Wentworth Lands Project
West Vancouver, BC

SCHEDULE E

Environmental Assessment

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PGL ENVIRONMENTAL CONSULTANTS

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List of Acronyms

BEC	**-**	Biogeoclimatic Ecosystem Classification
BMP	-	best management practices
CDC	-	Conservation Data Centre
CEMP	-	Construction Environmental Management Plan
CWHxm1	-	Very Dry Maritime subzone of the Coastal Western Hemlock Zone
DWV	-	District of West Vancouver
EM	-	Environmental Monitor
IPMP	-	Invasive Plant Management Plan
MFLNRO	-	BC Ministry of Forests, Lands, and Natural Resource Operations
MOE	-	BC Ministry of Environment
PGL	-	PGL Environmental Consultants
PWS	**-**	Pacific water shrew
SAR	-	species at risk
VC	-	Valued Component

1.0 INTRODUCTION

PGL Environmental Consultants (PGL) is pleased to provide our environmental assessment report for the proposed Wentworth Lands project (Figures 1 and 2). The proposed development includes subdivision of the property into the minimum size allowable (10,000 square feet or 929m^2) and construction of infrastructure and 31 single-family homes.

This report provides an overview environmental assessment of the proposed project. It is intended to support Wentworth Lands' Subdivision and Development Permit (DP) applications to the District of West Vancouver (DWV).

The report includes:

- A summary of environmental regulations and policies;
- An inventory of and comments on the quality of vegetation, fish, and wildlife habitat within the project area [i.e., Valued Components (VCs)];
- The potential occurrence of ecosystems or species at risk (SAR);
- An assessment of potential project impacts on the above-mentioned environmental VCs, and proposed mitigation; and
- An environmental management plan with measures to minimize potential project impacts.

2.0 PROJECT SETTING AND SCOPE

The site is located 200 meters above the Upper Levels Highway in West Vancouver, just west of the 22nd Street on-ramp to the west-bound lanes of Highway 1 (Figure 1). The project consists of four lots totaling approximately nine acres (Figure 2). The land is relatively isolated and is bounded to the north by five single-family residences in the Marr Creek Court subdivision, to the east by the Marr Creek ravine, to the south by four single-family residences and to the west by Collingwood School. Marr Creek runs from north to south immediately east of Lot C and along the eastern edge of Lot 6. The creek flows at the bottom of a significant, well-established ravine through a series of pools and small falls. The grade of the creek is consistent at approximately 20%. The site slopes steadily to the south at a relatively consistent grade of 20% (or 11°). The lower end of the property is at an elevation of 210 meters, while the upper end of the property is at 260 meters.

The majority of the site has been cleared approximately three years ago, with some pockets of mature and intermediate trees remaining. Skidder roads traverse all four lots. There are no buildings currently on the land and there is no evidence that any buildings have existed in the past. A frisbee golf course was set-up onsite that is used by the students in the adjacent Collingwood School.

A Stage 1 Preliminary Site Investigation report concluded the land is 'low risk' for the presence of contamination with a recommendation that no further investigation is considered warranted.

2.1 Scope of Construction

The proposed works include:

- The installation of stormwater, sewage, water, and electrical services;
- Construction of roads and trails; and
- Construction of single-family homes.

The scope of this assessment includes potential impacts to VCs within the entire site, including the Marr Creek ravine and riparian setback areas.

A copy of the CREUS Engineering Ltd. (CREUS) February 2016 Wentworth Lands Subdivision Plan Preliminary Design Brief will be provided in a separate submission entitled: "Wentworth Lands Subdivision & Development Permit Application Supplementary Information Package."

3.0 REGULATORY OVERVIEW

A variety of federal, provincial, and municipal regulations/policies are applicable to the project. A summary of relevant regulations and policies is provided in the following sections.

3.1 Federal Regulations

Federal regulations potentially applicable to the project are summarized below.

3.1.1 Fisheries Act

The federal *Fisheries Act* awards decision-making authority to Fisheries and Oceans Canada for the conservation and protection and fish and fish habitat. The *Fisheries Act* defines what is considered fish habitat, and prohibits the harmful alteration, disruption, or destruction of fish habitat (Section 35).

In addition, Section 36 of the *Fisheries Act* prohibits the release of deleterious substances of any type in water frequented by fish or areas where the substance may enter water frequented by fish. Deleterious substances are those that may degrade water quality to the point that it is harmful to fish and/or fish habitat (e.g., sediment, hydrocarbons, and metals).

3.1.2 Migratory Bird Convention Act

Most migrating birds found in Canada are protected under the federal *Migratory Birds Convention Act*. This act fulfills the terms of the Migratory Birds Convention between Canada and the United States, and provides Environment Canada the authority to pass and enforce regulations to protect those species of migratory birds which are included in the convention.

The Canadian government developed the Migratory Birds Regulations under the *Migratory Birds Convention Act*, which strictly prohibits the harming of migratory birds and the disturbance or destruction of their nests and eggs. Inadvertent destruction or "incidental take" is considered illegal; therefore, sufficient due diligence is required by development projects to ensure compliance.

3.1.3 Species at Risk Act

The Canadian *Species at Risk Act* protects both wildlife and plant species federally identified on the "List of Wildlife Species at Risk." The *Species at Risk Act* also protects critical habitat of those species. For due diligence and to ensure compliance with the *Species at Risk Act*, environmental assessments must always consider impacts on listed species and their critical habitat or residence.

3.2 Provincial Regulations

Provincial regulations potentially applicable to the project are summarized below.

3.2.1 Local Government Act

Primary responsibility for the administration of the *Local Government Act* currently lies with the province's Ministry of Community, Sport, and Cultural Development. The *Local Government Act* establishes the legal framework for regional districts, and contains other important local government authorities, such as elections, community planning, and land use. Under the *Local Government Act* a municipality is provided the ability to designate specific Development Permit Areas in its Official Community Plan for one or more of a variety of initiatives, including environmental protection.

3.2.2 Fish Protection Act

The *Fish Protection Act* provides legislative authority for water managers in BC. This act requires that regulators consider impacts on fish and fish habitat before approving new licences, amendments to licences, or issuing approvals for work in or near streams. The act focuses on four major objectives, which include:

- Ensuring sufficient water for fish;
- Protecting and restoring fish habitat;
- Improving riparian protection and enhancement; and
- Strengthening local government powers in environmental planning.

3.2.3 Riparian Areas Regulation

The provincial Riparian Areas Regulation was enacted under Section 12 of the *Fish Protection Act* in July 2004. It requires that local governments protect riparian areas during residential, commercial, and industrial development by ensuring that a Qualified Environmental Professional conducts a science-based assessment of the proposed activities. The purpose of the Riparian Areas Regulation is to protect the features, functions and conditions of a riparian environment that are essential to the preservation of healthy aquatic systems.

The criteria for determining streamside protection and enhancement area categories and the corresponding setbacks set out by the District's Development Procedures Bylaw No. 3984, 1996 (Amendment Bylaws: 4188- 1999, 4434-2005 & 4806-2014) Schedule C are consistent with the Provincial Riparian Areas Regulation.

3.2.4 Water Act

The provincial *Water Act* governs any proposed works in or about a stream, and ensures protection of fish and wildlife habitat. This act applies to the quantity and quality of water on which fish or wildlife depends directly or indirectly in order to carry out their life processes. The definition of a stream under this act is a "natural watercourse or source of water supply, whether usually containing water or not, and a lake, river, creek, spring, ravine, swamp, and gulch."

Under Section 9 of the *Water Act*, proponents are only allowed to make changes in and about a stream under an Approval from the Water Stewardship Division of the BC Ministry of Forests, Lands, and Natural Resource Operations (MFLNRO), which may involve referrals to other regulatory agencies such as Fisheries and Oceans Canada. If the proposed works do not involve the diversion of water, are anticipated to be completed in a short period of time, and are expected to have minimal impacts on the environment, then only a Notification is required. More significant works in and about a stream will require an Approval, which typically requires a 140-day review

period. We anticipate that the proposed Wentworth project works will not require MFLNRO Notification or Approval under the *Water Act*.

3.2.5 Wildlife Act

The provincial *Wildlife Act* protects most vertebrate animals from direct harm or harassment except as allowed by regulation (i.e., through hunting or trapping). A provision of the *Wildlife Act* can provide additional legal protection to designated Red- and Blue-listed species and their critical habitat. Red- and Blue-listed species are those listed by the BC Ministry of Environment (MOE) Conservation Data Centre (CDC) as endangered or threatened in British Columbia.

Section 34 of the *Wildlife Act* is commonly applicable to activities typical of a development project (i.e., land clearing, demolition, etc.). This section protects all bird species and their eggs from possession, molestation, injury, or destruction. The nests of eagles, peregrine falcons, gyrfalcons, ospreys, herons, and burrowing owls are specifically protected year-round regardless of bird activity, and nests of all other birds are protected when they are active (i.e., when occupied by a bird or egg).

3.2.6 Heritage Conservation Act

The intention of the provincial *Heritage Conservation Act* is to encourage the protection and conservation of heritage property in BC. The *Heritage Conservation Act* is currently administered by the MFLNRO and supported by the Archaeology Branch. The *Heritage Conservation Act* prohibits damage to designated heritage or archaeological sites, as well as those that qualify for automatic protection regardless of previous recognition. Values that qualify for automatic protection include:

- Burial places with historical or archaeological value;
- First Nations rock paintings or carvings with historic or archaeological value; and
- Any heritage object from a site that contains artifacts or other evidence of human habitation or use before 1846, including culturally modified trees.

The *Heritage Conservation Act* established a provincial registry to record sites that are recognized as having heritage/archaeological value. Once designated and recorded by the province, a permit is required from the Minister before the value can be damaged, altered, or removed.

3.3 Municipal Policies and Regulations

District regulations that may be applicable to the project are summarized below.

3.3.1 Development Permit Areas

Under the provincial *Local Government Act*, the District has the ability to designate Development Permit Areas in its Official Community Plan. These area designations may be intended to meet one or more objective, including the protection of the natural environment, protection of development from hazardous conditions, protection of farm lands; revitalization of an area, and establishment of standard form and character of residential, commercial, industrial, and multi-family development projects.

3.3.2 Upper Lands Planning Policies

Planning policies for the Upper Lands are long term and comprehensive, and intended to encourage exemplary planning initiatives for future changes within the area. The higher elevations have a long history of recreation use for hiking, skiing, and more recently, biking. Most of this area (72% of the Upper Lands or more than 4,500 acres), is above 1200 feet in elevation and will be preserved as Limited Use and Recreation. Of the remaining approximate 1760 acres below the 1200 foot elevation, approximately 1600 acres (excluding existing parks) are shown as "Future Neighbourhoods Area" to be planned for future development over the coming decades. Development will be guided by the Plan's policies that provide Council with the tools to:

- Realize defined community building principles,
- Protect environmentally sensitive areas,
- Create desirable neighbourhoods; and
- Acquire lands required to meet long-term community needs at minimal cost to existing and future residents.

