



February 22, 2017

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Re: Anmore Hillside Environmental Assessment

Sartori Environmental Services (SES) and Bianchini Biological Services (BBS) conducted an environmental assessment of Anmore hillside properties, which included an overview wildlife and vegetation assessment and a search for watercourses within the property boundaries (the Project) (Figures 1 and 2). The assessment focused on federally and provincially listed terrestrial wildlife and vegetation species and potential wildlife corridors, and unnamed watercourses that may be affected by any future works related to the Project.

Field work for this assessment was undertaken on January 24 and February 20, 2017, due to persistent snow covered conditions. The study area was assessed for occurrences of species listed under the SARA, Committee on the Status of Endangered Wildlife in Canada (COSEWIC), provincial *Wildlife Act*, provincially Red and Blue-listed species and for general wildlife and vegetation species as well as raptor/heron nests and current wildlife use. Watercourses were assessed with the Provincial Riparian Areas Regulation (RAR) detailed methodology to establish setbacks for their protection.

1.0 SUMMARY

The study area occurred upslope of Ridge Mountain Drive, Anmore, BC. All forested and non-forested areas encountered were assessed during the field program. These areas were part of potential wildlife corridors and habitats that may be used by at least eight federally or provincially listed terrestrial wildlife and vegetation species. The forested sites within the study area were identified as having high wildlife values and provided potential habitat for several federally listed wildlife species including red-legged frog (*Rana aurora*), western toad (*Anaxyrus boreas*), Band-tailed Pigeon (*Patagioenas fasciata*) and snowshoe hare (*Lepus americanus washingtonii*). These forested areas also provided important nesting habitat for other wildlife including raptors such as Bald Eagle (*Haliaeetus leucocephalus*), Cooper's Hawk (*Accipiter cooperii*) and owls. Wildlife sign encountered during the field program included Columbian black-tailed deer (*Odocoileus hemionus columbianus*), cougar (*Puma concolor*), coyote (*Canis lantrans*) and the Red-listed listed snowshoe hare.

No vegetation species listed under the SARA were detected during the field program. Due to survey timing (winter) many herbaceous species could not be identified. The site may provide habitat for at least one provincially listed plant species including the Red-listed Roell's brotherella moss (*Brotherella roellii*).

The study area fell within the Dry Maritime (CWHdm) Biogeoclimatic (BGC) subzone. Seventeen of nineteen of the forested ecological communities within the CWHdm have been listed by the British

Columbia Conservation Data Centre (BCCDC). One listed ecological community was identified within the Anmore Hillside study area.

Two unnamed headwaters streams were identified within the study boundaries and were assessed using RAR detailed methodology. The streams were mapped using hand held GPS and mapped.

Invasive vegetation species were encountered along interfaces of treed and disturbed sites. These invasive species included Himalayan blackberry (*Rubus armeniacus*) and English holly (*Ilex aquifolium*). Removal of these invasive plant species at strategic sites would benefit many native wildlife and vegetation species.

2.0 STUDY AREA

The Anmore Hillside study area is upslope of Ridge Mountain Drive, Anmore, BC. The study area fell within the Georgia Depression Ecoprovince, Lower Mainland Ecoregion, Fraser Lowland Ecoregion and was situated in the CWHdm BGC subzone. Legal description and size information for the properties assessed are listed in Table 1.

Table 1. The legal description, civic address, size of vegetation types identified and total size of the subject properties.

Legal Description*	Civic Address	PID	Regenerating Forest Vegetation Type (~ac)	Mature Forest Vegetation Type(~ac)	Total Property Size (~ac)
Lot 23 Plan BCP50736 Section 21 Township 39 Land District 36	N/A	028-861-256	40.277	0	40.277
Lot 8 Plan BCP38521 Section 16 Township 39 Land District 36 AND SECTION 20 AND 21	N/A	027-687-309		12.03	12.03
Lot 71 Plan NWP61510 Section 16&21 Township 39 Land District 36	1720 EAST RD ANMORE V3H 5E9	002-811-626		14.65	14.65

*BC Assessment (2017)

