May 2016

# Rodgers Creek Development – Area 6 Environmental Management Plan

**Prepared for**: British Pacific Properties Ltd.

Suite 1001 – 100 Park Royal

West Vancouver, BC, V7T 1A2

Sartori Environmental Services

#106 – 185 Forester Street

North Vancouver, BC, V7H 0A6

# Table of Contents

# Figures



# Appendix

# 1.0 Introduction

British Pacific Properties Limited (BPP) is continuing with development in the Rodgers Creek Development Area, located in the District of West Vancouver, B.C. The Rodgers Creek development is comprised of six distinct areas totalling 87 ha (215.1 acres), and this Environmental Management Plan (EMP) has been prepared for the Area 6 development.

## 1.1 Purpose of the Environmental Management Plan

BPP has commissioned Sartori Environmental Services (SES) to develop the following EMP for the proposed Area 6 development, as well as to act as an Environmental Monitor (EM) for the proposed development works. This EMP describes environmental protection measures and environmental guidance to be used to prevent and/or mitigate environmental impacts resulting from construction activities, and identifies project-specific considerations to be implemented.

## 1.2 Project Description and Location

Area 6 is situated north of Cypress Bowl Road and in between Cave Creek Main Branch (most westerly) and Tributary W (most easterly). Four (4) watercourses exist within the Area 6 boundaries (Cave Creek Main Branch, Cave Creek East, Cave Creek Far East, and Westmount Creek).

Development within the Area 6 site will consist of single family and multi-family housing, associated roads, services, parks, trails, and 5 culvert crossings. All municipal servicing will be provided including water, sanitary and storm sewers, electrical and telecommunications and natural gas.

Key objectives of the EMP are to:

- Identify streams and their ravines, with respect to fisheries and amphibian values;
- Provide guidance for working within environmentally sensitive areas; and,
- Ensure BPP's commitment to protecting the environment is communicated to construction contractors.

## 1.3 Environmental Setbacks

During the Rodgers Creek Development planning process, a series of tables and maps were developed following extensive review and a 'sieve analysis' with District staff. Each watercourse was evaluated as a collaborative process at technical meetings, including detailed field review, and categorized with respect to its environmental values as H (high), M (moderate), or L (low). The top of bank, RAR setback and District Development Permit setback lines were overlaid onto these maps and all creek setbacks were individually assessed and justified. At minimum, no setback is closer than the RAR designated line. Detailed environmental setback summary tables and maps are available in Appendix B.


CAVE CREEK EAST
CAVE CREEK EAST
CAVE CREEK FAR EAST
MAIN BRANCH
CAVE CREEK
CAVE CREEK
WESTMOUNT CREEK
TRIBUTARY W
TRIBUTARY U
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39

# 2.0 Environmental Management Measures

The following works-specific environmental protection measures were developed by SES in conjunction with BPP in attempt to have proposed works meet recommendations made in DFO's *Land Development Guidelines for the Protection of Aquatic Life* (DFO, 1993); and MOE's *Develop with Care: Environmental Guidelines for Urban and Rural Land Development in British Columbia* (MOE, 2006).

## 2.1 Preliminary Construction Schedule

Construction work commencement is anticipated in summer 2016, beginning with clearing and grubbing activities of road alignments. Detailed construction scheduling of the various components of the project will vary to some extent as determined by municipal approvals, weather conditions, and songbird nesting season.

## 2.2 Site Preparation

Prior to delineating the clearing boundaries, a pre-construction meeting will be held with the project manager, construction supervisor, project engineer, the District's Environmental Protection Officer and the owners' environmental consultant, to ensure that site safety and environmental procedures are adhered to.

### 2.2.1 *Temporary Protective Fencing*

Prior to any site work, tree protective fencing shall be installed along the boundaries of riparian areas. No work shall take place within riparian areas without the approval of the EM and the District's Environmental Protection Officer unless noted otherwise on the approved development permit and servicing drawings.

### 2.2.2 *Access, Delineation & Clearing*

Access into the Area 6 development site will utilize the existing intersection with Cypress Bowl Road, to the west of Tributary W. Clearing and grubbing activities has the potential to result in the greatest initial effects to the environment. The following are methods that will be used to minimize the potential for negative environmental effects to the extent possible:

- The boundaries of the construction/clearing area will be clearly marked. Only the area within these boundaries may be disturbed;
- All contractor employees and sub-contractors will be briefed on the limits of construction and the locations of the marked Environmentally Sensitive Areas (ESAs) during orientation prior to their first day on site;
- Machinery will operate within these boundaries only. Cleared debris will be properly disposed of, and will not be relocated outside of the delimited areas;
- Sediment control structures will be installed downslope of all ground disturbing activities as required, to reduce the input of sediment to all watercourses prior to grubbing or stripping activities;
- All reasonable efforts will be made to ensure that trees are felled away from riparian areas and proposed Covenant and Park areas unless it poses a risk to human safety. If it is determined that

a tree cannot be felled safely without going into a riparian area or proposed Covenant or Park area, the District's Environmental Protection Officer shall be notified and the EM shall be consulted on the methodology to minimize any damage to other trees or vegetation within the riparian areas and proposed Covenant and Park areas;

- Grub operations will carried out during favourable weather conditions. Should inclement weather be encountered, the site will be stabilized prior to work postponement as directed in the ESC plan to minimise the potential for sediment from being mobilized and entering the adjacent watercourses. Machinery will not enter below the High Water Mark (HWM) of watercourses, and clearing will not occur within adjacent environmentally-sensitive areas; and,
- Organic topsoil will be stockpiled separately from other materials for use in progressive reclamation activities. Shrubs will be salvaged and stored separately where possible to aid in revegetation. Coarse Woody Debris (CWD) will also be salvaged and stockpiled for future placement in revegetation areas.

Although existing vegetation is composed mostly of native species, invasive species such as Himalayan blackberry (*Rubus armeniacus*) and Holly (*IIex aquifolium*) are also present in the area. Cleared invasive vegetation will be trucked off site for proper disposal. Care will be taken when grubbing soils infected with invasive vegetation with rhizomes capable of fragmentation and regrowth (i.e. Himalayan blackberry) to grub to sufficient depth to remove all subsurface plant material. Grubbed soils known to contain invasive plant material will be trucked off site for proper disposal at an approved disposal facility.

### 2.2.3 *Pre-Clearing Bird Nesting Surveys*

Under the BC *Wildlife Act*, it is illegal to molest or destroy active bird nests not on current provincial exclusion lists. Concurrently, North American migratory birds are managed by the Canadian Wildlife Service (CWS) branch of Environment Canada (EC) under the *Migratory Birds Convention Act*. The CWS-recommended songbird nesting survey window for the proposed works area falls between March 15 and July 31.

If clearing of the Area 6 site coincides with the March 15 to July 31 window, SES will conduct pre-clearing surveys to identify active nests, and species, if present. If nesting activity is detected prior to or following the March 15 to July 31 window, surveys should be initiated in consultation with the EM. In the event that an active songbird nest is discovered, a 20m buffer radius from the nest will be flagged in field, and no clearing works or machinery operations will be conducted within the radius until SES confirms that the nest is no longer active. The nest buffer diameter may be adjusted by the QP based on species, site specific conditions and anticipated construction activities within the area. In the event that a raptor nest is observed, a species specific nest buffer will be established in the field in consultation with the EM. Identified active nests of bird species listed on provincial *Wildlife Act* exclusion lists including Rock Dove (*Columba livia*) and North-western Crow (*Corvus caurinus*) will be managed in consultation with SES.