The policies are intended to ensure that West Vancouver will continue to be a community of neighbourhoods, will focus on its environmental assets and will insist on the creation of great places to live. The Future Neighbourhoods Area, representing 7% of the total land area in the District, will be primarily comprised of homes, parks and protected creeks and greenbelts. It is expected that up to 60% of the dwelling units would be single-family homes, a proportion that currently exists in West Vancouver generally, but would differ from the single family emphasis above the highway of some years ago. The Plan describes the anticipated pace and expected areas of development for the next 10 to 20 years and provides that this projection will be reviewed regularly.\

3.3.3 Tree Policy

The objective of District's Tree Policy is to:

- Ensure the safety of the residents of West Vancouver (hazard trees);
- Establish a process following an application to work on non-hazardous trees; and
- Establish the process for residents applying to cut privately owned trees in the following areas:
  - Environmentally sensitive areas (areas governed by senior government Regulations or Acts);
  - Caulfeild Land Use Contract Area
  - Other tree covenant areas

In addition to this, under the DWV's Upper Lands Guidelines for DP Area Designations, proponents are required to "create a tree management scheme that identifies the means and extent of tree retention or replacement required to maintain a park-like character, ensure proper drainage and minimize view impacts". These guidelines are applicable to the Wentworth project and are being adhered to through the implementation of a site-specific Tree Management Plan (Appendix 1).

4.0 ENVIRONMENTAL SETTING

VCs are identified as any part of the environment that is considered important by the proponent, scientists, and government involved in the assessment process. Although the Canadian Environmental Assessment Agency regulations are not directly applicable to the project, the VC approach is a widely accepted method for impact assessment. In order to identify the VCs occurring in the project area, PGL biologists conducted overview field surveys (fish, wildlife and vegetation assessments), riparian assessments and tree surveys during 2015/2016. With respect to the

project area, VCs to be assessed include fish and fish habitat, vegetation, wildlife habitat, and the potential existence or use by SAR.

4.1 Valued Component: Fish and Fish Habitat

The reach of Marr Creek associated with the site is characterized by a steep ravine with slopes approximated at 70°. Riparian margins from the top of the bank are confined by residential development (east bank) and clearing (west bank – the site). The forest within the ravine is mature, primarily coniferous, with some mixed deciduous trees of red alder (*Alnus rubra*) and big leaf maple (*Acer macrophyllum*). Coarse woody debris is abundant (approximately 10% ground cover) with additional standing snags and stumps that represent additional wildlife habitat. The understory of the riparian habitat was productive with abundant occurrences of sword fern (*Polystichum munitum*) and lesser amounts of red huckleberry (*Vaccinium parvifolium*), salmonberry (*Rubus spectabilis*), salal (*Gaultheria shallon*), and red elderberry (*Sambucus racemosa*).

Fish habitat in Marr Creek is limited by the gradient. Field measurements ranged between 17 to 24° stream gradient. Cutthroat trout (*Oncorhynchus clarkii*) have been identified in Marr Creek from First Lake at Hollyburn Lodge down to the mouth of the creek (Pacific Streamkeepers Federation, 2003). The step-pool morphology could provide adequate pools for rearing cutthroat, but the gradient in the mid-watershed section of the creek likely has limited use. No other fish species have been identified in Marr Creek; however, the Pacific Streamkeepers Federation (2003) reported releases of coho salmon (*Oncorhynchus kisutch*) fry annually between 2000 and 2002.

4.2 Valued Component: Vegetation

The site is predominantly located in the Dry Maritime Subzone of the Coastal Western Hemlock (CWHdm) Biogeoclimatic Ecosystem Classification (BEC) Zone. A small portion of the southwest corner of the site falls within the Eastern Variant of the Very Dry Maritime Subzone of the Coastal Western Hemlock (CWHxm1) BEC Zone. Zonal, undisturbed plant communities (i.e., those influenced by moderate soil moisture and nutrient regimes) are dominated by Douglas-fir (*Pseudotsuga menziesii*), western redcedar (*Thuja plicata*), and western hemlock (*Tsuga heterophylla*). Shrub and herb layers typically include prominent populations of salal and red huckleberry. Typical moss species include step moss (*Hylocomium splendens*), Oregon beaked moss (*Kindbergia oregana*), lanky moss (*Rhytidiadelphus loreus*), and flat moss (*Plagiothecium undulatum*).

Zonal sites in the CWHXm1 Variant are characterized by plant communities also dominated by Douglas-fir and western hemlock, with lesser amounts of western redcedar. Understorey composition typically contains salal, dull Oregon-grape, and red huckleberry with step moss and Oregon beaked moss.

Given the dominance of the CWHdm Subzone throughout the majority of the site, we have used this BEC classification to characterize the site.

As mentioned, the ravine associated with Marr Creek is characterized by a mature forest stand dominated by conifers typical of the CWHdm. The remainder of the property has been mostly cleared, with pockets of retained trees, as well as areas of younger regenerating trees. A number of invasive plant species occurred throughout the cleared portion, with a few invasive species observed in the riparian corridor. The majority of the proposed development site is disturbed and is removed from the natural ecosystems that once occurred here.

A total of six polygons were differentiated onsite that exhibited different plant compositions (Figure 3). The field reconnaissance survey was used to record dominant plant species occurring within each of the polygons and, where possible, assess the ecosystems likely associated with that particular portion of the site. Observations are summarized below.

Polygon A

Polygon A occurs on the majority of the onsite portion of the study area (i.e., proposed development lands). The vegetation characteristics in Polygon A include a selectively cleared forest stand dominated by Douglas-fir and western redcedar, with lesser components of bigleaf maple (*Acer macrophyllum*) and western hemlock. A number of wildlife trees were observed throughout Polygon A.

The understorey is heavily disturbed by previous clearing/grubbing activities and the application of wood-chip mulch. Where shrub, herb, and fern species do occur, they are characterized by a mix of native and invasive species. Native species observed in Polygon A included sword fern (*Polystichum munitum*), salal (*Gaultheria shallon*), bracken fern (*Pteridium aquilinum*), red huckleberry (*Vaccinium parvifolium*), trailing blackberry (*Rubus ursinus*), red raspberry (*Rubus idaeus*), salmonberry (*Rubus spectabilis*), beaked hazelnut (*Corylus cornuta*), and young red alder (*Alnus rubra*). Invasive species occurring in Polygon A included Himalayan blackberry (*Rubus armeniacus*), English ivy (*Hedera helix*), English holly (*Ilex aquifolium*), common foxglove (*Digitalis purpurea*), Scotch broom (*Cytisus scoparius*), bull thistle (*Cirsium vulgare*), and butterfly bush (*Buddleja davidii*).

Although the plant community composition significantly differs from what would be expected in a less-disturbed environment, we have estimated site series (anticipated late seral or climax plant community) based on our overview field observations. Site series believed to dominate Polygon A include[1]:

- CWHdm-01: western hemlock – flat moss (Blue-listed); and
- CWHdm-06: western hemlock – western redcedar – deer fern (Red-listed).

Polygon B

Polygon B represents a vegetated portion of the site in the north end (Figure 3) that is more severely disturbed than Polygon A. There are notably fewer trees occurring in Polygon B. Species composition includes notably higher components of early successional species such as red alder and bracken fern. A few Douglas-fir, western redcedar, and western hemlock trees did occur in sporadic locations.

The shrub and herb species are considerably more abundant in Polygon B relative to Polygon A. In portions of Polygon B the coverage is approaching 100%. There is also a higher element of

[1] Red-listed ecosystems are endangered or threatened in BC; Blue-listed ecosystems are consider of special concern in BC.

invasive species including Scotch broom, Himalayan blackberry, butterfly bush, and common foxglove. The occurrence of Scotch broom increases further north in the polygon as it leads into Polygon C. Native species occurring in Polygon B include salmonberry, red raspberry, and red elderberry (*Sambucus racemosa*).

Although heavily disturbed and invaded, Polygon B is capable of supporting a mixed ecosystems of CWHdm-01 and CWHdm-06, similar to Polygon A.

Polygon C

Polygon C occurs on the very northern edge of the site within the developable portion of the study area (Figure 3). This area is dominated by a primarily monoculture stand of Scotch broom. This invasive species appears to be well-established and out-competing the native species and preventing them from establishing.

Polygon D

Polygon D occurs along the upper and mid-slope of the Marr Creek ravine along the eastern portion of the study area (Figure 3). This polygon is characterized by an intact forest ecosystem with little to no recent disturbance activity. A small, low-impact trail has been constructed through this polygon, primarily running across or just below the top of the bank. The forest stand is dominated by Douglas-fir and western redcedar with a number of mature trees occurring throughout. Red alder was also present in the codominant and intermediate layers, as well as notable occurrences of standing dead or wildlife trees.

The understorey is moderately developed with roughly 30–40% coverage. Sword fern is the dominant species, with lesser components of red huckleberry and dull Oregon-grape (*Mahonia nervosa*), and salal. Minor occurrences of invasive English ivy and English holly were observed throughout.

Based on our field observations, we estimate that the dominant site series occurring in Polygon D was CWHdm-06, with lesser components of zonal CWHdm-01.

Polygon E

Polygon E is represented by the lower slope at the toe of the Marr Creek ravine adjacent to the proposed development parcel (Figure 3). Given the topographical positioning, this area is inherently wetter and richer than the upland portions of the study area, and indicator plant species observed confirmed this. As with Polygon D, Polygon E is characterized by an intact forest ecosystem with little evidence of recent disturbance activities. The forest stand is dominated by western redcedar with lesser components of Douglas-fir, and even less western hemlock and red alder. A few occurrences of western yew (*Taxus brevifolia*) were also observed in the intermediate/suppressed forest layer.

The understorey is well-developed with significant occurrences of swordfern and salmonberry. Moderate occurrences of trailing blackberry and salal were also observed, as well as red elderberry, red huckleberry and stink currant (*Ribes bracteosum*). Lesser components of western mountain-ash (*Sorbus scopulina*) and spiny wood fern (*Dryopteris expansa*) were also present. Although sporadic, invasive species occurrences were observed included English holly and policeman's helmet (*Impatiens glandulifera*).

Based on our field observations, we estimate that the dominant site series occurring in Polygon E was Blue-listed CWHdm-05 (western redcedar – swordfern, dry Maritime), with lesser components of CWHdm-06.

Polygon F

Polygon F represents the severely disturbed, predominantly unvegetated areas within the boundaries of the proposed development parcel. These areas are characterized by cleared and grubbed corridors that appeared to be used frequently for recreational activities (e.g., frisbee golf course). The ground is covered by a thick layer of wood chip mulch that is inhibiting vegetation recovery.