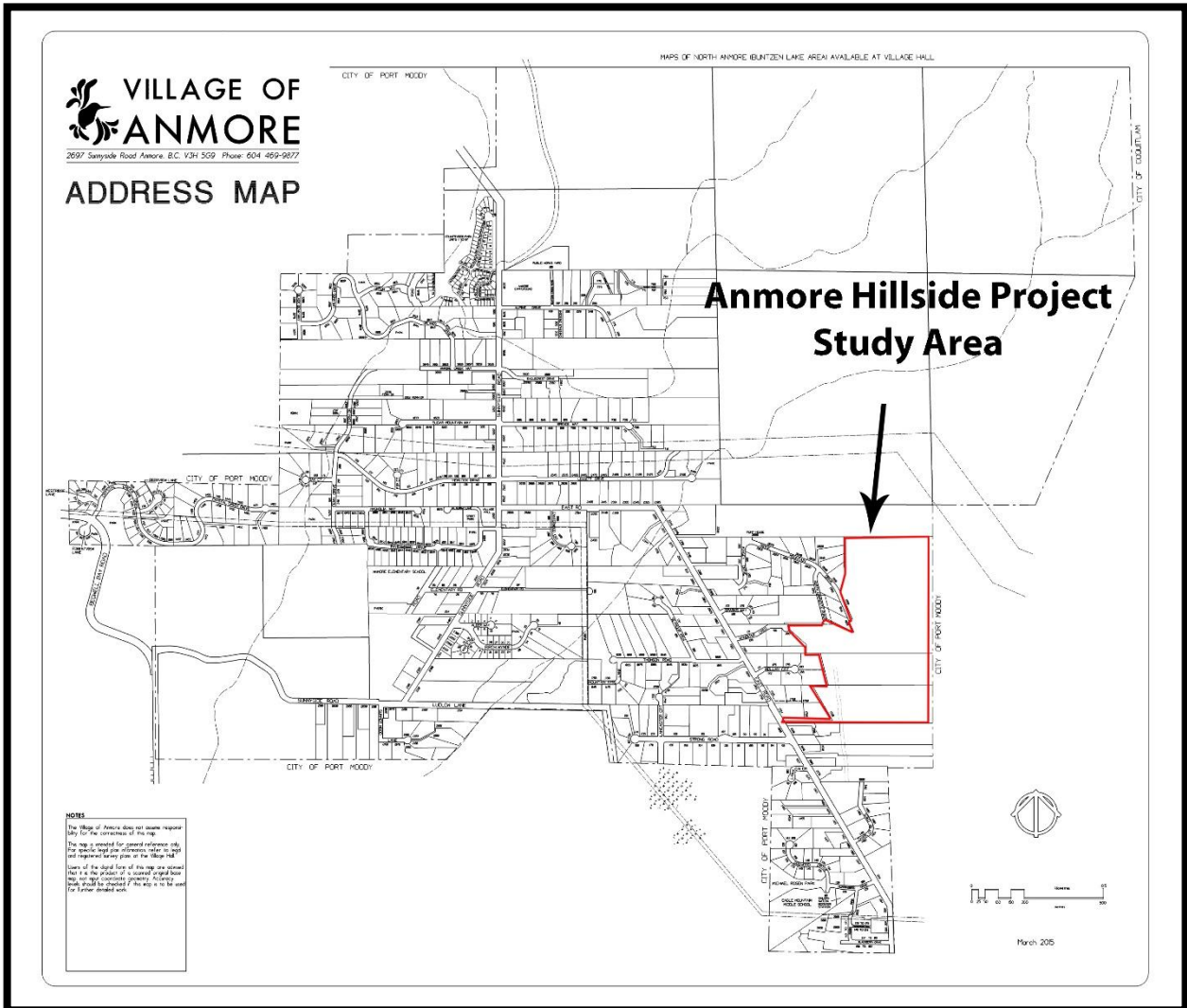


Figure 1. Location of the Anmore Hillside study area in relation to the Village of Anmore (VoA 2015).

3.0 METHODS

Prior to the field assessment, a literature search was conducted covering the Anmore Hillside area of the Village of Anmore, including British Columbia Conservation Data Centre (BCCDC) searches, BC Geographic Warehouse online iMap, South Coast Conservation Program (SCCP) and local knowledge. Area calculations were obtained using online mapping tools. The BCCDC website was searched for all species listed under the SARA, the COSEWIC, Provincial Identified Wildlife and the provincial *Wildlife Act* 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 were also reviewed from the BCCDC for all records within 2 km of the study area.

Random transects were surveyed through all habitats identified during the site assessment. Vegetation species within each site were identified and recorded. In addition, the presence of coarse woody debris (CWD), wildlife trees, dens, burrows and other habitat features were also recorded. All wildlife trees encountered were classified per methodologies identified by Backhouse (1993) and Fenger et al. (2006).

Assessment methods for listed wildlife were adapted from methodologies described in the most recent Best Management Practices (BMP) available. In addition, surveys were also conducted for non-listed wildlife, vegetation and habitat features detected at the site including raptor nest surveys.

Potential raptor/heron nest trees were scanned visually with binoculars. All wildlife and wildlife sign encountered were recorded.

Watercourses encountered on the property were followed and mapped with the use of a GPS. Once mapped, biophysical information and transects were applied using RAR methodologies. Visual observations were conducted for presence of fish or tailed frog species residing within the drainages.

4.0 FEDERALLY AND PROVINCIALY LISTED SPECIES OF CONCERN

Eight federally and/or provincially listed species may occur within the Anmore Hillside study area. These species are listed in Table 2.

Table 2: Federally and/or provincially listed species that may occur within the study area and in similar habitats within 2 km of the Anmore Hillside study site (SARA 2017; BCCDC 20171).

Species	Federal/Provincial Status	Legislation			Site Occurrence	
Common/Scientific Name	COSEWIC/SARA Status	BCCDC Status*	CADA	Provincial Identified Wildlife	Provincial Wildlife Act	Expected Onsite Habitat Use
Vegetation:						
Roell's Brotherella Moss (<i>Brotherella roellii</i>)	Endangered (2010)	Red	-	-	-	Suitable – Potential habitat occurs in all forested sites. Found on rotten logs, stumps, and bases of trees in cool to moist mixed deciduous and conifer forest, usually at low elevations along valley margins.
Vertebrates: Amphibians						
Red-legged Frog (<i>Rana aurora</i>)	Special Concern (2015)	Blue	Y	-	-	Suitable – Potential rearing habitat occurred throughout the forested portions of the study area. No breeding habitat (suitable ponds) at site.
Western Toad (<i>Anaxyrus boreas</i>)	Special Concern (2012)	Blue	Y	-	Y	Suitable – Potential rearing habitat occurred throughout the forested portions of the study area. No breeding habitat (suitable ponds) at site.

Species	Federal/Provincial Status	Legislation			Site Occurrence	
Common/Scientific Name	COSEWIC/SARA Status	BCCDC Status*	CADA	Provincial Identified Wildlife	Provincial Wildlife Act	Expected Onsite Habitat Use
Vertebrates: Birds						
Band-tailed Pigeon <i>(Patagioenas fasciata)</i>	Special Concern (2008)	Blue	Y	-	Y	Suitable - Breeding habitat may occur within the forests of the study area and adjacent conifer dominated forests.
Western Screech-owl <i>(Megascops kennicottii kennicottii)</i>	Special Concern (2002)	Blue	Y	-	Y	Unlikely – Lack of suitable riparian habitat observed within the study area.
Vertebrates: Mammals						
Snowshoe Hare <i>(Lepus americanus washingtonii)</i>		Red	-	-	Y	Suitable – Pellets detected within the regeneration forest of the study area.
Pacific Water Shrew <i>(Sorex bendirii)</i>	Endangered (April 2006)	Red	Y	Y	Y	Unlikely – the vegetation and features observed within the unnamed drainage provided poor habitat.
Trowbridge's Shrew <i>(Sorex trowbridgii)</i>	-	Blue	-	-	Y	Unlikely – the vegetation and features observed within the unnamed drainage provided poor habitat.

*Red= Extirpated, Endangered or Threatened Blue= Special Concern

5.0 RESULTS

5.1 Vegetation Overview

Two vegetation types were identified within the study area:

1. Regenerating Forest Vegetation Type
2. Mature Forest Vegetation Type

Representative photographs of each of the vegetation types are in Figure 2. A list of vegetation observed within the vegetation types is included in Table 3. The two vegetation types identified within the subject area are described below.