### 2.2.4 *Fish/Amphibian Salvage*

Fish presence in the proposed work area is not anticipated due to significant gradient barriers to fish passage that occur downstream through the Highway 1 culverts (25% gradient through a perched culvert);

however, amphibian salvages will be performed prior to the commencement of instream work activities as required. Wildlife exclusion fencing will be installed to preclude amphibian entrance to the immediate area. The salvage crew will comprise qualified environmental professionals (QEPs), and will be responsible for obtaining necessary permits required by the BC *Wildlife Act* prior to conducting salvage activities.

### 2.2.5 *Rare Elements Update*

A full rare elements assessment was conducted during the Rodgers Creek development assessment and published in the Rodgers Creek Area – Environmental Effects Report (March 2008). The BC Conservation Data Centre (BCCDC) website was searched for all vegetation species listed under the Federal *Species at Risk Act* (SARA), the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and Provincial Identified Wildlife that are suspected to occur within habitats identified within the study area. In addition, species listed as Red and Blue-listed by the BCCDC but not specifically covered under legislation were also included. Data was also requested from the BCCDC for all records within 2 km of the study area.

No ecological communities or rare plants, and species of concern were identified during the search and are expected to reside in Area 6.

### 2.2.6 *Temporary Channel Diversion*

Installation of culvert crossings will necessitate the installation of a channel diversion to ensure that the works take place in isolation of flows. The following mitigation measures are recommended to ensure water quality is maintained during the temporary flow diversion:

- Stage dewatering pumps and hoses in preparation for bypassing flows around the work area. The outlet of the dewatering hose should be placed in the channel downstream of the work area and be protected with an energy dissipation structure to prevent bank and channel scouring;
- Install a temporary sand bag and poly sheeting berm upstream of the work area and downstream of the staged diversion pump intakes. The berm should prevent water from seeping into the work area; and,
- Install a sump and berm at the downstream extent of the work area as required to collect all potentially turbid water seepage that may have entered the work area. All seepage water entering the active work area should be dewatered to a suitable vegetated area for bio-infiltration. If no suitable natural infiltration area exists, appropriately sized settlements areas should be constructed in consultation with the EM.

Periodic in-situ water quality monitoring (*e.g.* pH and turbidity) will be performed during the excavation activities. Water meeting the BC Water Quality Guidelines for the Protection of Freshwater Aquatic Life (BCWQG) will be pumped back to the Creek. Water of insufficient quality under BCWQG will be pumped to nearby vegetated receiving areas pending SES approval or will require treatment prior to discharge.

## 2.3 Erosion and Sediment Control

Once clearing and grubbing activities have been completed and earthworks, including construction of the roads and homes begins, it is anticipated that sediment control ponds or tanks and drainage ditching will

be utilized in controlling runoff and treating it prior to discharge into large vegetated buffer areas and not directly into watercourses.

All erodible stockpiled materials will be tarped or covered with poly to minimize erosion and the development of turbid runoff. Once the road has been excavated to sub-grade, large 6" angular rock will be placed at the site entrances to minimize the potential for sediment tracking.

Working during inclement weather conditions will be reviewed by the project manager in consultation with the EM and the contractor(s). Activities such as excavation and grubbing will not be undertaken if significant rainfall events are forecasted and the risk of creating unmanageable turbid runoff is possible.

A Draft Area 6 Erosion and Sediment Control Plan (ESCP) is presented in Appendix 1 for the clearing and road earthworks. This plan should be viewed as the start point for construction and site-specific field adjustments will be implemented as construction progresses in consultation with the EM. In order for erosion and sediment controls to be effective they need to be appropriately designed, implemented, inspected and maintained. The following four principles will be used for erosion and sediment control within Area 6:

1. Expose the smallest practical area of land for the shortest possible time;
2. Apply "soil erosion" control practices as a first line of defence against silt laden runoff;
3. Apply "sediment control" practices as a perimeter protection to prevent the off-site conveyance of turbid runoff; and,
4. Implement thorough maintenance and follow-up practices.

### 2.3.1 *Upland Construction Activities*

Construction of individual homes and site preparation of lots has the potential to have negative effects on water quality. Individual site erosion and sediment control procedures and prescriptions will be developed prior to excavation works on the lots, to ensure that water quality can be maintained during construction.

Site specific prescriptions and BMP's will be reviewed in the field by the EM during the pre-construction meeting and site inspections (see environmental monitoring below).

## 2.4 Waste Management Plan

Contractors working at the Project site shall adhere to applicable legislation with respect to the handling, transportation, and/or disposal of all materials related to Area 6 construction (waste or otherwise). These regulations may include (but not limited to):

- *Hazardous Waste Regulation*;
- *Contaminated Sites Regulation;*
- *Spill Reporting Regulation*;
- WorkSafeBC *Occupational Health and Safety Regulation*; and,
- *Transportation of Dangerous Goods Regulation*.

### 2.4.1 *Recyclable Waste*

Recyclable waste such as cardboard, wood and approved plastic will be separated from other materials and stored in appropriate, clearly identified containers. Contractor(s) are responsible for the appropriate disposal of recyclable waste coming from the construction site.

### 2.4.2 *Non-Recyclable Waste*

Non-recyclable waste generated during the project including general refuse, replacement air filters, construction debris, concrete, etc. and surplus oil requiring disposal off-site shall require approval from the local landfill operator prior to disposal. Only landfills authorized to accept the specific products requiring disposal shall be used.

### 2.4.3 *Hazardous Waste*

Absorbent materials or soils contaminated with oil (greater than 3% by weight) or any quantity of gasoline must be handled and transported as hazardous waste. Any contaminated soils will be excavated and hauled off-site to an authorized treatment/disposal area in accordance to the BC Hazardous Waste Regulations.

In the event that material believed to be contaminated or hazardous is discovered during excavation at the site, SES must be notified immediately. If the hazardous material is stable and does not pose an immediate threat, operations should be halted until SES determines the appropriate course of action for removal or neutralization of the hazardous material.

If the hazardous material poses an immediate threat and is unstable, then the spill response procedures outlined below (Section 2.8) should be immediately followed in order to contain the hazardous material.

### 2.4.4 *Burning*

Burning of any type is not permitted at the construction site.

### 2.4.5 *Portable Toilets*

A portable toilet will be on site during all construction. This will be kept clean and periodically cleared of waste matter (trucked off site to a designated waste facility by a waste pump truck) as required.

### 2.4.6 *Animal Attractants*

Contractors will place all animal attractive wastes (*i.e.* food scraps) in animal proof containers, and will ensure that these wastes are removed on a regular basis from the site. Food wastes are not to be disposed of on site.

## 2.5 Concrete Management Plan

Cast-in-place concrete works associated with construction of Area 6 include foundation walls, fence posts, footings, pools, abutment walls, and bridge deck pours. During these works, extra care will be taken to prevent the release of uncured concrete into water or nearby catch basins, ditches and/or any watercourses, as it is known to be toxic to the aquatic environment. Mitigation procedures will be

implemented to reduce the potential for environmental damage when pouring concrete around water or during rain events.

In addition, the following conditions will be met:

- All concrete wastewater from cleaning or mixing is considered toxic, and will be prevented from entering any catch basins, ditches and/or any watercourses for at least 48 hours to allow the water to reach neutral pH.
- Wash out of concrete trucks and equipment will be carried out away from the construction area in designated constructed settling areas (location yet to be determined) outside the riparian area of the stream in consultation with the EM.
- All waste concrete will be collected and disposed of at an approved facility and/or buried at an EM approved site away from any areas where the material may contact surface or groundwater.
- Freshly poured concrete will be covered immediately if rain is forecasted.
- If water is found to be out of the desired pH range (between 6.5 and 9) it will be contained using measures outlined in the Spill Response Plan and treated or disposed of at an approved disposal facility.
- Carbon dioxide will be diffused through any plumes/spills into water via a soaker hose to help neutralize the pH effect that concrete has on potentially effected waters. The carbon dioxide cylinder with the already attached soaker hose will be used to inject the carbon dioxide into the water. A $CO_2$ soaker hose will be readily available at the pour site during any concrete pour.
- Surplus concrete in rolling concrete mixers will be returned to the batch plant yard and will not be wasted on site.