4.3 Valued Component: Wildlife Habitat

Habitat suitability was assessed during the site reconnaissance. Incidental observations made during the recon included black bear scat in two locations of the cleared portion of the site, as well as a common garter snake along the upper slope of the Marr Creek ravine. The following sections summarize particular assessments for focal species groups and specific species of conservation concern.

Birds

Evidence of woodpecker use within the Marr Creek ravine habitat was abundant, including pileated woodpecker feeding cavities. A northern flicker was also heard in the vicinity. Songbirds were present throughout the ravine, most notably black-capped chickadee. Peeling bark from decaying trees also provides excellent nesting habitat for brown creeper, a species that was observed in the upper cleared portion of the site. The majority of songbirds were seen or heard around the cleared areas, where vegetation was more open and shrubs were more plentiful. Songbirds present in the clearings and edge habitat included black-capped chickadee, spotted towhee, northern flicker (pair observed investigating a nest cavity on a hydro pole on the right-of-way), brown creeper, Anna's hummingbird, varied thrush, American robin, and northwestern crow.

Bats

Suitable bat habitat occurs throughout the Marr Creek riparian corridor and within portions of the development site where mature tree stands were retained. Many standing conifer snags have peeling and loose bark which provides suitable roosting habitat for bats, including Keen's myotis (*Myotis keenii*), a provincially blue-listed species. Several other bat species (not provincially listed) are also found in the Lower Mainland and roost within dead and dying trees, such as those occurring onsite. These species could include the big brown bat (*Eptesicus fuscus*), silver-haired bat (*Lasionycteris noctivagans*), hoary bat (*Lasiurus cinereus*), Californis myotis (*Myotis californicus*), long-eared myotis (*myotis evotis*), little brown myotis (*Myotis lucifugus*), long-legged myotis (*Myotis volans*), and Yuma myotis (*Myotis yumanensis*) (Community Bat Projects of BC, 2014).

Pacific Water Shrew

Pacific water shrew (PWS) (Sorex bendirii) habitat suitability modelling was conducted at three transects within the Marr Creek corridor adjacent to the site. Habitat suitability modelling is assessed using the SHIM-based habitat rating system described in Craig, 2006. This method combines upland habitat characteristics, including riparian structural stage, shrub density, and the level of disturbance. Watercourse characteristics include bankfull width and depth, and stream gradient, in addition to a qualifier for the level of disturbance. Together the upland habitat and stream suitability combine to provide an overall habitat suitability rating.

Each of the three transects along Marr Creek indicated an overall habitat suitability rating of high (out of high, moderate, low or nil) for PWS. The ravine habitat on both banks of Marr Creek was classified as natural mixed mature forest, with 34–66% shrub density. The creek was classified as natural with a gradient under 45 degrees, bankfull width between 5 and 10 meters, and bankfull depth less than 2 meters. Large woody debris was abundant within the channel, which is an important element in PWS habitat.

While suitable habitat for PWS is limited to the Marr Creek ravine, the area is large enough to potentially support PWS. However, the lower portions of Marr Creek are fragmented, culverted, channelized, and highly developed, with limited to no riparian values. The riparian habitat associated with middle reaches of Marr Creek, in which the site is located, is mostly intact but is bisected by a major road and the Trans-Canada Highway. Land upslope of the creek and outside of the ravine has been developed by residential properties restricting much of the riparian habitat values to the ravine itself. Upper reaches of Marr Creek and watershed tributaries lie within Cypress Provincial Park. The riparian environment here is dominated by undisturbed forest habitat, with the exception of ski trails and associated culverts.

Coastal Tailed Frog

Coastal tailed frog habitat within the Marr Creek ravine is good. The section of Marr Creek within the Wentworth Project site is mid-watershed. The creek is a fast-flowing mountain stream within a mature forest, and has step-pool stream morphology, which are all ideal habitat characteristics for coastal tailed frog. A previous study in 2011 captured coastal tailed frog tadpoles within the Wentworth Project site (Schmidt, 2011). Further upstream an adult coastal tailed frog was also captured as a part of the same study.

4.4 Valued Component: Species and Ecosystems at Risk

British Columbia's CDC collects and disseminates information on plants, animals, and ecosystems (ecological communities) at risk in BC. A search of the CDC was completed to generate a list of both federally- and provincially-listed species at risk occurring in the regional project area with potential to occur on the site. A list of ecological communities at risk in BC was also generated from the CDC to identify those with potential to occur on the site either historically or in the future.

Animals, plants and ecological communities of conservation concern potentially occurring in or within close proximity to the study area are listed in Tables 1 through 3, respectively. The lists provided are comprehensive, based on searches using general, regional criteria; however, species whose range occurs outside of the project area and/or that prefer habitat conditions not likely provided by the site are identified.

The CDC Internet Mapping Service was also used to identify previously recorded known occurrences of species and ecosystems at risk on or within 1km of the study area. The CDC does not show any known unmasked occurrences of species or ecosystems either on or adjacent to the study area.

However, a masked occurrence polygon does overlap the study area. Information regarding masked SAR occurrences is secure and is not readily available to the general public. To obtain further information about this occurrence (e.g., species, population, nest/den locations, etc.), the proponent and their representatives (i.e., Qualified Environmental Professional) must consult with the CDC and enter into a confidentiality agreement. In future planning stages, this information may be needed to ensure that appropriate mitigation is implemented to avoid or minimize potential adverse effects through the design, construction, and use or operation of the development.

5.0 IMPACT ASSESSMENT

The following section assesses the impacts of the proposed Wentworth project.

5.1 Valued Ecosystem Component: Fish Habitat

The following sections assess potential impacts to fish and fish habitat from the proposed Wentworth project. The focus of this assessment will be fish habitat represented by the Marr Creek watercourse and its associated riparian zone, as well as downstream receiving environments such as Burrard Inlet.

5.1.1 Potential Impacts

The potential impacts of construction near riparian zones on fish habitat include:

- Loss or degradation of riparian habitat through clearing or construction activities immediately adjacent to the riparian zone; and
- Degradation of water quantity and quality.

5.1.1.1 Loss or Degradation of Riparian Habitat

Heavy machinery clearing the site and operating immediately adjacent to riparian zones could directly impact tree and shrub vegetation and their root structures.

5.1.1.2 Degradation of Water Quantity and Quality

Clearing and ground disturbances required for the project will likely result in exposed soil through excavation and stockpiling activities. Water management challenges in excavations may also occur during construction. As a result, erosion may occur during heavy-rain events and initiate sediment transport to downstream watercourses. The release of sediment-laden water into Marr Creek, both directly or indirectly, would negatively affect water quality and could result in a violation of the federal *Fisheries Act* under Section 36.

Accidental spills and leakages of other deleterious substances (i.e., fuel, oil/grease, paint, concrete wash water, etc.) from construction activities and equipment may negatively impact water quality if allowed to enter watercourses directly or indirectly. Such releases could negatively impact water quality, result in significant impacts to fish populations in downstream fish-bearing habitats (i.e., Burrard Inlet), and result in a violation of the federal *Fisheries Act*.

Stormwater generated from the completed development may impact water quantity and introduce contaminants from road runoff and impervious areas to receiving waters.

5.1.2 Mitigation and Management

The following section identifies avoidance, mitigation, and management strategies proposed to address the potential impacts to fish and fish habitat identified above.

5.1.2.1 Loss of Riparian Habitat

The primary strategy to avoid loss of riparian habitat is through avoidance. Prior to commencement of construction:

- The riparian zone will be clearly identified and fenced off, with adequate area provided to protect tree root structures; and
- A qualified environmental monitor will meet with the owner and construction crew to ensure they understand the importance of staying clear of the riparian zone.

Based on the measures provided above, it is not anticipated that the Marr Creek riparian zone will be affected by the development of the Wentworth site.

5.1.2.2 Degradation of Water Quantity and Quality

A project-specific Construction Environmental Management Plan (CEMP) will be prepared prior to the commencement of construction works. The CEMP will provide guidance on best practices to mitigate potential impacts to water quality during construction. In addition, standard soil erosion and sedimentation control best management practices (BMPs) should be implemented to ensure compliance with federal, provincial, and municipal regulations.

Detailed spill prevention and emergency response procedures will also be required from the contractor for the project. These procedures will list all spill emergency response materials and equipment to be available onsite for use in the event of a spill. Information will also be provided to all contractors onsite to emphasize the importance of implementing diligent BMPs and spill response programs.

To ensure compliance with the proposed mitigation measures, an Environmental Monitor (EM) will be employed during construction activities to ensure proper implementation of the CEMP, sediment and erosion control practices, spill response plans, and other environmental BMPs. The EM will also provide an ongoing assessment of potential impacts to aquatic environments and/or their associated riparian habitats, and ensure that all contractors adhere to environmental mitigation measures, applicable guidelines, and BMPs. Regular summary reports will be prepared by the EM and submitted to the developer and the District, as required.

If a release of deleterious substances does occur (i.e., through accidental spills and/or leakage), a post-emergency response soil and water quality sampling program will be implemented to assess the extent and severity of contamination to surrounding riparian and aquatic habitats. If deemed necessary, a remedial action plan will be prepared and implemented by qualified professionals.

The drainage and landscaping concepts will be integrated to ensure a sustainable integrated approach to stormwater management and landscaping. A rain infiltration system will be designed to regulate the discharge of stormwater runoff and contaminants from the roadway and impervious areas. In addition, rain gardens and biofiltration swales will promote water conservation and provide additional green space for wildlife. The thickness of water absorbent topsoil in the rain gardens and boulevard swales will promote the infiltration of stormwater runoff and treatment of contaminants.

The stormwater management plan to be prepared by CREUS will maintain pre- and post-development flows within District requirements and ensure that the quantity and quality of flows do not adversely affect receiving waters. The CREUS plan will adhere to Fisheries and Oceans Canada Urban Stormwater Guidelines for the Protection of Fish and Fish Habitat.

Based on the design and mitigation measures described above (along with the fact that existing site topography slopes away from the Marr Creek ravine) and adherence to BMPs and CREUS' stormwater management plan, negative effects to water quantity and quality are not anticipated.

5.2 Valued Ecosystem Component: Vegetation

The following sections assess potential impacts to vegetation within the Wentworth project area. Given the historical disturbance on the site, vegetation values are generally restricted to the riparian environment immediately adjacent to the Marr Creek ravine.

5.2.1 Potential Impacts

Potential impacts to vegetation and ecosystems include:

- Loss of trees;
- Loss of herb and shrub plant communities; and
- Introduction/promotion of invasive plant populations.

5.2.1.1 Loss of Trees

Although partially cleared, a number of trees exist throughout the site and immediately adjacent to the property. In order to facilitate development, clearing will be required.

5.2.1.2 Loss of Herb/Shrub Plant Communities

The shrub and herb plant communities within the project area will be removed or disturbed through the construction process.