5.1.1 Regenerating Forest Vegetation Type

The Regenerating Forest Vegetation Type (RFVT) occurred entirely within the northern 40.277 acre property. The mixed structural stage 4-6 (20-140 years old) stand was logged approximately 30 years ago and was dominated

by small patches mature western redcedar (*Thuja plicata*), western hemlock (*Tsuga heterophylla*) and Douglas-fir (*Pseudotsuga menziesii*) interspersed with red alder (*Alnus rubra*), paper birch (*Betula papyrifera*) and bigleaf maple (*Acer macrophyllum*). The mature trees within the RFVT averaged 80-100 years in age. The patchy shrub layer was dominated by moderate to dense areas of salmonberry (*Rubus spectabilis*), salal (*Gaultheria shallon*), vine maple (*Acer circinatum*), western redcedar and western hemlock (Photograph 1). The sparse herb layer was dominated by sword fern (*Polystichum munitum*) with a dense cover of leaf litter. Evidence of past forest fires was observed. Moderate CWD cover was observed within this vegetation type.

Recent and deactivated access roads bisected this vegetation type (Photographs 2 and 3). An unnamed drainage occurred within the RFVT which paralleled a deactivated access road then continued downslope where it flowed into a pipe at the southwest corner of the northern property. The creek was lined with geotechnical filter cloth and most of the vegetation along either bank had been cut back within the last two years (Photographs 4 to 6).



Photo 1. Typical vegetation composition of mature and regenerating vegetation within the RFVT (February 20, 2017).



Photo 2. A road currently under construction within the RFVT (February 20, 2017).



Photo 3. A deactivated road, likely associated with previous logging, within the RFVT (February 20, 2017).



Photo 4. Unnamed watercourse observed along a deactivated logging road. The vegetation along each bank had been cut and the channel lined with Nilex (February 20, 2017).



Photo 5. Unnamed watercourse as it flows downstream of Ridge Mountain Drive. The vegetation along each bank had been cut and the channel stabilized with filter cloth and sandbags (February 20, 2017).

Photo 6. Piped portion of the unnamed watercourse observed downstream of North Charlotte Road (February 20, 2017).

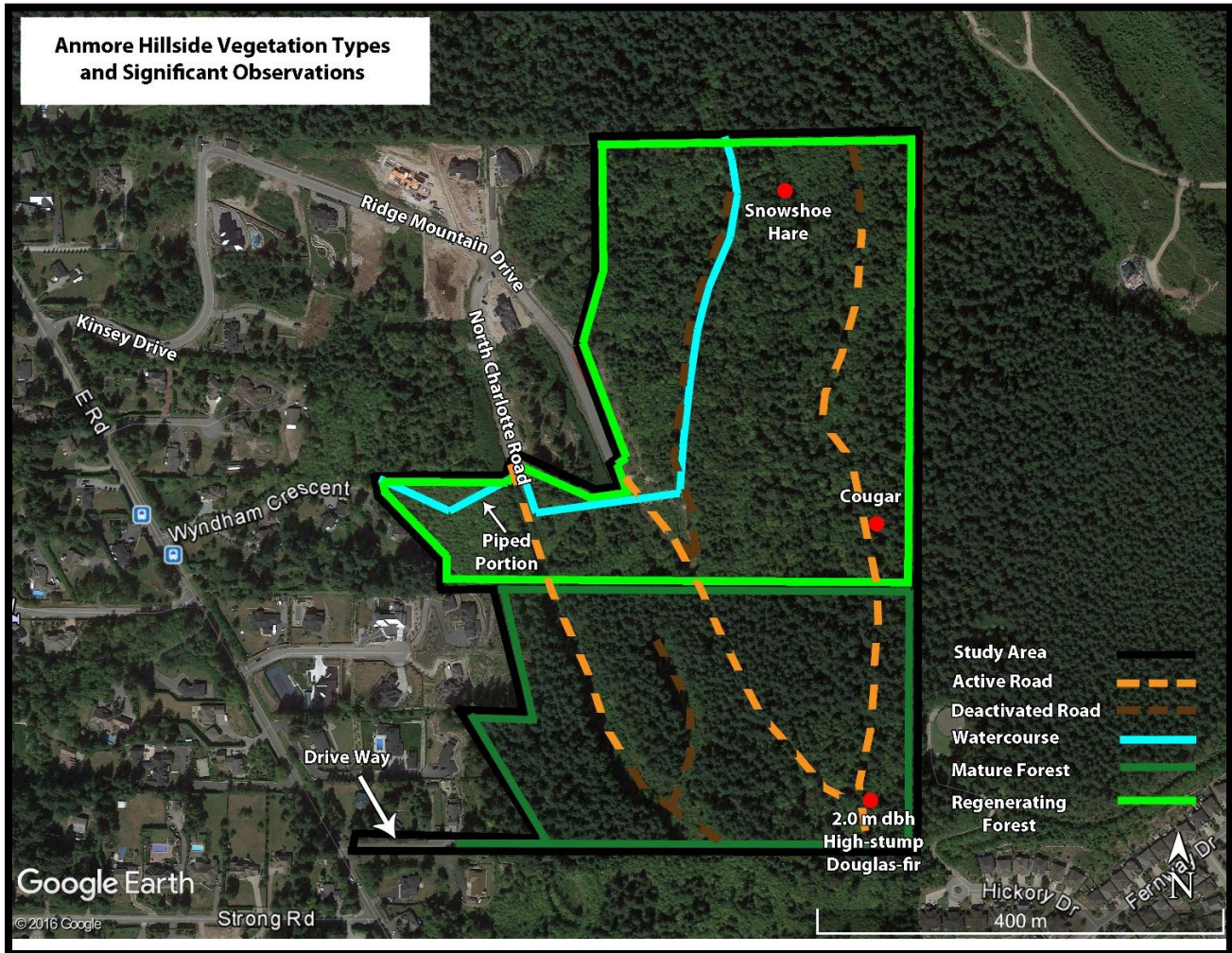


Figure 2. Modified image showing vegetation types and significant wildlife findings observed within the Anmore Hillside study area (Google Earth 2017).

5.1.2 Mature Forest Vegetation Type

The Mature Forest Vegetation Type (MFVT) occurred within the southern two properties and encompassed approximately 26.68 acres within the study area (Figure 2). The structural stage 6 (80-140 years old) stand was dominated by mature western redcedar, western hemlock and Douglas-fir with sparse occurrence of red alder (Photograph 7). These mature trees averaged 80-100 years in age. The patchy shrub layer was dominated by moderate to dense areas of salal, red huckleberry (*Vaccinium parvifolium*) and conifer regeneration. A moderate cover of sword fern dominated the herb layer. Evidence of past forest fires was observed. Moderate CWD cover was observed within this vegetation type. Recent and deactivated access roads also bisected this vegetation type. No watercourses were observed but a number of seepage sites were encountered along the access roads.