During all concrete pours near any watercourse, the contractor and the EM will inspect all forms for leakages. If such a situation should arise, the leakage will be immediately plugged utilizing tarps/catch nets and monitored for effectiveness by the EM.

## 2.6 Noise Reduction

Area 6 is not located within a residential area and therefore the potential for excessive noise levels during construction are less of a concern. However with respect to clearing, grubbing, and excavation work the following general measures will minimize the potential for construction related noise and vibration effects:

- Construction activities will be limited to the times allowed under the District of West Vancouver Bylaws. Permitted construction hours are confirmed as follows:
    - 7:30am to 5:30pm weekdays
    - 8:00am to 5:00pm Saturday
    - No work on Sundays
- All equipment will be properly maintained to limit noise generation and fitted with functioning exhaust and muffler systems.

- Diesel generator(s) required to run overnight for submersible pump diversion works will be housed in insulated housings (*e.g.* "Whisper-Watt" type) and be fitted with functioning exhaust and muffler systems. Gasoline generators will not be utilized for overnight works.

## 2.7 Wildlife Encounters

As the works area is located within a forested area, wildlife encounters may occur. In order to minimise the potential wildlife encounters (*e.g.* bears, coyotes, domestic dogs, etc.), animal attractants will be properly stored for disposal. If persistent or aggressive wildlife encounter(s) occur, construction staff should remove themselves from danger immediately and contact SES immediately.

Wildlife encounters deemed dangerous with a high probability of reoccurrence will be reported to the BC Conservation Service by SES.

### 2.7.1 *Bear Safety Essentials*

The following provides some basic safety essentials if a bear has been observed – Referenced from Safety Guide to Bears in the Wild (BC Environment, 1996)

- Respect all bears – they all can be dangerous;
- Never approach a bear;
- Never attempt to feed a bear;
- Be defensive - never surprise a bear;
- Learn about bears – anticipate and avoid encounters;
- Know what to do if you encounter a bear; and
- Each bear encounter is unique. No hard and fast rules can be applied when dealing with a potentially complex situation.

## 2.8 Emergency Spill Response Plan

Once a spill has occurred the primary objective will be to ensure health and safety, and to minimize environmental damage due to the spill. The order of priority when dealing with a spill will be people, environment, and property. A spill kit that will include tools and absorbent materials will be maintained near the work area and absorbent materials (including spill pads and absorbent booms) will also be available on each machine.

The response plan will be as follows:

1. Stop the Flow. Use common sense to ensure the safety of personnel in the area but act quickly.
    - Shut off machinery, pumps, valves etc.
    - Plug leaks.
    - Right containers.
2. No smoking, and no open flames, etc. as required.
3. Implement safety measures and ensure personnel have appropriate personal protective equipment.
4. If conditions permit, clean up the spill:

a. Immobilize the product with absorbent materials, earth, sand, booms, etc. Procedures will vary depending on the product spilled and the location of the spill. A spill kit will be maintained at each staging area.
b. For product spills and leaks on soil, liquid will be collected using absorbent materials and the soiled absorbent materials will be transferred into a drum. The contaminated soil will then be excavated and also placed within a designated drum. Drums of waste will be labelled to identify their contents and be stored at either of the staging areas prior to being hauled off site for disposal by a certified hauler.
c. For product spills into the watercourse, an absorbent boom will be utilized when possible to contain the spill. Absorbent materials will be used to recover floating product. This procedure will be most effective if the spill occurs in an aquatic environment that is relatively still.

5. Report spills and obtain assistance immediately. Do not attempt to contain a large spill by yourself.
6. Call for assistance as required.
7. Contact the following:
    - Environmental Consultant: 604.987.5588 (Sartori Environmental Services).
    - Government Notification for spills that reach reportable quantities, **Provincial Emergency Response Program (PEP)** *24 hour hotline*: 1-800-663-3456.

Spill reporting is mandatory as per the *Spill Reporting Regulation* under the *Waste Management Act*. The following are reporting thresholds:

| | |
|---|---|
| **Flammable Liquid, Class 3** | 100 litres |
| **Corrosive Liquids, Class 5** | 5 kg or 5 litres |
| **Oil** | 100 litres |

The report shall include:

- Name and phone number of person reporting the spill
- Name and phone number of person causing the spill
- Location and time of the spill
- Type and quantity of the spill
- Cause and effect of the spill
- Details of action proposed or taken to contain and minimize impact
- Names of agencies on the scene
- Names of other persons or agencies advised
- Methods implemented to contain The Spill

As part of the EMP, the contractor(s) will ensure that all on-site personnel are aware of the environmental features associated with the project. During the pre-construction meeting, environmental sensitivities related to the project will be conveyed to the construction crew, as well as the proper use of spill kits and absorbent booms. Site-specific precautions and conditions will be conveyed to the construction foreman prior to construction and on an on-going basis.

Back-up procedures in the event that the primary protective measures fail will be initiated during the mobilization phase. These measures include:

- Storm drains in areas of high risk will be sealed with drain seals. This will prevent any oil/hydraulic spills to gain quick access to the creek.
- Absorbent boom and pads will be on site at all times.
- Any fuel or oil tanks stored on near the site will be placed on containment pads with sufficient capacity to contain the fuel.

The following is a list of protective equipment available in the development area at all times:

- A spill response kit that will include absorbent pads, three shovels, nylon rope, one (1) axe, a roll of plastic, four 5-gallon buckets, and two empty drums will be kept in a designated area and clearly marked.
- An extra absorbent boom for use around watercourses.
- Drip trays, which can be placed under leaking vehicles and/or machinery.
- A list of contact numbers, in case of a spill.

## 3.0 Environmental Monitoring

SES has been commissioned as the EM for the construction of Area 6. SES has conducted monitoring of numerous instream works throughout Lower Mainland, and is known to all relevant local environmental regulatory agencies (DWV, DFO, MOE).

SES will inspect and monitor conditions in the vicinity of the development to ensure compliance with environmental permits and appropriate environmental regulations and Best Management Practices (BMP's). The frequency of inspections and monitoring will correspond to the environmental sensitivity of the construction activities, proximity to environmentally-sensitive areas and weather conditions.

Full-time monitoring will be conducted during high risk construction activities to ensure compliance with the mitigation plan and municipal watercourse protection bylaws. Construction activities scheduled for full time monitoring include:

- Stripping of material within 15 metres of any watercourse;
- Direct instream works;
- Excavation related to the installation of culvert crossings;
- Concrete pours (pile filling, and superstructure pours);
- Installation of the rip rap within 15 metres of any watercourse; and
- Installation of the culvert sections and substrate placement within.

The monitor will have authority to halt or modify pre-construction, construction or restoration activities as conditions warrant. The monitor will inspect equipment, material storage, work areas and riparian areas, and monitor turbidity and pH. In addition, the monitor will have sample containers on-hand to collect water samples for laboratory analysis if needed.