5.2.1.3 Introduction/Promotion of Invasive Plant Populations

Existing invasive plant populations occur throughout the site and within the Marr Creek ravine and riparian corridor. If mismanaged and/or allowed to propagate uncontrolled, invasive plants can dominate an ecosystem significantly impacting the values within. Invasive populations can gradually decrease species diversity in an ecosystem, which affects the quality of both plant and wildlife habitat. If allowed to occur, these impacts would be considered significant.

5.2.2 Mitigation and Management

The following sections identify avoidance, mitigation, and management strategies proposed to address the potential impacts to vegetation and ecosystems previously identified.

5.2.2.1 Loss of Trees

As per the DWV's Upper Lands Guidelines for DP Area Designations, a Tree Management Plan (Appendix 1) was prepared for the Wentworth project. The plan identifies the means by which tree retention and replacement will be determined to maintain a park-like character, ensure proper drainage and minimize view impacts. Implementation of the Tree Management Plan includes a tree inventory and assessment as well as the preparation of a tree retention, removal and replacement plan.

The tree inventory completed by an ISA Certified Arborist was conducted to meet industry best practice standards. The inventory study area included all four parcels of the Wentworth project, roughly 5m into adjacent properties, and roughly 5m into the adjacent riparian setback of Marr Creek. General tree characteristics were recorded (e.g., species, diameter at breast height, height, and general health/structure) for all trees measuring ≥30cm diameter at breast height. These trees were also numerically tagged. All inventoried trees will be surveyed by a qualified land surveyor team.

A Level 2 Basic Assessment was completed including a general, visual assessment of tree health and inspection of each inventoried tree for notable defects and/or potential risks. The risk assessment was based on existing conditions and land use, but also considered known development proposals and anticipated construction activities.

Based on the inventory and assessment, a Tree Retention and Removal Plan will be prepared that will include recommended protection measures (i.e., optimal root protection zones, critical root protection zones, and specifications for tree protection fencing) for those trees suitable for retention. The plan will identify the means and extent of tree retention and trees recommended for removal. The report will specify protection measures for the riparian corridor, as well as tree replacement strategies. The objective of the report will be to meet DWV DP guidelines and adequately mitigate potential impacts.

5.2.2.2 Loss of Herb/Shrub Plant Communities

The impacts to herb and shrub plant communities on the site will be permanent/temporary. It is our opinion that the temporary disturbance to the existing vegetation in this area will be offset by the new native planting components of the stormwater management plan biofiltration swales and onsite landscaping.

5.2.2.3 Introduction/Promotion of Invasive Plant Populations

Invasive plant species, by their nature, thrive in disturbed environments. These species are extremely opportunistic and will quickly inhabit disturbed sites if not managed. Typical characteristics of an invasive species include rapid growth, ability to withstand extreme environments, ability to carry out both sexual and asexual reproduction, prolific seed production, efficient seed dispersal, and long seed dormancy.

The presence of invasive plant populations onsite and within the Marr Creek ravine and setback presents a variety of challenges for management strategies. Existing plants represent vectors for establishment in disturbed and/or previously un-invaded areas through seed dispersal, existing seed banks within the soil, or invasive plants and plant parts left behind or transported into work areas.

It is recommended that an Invasive Plant Management Plan (IPMP) be prepared to address existing invasive plant populations in undeveloped areas (e.g., Marr Creek riparian corridor). The IPMP would outline site-specific management strategies for existing species, reduce risks associated with existing populations, and work to enhance values within retained habitats. The IPMP should also include a monitoring and maintenance component to improve success.

In addition to the IPMP, standard invasive plant BMPs will be summarized in the project CEMP. For example, machines that may be used for construction activities elsewhere onsite in and around designated natural areas will be clean and free of invasive plants and plant parts, and/or soil potentially containing invasive plants or plant parts. Clearing and grubbing activities will not stockpile debris within close proximity to the Marr Creek setback area, and both organic debris and contaminated soils (i.e., potentially containing invasive plants or plant parts) will be removed from the site and properly disposed of at acceptable facilities. The project EM will ensure that BMPs for invasive plant impact mitigation are implemented, as required.

It is expected that application of a site-specific IPMP and the implementation of standard BMPs will sufficiently mitigate potential impacts from invasive plant populations.

5.3 Valued Ecosystem Component: Wildlife Habitat

The following sections assess potential impacts to wildlife habitat values from the project. As previously noted, wildlife habitat occurring onsite is limited in both extent and quality. Historical development has reduced the availability of suitable wildlife habitat.

5.3.1 Potential Impacts

Potential impacts to wildlife habitat include:

- Loss of or disturbance to active or protected bird nests;
- Loss of wildlife corridors; and
- Loss of wildlife trees.

5.3.1.1 Impacts to Active Bird Nests

Clearing activities in the project area could potentially result in negative impacts to active or protected bird nests. As per the provincial *Wildlife Act*, it is illegal to disturb or destroy an active bird nest (i.e., occupied by a bird or egg) regardless of the species. In addition, nests of specific bird species (e.g., eagle, heron, burrowing owl, etc.) are protected year-round regardless of their occupancy.

5.3.1.2 Impacts to Wildlife Corridors

Portions of the site represent low to medium quality wildlife habitat corridors and usable edge habitat connecting habitat features to the west of the site with the Marr Creek corridor. Potential impacts to these wildlife features may occur via tree and shrub removal and the presence of anthropogenic infrastructure.

5.3.1.3 Loss of Wildlife Trees

Some trees on the site would be considered mid- to advanced-stage wildlife trees. The vast majority of wildlife trees within the site are found within the 10m riparian area at the top of the Marr Creek ravine, in addition to those in the ravine itself. The removal of any wildlife trees in direct conflict with the proposed project could result in the loss of wildlife habitat.

5.3.2 Mitigation and Management

The following sections identify avoidance, mitigation, and management strategies proposed to address the potential impacts to wildlife habitat values onsite previously identified.

5.3.2.1 Impacts to Active Bird Nests

If clearing activities are proposed during the breeding bird season, then a qualified biologist will conduct a pre-clearing bird nest survey. The objective of this survey will be to confirm the presence/absence of any active bird nests, regardless of species. If active bird nests are confirmed, impacts to these nests will be avoided through the modification of the clearing schedule, and/or establishment of a suitable buffer until the nest is no longer occupied. If a bird nest belonging to a species specifically identified under Section 24 of the *Wildlife Act* is present in the proposed clearing area, and avoidance is not possible, then consultation with the MOE will be initiated to determine suitable best practices and required compensation.

General timing windows for breeding birds are as follows:

Species	Least Risk Window
Bald Eagle	Sept 1 – Dec 31
Osprey	Sept 15 – March 31
Heron	Sept 15 – January 15
Other raptors	Oct 1 – February 28
Passerines	Sept 1 – February 28

By implementing these strategies, compliance with the provincial *Wildlife Act* will be achieved and impacts to bird nests will be sufficiently mitigated.

5.3.2.2 Impacts to Wildlife Corridors

The use of the Wentworth site as a wildlife corridor will be modified through the proposed works. The proposed stormwater management system and landscaping initiatives will include native plantings throughout the site. It is expected that these efforts will provide an adequate replacement wildlife corridor for birds. However, the use of the wildlife corridor by bears, deer, bats and other mammals will be impacted. Current use of the cleared portion of the site by wildlife has been

documented, and this area provides a somewhat fragmented (east-west) corridor to the Rodger's Creek watershed to the west. It is expected that the main corridor for wildlife travel is within the Marr Creek ravine habitat, as this area provides the most un-fragmented corridor for travel, in a north-south direction. As such, impacts to wildlife corridors are expected to be low to moderate.

5.3.2.3 Loss of Wildlife Trees

All wildlife trees in the Marr Creek ravine and 10m setback area will be retained. Opportunities to potentially salvage and re-use existing wildlife trees or other removed trees from the remainder of the site could be explored. However, this opportunity will need to be discussed with the DWV, and would likely need to be done on a "field-fit" basis depending on the condition of the felled wildlife trees.

In addition to this, an overview wildlife tree assessment will be completed and for the Marr Creek riparian corridor along the newly constructed trail. Wherever possible, wildlife trees will be retained in this area providing risks are acceptable.

5.4 Valued Component: Species and Ecosystems at Risk

The following sections assess potential impacts to plant and animal SAR, as well as ecosystems at risk.

5.4.1 Potential Impacts

Potential impacts to species and ecosystems at risk include:

- Loss or disturbance to plant species or ecosystems at risk; and
- Loss or disturbance to wildlife SAR and SAR habitat.

5.4.1.1 Impacts to Plant and Ecosystems at Risk

A plant SAR presence/absence survey was not specifically conducted; however, no plant SAR were observed during other site surveys. Given the level of disturbance onsite, heavy application of mulch throughout the site, and notable occurrences of invasive plant populations, it is not likely that plant SAR (Table 2) occur within the Wentworth project site. There is a greater chance that plant SAR may occur in the Marr Creek riparian corridor, relative to the development site. As the riparian corridor adjacent to Marr Creek will be protected, impacts to plant SAR from proposed development project are expected to be low. In addition to this, it is recommended that a pre-clearing plant SAR survey be completed during spring and summer to confirm the presence/absence of plant SAR within the development parcels. If present, a salvage and relocation plan should be prepared and implemented.

The vegetated areas within the Wentworth development site are heavily disturbed. Previous clearing activities have removed a significant percentage of the forests stand and disturbed the understorey. Extensive amounts of wood-chip mulch has been applied to the lands smothering shrub and herb layers. In addition to this, notable populations of invasive plant species occur throughout constraining the ability of the site to recover naturally. Although there is potential for these sites to recover and succeed into the natural ecosystems expected to occur here, the plant communities on the site are currently removed from this state. The proposed clearing and development of the site will reduce the ability of the site to recover; however, this impact will be restricted to previously disturbed areas.

The Marr Creek corridor contains natural ecosystems with both expected overstorey and understorey characteristics. These ecosystems represent less-disturbed plant communities closer to plant communities listed by the CDC. The majority of the Marr Creek ecosystems will be protected in the development plan. Impacts to these ecosystems will be mitigated through avoidance.

5.4.1.2 Impacts to Wildlife Species at Risk and Their Habitat

Based on field observations and habitat suitability assessments, it is very unlikely that any of the animal SAR listed in Table 1 would regularly occur at the Wentworth site, with the exception of the ravine habitat around Marr Creek. Migratory species could potentially use habitat at the site as roosting or temporary cover and foraging habitat; however, the use is expected to be brief and infrequent due to degradation caused by previous land clearing. Surrounding land uses (i.e., roadway/driveways, adjacent residential buildings and associated yards) likely deter sensitive animal SAR from using this habitat. In addition, the habitat provided at the site does not represent critical habitat for animal SAR listed in Table 1. Therefore, the proposed loss of the habitat is not expected to significantly impact animal SAR, as long as work is restricted from the 10m setback from top of bank adjacent to Marr Creek.