Photo 7. Typical vegetation observed within the MFVT (January 24, 2017).

Table 3. Vegetation species detected within the study area during the winter field program (January 24 and February 20, 2017).

Species	Scientific Name*	Regenerating Forest VT	Mature Forest VT
Tree Layer¹:			
Bigleaf Maple	<i>Acer macrophyllum</i>	✓	✓
Douglas-fir	<i>Pseudotsuga menziesii</i>	✓	✓
Paper Birch	<i>Betula papyrifera</i>	✓	
Red Alder	<i>Alnus rubra</i>	✓	✓
Western Hemlock	<i>Tsuga heterophylla</i>	✓	✓
Western Redcedar	<i>Thuja plicata</i>	✓	✓
Shrub Layer²:			
Bigleaf Maple	<i>Acer macrophyllum</i>	✓	✓
Black Gooseberry	<i>Ribes lacustre</i>	✓	
Douglas-fir	<i>Pseudotsuga menziesii</i>	✓	✓
English Holly	<i>Ilex aquifolium</i>	✓	✓
Evergreen Blackberry	<i>Rubus laciniatus</i>	✓	✓
Hardhack	<i>Spiraea douglasii</i>	✓	
Himalayan Blackberry	<i>Rubus armeniacus</i>	✓	✓
Paper Birch	<i>Betula papyrifera</i>	✓	
Red Alder	<i>Alnus rubra</i>	✓	✓
Red Elderberry	<i>Sambucus racemosa</i>	✓	
Red Huckleberry	<i>Vaccinium parvifolium</i>	✓	✓
Salal	<i>Gaultheria shallon</i>	✓	✓

Species	Scientific Name*	Regenerating Forest VT	Mature Forest VT
Salmonberry	<i>Rubus spectabilis</i>	✓	✓
Vine Maple	<i>Acer circinatum</i>	✓	✓
Western Hemlock	<i>Tsuga heterophylla</i>	✓	✓
Western Redcedar	<i>Thuja plicata</i>	✓	✓
Herb Layer:			
Bracken Fern	<i>Pteridium aquilinum</i>	✓	✓
Common Dandelion	<i>Taraxacum officinale</i>	✓	✓
Common Plantain	<i>Plantago major</i>	✓	✓
Common Rush	<i>Juncus effusus</i>	✓	✓
Creeping Buttercup	<i>Ranunculus acris</i>	✓	✓
Deer Fern	<i>Blechnum spicant</i>	✓	✓
Dull Oregon-grape	<i>Mahonia nervosa</i>	✓	✓
Foxglove	<i>Digitalis purpurea</i>	✓	✓
Grasses	<i>Graminoid sp.</i>	✓	✓
Hawkweed	<i>Hieracium sp.</i>	✓	✓

¹ Tree Layer: Woody plants >2m in height

² Shrub Layer: Woody plants 0-2m in height

* Scientific and common names from Klinkenberg 2017 (E-Flora BC)

5.2 Wildlife Trees

A wildlife tree is any standing dead or living tree with special features that provides present or future critical habitats for the maintenance or enhancement of wildlife. There are nine classifications of coniferous and six classes of deciduous wildlife trees in various successions from live and healthy with no decay, to stumps and debris (Fenger et al. 2006). Each of these wildlife tree stages provide important habitat and are known to support more than 90 animal species in British Columbia, including cavity nesting birds and mammals (Backhouse 1993). Some of the uses include nesting, feeding, territoriality (i.e. bear mark trees, bird singing sites, etc.), roosting, shelter, and overwintering (Backhouse 1993).

Most of the trees observed in the study area were identified as Class 1 wildlife trees. Class 1 wildlife trees are described as live healthy trees with no decay. Class 2 to 9 wildlife trees were also identified within the study area. Most of the decayed trees were associated with historical logging and fire.

Due to survey timing (winter) no active nests were observed within the study area during the field program. Nest cavities (likely from the previous breeding season) were detected in many of the wildlife trees observed. Forage sign from Pileated Woodpecker (*Dryocopus pileatus*) and Red-breasted Sapsucker (*Sphyrapicus ruber*) were observed on many of the wildlife trees (Photograph 8). A significant old-growth Douglas-fir stump with a

diameter-at-breast-height (dbh) of approximately 2 m was observed within the MFVT (Figure 2; Photograph 9). These trees also provided habitat for many bird and mammal species including songbirds, squirrels and bats.



Photo 8. A Class 6 western redcedar wildlife tree with Pileated Woodpecker activities observed within the MFVT (January 24, 2017).



Photo 9. A Class 8 old-growth Douglas-fir wildlife tree approximately 2 m dbh observed within the MFVT (January 24, 2017).

5.3 Coarse Woody Debris

CWD is typically described as woody debris greater than 0.3 m in diameter. CWD provides critical foraging, nesting, and cover components in the forested ecosystem for small mammals, amphibians, reptiles and invertebrates (Anonymous 1991). Many insectivorous small mammals, birds, and black bears feed on insects found in decomposing woody material. CWD provides a safe, moist environment in which species such as salamanders and shrews can forage and seek shelter.

Good CWD cover (>5%) was recorded within most of the RFVT and MFVT within the study area.

5.4 Potential Vegetation Species and Ecological Communities with Special Federal/Provincial Status that May Occur in the Study Area

Due to survey timing (winter) the presence of many herbaceous vegetation species could not be confirmed during the field survey. The following are descriptions for federally and/or provincially listed species that may occur within 2 km of the Anmore Hillside study site.

5.4.1 Roell's Brodiaea Moss

Roell's brodiaea moss is endemic to the Pacific Northwest, where it is only known from southwestern British Columbia and western Washington. This moss is described as trailing, lustrous, glossy green to golden-yellow, and irregularly pinnate. It is typically found in areas of high humidity where it forms mats on rotten logs, stumps, and bases of trees in cool to moist mixed deciduous and conifer forest, usually at low elevations along valley margins. Incident light, at least after hardwoods drop their leaves in the fall, appears to be important for the moss. Most reports are from open, mixed coniferous and deciduous forest, on slopes, stream terraces and swampy floodplains. Bigleaf maple and red alder are the preferred hardwood habitat. The moss appears to be most common on rotting wood, where it occurs with the mosses such as large leafy moss (*Rhizomnium glabrescens*), common four-tooth moss (*Tetraphis pellucida*), and coiled-leaf claw-moss (*Hypnum circinale*), and the liverworts little-hands liverwort (*Lepidozia reptans*), finger-leaf liverwort (*Blepharostoma trichophyllum*) and moon-leaved pincerwort (*Cephalozia media*) (Christy 1996).