## 3.1 Site Stabilization

Erodible material stabilization is an ongoing task to ensure that cut slopes and stockpiles do not erode and create turbid runoff. Typically BMP measures (*e.g.* polyethylene sheets, silt fencing, etc.) are used to minimize erosion or treat sediment during periods of active construction. However, to achieve further long term stabilization, the following criteria will be used to assess whether hydro-seeding exposed soils is appropriate:

- During summer months – hydro-seeding will be conducted on exposed soils if they are to be left for a period of four weeks or if drought conditions do not allow for hydro-seeding, all slopes exposed slopes will be covered prior to rain events;
- During spring/fall months – hydro-seeding will be conducted on all exposed soils if they are to be left for a period of three weeks, or otherwise be entirely covered prior to rain events; and,
- During winter months – hydro-seeding is not possible as seed will not germinate. All slopes to be covered as soon as possible after being exposed.

The use of wood mulch can also be used to cover exposed slopes up to 2H:1V.

## 3.2 Danger Tree Removal

After initial clearing, a certified arborist shall assess trees along the edge of riparian areas and proposed Covenant and Park areas to identify any danger trees. Danger trees may not be cut or removed without the approval of the District's:

- Environmental Protection Officer in proposed covenant areas, and,
- Manager of Parks in proposed Park areas.

## 3.3 Tree Replacement Criteria

All areas cleared of danger trees within the riparian zone of a watercourse will be restored at the completion of works. Restoration will include installation of clean, locally-sourced topsoil and revegetated according the approved Rodgers Creek tree replacement criteria. Key components of the vegetation restoration plan include:

- Prior to restoration works, a planting list including species-specific quantities and planting densities will be compiled or approved by the EM, and will be submitted to the District for review;
- Following topsoil installation, exposed areas will be ground seeded with season-appropriate stock to promote immediate root growth and associated stabilization against erosion;
- Following ground seeding, biogeoclimatic appropriate nursery stock native plants or locally source transplants will be installed in an attempt to expedite succession and reduce invasive plant intrusion;
- Recommendations for plant replacement and/or general restoration items (*e.g.* invasive species removal, watering, fertilization, *etc.*) will be made to BPP to ensure appropriate timing and ecological function; and,

- If insufficient space (due to bedrock, or existing vegetation is sufficiently dense) is available for planting of trees according the Provincial Tree Replacement Criteria, the replanting plan will be reviewed with the District's Manager of Parks.

# APPENDIX A

EROSION AND SEDIMENT CONTROL PLAN

TEMPORARY CREEK CROSSING WITH SUITABLY SIZED PIPE OR LOG BRIDGE (TO BE REVIEWED IN FIELD WITH ENGINEER AND ENVIRONMENTAL CONSULTANT)

SEDIMENT POND
*(DETAIL B & C)*

SILT FENCING, EXACT LOCATION TO BE DETERMINED IN FIELD WITH ENVIRONMENTAL CONSULTANT
*(DETAIL A)*

TEMPORARY SWALE TO CONVEY STORM WATER
*(DETAIL E)*

SEDIMENT POND
*(DETAIL B & C)*

TEMPORARY CREEK CROSSING WITH SUITABLY SIZED PIPE OR LOG BRIDGE (TO BE REVIEWED IN FIELD WITH ENGINEER AND ENVIRONMENTAL CONSULTANT)

SILT FENCING, EXACT LOCATION TO BE DETERMINED IN FIELD WITH ENVIRONMENTAL CONSULTANT
*(DETAIL A)*

SEDIMENT POND
*(DETAIL B & C)*

DISCHARGE TO FOREST IF GRADES ALLOW

TEMPORARY ARMOURED ACCESS/EGRESS ROUTE: COMPACTED 6"[MIN] MINUS ROAD BASE, 8"[MIN] LIFT *(DETAIL D)*

ENVIRONMENTAL SETBACK ALONG PROPERTY LINE

1800 x 1200mm CONCRETE BOX CULVERT

900mm CONCRETE CULVERT

CREEK

ROAD H

ROAD G

MOUNTAIN PATH

CYPRESS BOWL ROAD

DEVELOPMENT BOUNDARY

WESTMOUNT

CYPRESS BOWL

AREA 6

SEDIMENT CONTROL POND/SUMP

TEMPORARY SWALES

SILT FENCING

COLLEGE OF APPLIED BIOLOGY
J. Alex Sartori
R.P. Bio #1811
CAD

sartori environmental services

BPP AREA 6, CLEAR & GRUB - EROSION AND SEDIMENT CONTROL PLAN (SITE PLAN)
PERMIT DRAWINGS (1 OF 4)

DATE 2015-12-22

REV 0

DRAWN BY A.S.

Scale 1:1000

DRAWING NO. 2015_12_22 Area6_ESC1.dwg

ROAD H

SEDIMENT POND
(DETAIL B & C)

TEMPORARY SWALE TO CONVEY STORM WATER
(DETAIL E)

SEDIMENT POND
(DETAIL B & C)

SILT FENCING, EXACT LOCATION TO BE DETERMINED IN FIELD WITH ENVIRONMENTAL CONSULTANT
(DETAIL A)

TEMPORARY CREEK CROSSING WITH SUITABLY SIZED PIPE OR LOG BRIDGE (TO BE REVIEWED IN FIELD WITH ENGINEER AND ENVIRONMENTAL CONSULTANT)

ROAD H

SEDIMENT POND
(DETAIL B & C)

CAVE CREEK EAST

CAVE CREEK EAST

ENVIRONMENTAL SETBACK ALONG PROPERTY LINE

AREA 6

WETLAND

ENVIRONMENTAL SETBACK ALONG PROPERTY LINE

AREA 6

TEMPORARY CREEK CROSSING WITH SUITABLY SIZED PIPE OR LOG BRIDGE (TO BE REVIEWED IN FIELD WITH ENGINEER AND ENVIRONMENTAL CONSULTANT)

CAVE CREEK EAST

TEMPORARY CREEK CROSSING WITH SUITABLY SIZED PIPE OR LOG BRIDGE (TO BE REVIEWED IN FIELD WITH ENGINEER AND ENVIRONMENTAL CONSULTANT)

CAVE CREEK EAST

TEMPORARY SWALE TO CONVEY STORM WATER
(DETAIL E)

ROAD G

SEDIMENT POND
(DETAIL B & C)

TEMPORARY SWALE TO CONVEY STORM WATER
(DETAIL E)

ROAD G

SEDIMENT POND
(DETAIL B & C)

MOUNTAIN PATH

MOUNTAIN PATH

SILT FENCING, EXACT LOCATION TO BE DETERMINED IN FIELD WITH ENVIRONMENTAL CONSULTANT
(DETAIL A)

SILT FENCING, EXACT LOCATION TO BE DETERMINED IN FIELD WITH ENVIRONMENTAL CONSULTANT
(DETAIL A)

MOUNTAIN PATH

DEVELO

SEDIMENT CONTROL POND/SUMP

TEMPORARY SWALES

SILT FENCING

COLLEGE OF APPLIED BIOLOGY
J. Alex Sartori
R.P. Bio #1811
CAB

sartori environmental services

# BPP AREA 6, CLEAR & GRUB - EROSION AND SEDIMENT CONTROL PLAN (SITE PLAN)
## PERMIT DRAWINGS (2 OF 4)

DATE 2015-12-22

REV 0

DRAWN BY A.S.

Scale 1:1000

DRAWING NO. 2015_12_22 Area6_ESC1.dwg

# EROSION AND SEDIMENT CONTROL NOTES

1. THIS EROSION AND SEDIMENT CONTROL (ESC) PLAN HAS BEEN PREPARED FOR **Clearing & Road Earthworks Area 6**, WEST VANCOUVER.