Impacts to individual SAR may also be associated with the Wentworth site once residential buildings are completed and inhabited. Domestic pets, especially cats, are adept hunters and may impact local wildlife populations, including potentially catching SAR such as songbirds, shrews, frogs and other small wildlife. Window strikes are also common cause of death for birds. In addition, lighting from the development may interfere with feeding and sensory perception for bats and other aerial predators. Residential homes can also attract nuisance wildlife (odours from garbage, pet food, gardens, etc.) such as mice, rats, skunks, and raccoons that are opportunistic scavengers and may feed on bird eggs, small mammals, amphibians and reptiles.

Although impact risk to animal SAR is low to nil, standard environmental BMPs will be implemented during land clearing and future development (i.e., *Develop with Care: Environmental Guidelines for Urban and Rural Land Development in British Columbia*, MOE, 2006).

6.0 ASSESSMENT SUMMARY

A summary of VCs, potential impacts and proposed mitigation/compensation strategies are provided in Table A below.

Table A: Assessment Summary

VC	Potential Impacts	Proposed Mitigation/Compensation	Anticipated Residual Impact
Fish and Fish Habitat	Loss of riparian habitat due to construction activities immediately adjacent to the riparian zone	• The riparian zone will be clearly identified and fenced off, with adequate area provided to protect tree root structures. • A qualified environmental monitor will meet with the owner and construction crew to ensure they understand the importance of staying clear of the riparian zone.	Low or Nil
	Degradation of water quantity and quality	• Implementation of stormwater management features that incorporate rain gardens, biofiltration swales and vegetated areas that receive, retain, and filter storm runoff. • Implementation of a sustainable integrated stormwater management plan that promotes the infiltration of stormwater runoff for water quality treatment of contaminants and minimizes quality/quantity changes to receiving environments. • Implementation of standard erosion and sediment control strategies. • Preparation and implementation of a project-specific CEMP. • Preparation and implementation of a spill prevention and emergency response plan by all contractors. • Implementation of a post-emergency response soil and water quality sampling program. • Implementation of a post-spill remediation action plan, if deemed necessary through assessment. • Implementation of all applicable BMPs for working in and around a watercourse. • Presence of project EM during all work in sensitive habitat areas.	Low
	Loss of trees	• Implementation of a Tree Management Plan to achieve the objectives of the DWV's Upper Lands Guidelines for DP; • Implementation of standard protection measures and monitoring for trees identified for retention; and • Implementation of a tree replacement plan.	Minor
Vegetation	Loss of herb/shrub plant communities	• Implement landscaping/planting strategies and biofiltration swales incorporating native herbs/shrubs.	Nil
	Introduction/promotion of invasive plant populations	• Preparation and implementation of a CEMP. • Preparation and implementation of an IPMP. • Implementation of standard invasive plant BMPs. • Ongoing monitoring by project EM.	Benefit
Wildlife Habitat	Loss of or disturbance to active or protected bird nests	• Avoidance of clearing activities during the spring breeding season (April 1 to August 30). • If clearing in the spring breeding season cannot be avoided, a pre-clearing bird nest survey will be completed by a Qualified Environmental Professional. • If required, the clearing schedule will be modified to avoid any active or protected bird nests identified. • If a protected nest is identified and clearing cannot be avoided, consultation will be initiated with appropriate regulatory agencies.	Nil
	Loss of wildlife corridors	• The proposed stormwater management system and landscaping initiatives will include native plantings throughout the site. It is expected that these efforts will essentially replace the low quality existing wildlife corridors with similar conditions (i.e., trees and shrubs).	Low to moderate

VC	Potential Impacts	Proposed Mitigation/Compensation	Anticipated Residual Impact
	Loss of wildlife trees	• Wildlife trees in the development will be retained where possible. • All wildlife trees in the 10m setback and Marr Creek ravine will be retained, subject to their review as being potential hazard trees.	Low
Species and Ecosystems at Risk	Loss of disturbance to plant species or ecosystems at risk	• The possible occurrence of plant SAR within the development area is considered low. • Ecosystems within the development lands are heavily disturbed and removed from site series characteristics. • Ecosystems within the Marr Creek riparian corridor represent more natural ecosystems relative to the development site, and will be protected. • Conduct a pre-clearing plant SAR survey during spring/summer.	Nil
	Impacts to habitat for wildlife SAR	• Regular occurrence of wildlife SAR in the development area is very unlikely. • Habitat present in the development area does not represent critical habitat for any animal SAR listed in Table 1. • Standard *Develop with Care* BMPs will be implemented.	Nil
	Impacts to wildlife and wildlife SAR	• Occasional use of the development area by SAR may occur as part of a migration route or wildlife corridor from the adjacent ravine. • Domestic pets may pose a threat to wildlife SAR. • Windows and lighting may interfere with aerial SAR and could cause death. • Residential buildings (storage of garbage, gardens, pet food, etc.) may attract nuisance wildlife that in turn will prey on local wildlife. • Keep residents well informed about the potential impacts their pets could have on wildlife. Keep garbage and household wastes contained. Fence vegetable gardens.	Low to moderate

7.0 ENVIRONMENTAL MANAGEMENT PLAN

The Environmental Management Plan presents a compilation of the various measures recommended in the EA to minimize potential project impacts.

For this site, the main objectives of the Environmental Management Plan are:

- Protection of the 10m setback from the top of the Marr Creek ravine;
- Protection of the vegetation in the Marr Creek ravine;
- Protection of aquatic habitat in Marr Creek;
- Protect and enhance key wildlife habitats in the Marr Creek ravine and 10m setback area; and
- Minimize risk of accidental mortality to wildlife.

The following sections outline the measures to mitigate potential impacts on fish, vegetation, and wildlife.

7.1 Fish Habitat

Potential impacts to fish habitat and the aquatic environment that require mitigation are addressed through the following environmental management measures:

1. Provide the Marr Creek ravine with a setback of 10m from the top of the west ravine bank.
2. Prohibit all development/disturbance in the 10m setback.
3. Implement a CREUS environmentally sensitive integrated stormwater management plan that minimizes environmental impacts by incorporating current stormwater BMPs.
4. At the detailed design stage, ensure that significant surface hydrological contribution to downgradient watercourses is maintained. Design any potentially intercepting structures to maintain these processes.
5. Prepare a CEMP for the development, including an Erosion and Sediment Control Plan, which will be applied to relevant aspects of the project including temporary facilities for construction. Retain an environmental professional to prepare the CEMP and work directly with project engineers to design construction sediment control features.
6. Ensure that stringent sediment and erosion control measures are implemented during construction that meet or exceed recommendations outlined in the federal *Land Development Guidelines* and provincial *Develop With Care 2014: Environmental Guidelines for Urban and Rural Land Development In British Columbia*.
7. Adhere to reduced risk work windows where applicable.
8. Implement an environmental construction monitoring program that details the duties and responsibilities of the professional environmental monitor who will conduct regular site inspections during construction with a particular focus on works in and around the established 10m riparian setback zones. The monitor will help to ensure that:
    - The Erosion and Sediment Control Plan is properly implemented;
    - Vegetation loss is kept to an absolute minimum (e.g., as much of the existing native riparian vegetation as possible is retained, or salvaged and replanted);
    - Construction activities do not impact downstream fish habitat; and
    - Revegetation success is monitored for a period of three years following project completion.
9. Develop and use construction tender documents that will require construction contractor adherence to environmental objectives as part of their contractual obligations.
10. Temporarily fence-off sensitive areas during works in and around these areas.
11. Prepare a Spill Contingency Plan to deal with the accidental release of substances (e.g., hydrocarbons) that are harmful to the aquatic environment.
12. Prepare and implement a vegetation replacement and restoration plan for to enhance habitat with native species wherever possible. A qualified vegetation ecologist will be required to design and implement the plan to ensure success.

7.2 Vegetation and Wildlife

Potential impacts to wildlife habitat and the terrestrial environment that require mitigation are addressed through the following environmental management measures:

1. Prior to clearing, identify and mark the riparian buffer zone along the edge of the riparian area.

2. Design human access/trails in a manner to prevent disturbance of sensitive areas. By applying the BMPs described in *Access Near Aquatic Areas: A Guide to Sensitive Planning, Design and Management* [Fisheries and Oceans Canada/BC MOE, 1996], any proposed trail system can be field-fit and constructed with low-impact methods.

3. Design a vegetation restoration and enhancement program to infill open areas within the riparian zone, stabilize new forests edges, create natural barriers/deterrents along the edge of the riparian zone, restore disturbed sites during construction, and enhance succession where needed.

4. Remove non-native invasive species as much as possible in areas that are not scheduled for development and implement a site-specific IPMP.

5. Implement a vegetation monitoring program to ensure the long-term success of the any native plantings.

6. Strategically place woody debris in the 10m setback area for wildlife use based on advice from a wildlife biologist.

7. Native bird species and their active nests are protected by the federal *Migratory Birds Convention Act* and the British Columbia *Wildlife Ac*t. To minimize the risk of contravention of the federal or provincial Acts, land clearing should occur outside the March 1 to August 31 nesting season. For this Site, there would be particular risk to destruction of nests of ground-nesting species (e.g., Savannah Sparrow). Consult the provincial *Develop With Care 2014: Environmental Guidelines for Urban and Rural Land Development In British Columbia* guide for more details.

    a. Should vegetation clearing or ground work be necessary within the breeding season, ensure that a qualified biologist completes nest surveys and reports their findings. The surveys should provide a decision on areas that can and cannot be cleared during a specific timeframe based on the possible presence of active nests and the delineation of temporary buffers around nests (until the nest is vacated).

    b. Construction activities have the least risk of impacting raptor nests if they occur between October 1 and December 31. Prior to any work occurring outside of this window, a qualified environmental professional should assess the site for nesting raptors and current status any raptor nests, if found to be present. Specific details on BMPs regarding raptors and their nests can be found in the *Guidelines for Raptor Conservation during Urban and Rural Land Development in British Columbia (2013)*.

8. Maintain as many existing wildlife trees and snags as possible within the project site (e.g., existing in riparian setback and Marr Creek ravine). These dead or dying trees provide food and/or habitat for many native species birds, mammals and amphibians. Dead trees provide roosting sites and nesting sites (e.g., for owls in old woodpecker holes). Signs indicating important wildlife trees should be installed to raise awareness of their value and identify them for future protection.

9. Ban the use of chemical fertilizers and/or pesticides and herbicides to control pests. An integrated pest management approach should be used to ensure there is no use of chemical pesticides that are harmful to wildlife. Guidance for the integrated pest management plan can be obtained from:

    - *Integrated Pest Management Manual for Landscape Pests in British Columbia* (Gilkeson and Adams, 2000); and
    - *Integrated Pest Management Manual for Home and Garden Pests in BC* (Adams and Gilkeson, updated 2001).

10. Minimize the use of other domestic chemicals (e.g., road salts, fertilizers) that degrade aquatic habitats and are potentially toxic to fish, amphibians and other wildlife.