No Roell's Brotherella moss were observed within the study area during the field program. No BCCDC records for this species occurred within 2 km of the study area.

5.4.2 Ecological Communities

The BCCDC defines listed ecological communities as natural plant communities and plant associations. These communities and associations include a wide range of known ecosystems with their environmental site requirements such as soil moisture and nutrients, climate, physiographic features and energy cycles. These sites are generally old-growth stands that are usually 500 m² or greater. These ecosystems are often the remnants of the natural ecosystems that once occupied a much larger area. Typically, mature and old-growth upland ecological communities are of concern to the BCCDC. In addition, all listed riparian, wetland and estuarine communities at any growth stage are also of concern to the BCCDC (K.A. McIntosh pers. comm.). The listed ecological communities are classified using methodologies and nomenclature developed by Green and Klinka (1994).

Most of the study area occurred on a west facing (~246°) moderate slope (~35%). Of the 19 forested ecological communities identified within the CWHdm, the BCCDC has identified seven as Red-listed and ten as Blue-listed. The Blue-listed Western Hemlock / Flat-Moss (Site Series 01) was observed throughout most of the Anmore Hillside study area.

Invasive vegetation species were encountered at many of the habitats observed within the study area and included species such as Himalayan blackberry and English holly.

5.5 General Wildlife Observations

Wildlife sign and activity were recorded throughout the study area. Sign of deer, coyote, cougar and snowshoe hare were detected within the RFVT and MFVT. Songbirds were observed flying and feeding in vegetation throughout the area. One Bald Eagle was observed soaring over the subject site. Suitable nesting habitat for raptors such as Bald Eagle, Cooper's Hawk and owls were observed in most forested sites within and surrounding the study area. All animal species detected are listed below in Table 4.

Table 4. Wildlife species detected within the study area (January 24 and February 20, 2017).

Species	Scientific Name	Regenerating Forest VT	Mature Forest VT
Amphibians:			
Northern Pacific Tree Frog ¹	<i>Pseudacris regilla</i>	√	
Birds:			
American Robin ^{1,2}	<i>Turdus migratorius</i>	√	√
Anna's Hummingbird ^{1,2}	<i>Calypte anna</i>	√	
Bald Eagle ^{1,2}	<i>Haliaeetus leucocephalus</i>	√	
Black-capped Chickadee ^{1,2}	<i>Poecile atricapillus</i>		√

Brown Creeper ¹	<i>Certhia americana</i>		√	¹ Heard ² Seen ³ Forage Sign ⁴ Tracks ⁵ Scats
Common Raven ^{1, 2}	<i>Corvus corax</i>	√	√	
Dark-eyed Junco ^{1, 2}	<i>Junco hyemalis</i>	√	√	
Evening Grosbeak ¹	<i>Coccothraustes vespertinus</i>	√		
Golden-crowned Kinglet ^{1, 2}	<i>Regulus satrapa</i>	√	√	
Northwestern Crow ^{1, 2}	<i>Corvus caurinus</i>	√		
Pacific Wren ^{1, 2}	<i>Troglodytes pacificus</i>	√	√	
Pileated Woodpecker ³	<i>Dryocopus pileatus</i>	√	√	
Pine Siskin ^{1, 2}	<i>Spinus pinus</i>	√	√	
Red-breasted Nuthatch ¹	<i>Sitta canadensis</i>		√	
Red-breasted Sapsucker ³	<i>Sphyrapicus ruber</i>	√	√	
Varied Thrush ²	<i>Ixoreus naevius</i>		√	
Mammals:				
Columbian Black-tailed Deer ⁴	<i>Odocoileus hemionus columbianus</i>	√	√	
Cougar ⁴	<i>Puma concolor</i>	√		
Coyote ⁴	<i>Canis latrans</i>	√	√	
Douglas' Squirrel ³	<i>Tamiasciurus douglasii</i>	√	√	
Snowshoe Hare ⁵	<i>Lepus americanus washingtonii</i>	√		

5.6 Wildlife Habitat Assessment

Habitats were assessed for the seven wildlife species listed in Table 2. The following are the results of the habitat assessment for each of the seven species.

5.6.1 Red-legged Frog

In addition to being listed on Schedule 1 of the SARA, the red-legged frog is also listed on the provincial Blue List (BCCDC 2017¹). Red-legged frogs in BC are found in moist forests and in forested wetlands (Corkran and Thoms 1996). Adults will often wander far from standing water to forage on small insects or forest invertebrates (Nussbaum et al. 1983 in Ovaska and Sopuck 2004). Generally, they breed in cool, shaded temporary ponds where they attach their eggs to submerged woody debris or vegetation (Corkran and Thoms 1996). Critical habitats for the red-legged frog would include all temporary and permanent breeding ponds. CWD would also be considered a critical habitat element for cover and foraging.

No red-legged frogs were detected during the field survey. Red-legged frogs are generally not active in the late fall and winter which limits their detection. No suitable breeding habitats (ponds and wetlands) occurred within the study area. The forested portions of the RFVT and MFVT provided suitable rearing habitat for red-legged frog and many other amphibian species. No BCCDC records occurred within 2 km of the study area.

5.6.2 Western Toad

Western toads utilize riparian areas and small, moist depressions for re-hydration (Davis 2000), downed wood for cover in recent clearcuts (Wind and Dupuis 2002) and are one of the few amphibian species found at high elevations (>3,000 m). Western toads are explosive breeders, with reproduction occurring for a short period in early spring (e.g., during a one to two-week period). They breed in shallow, littoral zones of lakes, temporary and permanent pools and wetlands, bogs and fens, and roadside habitats (Corkran and Thoms 1996; Olson 1992).

Western toads are expected to occur throughout the forested habitats within the study area. No suitable breeding habitat (ponds) for this toad species was observed within the study area.

5.6.3 Band-tailed Pigeon

The Band-tailed Pigeon occurs throughout the Fraser Valley. It frequents both natural and man-made habitats such as edges, openings in mature coniferous, mixed, and deciduous forests, city yards, parks, wooded groves, open bushland, and golf courses (Campbell et al. 1990). It is usually associated with conifer dominated stands with diverse structure and ages (Keppie and Braun 2000).

No Band-tailed Pigeons were detected during the field program. Suitable habitat for this species occurs throughout the forested portions of the study area.

