 3). Native Roadside Riparian seed mix mitigates invasive plant growth in disturbed soils, provides erosion and sediment control, and is tolerant to high soil moisture and seasonal flooding (Premier Pacific Seeds 2020).

Table 3. Native Roadside Riparian seed mix.

Common Name	Botanical Name	Percentage by Weight (%)
Meadow barley	*Hordeum brachyantherum*	41
Mountain brome	*Bromus marginatus*	40
Native red fescue	*Festuca rubra*	15
Tufted hairgrass	*Deschampsia cespitosa*	3
Spike bentgrass	*Agrostis exarata*	1

Seeding Rate: 40-50 kg per hectare (one bag equals 22.7 kg)

4.3. Schedule, Design Supervision, and Reporting

Ideally, the clearing for extension of Forbes Road to Marine Drive will occur in the spring of 2024 from March to May. Replanting activities in the Stream 14 Wetland Restoration and Wetland Buffer Reclamation sites could occur concurrently with this clearing to make use of salvaged

soil and plant materials. To minimize risk to breeding amphibians, remediation activities during the spring will be focused on the placement of salvaged soil and plants in the Wetland Buffer Reclamation site and will avoid the shallow open water and wetted areas of the Stream 14 Wetland Restoration site, which will be planted in late summer, coinciding with planting at the Offsetting Site. Additionally, a General Wildlife Permit for salvage will be obtained prior to the start of works, and exclusion fencing for amphibians will be erected in the wetland remediation site in spring to avoid wetted areas, and around the perimeter of the wetland and/or wetland buffer where road clearing activities are taking place.

A QEP will supervise all stages of remediation habitat design works, including daily search and salvage for amphibians prior to road clearing and remediation activities, invasive plant identification and removal, plant and soil salvage, and implementation of site protection measures during construction activities and post-remediation. A memorandum will be produced by the QEP following remediation that describes the methods and results of the initial restoration and reclamation activities to inform effectiveness monitoring (Section 6).

5. OFFSETTING SITE AND PRESCRIPTION

A swamp wetland of approximately 888 m^2 will be created to offset the loss of approximately 394 m^2 of Raven Haven Wetland and a portion of the reduced riparian setback of Stream 14 Wetland. The newly created wetland will be protected by a buffer totalling 2,630 m^2, which will offset the loss of the Raven Haven Wetland riparian buffer and a portion of the Stream 14 riparian buffer. Appendix B provides an overview of the Wetland Offsetting Site design, including a plan view, longitudinal profiles, and a summary of the planting prescriptions and standards.

5.1. Wetland Offsetting Site Description

The wetland offsetting site (Area 3 in the Conceptual Design Brief; Wright *et al.* 2023) was chosen for its large size (888 m^2), disturbed condition, and its location adjacent to Stream 14 and an intact, blue-listed ecosystem. The wetland offsetting site is a gravel clearing, possibly a previous parking lot, located adjacent to a closed (but utilized) footpath that is on private (Weyerhaeuser) property. The wetland offsetting site is adjacent to and east of Stream 14, and adjacent to and north of an intact, blue-listed terrestrial ecosystem (CWHvh1/15). Only sparse vegetation is growing out of the gravel, mostly non-native grasses and herbs. The edges of the site have regenerated western redcedar (*Thuja plicata*), Sitka spruce (*Picea sitchensis*), salal (*Gaultheria shallon*), salmonberry, evergreen huckleberry, deer fern, common horsetail, and Pacific soft rush. Two soil pits were manually excavated in November 2023 reaching about 30 cm in depth, showing a persistent gravel layer. There is a large pile of wood pulp at the northwest end of the site and a large pile of wood debris and logs at the northeast end of the site. A portion of this material is anticipated to contribute to organic material and large wood for wetland construction.

5.2. General Prescriptions for Wetland Offsetting

The steps for site preparation and construction of the Offsetting Wetland are outlined below. Further details, including site design, are provided in Appendix B. Recommended construction timing is discussed in Section 6.3.

1. Remove all invasive plant species and salvage any native plant species.

Manually remove all noxious invasive plant species from the Wetland Offsetting Site, including its buffer and dispose at an approved site, according to the BC Weed Control Regulation (*Weed Control Act* 2011). Invasive plant species detected at site or along adjacent paths shall be manually removed and disposed of at an approved site. Invasive plant infestations should not be mowed, and plant materials are not to be mixed into the existing soil. Any equipment arriving at site must be clean and free of soil and plant material to prevent the potential for the spread of invasive plant species. The use of chemical herbicides for control or management of invasive species will be avoided due to the proximity to waterbodies.

Existing native vegetation at the excavation site will be kept for future planting, if practical.

2. Excavate and grade the Site.

Prior to any excavation or movement of gravel or other materials from the Wetland Offsetting Site, and during wetland construction, the contractor will implement erosion and sediment control measures along the east edge of Stream 14, as per the Project's EMP, to minimize sediment input to the watercourse and riparian area. The existing gravel surface will be excavated to a depth of approximately 1.5 – 2.5 m to match the elevation of the adjacent Stream 14 streambed, which is expected to remove all introduced gravels. Introduced gravel surface materials will be removed from the site and can be used for lot construction elsewhere on the Property.

The surface of the site will be regraded to mimic swamp topography, which consists of a sequence of hummocks (mounds) and hollows (depressions) of varying dimensions (see Appendix B). The resultant topography should direct water drainage towards Stream 14 by sequencing hollows toward the stream. This will be supported by the creation of a subtle berm (approximately 0.3 – 0.5 m high and 40 m long) along the south edge of the wetland, parallel to the existing footpath so that water flows toward Stream 14 and not south across the footpath.

3. Add soil and woody debris.

Where soils are not adequately established, topsoil will be added to a 200 – 300 mm thickness in a rough or loose finished grade lining the hummocks and hollows. Careful consideration of topsoil requirements will be made prior to purchase. Topsoil should be weed-free and consist of 'premium mix' or organically enriched soil with approximately 75% organic compost and 25% washed sand. Wood debris and pulp will be scattered in depressions and hollows to kickstart organic soil development and logs from the existing log pile will be positioned to create microsite habitats adjacent to the open water features.

4. Plant native species applicable to site conditions.

Plant nursery stock by hand following the General Planting Standards in Appendix B. Plant sedges, rushes, and skunk cabbage within shallow open water areas, wet depressions, or hollows throughout the Wetland Offsetting Site. Plant at least half of the salmonberry stock within the riparian area near Stream 14. Distribute and plant all other tree, shrub, and herb stock throughout the rest of the offset site. Estimated plant densities and layout are provided in Appendix B. Upon completion of earthworks, the planting plan may be updated to suit existing conditions before nursery stock is ordered. In addition, any plant or soil material salvaged from the extension of Forbes Road to Marine Drive that was not used in the restoration and reclamation of the Stream 14 Wetland and Buffer Sites can be used at the Wetland Offsetting Site.

5. Implement site protection measures.

Assess risk of deer browse and identify whether any browse protection should be installed prior to planting. Seek to provide adequate browse protection to achieve 80% conifer survival. Provide browse protection on a minimum of 20% of planted conifers if high browse levels are observed at nearby sites.

Keep the existing footpath but install a low split cedar fence to discourage people and pets from entering the wetland. Installation of signs indicating that the area is a dedicated park for stream and wetland conservation could also help protect the site from disturbance.

Seed native species by hand or handheld spreader along the south edge of the wetland adjacent to the existing footpath (following invasive species removal) to prevent new introductions of invasive species. Use a native seed mixture, such as 100% Native Roadside Riparian seed mix from Premier Pacific Seeds. The seeding rate must be 40–50 kg per hectare (Table 3).

5.3. Schedule, Design Supervision, and Monitoring

Depending on equipment resources, the Wetland Offsetting Site could be excavated, and gravel removed, during clearing activities associated with the extension of Forbes Road to Marine Drive, to make use of any excess salvaged soil and plant materials. Otherwise, the Wetland Offsetting Site should be constructed in late summer of 2024, with initial nursery plugs planted in September to October 2024, followed by planting remaining nursery plugs and container stock in the spring of 2025.

A General Wildlife Permit for salvage will be obtained prior to the start of works, and exclusion fencing for amphibians will be erected between the Offsetting Site and Stream 14 during clearing and wetland construction activities. Daily search and salvage for amphibians will be completed prior to clearing and construction work.

A QEP will supervise all stages of wetland construction design works, including updating the planting plan to suite existing conditions prior to ordering nursery stock, if necessary. A memorandum will be produced by the QEP following wetland construction that describes the methods and results of the initial construction activities to inform effectiveness monitoring (Section 6).