11. Develop an Environmental Homeowner's Manual for residents. The manual should:

    - Encourage water conservation by limiting irrigation and lawn watering and encouraging planting of native vegetation with low-water demands;
    - Recommend that pesticides not be used, and that natural composted material be used in place of fertilizers; and
    - Educate residents about environmentally sensitive areas.

8.0 CONCLUSION

It is our belief that the mitigation, maintenance, management plans, and BMPs proposed in this assessment will sufficiently address potential long-term impacts resulting from the loss of habitat at the Wentworth site. In addition, anticipated temporary impacts will be mitigated through diligent application of BMPs and monitoring programs. Given the relatively low to moderate quality of habitat that currently exists in the project construction area, the proposed restoration efforts will work to improve available habitat within close proximity to the impacted area.

9.0 REFERENCES

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Figures

Site Location

Study Area

1:7,500

0 100 200

Metres

Coordinate System: NAD 1983 UTM Zone 10N

PGL
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Figure 1

Site Plan

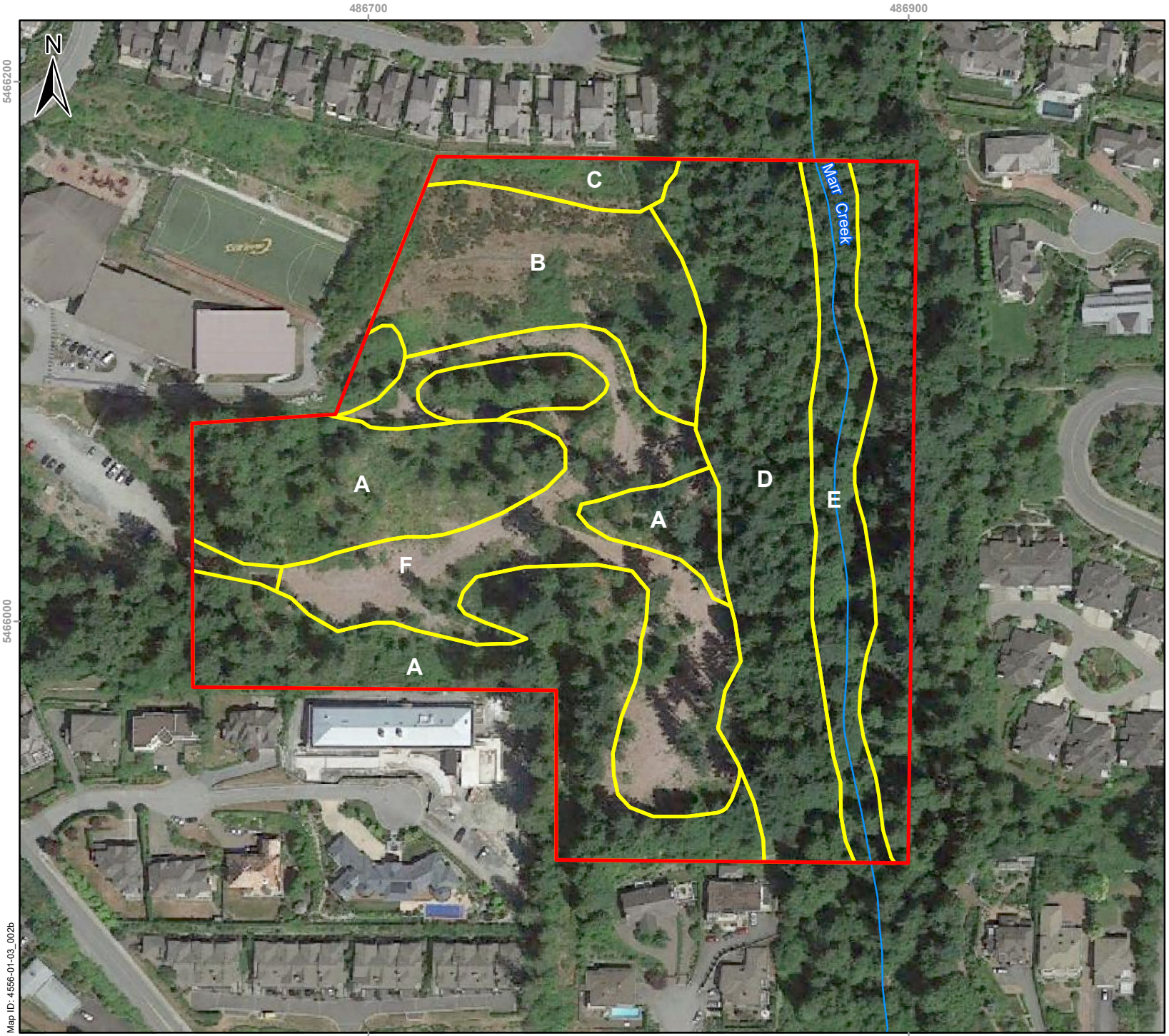
Map ID: 4556-01-03_002

March 11 2016

Derived for Figure 1, 4.1 Site Location, "Development Permit Application and Subdivision Application," June 26, 2915

PGL ENVIRONMENTAL CONSULTANTS

Figure 2



Ecosystem Polygons

Study Area

Ecosystem Polygon

1:2,000

0 25 50

Metres

Coordinate System: NAD 1983 UTM Zone 10N

PGL
ENVIRONMENTAL CONSULTANTS

Map ID: 4556-01-03_002b

March 11 2016

Google earth. © 2015 TerraMetrics
(image date: 7/14/2014)

Figure 3

Tables

Table 1
Animal SAR Potentially Ocurring in the Study Area
Wentworth Project, West Vancouver, BC
Canland Investments Inc., PGL File: 4556-01.03

Scientific Name	English Name	COSEWIC Status	BC List	SARA
	Amphibians			
Anaxyrus boreas	Western Toad	Special Concern	Blue	1
Ascaphus truei	Coastal Tailed Frog	Special Concern	Blue	1
Rana aurora	Northern Red-legged Frog	Special Concern	Blue	1
Rana pretiosa	Oregon Spotted Frog	Endangered	Red	1
	Birds			
Ardea herodias fannini	Great Blue Heron, *fannini* subspecies	Special Concern	Blue	1
Asio flammeus	Short-eared Owl	Special Concern	Blue	1
Botaurus lentiginosus	American Bittern		Blue	
Brachyramphus marmoratus	Marbled Murrelet	Threatened	Blue	1
Buteo lagopus	Rough-legged Hawk	Not At Risk	Blue	
Butorides virescens	Green Heron		Blue	
Contopus cooperi	Olive-sided Flycatcher	Threatened	Blue	1
Cypseloides niger	Black Swift	Endangered	Blue	
Falco peregrinus anatum	Peregrine Falcon, *anatum* subspecies	Special Concern	Red	1
Hirundo rustica	Barn Swallow	Threatened	Blue	
Hydroprogne caspia	Caspian Tern	Not At Risk	Blue	
Megascops kennicottii kennicottii	Western Screech-Owl, *kennicottii* subspecies	Threatened	Blue	1
Nycticorax nycticorax	Black-crowned Night-heron		Red	
Patagioenas fasciata	Band-tailed Pigeon	Special Concern	Blue	1
Phalacrocorax auritus	Double-crested Cormorant	Not At Risk	Blue	
Progne subis	Purple Martin		Blue	
Strix occidentalis	Spotted Owl *caurina* Subspecies	Endangered	Red	1
Tyto alba	Barn Owl	Threatened	Red	1

Table 1
Animal SAR Potentially Ocurring in the Study Area
Wentworth Project, West Vancouver, BC
Canland Investments Inc., PGL File: 4556-01.03

Scientific Name	English Name	COSEWIC Status	BC List	SARA
	Insects			
Argia emma	Emma's Dancer		Blue	
Callophrys johnsoni	Johnson's Hairstreak		Red	
Danaus plexippus	Monarch	Special Concern	Blue	1
Epargyreus clarus	Silver-spotted Skipper		Blue	
Octogomphus specularis	Grappletail		Red	
Ophiogomphus occidentis	Sinuous Snaketail		Blue	
Pachydiplax longipennis	Blue Dasher		Blue	
Speyeria zerene bremnerii	Zerene Fritillary, *bremnerii* subspecies		Red	
Sphaerium patella	Rocky Mountain Fingernailclam		Red	
Sympetrum vicinum	Autumn Meadowhawk		Blue	
Tanypteryx hageni	Black Petaltail		Blue	
	Gastropods			
Allogona townsendiana	Oregon Forestsnail	Endangered	Red	1
Carychium occidentale	Western Thorn		Blue	
Monadenia fidelis	Pacific Sideband		Blue	
Prophysaon vanattae	Scarletback Taildropper		Blue	
Zonitoides nitidus	Black Gloss		Blue	
	Mammals			
Corynorhinus townsendii	Townsend's Big-eared Bat		Blue	
Gulo gulo luscus	Wolverine, *luscus* subspecies	Special Concern	Blue	
Lepus americanus washingtonii	Snowshoe Hare, *washingtonii* subspecies		Red	
Mustela frenata altifrontalis	Long-tailed weasel, *altifrontalis* subspecies		Red	
Myodes gapperi occidentalis	Southern Red-backed Vole, *occidentalis* subspecies		Red	
Myotis keenii	Keen's Myotis	Data Deficient	Blue	3
Oreamnos americanus	Mountain Goat		Blue	
Sorex bendirii	Pacific Water Shrew	Endangered	Red	1
Sorex rohweri	Olympic Shrew		Red	
Sorex trowbridgii	Trowbridge's Shrew		Blue	
Ursus arctos	Grizzly Bear	Special Concern	Blue	

Table 1
Animal SAR Potentially Ocurring in the Study Area
Wentworth Project, West Vancouver, BC
Canland Investments Inc., PGL File: 4556-01.03

Scientific Name	English Name	COSEWIC Status	BC List	SARA
	Reptiles			
Chrysemys picta	Painted Turtle - Pacific Coast Population	Endangered	Red	1

2016).

Search Criteria:

- BC Conservation Status: Red (Extirpated, Endangered, or Threatened) OR Blue (Special Concern)
- Forest Districts: Chilliwack Forest District (DCK)
- MOE Regions: 2- Lower Mainland
- BGC Zone: CWH
- Habitat Type: Anthropogenic; Forest; Forest; Riparian; Stream/River

Species not likely to occur in the study area based on typical habitat characteristic.

See Appendix 1 for COSEWIC, SARA and BC List definitions and status descriptions.