## *GENERAL*

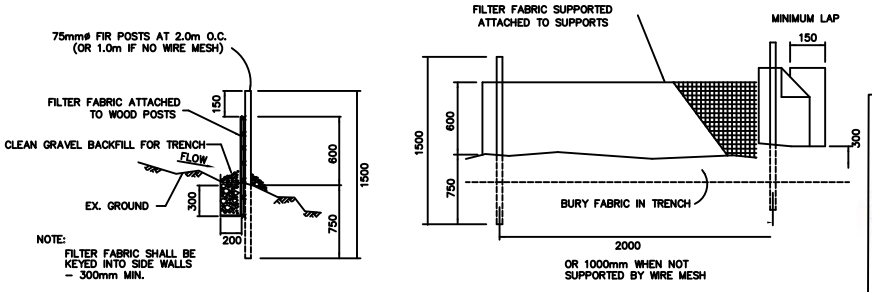
2. UNDER THIS ESC PLAN, IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE THAT ALL OF THE EROSION AND SEDIMENT CONTROL FACILITIES DESCRIBED UNDER THIS ESC PLAN ARE CONSTRUCTED, IMPLEMENTED, INSTALLED AND MAINTAINED FOR THE DURATION OF CONSTRUCTION, OR UNTIL REMOVAL/DECOMISSIONING IS RECOMMENDED BY THE ESC MONITOR.
3. THE CONSTRUCTION CONTRACTOR, AND ALL OTHER SUB-CONTRACTORS OR PERSONS INVOLVED WITH CONSTRUCTION OF THE PROJECT SHALL COMPLY WITH FEDERAL, PROVINCIAL AND LOCAL GOVERNMENT LAWS AND REGULATIONS PERTAINING TO THE PROTECTION OF FISH AND AQUATIC HABITAT AND EROSION AND SEDIMENT CONTROL, INCLUDING BUT NOT LIMITED TO THE LAND DEVELOPMENT GUIDELINES FOR PROTECTION OF FISH AND AQUATIC HABITAT AND THE DISTRICT OF WEST VANCOUVER BYLAW NO.4364.
4. IT IS THE RESPONSIBILITY OF THE CONTRACTOR, AND ANY SUB-CONTRACTORS OR EMPLOYEES TO ENSURE THAT WATER DISCHARGING FROM THE SITE SHALL NOT EXCEED THE WATER QUALITY STANDARD OF 75 MG/L FOR TOTAL SUSPENDED SOLIDS (TSS) FOLLOWING A SIGNIFICANT RAINFALL EVENT. A SIGNIFICANT RAINFALL EVENT IS DEFINED AS A PRECIPITATION EVENT THAT MEETS OR EXCEEDS THE INTENSITY OF 20 MM OF TOTAL RAINFALL OVER A 24 HOUR PERIOD.
5. THE ESC MONITOR OR PROJECT MANAGER, AT THEIR DISCRETION, MAY RECOMMEND THAT ESC FACILITIES AND MITIGATIONS BE ADDED TO THE SITE, OR RECOMMENDED ESC FACILITIES BE MODIFIED AS REQUIRED TO COMPLY WITH BYLAW NO. 4364, AND DEPENDENT ON SITE CONDITIONS, WEATHER CONDITIONS, OR UNFORESEEN OBSTACLES DURING CONSTRUCTION. THE CONTRACTOR SHALL COMPLY WITH THE DIRECTIONS OF THE ESC MONITOR AND THE PROJECT MANAGER, AND SHALL ENSURE THAT ESC FACILITIES ARE CONSTRUCTED, IMPROVED, REPAIRED AND MAINTAINED AS A PRIORITY AHEAD OF ALL OTHER SITE CONSTRUCTION ACTIVITIES.

## *EARTHWORKS & GRADING*

6. STRIPPING, PRELIMINARY EXCAVATION, AND TRENCHING WORKS ARE TO BE CONDUCTED DURING FAVOURABLE WEATHER TO MINIMIZE EROSION AND GENERATION OF SEDIMENT-LADEN DRAINAGE.
7. TRUCK AND VEHICLE ACCESS TO THE WORKS AREA IS TO BE CONFINED, AS MUCH AS POSSIBLE, TO DEFINED ACCESS POINTS FROM PUBLIC ROADS TO PREVENT SILT TRACKING TO PAVED SURFACES. PAVED ACCESS ROADS SHOULD BE EMPLOYED TO PREVENT UNNECESSARY SEDIMENT TRACKING TO PUBLIC ROADS FROM MACHINERY AND VEHICLES.
8. THE CONSTRUCTION CONTRACTOR WILL BE RESPONSIBLE FOR MAINTAINING CLEAN PUBLIC ROADS ADJACENT TO THE SITE THROUGH PERIODIC SWEEPING AND SCRAPING AS REQUIRED.
9. ALL CATCH BASINS ADJACENT TO ACTIVE WORKS AND CONSTRUCTION ACCESS ROUTES ARE TO BE PROTECTED AS REQUIRED WITH CATCH BASIN PROTECTION DEVICES IF SEDIMENT DEPOSITION IS OBSERVED.
10. NO SITE DRAINAGE IS TO FLOW DIRECTLY TO THE MUNICIPAL STORM SYSTEM, WITHOUT PRIOR TREATMENT (e.g. SEDIMENT CONTROL POND)
11. EXPOSED CUT AND/OR FILL SLOPES ARE TO BE COVERED WITH DENSE APPLICATION STRAW, COMPOSTABLE MATTING, STAKED-IN POLYETHYLENE TARPING, OR EQUIVALENT TO PREVENT EROSION WHILE POOR WEATHER EXISTS.
12. STOCKPILES OF ERODABLE MATERIALS (e.g. EXCAVATION SPOIL, CLAYS, PIT RUN, TOPSOIL, etc.) WILL BE COVERED WITH STAKED-IN POLYETHYLENE TARPING OR EQUIVALENT WHEN NOT IN USE AND ALWAYS PRIOR TO AND DURING FORECAST PRECIPITATION. NON-ERODABLE MATERIALS WILL BE STOCKPILED ON PAVED SURFACES.