6. EFFECTIVENESS MONITORING AND EVALUATION

This section describes effectiveness monitoring for the Plan, which is intended to verify the recovery of the compensation sites based on the objectives outlined in Section 6.1, and to guide corrective actions to promote the long-term effective performance of the compensatory wetland and riparian habitat to provide conditions and functions similar to unimpacted wetland and riparian habitat on the Property.

The following sections describe the monitoring objectives and approach (Section 6.1), field methods and standards for monitoring (Section 6.2), the timing and frequency of monitoring relative to the timing of habitat restoration/reclamation/construction and site conditions upon monitoring (Section 6.3), when and how adaptive management strategies should be implemented (Section 6.4), and reporting schedule (Section 6.5).

6.1. Monitoring Objectives and Approach

The effectiveness monitoring program is based on the repeated collection of monitoring data over time and the analysis of these data with the objective of evaluating the effectiveness of wetland remediation and construction, including site contouring (for the Wetland Offsetting Site) and revegetation techniques, and adaptively modifying prescriptions based on monitoring results to achieve no overall loss to wetland and riparian buffer functions.

Monitoring methods will follow a qualitative approach to assess the effectiveness of Stream 14 Wetland restoration, Stream 14 Wetland buffer reclamation, and Wetland Offsetting Site construction based on hydrological, water quality and habitat functions, following these objectives:

1. The objective for the Stream 14 Wetland Site is to restore the site with adequate soil and vegetation cover of similar plant species as the unimpacted (intact) Stream 14 Wetland area. The result of the topsoil replacement and planting plan is intended to set the wetland community on a trajectory toward functions comparable to the adjacent Stream 14 Wetland, such that water flow, water quality, and habitat mirror an early successional stage western redcedar - Sitka spruce/skunk cabbage forested swamp community (CWHvh1/13). This wetland swamp community will be enhanced with an area of shallow open water wetland in the northern portion, and a riparian stream community in the southern portion where Stream 14 flows from the northeast to southwest.
2. The objective for the Stream 14 Wetland Buffer Site is to reclaim the site with adequate soil and vegetation cover of similar plant species as the unimpacted (intact) Stream 14 Wetland Buffer area to the east of the intact Stream 14 Wetland. The result of the topsoil replacement and planting plan is intended to set the buffer community on a trajectory toward functions comparable to the intact Stream 14 Wetland Buffer, such that water flow, water quality, and habitat mirror an early successional stage western redcedar – western hemlock/salal forested community (CWHvh1/01). The vegetation cover will reflect local site conditions. For example, the crest of the bedrock outcrop area will naturally be dryer

than the areas between the outcrops, with vegetation communities differing based on these conditions.

3. The objective for the Wetland Offsetting Site is to excavate the compacted gravel and create a wetland swamp with open water features to compensate for the loss of wetlands and wetland riparian buffers that were impacted by Phase 5 development. Organic topsoil will be added and graded to create a depressional area with hummocks and hollows. Vegetation will be replanted using similar plant species as the unimpacted (intact) Stream 14 Wetland Site, including vegetation adapted to shallow open water. The result of the topsoil replacement and planting plan is intended to set the wetland community on a trajectory toward functions comparable to a forested swamp, such that water flow, water quality, and habitat mirror an early successional stage western redcedar - Sitka spruce/skunk cabbage forested swamp community (CWHvh1/13). This wetland swamp community will be enhanced with areas of shallow open water, hummocks, hollows, and riparian vegetation at the southwestern edge adjacent to Stream 14.

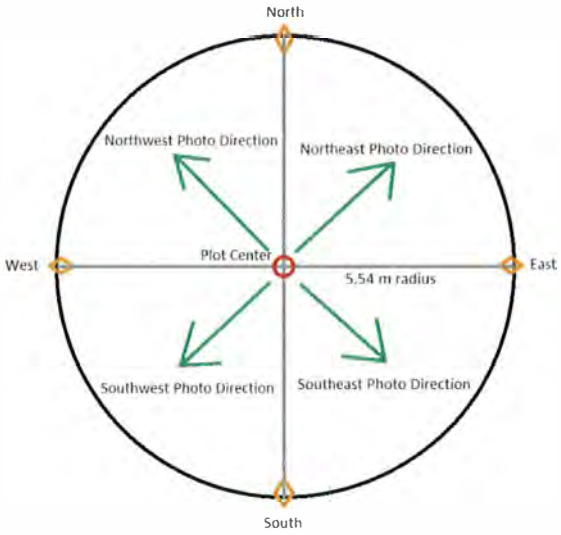
Compensation sites will be monitored by establishing permanent plots to record physical stability and hydraulic function, and revegetation progress over time, and by comparing these to data collected in plots established in adjacent unimpacted (or intact) areas of Stream 14 Wetland and its riparian buffer to the east.

6.2. Field Methods and Standards

Field crews will assess revegetation progress and functions using qualitative assessments according to standards of practice for ecosystem restoration (RIC 1996; Machmer and Steeger 2002; Nelson *et al.* 2023).

Prior to construction and revegetation activities, two permanent plots will be established in each of the three restoration/reclamation/offsetting sites and in reference sites (Intact Stream 14 Wetland and Buffer). Plot data will be recorded prior to and after vegetation planting. Plot locations will be selected to capture the variability of vegetation communities and microsite positions, such as shallow open water, swamp, riparian, and bedrock outcrop. Plots will be 100 m^2 in size with a radius of 5.54 m. Plot centers will be permanently marked with a wooden stake and the perimeter will be marked with temporary bright-coloured flagging tape or pin flags. String will be placed from plot center to the perimeter at each cardinal direction: north, east, south, and west. Within each plot, photos will be taken to capture the vegetation cover and site conditions within each quarter of the plot viewing northeast, southeast, southwest, and northwest (Figure 1).

Figure 1. Permanent plot setup.



At each plot, the following biophysical conditions will be monitored once during each monitoring year, at the same time each year (within one month and under the same conditions, i.e., considering whether the monitoring year is drier or wetter than in previous years of monitoring), recording:

- Vegetation species composition and structure;
- Mortality percent cover;
- Vegetation species percent cover;
- Exposed soil or erosion percent cover;
- Invasive plant species percent cover;
- Deer browse percent cover or rating (none, low, moderate, high);
- Evidence of bank slumping;
- Notes on bird, mammal, or amphibian observations;
- Notes on water flow and water direction (if applicable);
- Measurements of surface water level and water table depth;
- Notes on water quality – visual assessment of sedimentation/water turbidity (none, low, moderate, high); and
- Water pH – quantitative measurement of water acidity or hydrogen ion (H^+) content.

Additional qualitative assessments of the entire site (outside of permanent plots) will also be completed. These assessments will include noting observations of invasive plant species, deer browse, exposed soil or evidence of erosion, areas of significant plant mortality, and incidental observations of birds, small and large mammals, and amphibians.

6.3. Schedule

The timing of recovery within and between the compensation (remediation and offsetting) sites is expected to differ due to the initial level of disturbance. For instance, the northern portions of the Stream 14 Wetland Restoration and Buffer Reclamation Sites have areas of little to no soil remaining and only sparse regenerating vegetation cover since it was initially cleared, such as in the shallow open water and bedrock outcrop zones, whereas the central and southern portions have varying amounts of remaining soil and regenerating patches of vegetation. Stream 14 Wetland and Buffer Sites will only have topsoil added to the existing surface grade, whereas the topography of the Wetland Offsetting Site will be created and completely regraded to represent a depressional swamp with shallow open water features. Monitoring for effectiveness will therefore need to be flexible and adaptable, as described below.

Post-construction effectiveness monitoring will occur during the summer (July – September) in year one (if wetland and riparian habitats are remediated/constructed in spring), and in at least years three, five, and seven after remediation/construction at the sites is completed. Depending on the monitoring results from year one, and/or the timing of remediation/construction works, it may be important to monitor again in year two. For instance, if first year monitoring results show poor planting survival, inadequate water flow/depth, or high rates of invasive plant species, then it will be prudent to add year two monitoring and adaptive management solutions to the schedule to avoid escalating issues. The monitoring schedule must also be adaptive to ensure the restored and constructed wetlands and reclaimed riparian buffers meet or exceed the function and habitat quality of existing unimpacted (intact) wetlands and riparian buffers.