Table 2
Plant SAR Potentially Occurring in the Study Area
Wentworth Project, West Vancouver, BC
Canland Investments Inc., PGL File 4556-01.03

Scientific Name	English Name	COSEWIC Status	BC List	SARA Schedule	Typical Habitat Characteristics
			Fungus		
Nephroma occultum	cryptic paw	Special Concern	Blue	1	Insufficient data.
			Nonvascular Plant		
Alsia californica			Blue		Insufficient data.
Barbula amplexifolia			Red		Insufficient data.
Brachythecium holzingeri			Blue		Insufficient data.
Brotherella roellii	Roell's brotherella	Endangered	Red		Insufficient data.
Bryum gemmiparum			Blue		Insufficient data.
Bryum schleicheri			Blue		Insufficient data.
Callicladium haldanianum			Blue		Insufficient data.
Diphyscium foliosum			Blue		Insufficient data.
Discelium nudum			Red		Insufficient data.
Entosthodon fascicularis	banded cord-moss	Special Concern	Blue	1	Insufficient data.
Fissidens fontanus			Red		Insufficient data.
Fissidens pauperculus	poor pocket moss	Endangered	Red	1	Insufficient data.
Fissidens ventricosus			Blue		Insufficient data.
Grimmia anomala			Blue		Insufficient data.
Hygrohypnum alpinum			Blue		Insufficient data.
Hymenostylium recurvirostre var. insigne			Blue		Insufficient data.
Orthotrichum rivulare			Blue		Insufficient data.
Philonotis yezoana			Blue		Insufficient data.
Physcomitrium immersum			Red		Insufficient data.
Platyhypnidium riparioides			Blue		Insufficient data.
Pohlia cardotii			Blue		Insufficient data.
Racomitrium pacificum			Blue		Insufficient data.
Schistidium trichodon			Blue		Insufficient data.
Seligeria tristichoides			Blue		Insufficient data.
Sphagnum contortum			Blue		Insufficient data.
Sphagnum quinquefarium			Blue		Insufficient data.
Tortula bolanderi			Red		Insufficient data.
Tripterocladium leucocladulum			Blue		Insufficient data.

Table 2
Plant SAR Potentially Occurring in the Study Area
Wentworth Project, West Vancouver, BC
Canland Investments Inc., PGL File 4556-01.03

Scientific Name	English Name	COSEWIC Status	BC List	SARA Schedule	Typical Habitat Characteristics
			Vascular Plant		
Anagallis minima	chaffweed		Blue		Estuary; Stream/River; Rock/Sparsely Vegetated Rock; Meadow; Beach; Pond/Open Water; Gravel Bar; Garry Oak Vernal Pool; Garry Oak Maritime Meadow
Bidens amplissima	Vancouver Island beggarticks	Special Concern	Blue	1	Estuary; Marsh; Beach; Mudflats - Intertidal
Botrychium ascendens	upswept moonwort		Blue		Riparian Forest; Meadow; Conifer Forest - Mesic (average); Alpine/Subalpine Meadow
Callitriche heterophylla var. heterophylla	two-edged water-starwort		Blue		Pond/Open Water
Carex feta	green-sheathed sedge		Blue		Marsh; Vernal Pools/Seasonal Seeps; Meadow; Urban/Suburban; Riparian Herbaceous
Carex interrupta	green-fruited sedge		Blue		Stream/River; Riparian Herbaceous; Gravel Bar
Cephalanthera austiniae	phantom orchid	Endangered	Red	1	Conifer Forest - Mesic (average); Mixed Forest (deciduous/coniferous mix)
Claytonia washingtoniana	Washington springbeauty		Red		Cliff; Talus; Conifer Forest - Dry; Mixed Forest (deciduous/coniferous mix)
Elatine rubella	three-flowered waterwort		Blue		Estuary; Bog; Fen; Swamp; Marsh; Pond/Open Water; Mudflats - Intertidal
Eleocharis parvula	small spike-rush		Blue		Swamp; Intertidal Marine; Pond/Open Water; Mudflats - Intertidal
Eleocharis rostellata	beaked spike-rush		Blue		Marsh; Meadow; Hot Spring
Erigeron philadelphicus var. glaber	salt marsh Philadelphia daisy		Red		Insufficient data.
Glyceria leptostachya	slender-spiked mannagrass		Blue		Bog; Fen; Swamp; Marsh; Lake; Pond/Open Water; Mudflats - Intertidal
Helenium autumnale var. grandiflorum	mountain sneezeweed		Blue		Meadow; Garry Oak Maritime Meadow
Heterocodon rariflorum	heterocodon		Blue		Vernal Pools/Seasonal Seeps; Conifer Forest - Mesic (average); Conifer Forest - Moist/wet
Hydrophyllum tenuipes	Pacific waterleaf		Red		Riparian Forest; Deciduous/Broadleaf Forest; Conifer Forest - Moist/wet; Mixed Forest (deciduous/coniferous mix)
Hypericum scouleri ssp. nortoniae	western St. John's-wort		Blue		Rock/Sparsely Vegetated Rock; Meadow; Alpine/Subalpine Meadow
Idahoa scapigera	scalepod		Blue		Vernal Pools/Seasonal Seeps; Rock/Sparsely Vegetated Rock; Meadow; Sagebrush Steppe
Isoetes nuttallii	Nuttall's quillwort		Blue		Vernal Pools/Seasonal Seeps; Stream/River; Rock/Sparsely Vegetated Rock; Meadow; Conifer Forest - Dry; Garry Oak Woodland; Garry Oak Vernal Pool; Garry Oak Maritime Meadow
Juncus oxymeris	pointed rush		Blue		Estuary; Marsh; Intertidal Marine; Meadow
Lilaea scilloides	flowering quillwort		Blue		Marsh; Pond/Open Water; Mudflats - Intertidal
Lindernia dubia var. anagallidea	false-pimpernel		Blue		Bog; Fen; Swamp; Marsh; Vernal Pools/Seasonal Seeps; Riparian Shrub
Lindernia dubia var. dubia	yellowseed false pimpernel		Red		Bog; Fen; Swamp; Marsh; Vernal Pools/Seasonal Seeps
Lupinus rivularis	streambank lupine	Endangered	Red	1	Stream/River; Meadow; Urban/Suburban; Mudflats - Intertidal; Garry Oak Woodland
Mitellastra caulescens	leafy mitrewort		Blue		Riparian Forest; Cliff; Rock/Sparsely Vegetated Rock; Talus; Conifer Forest - Mesic (average); Conifer Forest - Moist/wet; Mixed Forest (deciduous/coniferous mix)
Navarretia intertexta	needle-leaved navarretia		Red		Vernal Pools/Seasonal Seeps; Meadow
Polemonium elegans	elegant Jacob's-ladder		Blue		Cliff; Rock/Sparsely Vegetated Rock; Talus
Rubus lasiococcus	dwarf bramble		Blue		Conifer Forest - Mesic (average); Conifer Forest - Moist/wet
Rubus nivalis	snow bramble		Blue		Conifer Forest - Mesic (average); Conifer Forest - Moist/wet
Rupertia physodes	California-tea		Blue		Deciduous/Broadleaf Forest; Garry Oak Woodland
Sanguisorba menziesii	Menzies' burnet		Blue		Bog; Fen; Swamp; Marsh; Meadow
Sidalcea hendersonii	Henderson's checker-mallow		Blue		Estuary; Marsh
Sparganium fluctuans	water bur-reed		Blue		Lake; Pond/Open Water
Toxicodendron diversilobum	poison oak		Blue		Cliff; Rock/Sparsely Vegetated Rock; Deciduous/Broadleaf Forest; Conifer Forest - Dry; Garry Oak Woodland
Verbena hastata var. scabra	blue vervain		Blue		Marsh; Meadow
Wolffia borealis	northern water-meal		Red		Pond/Open Water

Source: B.C. Conservation Data Centre. 2015. BC Species and Ecosystems Explorer. B.C. Minist. of Environ. Victoria, B.C. Available: http://a100.gov.bc.ca/pub/eswp/ (accessed Dec 2, 2015).

Search Criteria:
- BC Conservation Status: Red (Extirpated, Endangered, or Threatened) OR Blue (Special Concern)
- COSEWIC Status: Endangered OR Threatened OR Special Concern
- Forest Districts: Chilliwack Forest District (DCK)
- MOE Regions: 2- Lower Mainland
- BGC Zone: CWHxm

Species not likely to occur in the study area based on typical habitat characteristic.

See Appendix 1 for COSEWIC, SARA and BC List definitions and status descriptions.

Table 3
Ecosystems at Risk Potentially Occurring in the Study Area
Wentworth Project, West Vancouver, BC
Canland Investments Inc., PGL File 4556-01.03

Scientific Name	English Name	BC List	Biogeoclimatic Units (Site Series)	Ecosystem Group
Leymus mollis ssp. mollis - Lathyrus japonicus	dune wildrye - beach pea	Red	CWHxm1	Terrestrial - Beach: Beach Beachland (Bb)
Pseudotsuga menziesii / Mahonia nervosa	Douglas-fir / dull Oregon-grape	Red	CWHxm1	Terrestrial - Forest: Coniferous - mesic
Selaginella wallacei / Cladina spp.	Wallace's selaginella / reindeer lichens	Blue	CWHxm1	Terrestrial - Grassland: Grassland (Gg);Terrestrial - Rock: Rock Outcrop (Ro)
Sidalcea hendersonii Tidal Marsh	Henderson's checker-mallow Tidal Marsh	Red	CWHxm1/00	Estuarine: Estuary Marsh (Em)
Tsuga heterophylla - Pseudotsuga menziesii / Eurhynchium oreganum	western hemlock - Douglas-fir / Oregon beaked-moss	Red	CWHxm1/01	Terrestrial - Forest: Coniferous - mesic
Pseudotsuga menziesii - Pinus contorta / Racomitrium canescens	Douglas-fir - lodgepole pine / grey rock-moss	Red	CWHxm1/02	Terrestrial - Forest: Coniferous - dry
Pseudotsuga menziesii - Tsuga heterophylla / Gaultheria shallon Dry Maritime	Douglas-fir - western hemlock / salal Dry Maritime	Blue	CWHxm1/03	Terrestrial - Forest: Coniferous - dry
Pseudotsuga menziesii / Polystichum munitum	Douglas-fir / sword fern	Blue	CWHxm1/04	Terrestrial - Forest: Coniferous - dry
Thuja plicata / Polystichum munitum Very Dry Maritime	western redcedar / sword fern Very Dry Maritime	Blue	CWHxm1/05	Terrestrial - Forest: Coniferous - mesic
Tsuga heterophylla - Thuja plicata / Blechnum spicant	western hemlock - western redcedar / deer fern	Red	CWHxm1/06	Terrestrial - Forest: Coniferous - moist/wet
Thuja plicata / Tiarella trifoliata Very Dry Maritime	western redcedar / three-leaved foamflower Very Dry Maritime	Blue	CWHxm1/07	Terrestrial - Forest: Coniferous - moist/wet
Picea sitchensis / Rubus spectabilis Very Dry Maritime	Sitka spruce / salmonberry Very Dry Maritime	Red	CWHxm1/08	Terrestrial - Flood: Flood (Highbench);Terrestrial - Forest: Mixed - moist/wet
Populus trichocarpa - Alnus rubra / Rubus spectabilis	black cottonwood - red alder / salmonberry	Blue	CWHxm1/09	Terrestrial - Flood: Flood Midbench (Fm);Terrestrial - Forest: Broadleaf - moist/wet
Populus trichocarpa / Salix sitchensis	black cottonwood / Sitka willow	Blue	CWHxm1/10	Terrestrial - Flood: Flood Midbench (Fm);Terrestrial - Forest: Broadleaf - moist/wet
Pinus contorta / Sphagnum spp. Very Dry Maritime	lodgepole pine / peat-mosses Very Dry Maritime	Blue	CWHxm1/11	Wetland - Peatland: Wetland Bog (Wb)
Thuja plicata - Picea sitchensis / Lysichiton americanus	western redcedar - Sitka spruce / skunk cabbage	Blue	CWHxm1/12	Terrestrial - Forest: Coniferous - moist/wet;Wetland - Mineral: Wetland Swamp (Ws)
Thuja plicata / Rubus spectabilis	western redcedar / salmonberry	Red	CWHxm1/13	Terrestrial - Forest: Coniferous - moist/wet
Thuja plicata / Lonicera involucrata	western redcedar / black twinberry	Red	CWHxm1/14	Terrestrial - Forest: Coniferous - moist/wet
Thuja plicata / Carex obnupta	western redcedar / slough sedge	Blue	CWHxm1/15	Terrestrial - Forest: Coniferous - moist/wet;Wetland - Mineral: Wetland Swamp (Ws)
Distichlis spicata var. spicata Herbaceous Vegetation	seashore saltgrass Herbaceous Vegetation	Red	CWHxm1/Em03	Estuarine: Estuary Marsh (Em)
Rhododendron groenlandicum / Kalmia microphylla / Sphagnum spp.	Labrador-tea / western bog-laurel / peat-mosses	Blue	CWHxm1/Wb50	Wetland - Peatland: Wetland Bog (Wb)
Myrica gale / Carex sitchensis	sweet gale / Sitka sedge	Red	CWHxm1/Wf52	Wetland - Peatland: Wetland Fen (Wf)
Carex lasiocarpa - Rhynchospora alba	slender sedge - white beak-rush	Red	CWHxm1/Wf53	Wetland - Peatland: Wetland Fen (Wf)
Typha latifolia Marsh	common cattail Marsh	Blue	CWHxm1/Wm05	Wetland - Mineral: Wetland Marsh (Wm)
Schoenoplectus acutus Deep Marsh	hard-stemmed bulrush Deep Marsh	Blue	CWHxm1/Wm06	Wetland - Mineral: Wetland Marsh (Wm)
Carex sitchensis - Oenanthe sarmentosa	Sitka sedge - Pacific water-parsley	Blue	CWHxm1/Wm50	Wetland - Mineral: Wetland Marsh (Wm)