5.6.4 Western Screech-owl

In addition to being listed on Schedule 1 of the SARA, the *kennicottii* subspecies of the Western Screech-owl is also listed on the provincial Blue List (BCCDC 2017¹). Along the coast the Western Screech-owl seems to be mostly found in either coniferous or mixed (deciduous or coniferous) forests, particularly near riparian areas. This owl prefers open forest for foraging and requires cavities in old, large trees for nesting and roosting. During the daytime, it roosts in either coniferous or deciduous trees (COSEWIC 2002).

The limited riparian vegetation associated with the unnamed drainage identified within the study area provided poor habitat for this owl species.

5.6.5 Snowshoe Hare

The Red-listed Lower Mainland subspecies of the snowshoe hare is thought to occupy the foothills of the Coast Mountains, north of the Fraser River (Nagorsen 2005). It has been found in undeveloped areas of the Lower Mainland and Fraser Valley. It is considered critically imperiled since almost the entire native habitat for this species in the lower mainland has been developed. This primarily nocturnal species favours moist semi-open forests with clearings and thickets (McTaggart-Cowan and Guiguet 1965). Recent observations of this subspecies have been observed near Mission, (D. Nagorsen and D. Urban, pers. comm. 2014).

Snowshoe hare pellets were detected within the RFVT during the field survey.

5.6.6 Pacific Water Shrew

Pacific water shrews are usually associated with riparian areas (Nagorsen 1996; Craig 2003). Past studies have reported that most water shrews were captured within 25 m of streams, however in moist forests, Pacific water shrews can be found up to 1 km from water (Pattie 1973 in Craig 2003). The home range of the Pacific water shrew is suspected to be 400 m along a waterbody (Craig 2003).

In British Columbia, capture sites appear to be primarily associated with coniferous or deciduous forest with capture sites located very close to water. Habitat components usually found at Pacific water shrew sites include the presence of red alder, bigleaf maple, western hemlock or western redcedar that border streams and skunk cabbage marshes (Nagorsen 1996). In addition, Pacific water shrews have also been captured in more open habitat, with dense marsh vegetation. These include reed canarygrass vegetated roadside ditches and water bodies within highway medians (pers. obs.). CWD also seems to be an important habitat component. The presence of moist habitat appears to be more important than forest age (Craig 2003).

No Pacific water shrews were detected during the field survey. No recent BCCDC records for this species occur within 2 km of the study area. A historical record from 1897 occurs southwest of the study area (Figure 3). The unnamed drainage within the study area provided poor habitat for this listed shrew species.

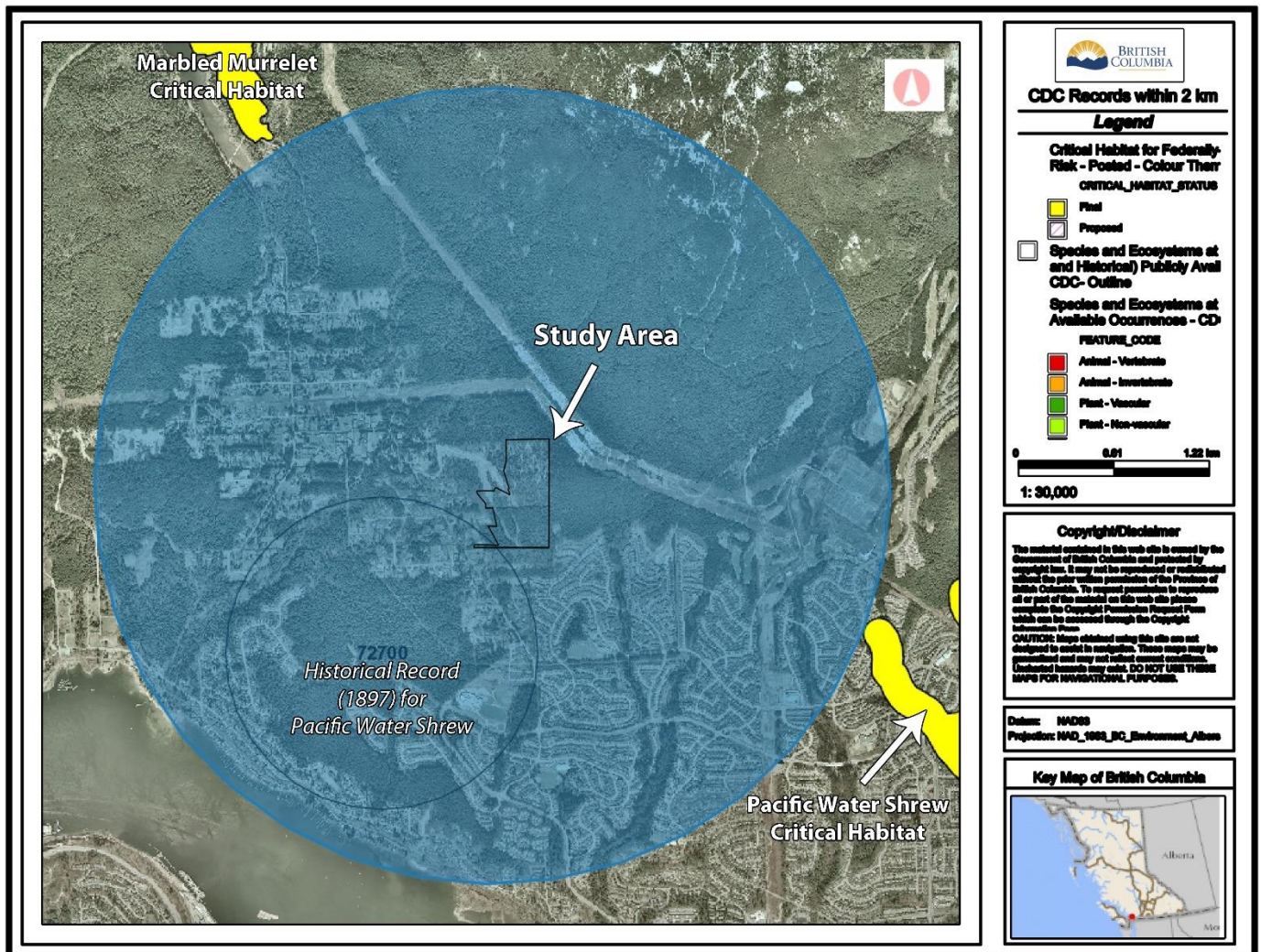


Figure 3. BCCDC map showing occurrence records within 2 km (blue circle) of the study area. No current BCCDC records occur within 2 km of the study area. A historical record (72700) from 1897 occurs within 2 km for Pacific Water Shrew (BCCDC 2017²).