6.4. Success Criteria and Adaptive Management

Corrective (adaptive) management actions will be implemented immediately if the QEP and/or the Ministry advises it is necessary based on monitoring results, i.e., to address any performance criteria that are not trending towards success to meet the compensation objectives. Field data will be analyzed to evaluate whether success criteria have been met. The recommended success criteria for evaluating the effectiveness of compensation habitats are as follows:

- 85% or more of ponds/pools and wetland habitat shows no sign of bank slumping that negatively affects the functionality of the wetland habitat;
- No more than 5% exposed soil;
- Soil thickness remains a minimum of 200 mm and has established vegetation growth;

REFERENCES

BC MOE (British Columbia Ministry of Environment). 2014. Procedures for Mitigating Impacts on Environmental Values (Environmental Mitigation Procedures) Version 1.0. Ecosystems Branch, Environmental Sustainability and Strategic Policy Division. Available online at: https://www2.gov.bc.ca/gov/content/environment/natural-resource-stewardship/laws-policies-standards-guidance/environmental-guidance-and-policy/environmental-mitigation-policy Accessed on January 3, 2024.

EDI (EDI Environmental Dynamics Inc.). 2020. Environmental Management Plan: Weyerhaeuser Lands – Phase 5 Development. Prepared for Weyerhaeuser Company, October 2020.

Machmer, M.M. and C. Steeger. 2002. Effectiveness monitoring guidelines for ecosystem restoration. Report prepared for Habitat Branch, Ministry of Water, Land and Air Protection, Victoria, BC. Available at: https://www.env.gov.bc.ca/fia/documents/rest_effect_mon_guidelines_s.pdf Accessed on January 28, 2024.

Nelson, C.R., J.G. Hallett, A.E. Romero Montoya, A. Andrade, C. Besacier, V. Boerger, K. Bouazza, R. Chazdon, E. Cohen-Shacham, D. Danano, A. Diederichsen, Y. Fernandez, G.D. Gann, E.K. Gonzales, M. Gruca, M.R. Guariguata, V. Gutierrez, B. Hancock, P. Innecken, S.M. Katz, R. McCormick, L.F.D. Moreas, C. Murcia, N. Nagabhatla, D. Pouaty Nzembialela, F.J. Rosado-May, K. Shaw, K. Swiderska, L. Vasseur, R. Venkataraman, B. Walder, Z. Wang, and E.W.A. Weidlich. 2023. Standards of practice to guide ecosystem restoration. A contribution to the United Nations Decade on Ecosystem Restoration 2021-2030. Rome, FAO, Washington, DC, SER & Gland, Switzerland, IUCN CEM.

NWWG (National Wetlands Working Group). 1997. The Canadian Wetland Classification System. Second Edition. Edited by B.G. Warner and C.D.A. Available online at: Canadian Wetland Classification System — Wetland Policy. Accessed on September 21, 2022.

Premier Pacific Seeds. 2020. Reclamation Seed. 100% Native Roadside Riparian Mix. Available online at: https://premierpacificseeds.ca/products/Reclamation-Seed/ Accessed on January 5, 2023.

RIC (Resources Inventory Committee). 1996. Habitat Monitoring Committee. Procedures for environmental monitoring in range and wildlife habitat management. Version 5.0. BC Ministry of Environment, Lands, and Parks; and BC Ministry of Forests, Victoria BC. 225pp.

Weed Control Act. 2011. Weed Control Regulation. Reg. 76/2022. Province of British Columbia. Weed Control Act. Reg. 66/85.

Wright, N., N. Nahirnick, and A. Smith. 2022. District of Ucluelet Wetland Assessment and Remediation Plan. Memo prepared by Ecofish Research Ltd. for EDI Environmental Dynamics Inc. October 20, 2022.

Wright, N., A. Marriner, N. Nahirnick, and A. Smith. 2023. District of Ucluelet Wetland Offsetting Plan – Conceptual Design Brief. Memo prepared by Ecofish Research Ltd. for EDI Environmental Dynamics Inc. June 7, 2023.

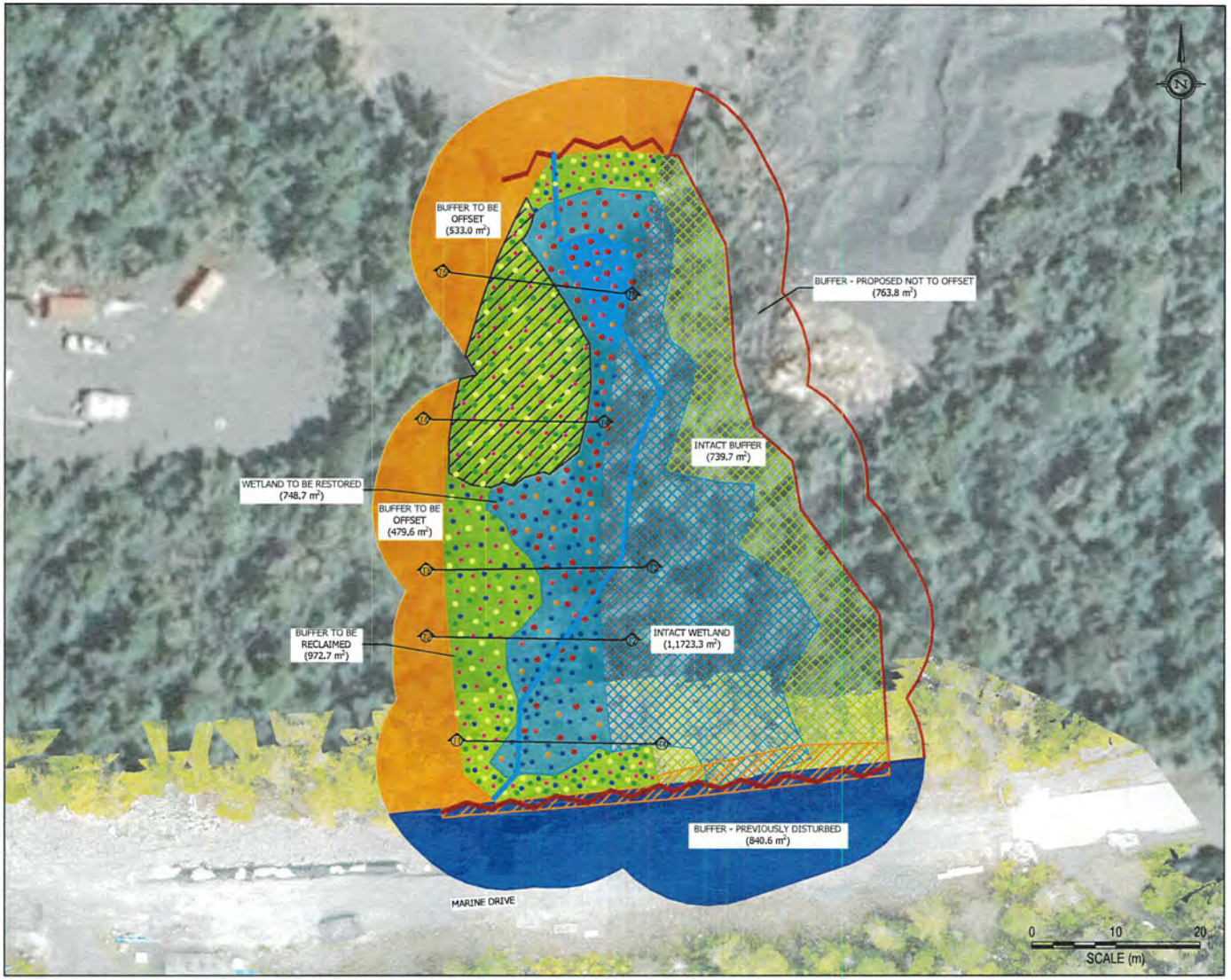
WSA (Province of BC (British Columbia)). 2016. *Water Sustainability Act*. Dated February 29, 2016. Available online at: https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/14015. Accessed on December 13, 2023.

PROJECT MAP

Path: M:\Projects-Active\1494 EDI\MXD\Detailed Plan\1494_EDI_OffsettingPlan_Overview_20240124.mxd

Appendix A. Stream 14 Wetland and Buffer Remediation Design

LIST OF FIGURES



PLAN VIEW
SCALE AS SHOWN

CONCEPT FOR PERMITTING

GENERAL NOTES

1. AERIAL IMAGE CAPTURED ON MARCH 9, 2023.
2. SEE FIGURE 2 FOR THE CROSS SECTION PROFILE OF THE STREAM 14 WETLAND AND BUFFER REMEDIATION SITE.