## *ESC MONITORING PROGRAM*

13. THE OWNER/DEVELOPER IS REQUIRED TO CONTACT THE ESC MONITOR BY EMAIL AT MINIMUM 72HRS PRIOR TO THE COMMENCEMENT OF CONSTRUCTION ACTIVITIES TO SET-UP A SITE KICK-OFF MEETING. AT THIS TIME, AND THROUGHOUT CONSTRUCTION, THE ESC MONITOR WILL ADDRESS POTENTIAL CONFLICTS BETWEEN THIS ESC PLAN AND ACTUAL SITE CONDITIONS. THE ESC MONITORING WILL CONTINUE UNTIL ALL SITE SURFACES ARE AT FINAL GRADE, BUILDING IS CONSTRUCTED AND DISTURBED SURFACES ARE VEGETATED.
14. THE ESC MONITOR WILL BE CONFIRMED PRIOR TO ISSUANCE OF THE ESC PERMIT THROUGH A CONFIRMATION OF COMMITMENT BY ESC SUPERVISOR. THE ESC MONITOR WILL IMPLEMENT THE FOLLOWING MONITORING SCHEDULE:
    ***a.JUNE 1 TILL SEPTEMBER 30 - BIWEEKLY OR AS REQUIRED IF PRECIPITATION EXCEEDS 20MM IN 24HRS.***
    ***b.OCTOBER 1 TILL MAY 31 - WEEKLY OR AS REQUIRED IF PRECIPITATION EXCEEDS 20MM IN 24 HRS.***
15. THE ESC MONITOR WILL INSPECT AND MONITOR THE ESC FACILITIES TO ENSURE SEDIMENT AND SEDIMENT LADEN WATER DO NOT REACH THE MUNICIPAL DRAINAGE SYSTEM WITHOUT TREATMENT AND THE FACILITIES HAVE BEEN INSTALLED AS DESIGNED, ARE OPERATING EFFECTIVELY, AND TO DETERMINE IF ANY REPAIR OR MAINTENANCE OF THE FACILITIES ARE REQUIRED. THE CONTRACTOR IS RESPONSIBLE FOR THE MAINTENANCE OF ALL ESC FACILITIES OVER THE COURSE OF WORKS. THE ESC MONITOR MAY MODIFY OR ADJUST ESC FACILITIES AS REQUIRED IN ORDER TO ASSURE COMPLIANCE WITH THE MUNICIPAL BYLAW.
16. AT THE DISCRETION OF THE ENVIRONMENTAL MONITOR, SITE SAMPLING (TURBIDITY SAMPLING) MAY BE CONDUCTED DURING EACH SITE VISIT. IF HIGH TURBIDITY (≥ 65NTU) IS OBSERVED, A TSS WATER SAMPLE WILL BE COLLECTED AND SUBMITTED TO THE LABORATORY FOR ANALYSIS. ALL DATA WILL BE AVAILABLE TO THE DISTRICT FOR INSPECTION IF REQUESTED.
17. THE ESC MONITORING PROGRAM SHOULD CONTINUE FROM THE START OF CONSTRUCTION TO SUCH A TIME THAT THE ESC MONITOR DETERMINES THAT FURTHER MONITORING IS NO LONGER REQUIRED AS CONSTRUCTION PROGRESS HAS REACHED FINAL STAGES AND THE RISK TO THE SURROUNDING ENVIRONMENT IS NEGLIGIBLE. THE ESC MONITOR WILL PROVIDE THE DISTRICT OF WEST VANCOUVER ENVIRONMENTAL STAFF WITH CONFIRMATION VIA EMAIL THAT THE MONITORING PROGRAM HAS CEASED.




DETAIL A: SILT FENCE INSTALLATION (TYP)

COLLEGE OF APPLIED BIOLOGY
J. Alex Sartori
R.P. Bio #1811
CAB

sartori environmental services

DATE 2015–12–22

DRAWN BY A.S.

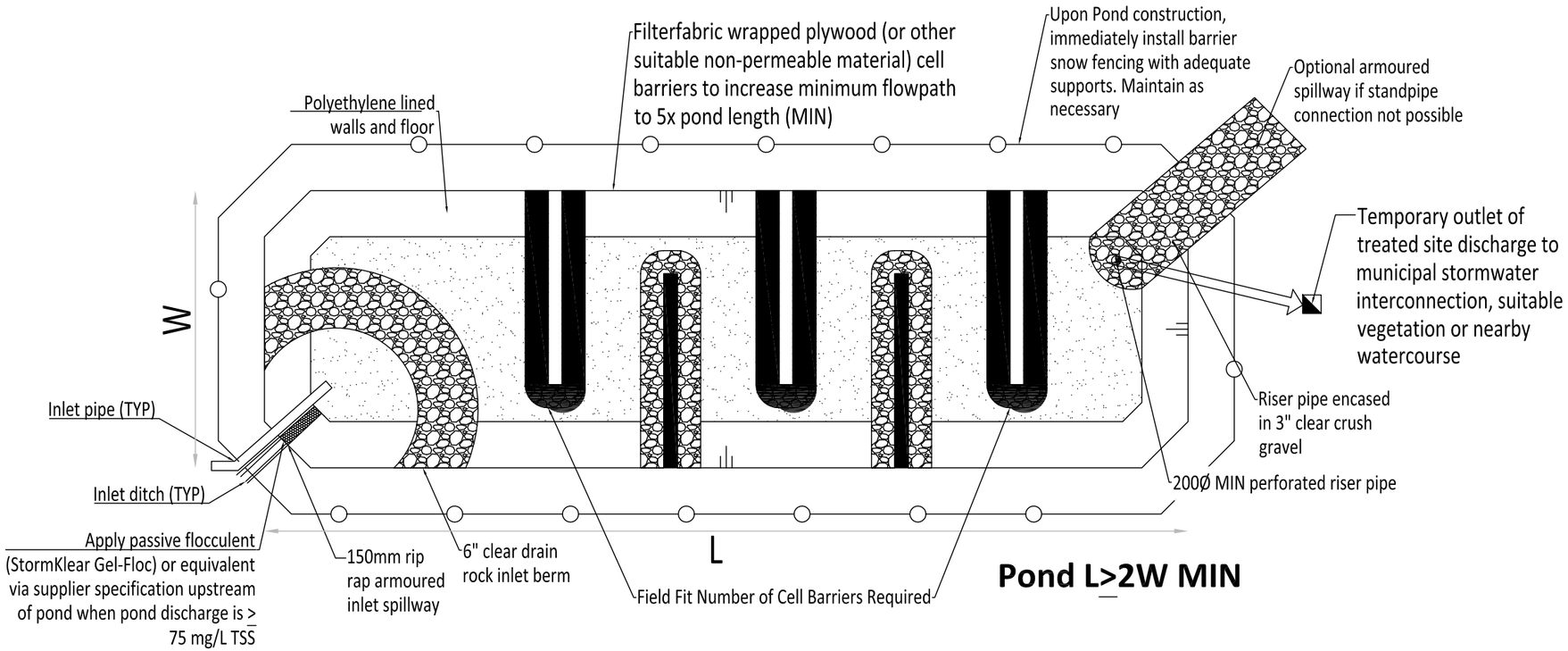
# BPP AREA 6, CLEAR & GRUB - EROSION AND SEDIMENT CONTROL PLAN (DETAILS)