5.6.7 Trowbridge’s Shrew

The Trowbridge's shrew is Blue-listed by the BCCDC (BCCDC 2017¹). Trowbridge's shrew use both riparian and non-riparian forest (Zuleta and Galindo-Leal 1994). In non-riparian forests, the Trowbridge’s shrew has shown a preference for areas with a high moisture regime (Nagorsen 1996).

Critical habitat elements for this species include rich soils and abundant decaying CWD and leaf litter on the forest floor (Nagorsen 1996). Ground litter, woody debris and shrub cover provides a secure environment for tunnelling and nesting.

The riparian habitat associated with the unnamed drainage identified within the study area and generally dry forests provided poor habitat for this Trowbridge’s shrew.

5.7 Wildlife Corridors

Well used wildlife trails, attributed to deer and coyotes, and were detected within the study area (Photograph 10). Sign of cougar was also observed during the field program (Figure 2). These animals appeared to travel mainly along the access roads, old skid trails and along the unnamed drainage. In addition to deer, coyotes and cougar, these corridors may also be used by many species of birds, amphibians, reptiles and small mammals including the Red-listed snowshoe hare.



Photo 10. A well-used game trail observed within the MFVT (January 24, 2017).

5.8 Watercourse Assessment

The headwater of unnamed drainage system on the subject property is located at the north boundary of the property line (Photo 11). This unnamed drainage looks to be man-made and lined with 1cm geotechnical mesh and filter fabric with successive vegetation and algae established throughout. Initial 600m of unnamed drainage follows a deactivated road on the west side of the watercourse (Photo 12). The east side of the watercourse during this 600m section borders successive riparian habitat and established forest. Sediment size within drainage ranges from gravel (10-30mm) to boulders (30-70cm). Drainage originates from local seepage derived on and off the subject property.

Unnamed drainage contains low velocity seepages at origin with wetted widths (WW) of 0.18 to 0.20m and with lower gradient. Areas of pooling occur with WW of approximately 0.6m, as it continues downslope, collecting further seepage areas and increasing in average width to 0.4m.

Instream grasses and sparse riparian vegetation increase further downstream (Photo 13), however vegetation remains sparse and young. The watercourse flows down a very high gradient cascading man-made cloth and meshed trench with boulders and established grasses (Photo 14). Lower end of watercourse's banks of drainage, contain blackberry varieties and small alder growth. The high gradient westward flows continue for a total length of approximately 170m with average WW of 1-1.5m. Steep flows then approach deactivated road berm at western edge of Anmore property, with some flows seeping through berm and crossing west across deactivated road, continuing off property. Unnamed drainage continues for 20m before heading west southwest into a 14" pipe off property.



Photo 11- Origin of unnamed drainage at northern border of property. Drainage flows south southwest towards the left side of the photo (Feb 20, 2017).



Photo 12 – Looking south and downstream at the unnamed drainage with the deactivated road on the west side and forest on the east side. View of man-made mesh trench for drainage (Feb 20, 2017).

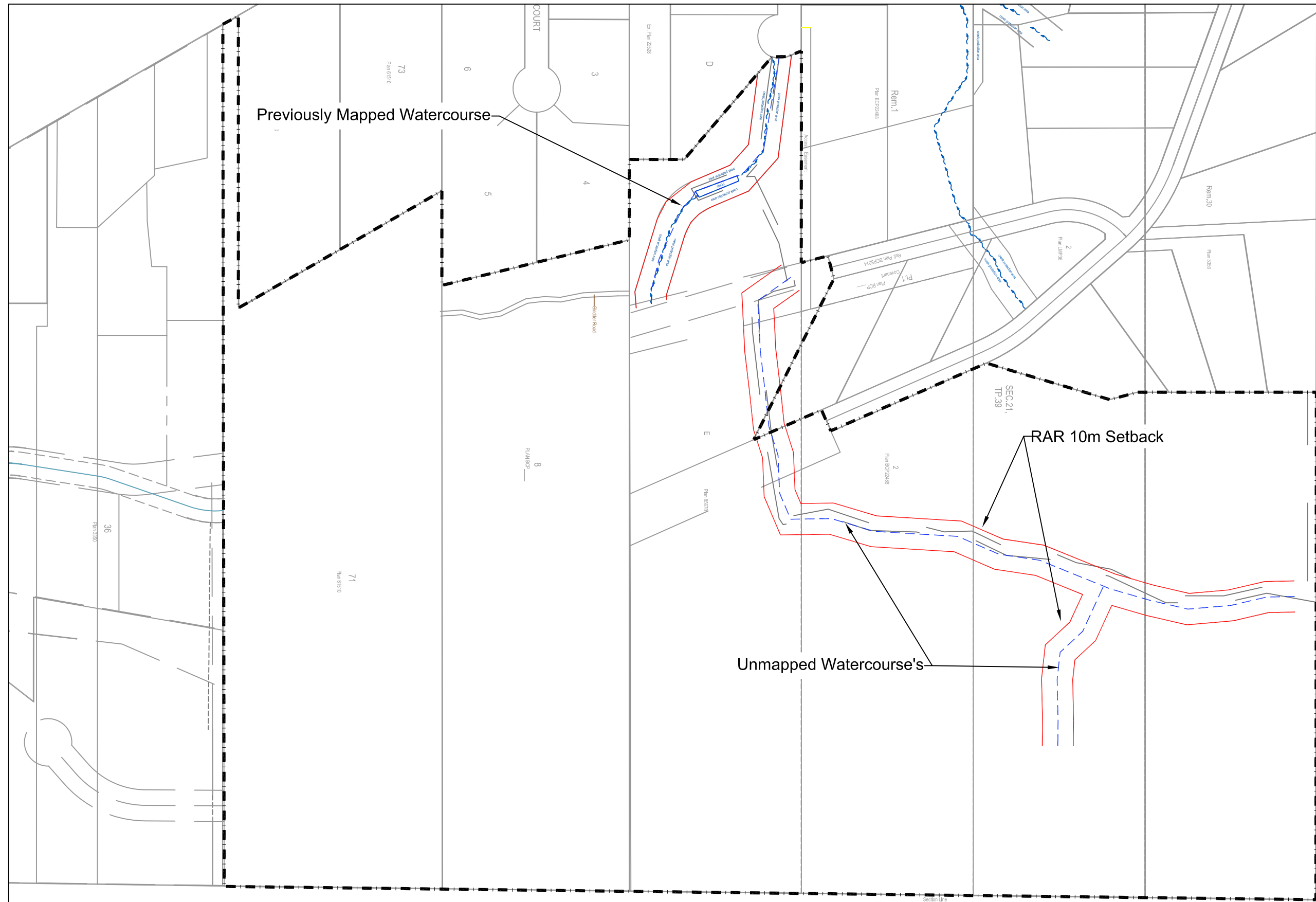
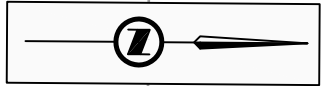


Photo 13 – Looking south at low gradient pooling area with view of some established grasses instream (Feb 20, 2017).