LEGEND

- OPEN WATER
- INTACT BUFFER
- INTACT WETLAND
- BUFFER TO BE OFFSET
- BUFFER TO BE RECLAIMED
- BUFFER - PREVIOUSLY DISTURBED
- BUFFER - PROPOSED NOT TO OFFSET
- INVASIVE SPECIES REMOVAL AND RESEED
- SPLIT CEDAR FENCE
- ROCK OUTCROP
- SALAL / EVERGREEN HUCKLEBERRY
- SALMONBERRY
- SEDGES
- SKUNK CABBAGE
- RED HUCKLEBERRY
- TREES
- PACIFIC RUSH
- STREAM 14
- SURVEYED TRANSECT

DATE	BY	REVISIONS

DESIGNED BY: N.W./N.N./T.I.	CHECKED BY:
DRAWN BY: P.L.	DATE: JANUARY 26, 2024

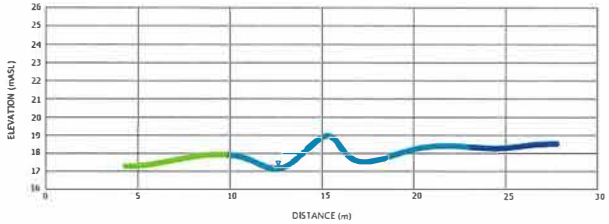
ECOFISH RESEARCH

OCEANWEST PHASE 5 WETLAND OFFSETTING DESIGN

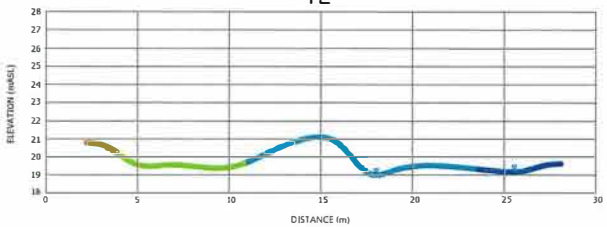
PLAN VIEW

PROJECT No. 1494-02	DRAWING No. FIGURE 1
SCALE: AS SHOWN	SHEET 1 OF 1

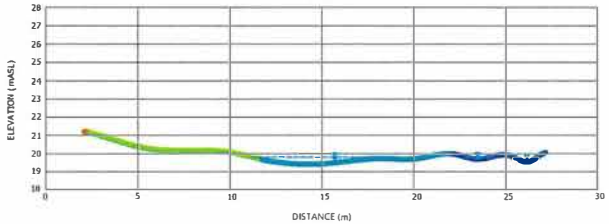
T1



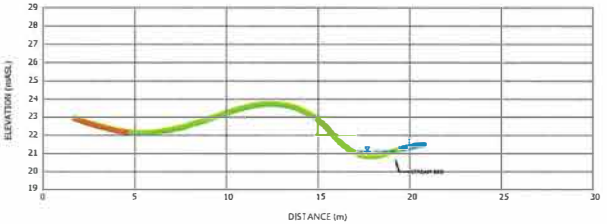
T2



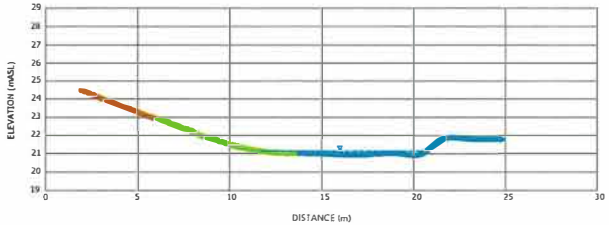
T3



T4



T5



TRANSVERSE PROFILE VIEW

SCALE AS SHOWN

GENERAL NOTES

1. DRAWINGS ARE CONCEPTUAL DRAFTS FOR PERMITTING AND MAY BE UPDATED PRIOR TO CONSTRUCTION.
2. SEE THE FOLLOWING SITE PLANS FOR A DESCRIPTION OF THE DESIGN PRESCRIPTIONS, SUITABLE PLANT SPECIES, AND PLANTING STANDARDS FOR STREAM 14 WETLAND RESTORATION AND STREAM 14 WETLAND BUFFER RECLAMATION.

LEGEND

- BUFFER TO BE OFFSET
- INTACT WETLAND
- WETLAND TO BE RESTORED
- BUFFER TO BE RECLAIMED
- WATER ELEVATION*

*AS SURVEYED ON NOVEMBER 17, 2023

	DATE	BY	REVISIONS
DESIGNED BY:	N.W./N.N./T.I.	CHECKED BY:	
DRAWN BY:	P.L.	DATE	2024-01-26

ECOFISH RESEARCH

OCEANWEST PHASE 5 WETLAND OFFSETTING DESIGN

SURVEYED TRANSECTS

PROJECT No.	1494.02	DRAWING No.	FIGURE 2
SCALE:	AS SHOWN	SHEET	1 OF 1

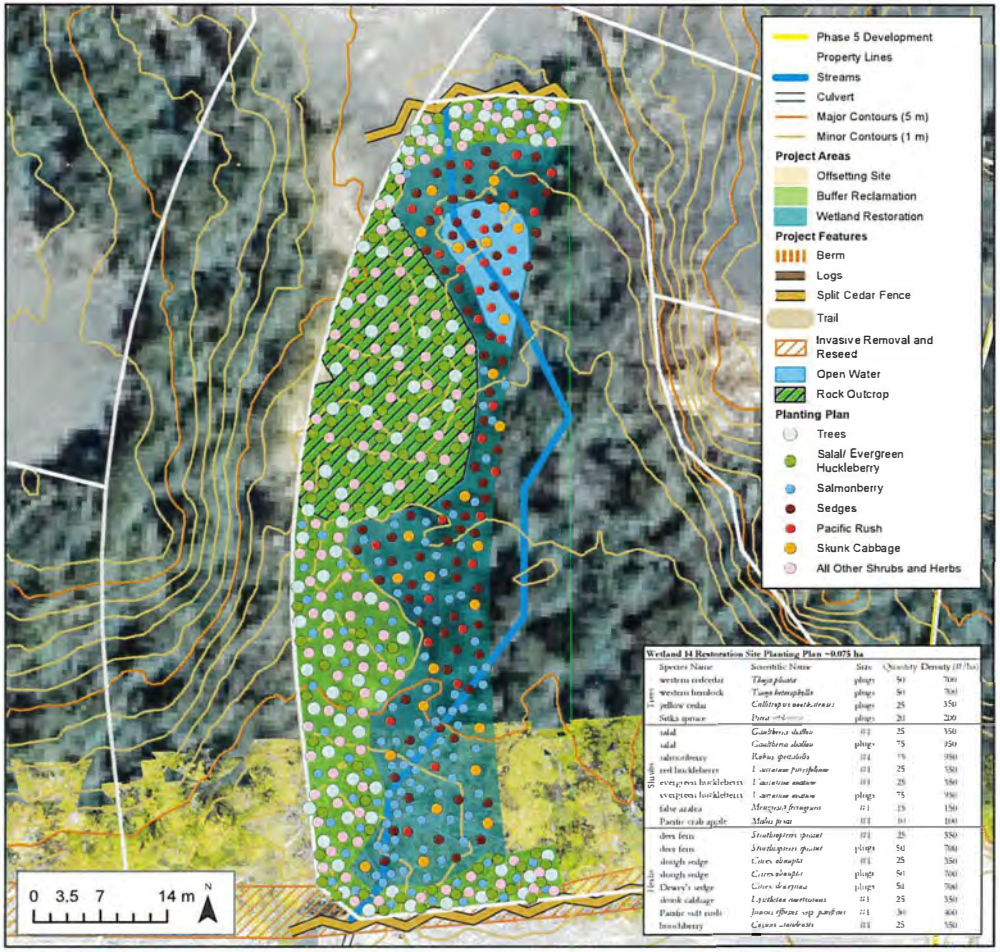
Stream 14 Wetland Restoration Site Plan

Stream 14 Wetland Restoration Site Description

Stream 14 Wetland is a 749 m^2 area lost through vegetation and soil removal. Three general zones, including shallow open water in the northern portion, a shrub and herb-dominated swamp in the central portion, and a shrubby riparian area in the south portion, comprise the Stream 14 Wetland. The shallow open water is approximately 200 m^2, with an open water pool and a sparse cover of common horsetail, slough sedge, Pacific soft rush, and cattail. The shrub and herb-dominated swamp is approximately 250 m^2 with a variety of scattered shrubs, herbs, and mosses, such as evergreen huckleberry, salmonberry, thimbleberry, deer fern, slough sedge, and Pacific soft rush. The shrubby riparian area is approximately 300 m^2, and the vegetation is dominated by a thick cover of salmonberry with patches of evergreen huckleberry and slough sedge. Stream 14 Wetland has areas of developing soil remaining after clearing.