Source: B.C. Conservation Data Centre. 2015. BC Species and Ecosystems Explorer. B.C. Minist. of Environ. Victoria, B.C. Available: http://a100.gov.bc.ca/pub/eswp/ (accessed Dec 2, 2015).

Search Criteria:
- BC Conservation Status: Red (Extirpated, Endangered, or Threatened) OR Blue (Special Concern)
- Forest Districts: Chilliwack Forest District (DCK)
- MOE Regions: 2- Lower Mainland
- BGC Zone, Subzone, Variant, Phase:CWHxm1

See Appendix 1 for COSEWIC, SARA and BC List definitions and status descriptions.

Appendix 1

Tree Management Plan

PGL
ENVIRONMENTAL CONSULTANTS

PGL ENVIRONMENTAL CONSULTANTS
1200 – 1185 West Georgia Street
Vancouver BC V6E 4E6
604 682 3707
pggroup.com

June 25, 2015
PGL File: 4556-01.02

Via E-mail: **rick@canlands.com**

Canland Investments Inc.
223 – 4940 No. 3 Road
Richmond, BC
V6X 3A5

Attention: **Rick Gregory**
Vice President

RE: TREE MANAGEMENT PLAN, WENTWORTH PROJECT, WEST VANCOUVER, BC

Further to our recent discussions and the site meeting conducted on May 12, 2015, PGL Environmental Consultants (PGL) has prepared the following Tree Management Plan (TMP) for the Wentworth Project (the Project).

BACKGROUND

We understand that the District of West Vancouver (DWV) requires a TMP for your project, which includes four lots:

- Lot B District Lot 793 Group I New Westminster District Plan LMP 46365;
- Lot C District Lot 793 Group I New Westminster District Plan LMP 52165;
- Lot 3 Block 4 District Lot 815 Plan 4565, 2510 Wentworth; and
- Lot 6 West 1/2 Of District Lot 783 Plan 1599, 2480 Wentworth.

The properties are also influenced by an environmentally-sensitive area associated with Marr Creek, which is situated along the east side of the Project. Portions of the riparian corridor, as well as adjacent properties (i.e., within 5m), will need to be considered in the TMP.

As per the DWV's Upper Lands Guidelines for Development Permit (DP) Area Designations, you are required to "create a tree management scheme that identifies the means and extent of tree retention or replacement required to maintain a park-like character, ensure proper drainage and minimize view impacts." The TMP proposed in this document is intended to meet these requirements in support of your Project approvals.

TREE MANAGEMENT PLAN

The TMP will include four components, including:

- Tree Inventory and Assessment;
- Tree Retention, Removal and Replacement Plan;
- Stormwater Management Plan; and
- Compliance Monitoring.

Tree Inventory and Assessment

PGL's ISA Certified Arborist will conduct a tree inventory in the study area, and it will be conducted to meet industry best practice standards. The inventory study area will include all four parcels of the Project, roughly 5m into adjacent properties, and roughly 5m into the adjacent riparian corridor of Marr Creek. General tree characteristics will be recorded (e.g., species, diameter at breast height, height, and general health/structure) for all trees measuring ≥30cm diameter at breast height (dbh).

We understand that some trees have already been tagged and surveyed by a land surveyor team. Tag numbers and previously-recorded tree characteristics will be ground-truthed and confirmed/updated. For trees that have not been previously tagged, we will install numerical tags and attempt to correspond these with associated survey points. For any trees that have not been previously surveyed, we will identify these and provide directions to update your survey plan. All inventoried trees will be surveyed by a qualified land surveyor team.

PGL's ISA Certified Arborist will also complete a Level 2 Basic Assessment, as per the process defined in the ISA *Tree Risk Assessment Manual* (Dunster *et al*., 2013). This approach will include a general assessment of tree health, and visual inspection of each tree for notable defects and/or potential risks. The risk assessment will be based on existing conditions and land use, but will also consider the proposed development and required construction activities to the best of our knowledge.

Tree Retention, Removal and Replacement Plan

PGL will prepare a summary report outlining our findings during the tree inventory and Level 2 assessment. Our report will include a general description of the urban forest condition in the study area, as well as a summary table of all inventoried trees, associated characteristics, and potential risks.

As part of this package, PGL will prepare a Tree Retention and Removal Plan that will include recommended protection measures (i.e., optimal root protection zones, critical root protection zones, and specifications for tree protection fencing). The plan will identify the means and extent of tree retention and trees recommended for removal. Our report will specify the recommended number of replacement trees, based on an approximate replacement ratio of 2:1.

Stormwater Management Plan

PGL's ISA Certified Arborist will work with the project engineers to ensure that arboriculture issues are considered and incorporated into the Project Stormwater Management Plan. Trees recommended for retention or removal will consider both impacts to and from stormwater management onsite to ensure proper drainage onsite.

Compliance Monitoring

Upon approval of the Project and initiation of construction, specified tree protection measures will be implemented as outlined in the Tree Retention, Removal and Replacement Plan. The tree protection zones will be delineated through site-specific considerations, including optimum tree protection zones and critical root zones, as well as the riparian setback zone.

Tree protection fencing will be constructed using sturdy and highly-visible materials to a minimum height of 1.2m above grade. The fencing will use 2"x4" vertical posts, top and bottom rails, and cross-bracing. Signage will also be installed on the tree protection fencing identifying the area as a "**Tree Protection Zone**" and stating that no encroachment, material storage, or damage to trees is permitted.

The Project Arborist Tree will inspect protection fencing on a regular basis throughout the Project construction phase. Additional tree protection measures will be recommended to facilitate successful retention, as needed. Any work with the potential to damage or disturb retained trees (either to the upper canopy or critical root protection zones) may require full-time monitoring by the Project Arborist. Additional measures will be required to mitigate encroachment impacts such as minimizing repetitive traffic, implementing proper canopy and/or root pruning, and prevention or reduction of ground compaction (e.g., use of rubber tires vs. tracks, wood chip mulch applied at a minimum depth of 15cm, use of smaller equipment, etc.).

All site inspections, observations and recommendations will be outlined in short summary reports for distribution to appropriate recipients (e.g., owner/proponent, contractor(s), the DWV). A final inspection will be conducted upon completion of Project construction to confirm all replacement trees have been planted and are accounted for.

PROPOSED FINANCIAL SECURITY

To provide assurance to the DWV that the TMP will be implemented as outlined in this document, we recommend that the Proponent post a letter of credit in the amount of **$7,500**. The letter of credit should be held by the DWV until such a time that the Tree Retention, Removal and Replacement Plan and associated report has been submitted and accepted by the DWV. Future securities may be requested by the DWV as assurance for the replacement trees; however, the amount will depend on the implementation of the TMP and determination of the required replacement trees.

We trust that this meets your needs. If you have any questions or require clarification, please contact Keven Goodearle at 604-895-7646.

PGL ENVIRONMENTAL CONSULTANTS

Per:

Keven Goodearle, B.Sc., R.P.Bio.
Environmental Scientist

Bruce H. Nidle, B.Sc., R.P.Bio.
Senior Environmental Scientist

KMG/BHN/mtl
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Appendix 2

Status Definitions for Provincial and Federal Species at Risk

PGL ENVIRONMENTAL CONSULTANTS

STATUS DEFINITIONS FOR PROVINCIAL AND FEDERAL SPECIES AT RISK

Status Definitions as per provincial Conservation Data Centre (CDC)

RED: Species and ecological communities that are candidates for Extirpated, Endangered, or Threatened status in BC. Red-listed species/communities flags them as being at risk and requiring investigation.

BLUE: Species and ecological communities considered of Special Concern in BC. Species/communities of Special Concern have characteristics that make them particularly sensitive or vulnerable to human activities or natural events.

YELLOW: Species and ecological communities that are apparently secure and not at risk of extinction. Yellow-listed species/communities may have red- or blue-listed subspecies.

Status Definitions as per federal *Species at Risk Act* (SARA)

ENDANGERED: A wildlife species that is facing imminent extirpation or extinction.

THREATENED: A wildlife species that is likely to become an endangered species if nothing is done to reverse the factors leading to its extirpation or extinction.

SPECIAL CONCERN: A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.

SCHEDULE 1: Official list of federally protected species.

SCHEDULE 2 and 3: Species under assessment for inclusion to Schedule 1.