Photo 14 – Looking east northeast and upstream at the unnamed drainage where it bends down the very high gradient section and cascades westward (Feb 20, 2017).

Environmental setbacks using the Provincial RAR were applied to the sections of watercourse identified during the field work. Each portion of channel was determined to be a 10m from high water mark (HWM) setback (Figure 4).



PROJECT SITE	RAR SETBACK
CREEK CENTRE LINE (APPROXIMATE)	



ANMORE HILLSIDE DEVELOPMENT - DETAILED
RAR ASSESSMENT SITE PLAN
FIGURE 4

DATE 2017-02-26
DRAWN BY A.S.

DRAFT - FOR REVIEW
SCALE 1:2,500
Rev 00

ENDORSED BY:

6.0 CONCLUSIONS AND DISCUSSION

6.1 Vegetation and Ecological Communities

No SARA listed vegetation species were detected during the field program. Due to survey timing (winter) many herbaceous species could not be identified. The site may provide habitat for at the provincially listed species Roell's brotherella moss. No Best Management Practices (BMPs) currently exist for Roell's brotherella moss.

No Terrestrial Ecosystem Mapping (TEM) is available for the Anmore Hillside study area. The Blue-listed Western Hemlock / Flat-Moss (Site Series 01) was observed throughout most of the Anmore Hillside study area.

Invasive vegetation species such as Himalayan blackberry and English holly were encountered along interfaces of forested areas and access roads. Removal of these invasive plant species at strategic sites would benefit many native wildlife and vegetation species.

6.2 Wildlife Trees

Most wildlife trees in the study area were identified as Class 1 wildlife trees. Many Class 2-9 wildlife trees were also detected within the subject area. Potential nest cavities were detected in many of the wildlife trees identified. Woodpecker forage sign was evident on many of the wildlife trees. All wildlife trees within the study area also provided habitat for secondary cavity nesting birds and roosting bats. Habitat for nesting birds and roosting bats would be improved with the addition of bird and bat boxes at strategic sites.

6.3 Coarse Woody Debris

Good CWD cover occurred within both the RFVT and MFVT within the study area. Wildlife within the study area would benefit from the retention of CWD in strategic locations.

6.4 General Wildlife

Sign of deer, coyote, cougar, snowshoe hare, woodpecker and passerines were detected within the study area. Most of the treed portions within and adjacent to the study area provided potential breeding/roosting habitat for raptors, passerines, woodpeckers and several bat species.

6.4.1 Mammals

Sign of Columbian black-tailed deer, coyote and cougar were recorded. Sign of the Red-listed *washingtonii* subspecies of the snowshoe hare was observed within the RFVT. The unnamed drainage and relatively dry forests within the study area provided poor habitat for the SARA listed Pacific water shrew and provincially listed Trowbridge's shrew.

6.4.2 Birds

One Bald Eagle was observed flying over the study area. The treed portions of the study area provided suitable breeding and roosting habitat for many raptor species including Bald Eagle, Cooper's Hawk and owls as well as songbirds and woodpeckers.

6.4.3 Amphibians

No red-legged frogs or western toads were observed within the study area. No amphibian breeding habitat (ponds or wetlands) was detected within the assessed area. Rearing habitat for western toad and red-legged frog was detected within the forested portions of the study area.

6.5 Best Management Practices

The Pacific water shrew draft BMP (Craig and Vennesland 2008) recommends 100 m setbacks for moderate to high rated habitats and makes no recommendation for low rated habitats. The Western Screech-owl BMP recommends up to 200 m buffers from known nest sites (Develop with Care 2014). The amphibian BMP recommends minimum 30 m setbacks for all western toad and red-legged frog breeding habitats (Develop with Care Factsheet 2014). No BMPs currently exist for Roell's brotherella moss, Band-tailed pigeon, snowshoe hare or Trowbridge's shrew.

6.6 Wildlife Corridors

Moderately to well-used wildlife corridors were observed within the study area, particularly along the access roads and the unnamed drainage. The forested areas provided good security habitat for many wildlife species.

6.7 Unnamed Watercourse

The unnamed watercourse through the property consists of primarily seepage from within the site and flows through what looks to be anthropogenically constructed channel, with minimal habitat value. The watercourse will be subject to 10m from HWM RAR setbacks.

7.0 RECOMMENDATIONS

7.1 Vegetation

The following recommendations should be implemented to protect habitat for sensitive vegetation species:

- Remove invasive vegetation species including Himalayan blackberry and English holly at strategic sites identified by a QEP and revegetate these areas with native species. Removal of these invasive vegetation species will improve the habitat quality of the Blue-listed Western Hemlock / Flat-Moss (Site Series 01) Ecological Community.

7.2 Terrestrial Wildlife

Within the subject area, the following recommendations should be implemented to protect and improve habitat for all wildlife species:

- Revegetate the banks of all disturbed portions of the unnamed drainage within the study area with native trees and shrubs to maintain and improve a secure corridor for wildlife.

7.3 Birds and Bats

Within the subject area the following recommendations should be implemented to protect and improve habitat for all bird and bat species as well as other wildlife:

- Avoid vegetation removal/enhancement in all vegetation types during the breeding season (April 1-July 31) to protect breeding birds and avoid contravention of Section 34 of the *Wildlife Act*.

- Conduct a follow-up raptor nest survey prior to any clearing or construction activities as some raptor species are known to construct nests throughout the year. If any raptor nests are detected then a QEP will be required to develop a raptor nest management prior to any clearing, construction or enhancement activities.
- Install bird and bat boxes at strategic sites to improve nesting and roosting habitat.

I trust that this assessment is sufficient for your purposes at this time. If you have any questions or concerns, please contact Alex Sartori at (604) 220-0199.

Sincerely,

Sartori Environmental Services



J. Alex Sartori, R.P.Bio.

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