Stream 14 Wetland Restoration Site Prescription

1. Remove invasive plant species. Per the BC Weed Control Regulation, remove any noxious invasive plant species detected at site and dispose at an approved site. Use caution to avoid mixing invasive plant materials with the existing soil. Avoid using chemical pesticides and herbicides for control or management of invasive species (e.g., noxious weeds).
2. Implement erosion and sediment control measures before clearing or moving soil materials along adjacent edges of the wetland restoration site and its buffer to minimize sediment inputs to the restored wetland areas, per the EMP.
3. Retain sections of topsoil, root mats with small trees, shrubs, herbs, mosses, and seed bank when clearing vegetation for construction of Forbes Road, for use in the wetland restoration.
4. Stockpile and/or spread soils, root mats, and vegetation directly to the restoration site where existing soils are less than 25 cm to save costs from importing purchased topsoil. Do not cover existing natural vegetation that has already been established.
5. Establish or verify adequate topsoil depth and restore any eroded/thin-soil areas with a 200 to 300 mm thick layer of topsoil.
6. Manually roughen and loosen the finished grade surface to reduce erosion, establish roots of planted stock, and aid in seed capture for additional natural regeneration.
7. Scatter coarse woody debris from any newly cleared construction areas throughout the restoration site. Verify that logs are greater than 0.2 m in diameter and 5.0 m in length, and the bole of stumps is greater than 0.2 m in diameter.
8. Plant nursery stock by hand with shovels and trowels. See General Planting Standards for further planting guidelines.
9. Plant cattails in the shallow open water area, and sedges, rushes, and skunk cabbage along the edge of the shallow water area and in wet depressions or hollows throughout the rest of the restoration site. Distribute and plant all other tree, shrub, and herb stock throughout the rest of the restoration site.
10. Seed native species by hand or handheld spreader at a seeding rate of 40-50 kg per hectare (one bag is 22.7 kg). Use a native seed mixture, such as 100% Native Roadside Riparian seed mix from Premier Pacific Seeds.
11. Assess the risk of deer browse and identify whether browse protection should be installed before planting. Seek to provide adequate browse protection to achieve 80% conifer survival. Provide browse protection on at least 20% of planted conifers if high browse levels are observed at nearby sites.



Wetland 14 Restoration Site Planting Plan ~0.075 ha

	Species Name	Scientific Name	Size	Quantity	Density (#/ha)
Trees	western redcedar	*Thuja plicata*	plugs	50	700
	western hemlock	*Tsuga heterophylla*	plugs	50	700
	yellow cedar	*Callitropsis nootkatensis*	plugs	25	350
	Sitka spruce	*Picea sitchensis*	plugs	20	200
Shrubs	salal	*Gaultheria shallon*	#1	25	350
	salal	*Gaultheria shallon*	plugs	75	350
	salmonberry	*Rubus spectabilis*	#1	75	350
	red huckleberry	*Vaccinium parvifolium*	#1	25	350
	evergreen huckleberry	*Vaccinium ovatum*	#1	25	350
	evergreen huckleberry	*Vaccinium ovatum*	plugs	75	350
	false azalea	*Menziesia ferruginea*	#1	15	150
	Pacific crab apple	*Malus fusca*	#1	10	100
Herbs	deer fern	*Struthiopteris spicant*	#1	25	350
	deer fern	*Struthiopteris spicant*	plugs	50	700
	slough sedge	*Carex obnupta*	#1	25	350
	slough sedge	*Carex obnupta*	plugs	50	700
	Dewey's sedge	*Carex deweyana*	plugs	50	700
	skunk cabbage	*Lysichiton americanus*	#1	25	350
	Pacific wild ginger	*Asarum caudatum* var. *pacificum*	#1	30	400
	bunchberry	*Cornus canadensis*	#1	25	350

General Planting Standards

1. Refer to recommendations from the Project's Environmental Management Plan (EDI 2020).
2. Ensure that plants are from a certified nursery stock, free of disease and invasive species, and have provenance records where available.
3. Confirm that plants meet and/or exceed British Columbia Nursery and Landscape Association Standards.
4. Arrange for planting to be overseen by a qualified professional (QP) who will determine appropriate locations of trees and shrubs based on spacing requirements and onsite conditions.
5. Apply native grass seed to the planting areas adjacent to existing road edges or pedestrian pathways by hand or manual spreader.
6. Plant during the dormant season in the spring (March to April) or fall (September to October), depending on local conditions during the year of planting.
7. Install up to 3 plants per square meter (minimum 1 plant per square meter) using a mix of trees, shrubs, and herbs as directed by planting plans or by the QP.
8. Use associative plant groupings, such as planting clusters of two to three of the same plants close together, interspersed with different species.
9. Plant on a rainy or overcast day. If it is sunny and dry, ensure the roots are not exposed to sunlight and are always kept moist.
10. Dig holes one and a half times larger in diameter than the root ball and several inches deeper. Backfill with enough loose topsoil so that the top of the root ball is even or slightly below ground level. Add a handful of bonemeal and mix into the loose soil.
11. Place the nursery stock in the hole, disturbing the roots as little as possible. Backfill with topsoil and water thoroughly. Prune off any damaged branches.
12. Apply water to planted areas on an as-needed basis during periods of dry weather to facilitate growth from June to September. Consider if additional watering and/or replanting is required to establish vigorous vegetative cover throughout the first year of growth.
13. Maintain planting machinery per the Project's EMP and any subsequent management plans created for the Project. Check that all equipment arriving at site is clean and free of soil and plant material to prevent the potential for the spread of invasive plant species.

Monitoring

1. Monitor plantings for survival and invasive species presence one growing season following planting, then every two years for five years (e.g., at year 1, year 3, year 5, and year 7 after planting). The schedule may be adapted according to revegetation success.
2. Aim to achieve a target survival of 80% of the planted stock. Natural revegetation may compensate for planted stock as long as the total density of native shrub, tree, and fern species is equivalent to at least 80% of their density when planting.
3. Monitor plantings for adequate amounts of water during extensive dry periods.
4. Monitor water quality (e.g., turbidity and pH) per the EMP for one growing season following planting, then every two years for five years (e.g., at year 1, year 3, year 5, and year 7) after planting.
5. Provide recommendations on the potential removal of invasive species or additional plantings, if necessary, to promote the regeneration of native ecological communities.

Figure 3

ECOFISH RESEARCH

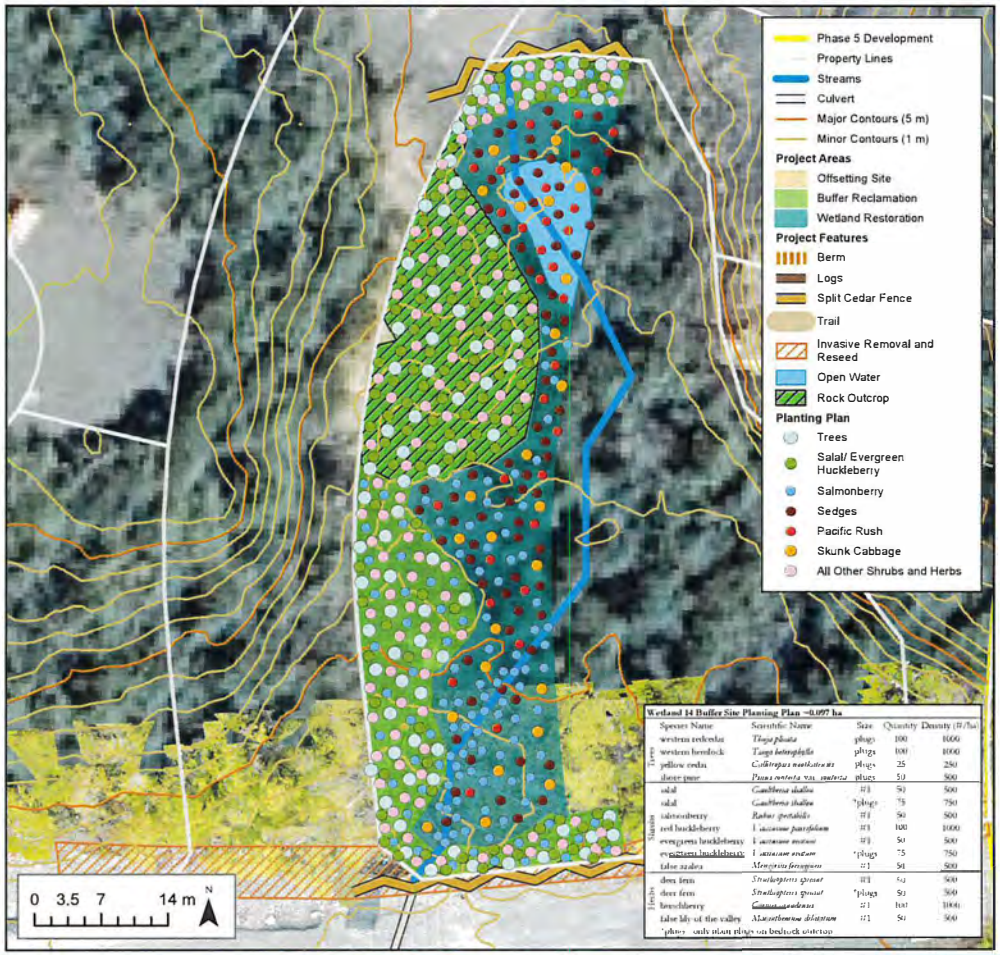
Stream 14 Wetland Buffer Site Plan

Stream 14 Wetland Buffer Site Description

Stream 14 Wetland Buffer is a 973 m^2 area lost through vegetation and soil removal. Two general zones, including a bedrock outcrop in the northern portion and a shrub and herb community in the central and southern portions, comprise the Stream 14 Wetland Buffer. The bedrock outcrop has patches of remaining soil with sparsely distributed herbs and mosses, such as deer fern and juniper haircap moss. A variety of shrubs, herbs, and mosses, such as evergreen huckleberry, salmonberry, thimbleberry, deer fern, juniper haircap moss, and crane's-bill moss, comprise the shrub and herb community. The shrub and herb community has areas of adequate soil development remaining.