## PERMIT DRAWINGS (3 OF 4)

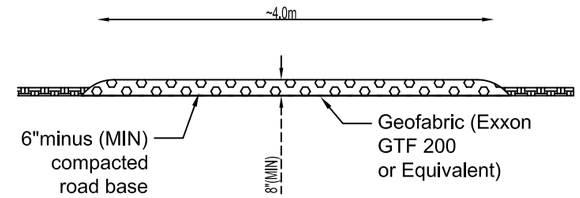
REV 0

Scale: not to scale

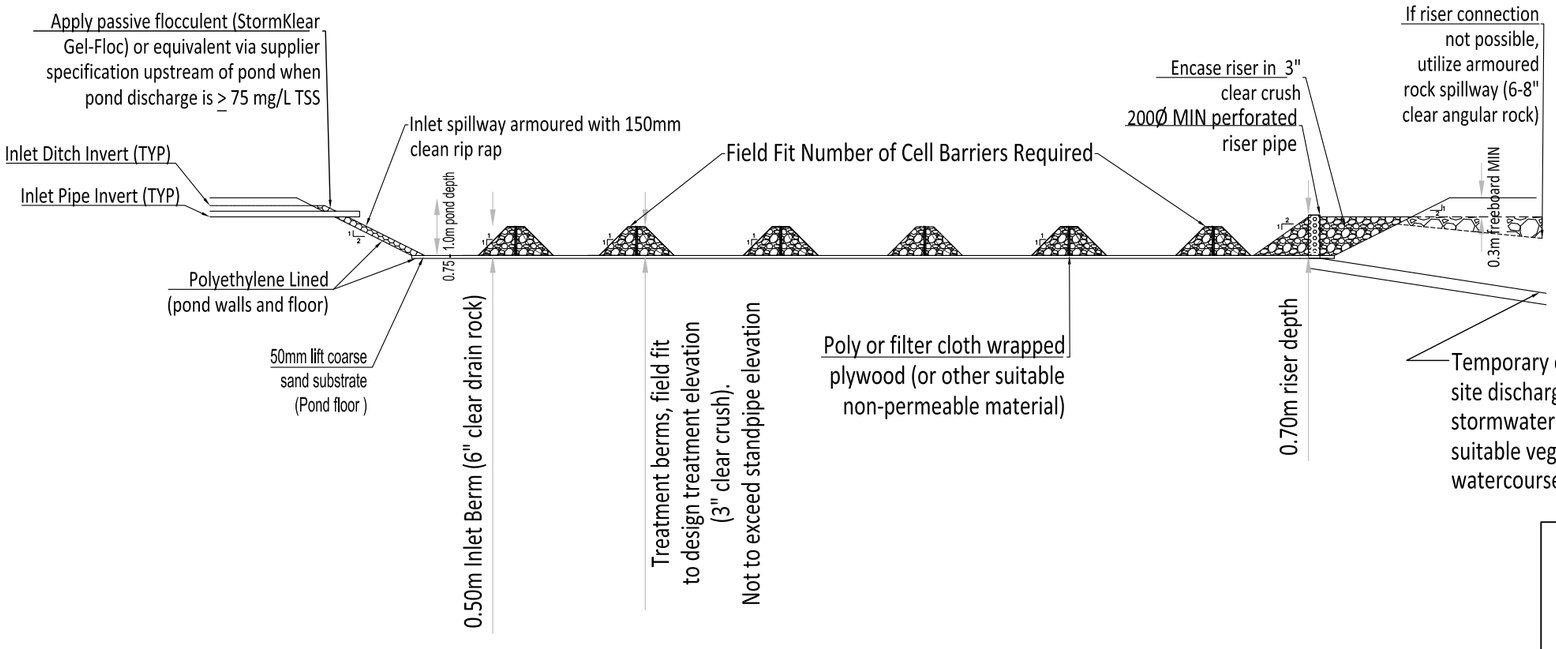
DRAWING NO. 2015_12_22 Area6_ESC1.dwg



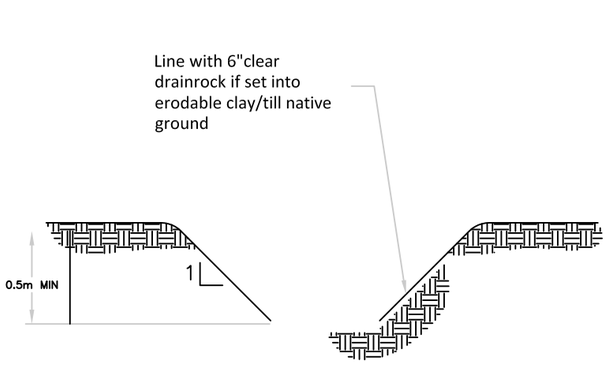

DETAIL B: TYPICAL SEDIMENT CONTROL POND DETAILS (FIELD FIT REQUIRED)




DETAIL D: ACCESS/EGRESS ROAD X-SEC




DETAIL C: TYPICAL SEDIMENT CONTROL POND DETAILS *(FIELD FIT REQUIRED)*




DETAIL E: TEMPORARY SWALE DETAILS X-SEC.

COLLEGE OF APPLIED BIOLOGY
J. Alex Sartori
R.P. Bio #1811
CAB

sartori environmental services

BPP AREA 6, CLEAR & GRUB - EROSION AND SEDIMENT CONTROL PLAN
(ESC DETAILS)
PERMIT DRAWINGS (4 OF 4)

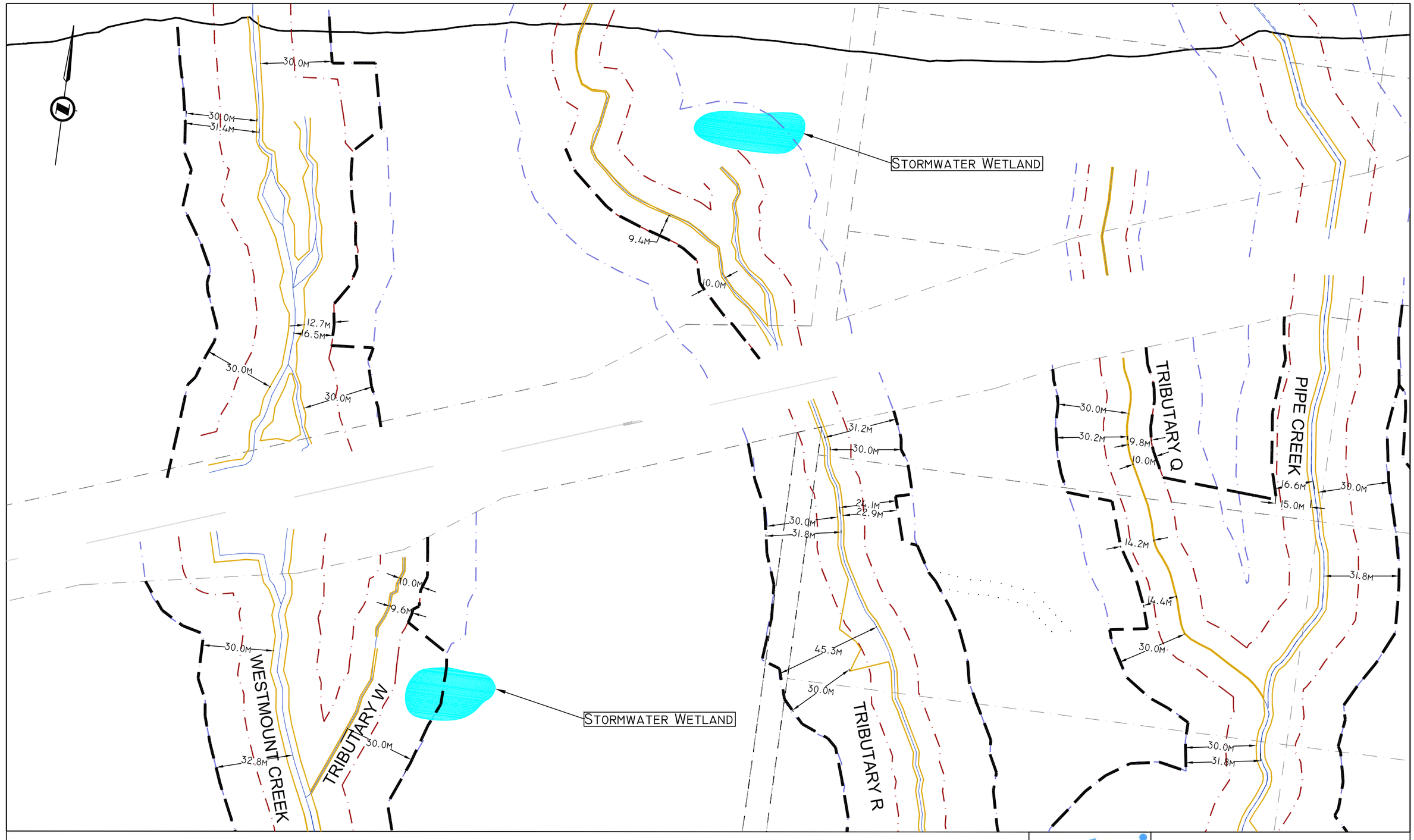
DATE 2015-12-22
REV 0
DRAWN BY A.S.
Scale: not to scale
DRAWING NO. 2015_12_22 Area6_ESC1.dwg