Stream 14 Wetland Buffer Site Prescription

1. Remove invasive plant species. Per the BC Weed Control Regulation, remove any noxious invasive plant species detected at site and dispose at an approved site. Use caution to avoid mixing invasive plant materials with the existing soil. Avoid using chemical pesticides and herbicides for control or management of invasive species (e.g., noxious weeds).
2. Implement erosion and sediment control measures before clearing or moving soil materials along the edge of the riparian buffer reclamation site to minimize sediment inputs, per the EMP.
3. Retain topsoil, root mats with small trees, shrubs, herbs, mosses, and seed bank for use in reclamation site when clearing vegetation west of Stream 14 Wetland and its riparian buffer.
4. Stockpile or spread soils directly to the bedrock outcrops and where existing soils are less than 25 cm to save costs from importing purchased topsoil.
5. Spread a 100 to 300 mm thick layer of topsoil over the bedrock outcrops and wetland buffer where natural vegetation has not been established.
6. Manually roughen and loosen the finished grade surface to reduce erosion, establish roots of planted stock, and aid in seed capture for additional natural regeneration.
7. Scatter coarse woody debris from any adjacent cleared areas throughout the Buffer Reclamation Site. Verify that logs are greater than 0.2 m in diameter and 5.0 m in length, and the bole of stumps is greater than 0.2 m in diameter.
8. Plant nursery stock by hand with shovels and trowels. See General Planting Standards for further planting guidelines.
9. Plant nursery stock plugs on bedrock outcrops where soils may be thinner. Plant sedges, rushes, and skunk cabbage in wet depressions or hollows throughout the rest of the reclamation site. Distribute and plant all other tree, shrub, and herb stock throughout the rest of the reclamation site.
10. Seed native species by hand or handheld spreader at a seeding rate of 40-50 kg per hectare (one bag is 22.7 kg), especially at intersection points with Marine Drive and Forbes Road. Use a native seed mixture, such as 100% Native Roadside Riparian seed mix from Premier Pacific Seeds.
11. Assess the risk of deer browse and identify whether any browse protection should be installed before planting. Seek to provide adequate browse protection to achieve 80% conifer survival. Provide browse protection on at least 20% of planted conifers if high browse levels are observed at nearby sites.



General Planting Standards

1. Refer to recommendations from the Project's Environmental Management Plan (EDI 2020).
2. Ensure that plants are from a certified nursery stock, free of disease and invasive species, and have provenance records where available.
3. Confirm that plants meet and/or exceed British Columbia Nursery and Landscape Association Standards.
4. Arrange for planting to be overseen by a qualified professional (QP) who will determine appropriate locations of trees and shrubs based on spacing requirements and onsite conditions.
5. Apply native grass seed to the planting areas adjacent to existing road edges or pedestrian pathways by hand or manual spreader.
6. Plant during the dormant season in the spring (March to April) or fall (September to October), depending on local conditions during the year of planting.
7. Install up to 3 plants per square meter (minimum 1 plant per square meter) using a mix of trees, shrubs, and herbs as directed by planting plans or by the QP.
8. Use associative plant groupings, such as planting clusters of two to three of the same plants close together, interspersed with different species.
9. Plant on a rainy or overcast day. If it is sunny and dry, ensure the roots are not exposed to sunlight and are always kept moist.
10. Dig holes one and a half times larger in diameter than the root ball and several inches deeper. Backfill with enough loose topsoil so that the top of the root ball is even or slightly below ground level. Add a handful of bonemeal and mix into the loose soil.
11. Place the nursery stock in the hole, disturbing the roots as little as possible. Backfill with topsoil and water thoroughly. Prune off any damaged branches.
12. Apply water to planted areas on an as-needed basis during periods of dry weather to facilitate growth from June to September. Consider if additional watering and/or replanting is required to establish vigorous vegetative cover throughout the first year of growth.
13. Maintain planting machinery per the Project's EMP and any subsequent management plans created for the Project. Check that all equipment arriving at site is clean and free of soil and plant material to prevent the potential for the spread of invasive plant species.

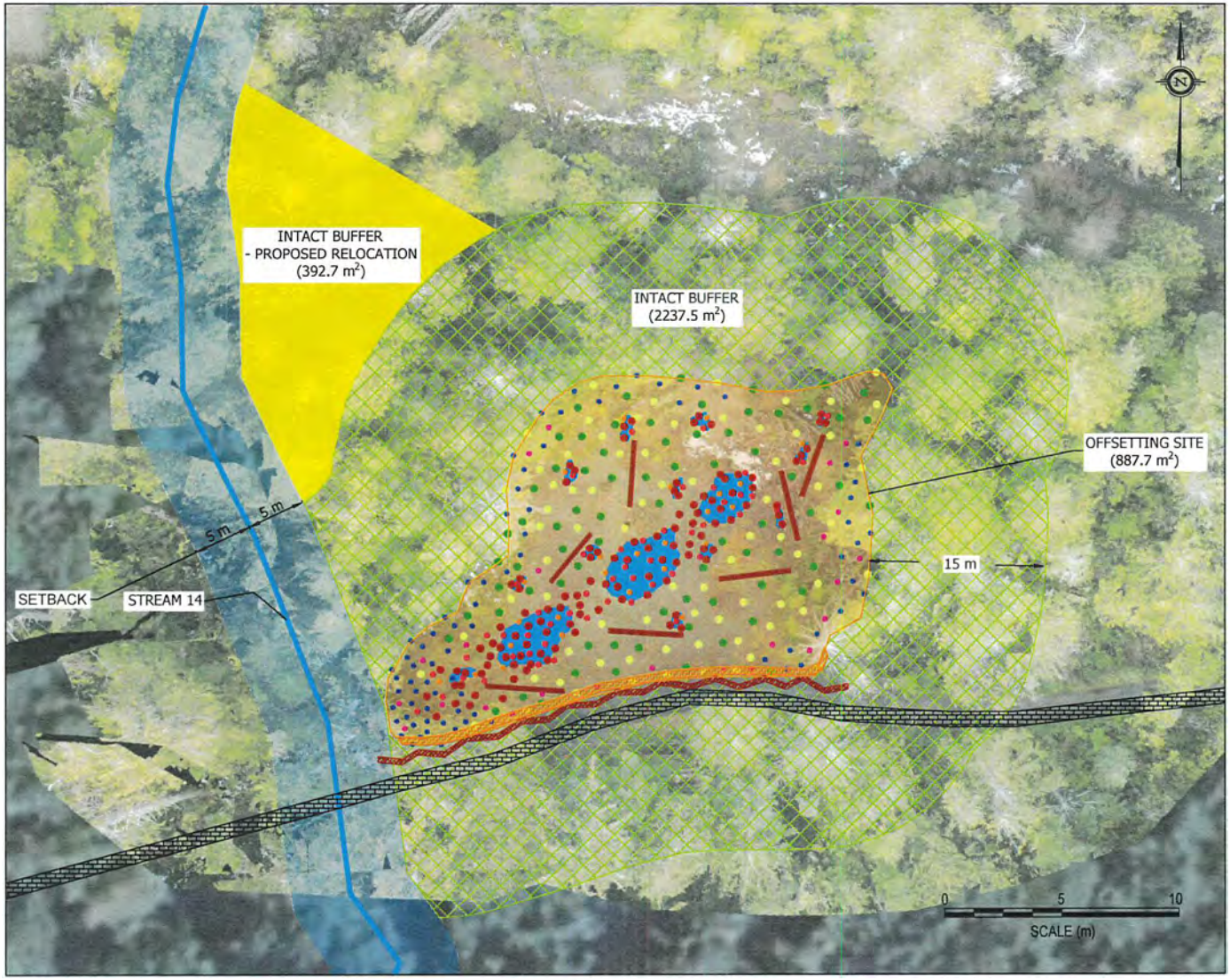
Monitoring

1. Monitor plantings for survival and invasive species presence one growing season following planting, then every two years for five years (e.g., at year 1, year 3, year 5, and year 7 after planting). The schedule may be adapted according to revegetation success.
2. Aim to achieve a target survival of 80% of the planted stock. Natural revegetation may compensate for planted stock as long as the total density of native shrub, tree, and fern species is equivalent to at least 80% of their density when planting.
3. Monitor plantings for adequate amounts of water during extensive dry periods.
4. Monitor water quality (e.g., turbidity and pH) per the EMP for one growing season following planting, then every two years for five years (e.g., at year 1, year 3, year 5, and year 7) after planting.
5. Provide recommendations on the potential removal of invasive species or additional plantings, if necessary, to promote the regeneration of native ecological communities.

Figure 4

ECOFISH RESEARCH

LIST OF FIGURES



PLAN VIEW
SCALE AS SHOWN

CONCEPT FOR PERMITTING

GENERAL NOTES

1. AERIAL IMAGE CAPTURED ON MARCH 9, 2023.
2. AREA OF OFFSETTING (CONSTRUCTED) WETLAND = ~887.7 m^2.
3. SEE FIGURE 2 FOR THE LONGITUDINAL PROFILE OF THE WETLAND OFFSETTING SITE.

LEGEND

- CONSTRUCTED WETLAND
- OPEN WATER
- INTACT BUFFER
- INTACT BUFFER - PROPOSED RELOCATION
- EXISTING SETBACKS
- EXISTING TRAIL
- SPLIT CEDAR FENCE
- BERM
- LOGS
- SALAL / EVERGREEN HUCKLEBERRY
- SALMONBERRY
- SEDGES
- SKUNK CABBAGE
- RED HUCKLEBERRY
- TREES
- PACIFIC RUSH
- STREAM 14

DATE	BY	REVISIONS

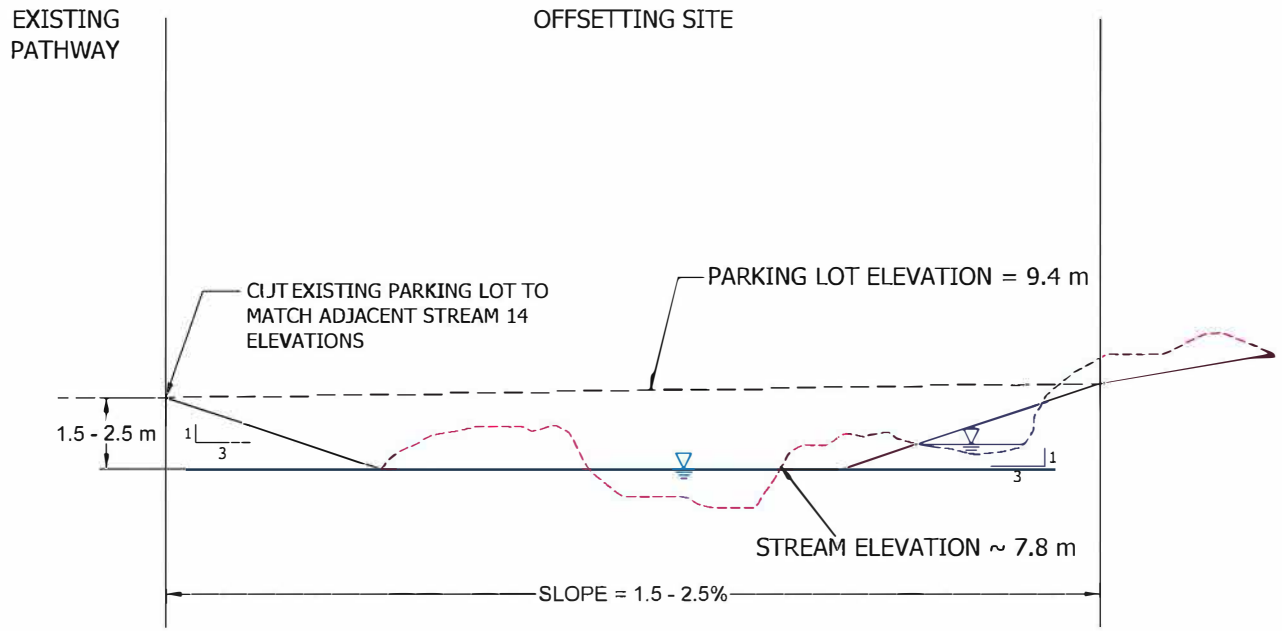
DESIGNED BY:	N.W./N.N./T.I.	CHECKED BY:	
DRAWN BY:	P.L.	DATE	JANUARY 26, 2024

ECOFISH RESEARCH

OCEANWEST PHASE 5 WETLAND OFFSETTING DESIGN

PLAN VIEW

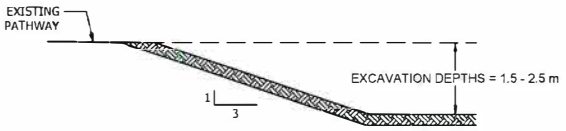
PROJECT No.	1494-02	DRAWING No.	FIGURE 1
SCALE:	AS SHOWN	SHEET	1 OF 1



LONGITUDINAL PROFILE
N.T.S.

LEGEND

- WATER
- EXISTING GROUND
- FINISH GROUND
- HUMMOCKS/HOLLOWS



OFFSETTING SITE: EXISTING PATHWAY EXCAVATION DETAIL
N.T.S.

CONCEPT FOR PERMITTING

GENERAL NOTES

1. DRAWINGS ARE CONCEPTUAL DRAFTS FOR PERMITTING AND MAY BE UPDATED PRIOR TO CONSTRUCTION.
2. SEE THE FOLLOWING SITE PLAN FOR A DESCRIPTION OF THE DESIGN PRESCRIPTIONS, SUITABLE PLANT SPECIES, AND PLANTING STANDARDS FOR THE WETLAND OFFSETTING SITE.