# APPENDIX B

ENVIRONMENTAL SETBACK SUMMARY & MAPS

| Development Area No. | Stream Name | Biophysical Characteristics | Proper Functioning Condition Description | Stream Ranking | Restoration Opportunities | Closest Point to Potential Development Area | EDP Setback Infringement | Stream Setback Rationale |
|---|---|---|---|---|---|---|---|---|
| 5 | Trib.W | * average channel width of 0.98 metres<br>* no tailed frogs or fish identified<br>* minimal flow conditions<br>* no connection above Cypress Bowl Road | Tributary W is a short reach segment that is functional, whose channel begins as headwater seepage from Cypress Bowl Road; channel ill defined in this upper-most reach | Low | Potential to construct a large wetland pond within the old logging road bench. | 10 metres HWM<br>9.5 metres ToB | Yes | A minor infringement is proposed within the EDP setbacks near an ill defined portion of the creek channel. A 10 metre RAR setback is proposed and is sufficient to maintain the form, function and condition of the watercourse. |
| 5 | Westmount Creek | * average channel width of 5.44 metres<br>* no tailed frogs or fish identified<br>* intermittent flow conditions<br>* large watershed<br>* large tract of green space between Pipe Creek and Cave Creek provides connectivity in an east/west alignment and riparian areas provide connections in a north/south configuration | Westmount Creek is functional throughout its length, with an extensive catchment above CBR; this channel is an A1/2/3, with steep reaches that have evidenced some slumping and blow down and that has steep chute-like sections in the lower reaches | Medium | Restoration opportunities exist within disturbed mountain bike crossing locations | No Impacts | No | No impacts to Westmount Creek. |
| 5 | Trib. U | * average channel width of 1.15 metres<br>* no tailed frogs or fish identified<br>* minimal flow conditions<br>* originates within study area, 150 metres in length | Tributary U is functional, given that it has virtually no catchment and the minor flows reflect the ground water discharge and interflow arising from logging roads and seepage from depressional wet zone; Tributary U consists of a mix of minor braided interrupted channels, with a remnant headwater wetland arising from former log sort landing; lowest-most segment is ill-defined and drains into CBR drainage ditch | Low | Potential to construct a large wetland headwater pond which could also be used for biofiltration purposes for the development pod above. | No Impacts | No | No impacts to Trib.U |
| 5 | Cave Creek | * average channel width of 3.76 metres<br>* no tailed frogs or fish identified<br>* intermittent flow conditions<br>* braided and unconfined between Cypress Bowl Roads<br>* large tract of green space between Pipe Creek and Cave Creek provides connectivity in an east/west alignment and riparian areas provide connections in a north/south configuration | Cave Creek is functional throughout its length, except at the lowest segment where it flows into the culvert routing its flows under CBR; this channel is also an A1/2/3; there are, in the lower reaches, braided channels arising from historical slope failures, leaving multiple thread channels, that reconverge immediately above CBR; these creek channels have steep chute-like sections in the lower reaches; there is significant logging LWD and some blow down throughout the channels | Medium | | 11.3 metres HWM*<br>9.4 metres ToB | Yes | A minor infringement within the EDP setbacks is proposed and is offset by the large contiguous riparian area to the west and south. |
| 5 | Trib VV | * average channel width of 1.5 metres<br>* no tailed frogs or fish identified<br>* intermittent flow conditions | Tributary VV is functional, except in that segment immediately above CBR; this channel is narrow, with segments of A3/4b with some B3/4; narrow riparian zone and intermittent flows | Low | | No Impacts | No | No impacts to Trib.VV. |
| 6 | Trib R | * average channel width of 2.5 metres<br>* no tailed frogs or fish identified<br>* intermittent flow conditions<br>* lower end channelized into Pipe Creek | Upper reaches of tributary R, above CBR, are non-functional, consisting of downcut, deeply entrenched channels/ditches; damage arising from failing logging roads and recreational trails through the stream channel, it evidences extensive braiding and avulsions; flows are irregular; reaches downstream of CBR are functional, with significant logging LWM and blow-down; the channel consists of A3/4b with some B3/4; deeply incised and entrenched in lower reaches; lower-most segment, immediately above confluence with Pipe Creek is ditched and non-functional | Medium | Restoration opportunities exist within disturbed mountain bike crossing locations. Headwater wetland opportunity presently being assessed. | 10 metres HWM<br>9.4 metres ToB | Yes | An infringement within the EDP setbacks is proposed on the west side, however the proposed setback is sufficient to maintain the form, function and condition of the watercourse. |
| 6 | Westmount Creek | * average channel width of 5.44 metres<br>* no tailed frogs or fish identified<br>* intermittent flow conditions<br>* large watershed<br>* large tract of green space between Pipe Creek and Cave Creek provides connectivity in an east/west alignment and riparian areas provide connections in a north/south configuration | Westmount Creek is functional throughout its length, with an extensive catchment above CBR; this channel is an A1/2/3, with steep reaches that have evidenced some slumping and blow down and that has steep chute-like sections in the lower reaches | Medium | Restoration opportunities exist within disturbed mountain bike crossing locations | 16.5 metres HWM (left bank)*<br>12.7 metres ToB (left bank)<br>31.4 metres HWM (right bank)<br>30 metres ToB (right bank) | Yes | A minor infringement within the EDP setbacks is proposed on the east side, however the proposed setback is sufficient to maintain the form, function and condition of the watercourse. |
| 6 | Cave Creek | * average channel width of 3.76 metres<br>* no tailed frogs or fish identified<br>* intermittent flow conditions<br>* braided and unconfined between Cypress Bowl Roads<br>* large tract of green space between Pipe Creek and Cave Creek provides connectivity in an east/west alignment and riparian areas provide connections in a north/south configuration | Cave Creek is functional throughout its length, except at the lowest segment where it flows into the culvert routing its flows under CBR; this channel is also an A1/2/3; there are, in the lower reaches, braided channels arising from historical slope failures, leaving multiple thread channels, that reconverge immediately above CBR; these creek channels have steep chute-like sections in the lower reaches; there is significant logging LWD and some blow down throughout the channels | Medium | Restoration opportunities exist within disturbed logging road alignments | 11.3 metres HWM (west trib)*<br>9.8 metres ToB (west trib)<br>13.6 metres HWM (east trib)<br>13.6 metres ToB (east trib) | Yes | A minor infringement within the EDP setbacks is proposed on the west channel within previously disturbed road crossing areas. The reduced setback proposed is sufficient to maintain the form, function and condition of the watercourse. |
| 6 | Cave Creek West | * average channel width of 1.64 metres<br>* no tailed frogs or fish identified<br>* intermittent flow conditions<br>* lower portion of channel within powerline ROW, and subject to a managed riparian. | | Low | Restoration opportunities exist within three old logging road crossings and an area where the watercourse has avulsed onto a trail. | 10 metres HWM<br>9.8 metres ToB | Yes | 30 metre setback provided along entire length, except where the stream flows within the Hydro ROW, as the riparian zone is permanently managed due to the powerlines. |

* Requires either temporary road construction disturbance to the setback area or a road crossing




sartori environmental services

# RODGERS CREEK ADP - AREA 6 SETBACK MAP (1 OF 2)

| | | |
|---|---|---|
| DATE July 2008 | | REV |
| DRAWN BY A. Sartori | SCALE 1:1,500 | DRAWING NO. BPP-ADP-190208 |

CAVE CREEK WEST

30.0M
9.8M
9.8M
10.0M
30.0M
9.8M
11.3M
30.0M
30.0M
15.0M
17.0M
15.0M
16.9M
13.6M
30.0M

HABITAT RESTORATION AREA

SETBACKS
TOP OF BANK
RAR SETBACK LINE
30M EDP SETBACK

sartori environmental services

# RODGERS CREEK ADP - AREA 6 SETBACK MAP (2 OF 2)

DATE July 2008
REV
DRAWN BY A. Sartori
SCALE 1:1,500
DRAWING NO. BPP-ADP-190208