DATE	BY	REVISIONS

DESIGNED BY	N.W./A.M.	CHECKED BY	A.M.
DRAWN BY	S.D.J./P.L.	DATE	APRIL 11, 2023

ECOFISH RESEARCH

OCEANWEST PHASE 5 WETLAND OFFSETTING DESIGN

LONGITUDINAL PROFILE AND DETAILS

PROJECT No.	1494-02	DRAWING No.	FIGURE 2
SCALE	AS SHOWN	SHEET	1 OF 1

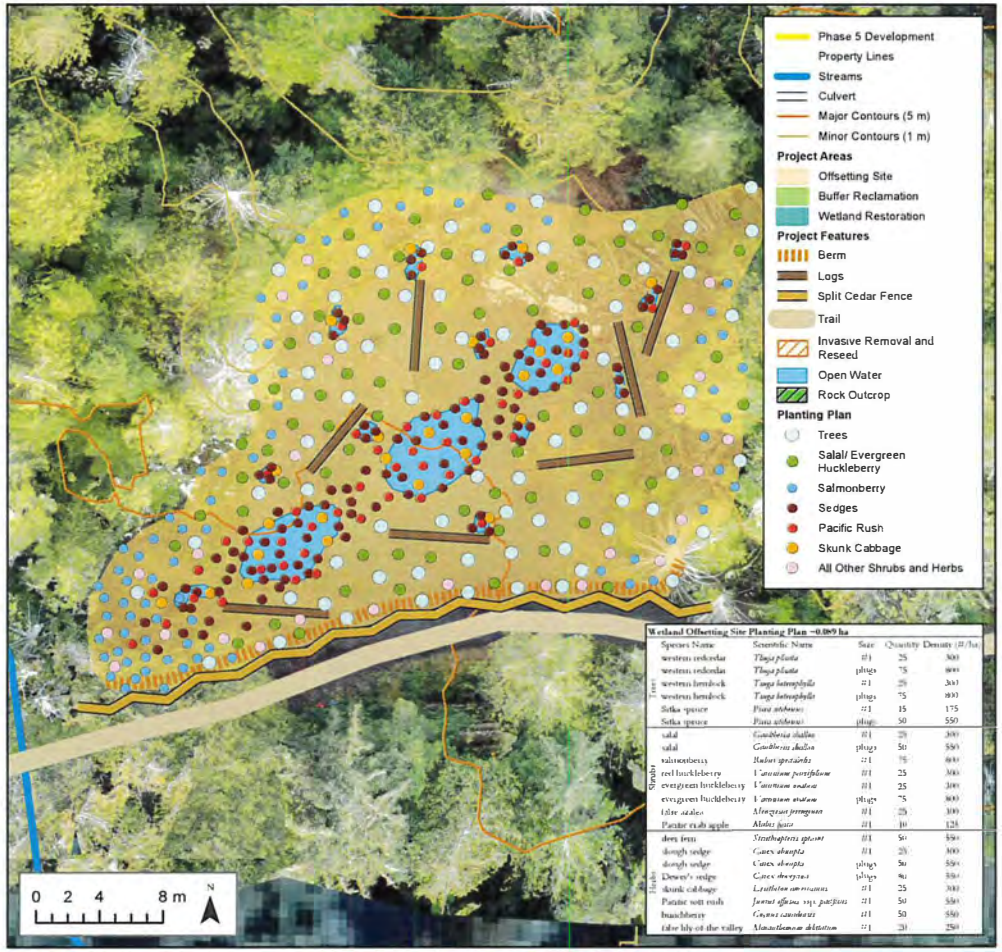
Wetland Offsetting Site Plan

Wetland Offsetting Site Description

The Offsetting Site is an 888 m² disturbed area that will be used to offset the loss of wetland and wetland riparian functions through the creation of a swamp wetland. The Offsetting Site is currently a gravel clearing, possibly a previous parking lot, located adjacent to and east of Stream 14, and adjacent to and north of a closed (but utilized) footpath that is on private (Weyerhaeuser) property that borders an intact, blue-listed terrestrial ecosystem (CWHxhl/15) to the south. The Wetland Offsetting Site has sparse vegetation, mostly grasses and weeds growing out of the gravel. The edges of the gravel area had regenerated western redcedar, Sitka spruce, salal, salmonberry, evergreen huckleberry, deer fern, common horsetail, and Pacific soft rush. Two soil pits were manually excavated in November 2023, reaching about 30 cm in depth and showing a persistent gravel layer. There is a large pile of wood pulp at the northwest end of the site and a large pile of wood debris and logs at the northeast end of the site. A portion of this material is anticipated to contribute to the organic content and large wood for wetland construction.

Wetland Offsetting Site Prescription

1. Remove invasive plant species. Per the BC Weed Control Regulation, remove any noxious invasive plant species detected at site and dispose at an approved site. Use caution to avoid mixing invasive plant materials with the existing soil. Avoid using chemical pesticides and herbicides for control or management of invasive species (e.g., noxious weeds).
2. Excavate the existing gravel parking lot surface to match the elevation of the adjacent stream bed. Verify that excavation depths are approximately 1.5 to 2.5 m. Remove excess surface material from site.
3. Regrade areas to mimic swamp topography, which is a sequence of hummocks (mounds) and hollows (depressions) of varying dimensions; the resultant topography should direct water drainage towards Stream 14 by sequencing hollows toward the creek. Keep existing natural vegetation, if practical. Create a subtle berm (approximately 0.3 to 0.5 m) along the south edge of the wetland, parallel to the existing path so that water flows toward Stream 14 and not south across the path. Keep the existing path and install a low split cedar fence to discourage people and pets from entering the wetland. Use existing swamps (intact portions of Stream 14 Wetland) as a reference site.
4. Spread a 100 to 300 mm thick layer of topsoil over the Wetland Offsetting Site where natural vegetation has not been established.
5. Manually roughen and loosen the finished grade surface to reduce erosion, establish roots of planted stock, and aid in seed capture for additional natural regeneration.
6. Scatter coarse woody debris throughout the site. Verify that logs are greater than 0.2 m in diameter and 5.0 m in length, and the bole of stumps is greater than 0.2 m in diameter. The stockpiled logs in the northeastern corner of the site may be used.
8. Plant nursery stock by hand with shovels and trowels. See General Planting Standards for further planting guidelines.
9. Plant sedges, rushes, and skunk cabbage within shallow open water areas, wet depressions, or hollows throughout the Wetland Offsetting Site. Plant at least half of the salmonberry stock within the riparian area near Stream 14. Distribute and plant all other tree, shrub, and herb stock throughout the rest of the site.
10. Seed native species by hand or handheld spreader at a seeding rate of 40-50 kg per hectare (one bag is 22.7 kg), especially at intersection points with the pedestrian pathway. Use a native seed mixture, such as 100% Native Roadside Riparian seed mix from Premier Pacific Seeds.
11. Assess the risk of deer browse and identify whether any browse protection should be installed before planting. Seek to provide adequate browse protection to achieve 80% conifer survival. Provide browse protection on at least 20% of planted conifers if high browse levels are observed at nearby sites.



Wetland Offsetting Site Planting Plan ~0.09 ha

	Species Name	Scientific Name	Size	Quantity	Density (#/ha)
Trees	western redcedar	*Thuja plicata*	#1	25	300
	western redcedar	*Thuja plicata*	plugs	75	900
	western hemlock	*Tsuga heterophylla*	#1	25	300
	western hemlock	*Tsuga heterophylla*	plugs	75	900
	Sitka spruce	*Picea sitchensis*	#1	15	175
	Sitka spruce	*Picea sitchensis*	plugs	50	550
Shrubs	salal	*Gaultheria shallon*	#1	25	300
	salal	*Gaultheria shallon*	plugs	50	550
	salmonberry	*Rubus spectabilis*	#1	75	900
	red huckleberry	*Vaccinium parvifolium*	#1	25	300
	evergreen huckleberry	*Vaccinium ovalifolium*	#1	25	300
	evergreen huckleberry	*Vaccinium ovatum*	plugs	75	900
	false azalea	*Menziesia ferruginea*	#1	25	300
	Pacific crab apple	*Malus fusca*	#1	10	125
Herbs	deer fern	*Struthiopteris spicant*	#1	50	550
	slough sedge	*Carex obnupta*	#1	25	300
	slough sedge	*Carex obnupta*	plugs	50	550
	Dewey's sedge	*Carex deweyana*	plugs	90	550
	skunk cabbage	*Lysichiton americanus*	#1	25	300
	Pacific soft rush	*Juncus effusus* ssp. *pacificus*	#1	50	550
	bunchberry	*Cornus canadensis*	#1	50	550
	false lily-of-the-valley	*Maianthemum dilatatum*	#1	20	250

General Planting Standards

1. Refer to recommendations from the Project's Environmental Management Plan (EDI 2020).
2. Ensure that plants are from a certified nursery stock, free of disease and invasive species, and have provenance records where available.
3. Confirm that plants meet and/or exceed British Columbia Nursery and Landscape Association Standards.
4. Arrange for planting to be overseen by a qualified professional (QP) who will determine appropriate locations of trees and shrubs based on spacing requirements and onsite conditions.
5. Apply native grass seed to the planting areas adjacent to existing road edges or pedestrian pathways by hand or manual spreader.
6. Plant during the dormant season in the spring (March to April) or fall (September to October), depending on local conditions during the year of planting.
7. Install up to 3 plants per square meter (minimum 1 plant per square meter) using a mix of trees, shrubs, and herbs as directed by planting plans or by the QP.
8. Use associative plant groupings, such as planting clusters of two to three of the same plants close together, interspersed with different species.
9. Plant on a rainy or overcast day. If it is sunny and dry, ensure the roots are not exposed to sunlight and are always kept moist.
10. Dig holes one and a half times larger in diameter than the root ball and several inches deeper. Backfill with enough loose topsoil so that the top of the root ball is even or slightly below ground level. Add a handful of bonemeal and mix into the loose soil.
11. Place the nursery stock in the hole, disturbing the roots as little as possible. Backfill with topsoil and water thoroughly. Prune off any damaged branches.
12. Apply water to planted areas on an as-needed basis during periods of dry weather to facilitate growth from June to September. Consider if additional watering and/or replanting is required to establish vigorous vegetative cover throughout the first year of growth.
13. Maintain planting machinery per the Project's EMP and any subsequent management plans created for the Project. Check that all equipment arriving at site is clean and free of soil and plant material to prevent the potential for the spread of invasive plant species.

Monitoring

1. Monitor plantings for survival and invasive species presence one growing season following planting, then every two years for five years (e.g., at year 1, year 3, year 5, and year 7 after planting). The schedule may be adapted according to revegetation success.
2. Aim to achieve a target survival of 80% of the planted stock. Natural revegetation may compensate for planted stock as long as the total density of native shrub, tree, and fern species is equivalent to at least 80% of their density when planting.
3. Monitor plantings for adequate amounts of water during extensive dry periods.
4. Monitor water quality (e.g., turbidity and pH) per the EMP for one growing season following planting, then every two years for five years (e.g., at year 1, year 3, year 5, and year 7) after planting.
5. Provide recommendations on the potential removal of invasive species or additional plantings, if necessary, to promote the regeneration of native ecological communities.

Figure 3

ECOFISH RESEARCH