

DPA 2 – Watercourses (Habitat protection and creek hazards)

Location

DPA 2 applies to watercourses within the District of Sechelt as follows:

- All watercourses and their tributaries, including seasonal or ephemeral flows, are subject to the habitat protection DPA guidelines;
- Specific creeks identified on Map Schedules D1-D3 with potentially hazardous conditions⁵ are subject to the DPA guidelines for hazardous creeks.

Category:

- Protection of the natural environment, its ecosystems and biodiversity.
- Protection of development from hazardous conditions.

Habitat Protection (Riparian) Areas

DPA 2 habitat protection (riparian area) guidelines apply to all watercourses in Sechelt, whether mapped or unmapped, that provide fish habitat or flow to a waterbody that provides fish habitat. Mapped streams are shown generally on Schedules D1-D3. In accordance with the provincial *Riparian*

⁵ As identified in the *Sechelt Geotechnical and Environmental Reconnaissance Study*, 1993 (Golder Associates). Refer to original report for detailed maps and descriptions of hazard areas.

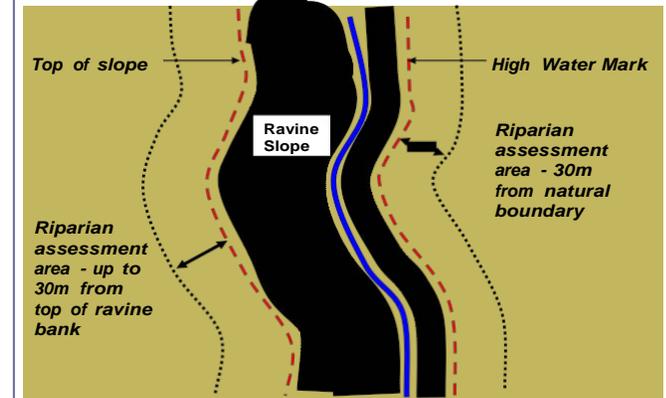
Area Regulations, a “stream” includes any watercourse, whether it usually contains water or not; a pond, lake, river, creek or brook; or a ditch, spring or wetland that is connected by surface flow to the preceding watercourses.

The **riparian assessment area** (as illustrated in the following diagram) consists of the areas within and adjacent to:

- For a stream, a 30 metre strip on both sides of the stream measured from high water mark;
- For a ravine less than 60 metres wide, a strip on both sides of the stream measured from high water mark to a point 30 metres beyond the top of ravine bank; and
- For a ravine 60 metres wide or greater, a strip on both sides of the stream measured from the natural boundary to a point that is 10 metres beyond the top of the ravine bank.

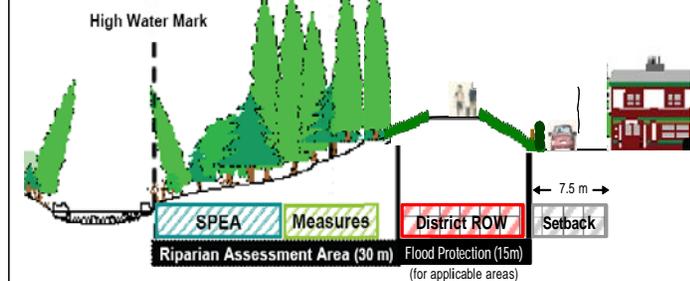
Within the riparian assessment area, a **streamside enhancement and protection area (SPEA)** will be established on a site-specific basis through a report prepared by a Qualified Environmental Professional (QEP). That report will determine the SPEA width, required building setbacks and measures necessary to protect the integrity of the streamside area,

Riparian Assessment Area



- ✘ The riparian assessment area is a 30m wide strip on both sides of the stream, measured from the high water mark, or from the top of the ravine bank (if the stream is in a ravine). In some areas, the District of Sechelt may also designate a flood protection right-of-way for the protection of the community.

Streamside Protection and Enhancement Area (SPEA)



- ✘ The SPEA width (the area that must be protected) will be determined through an assessment report prepared by a Qualified Environmental Professional. Assessment reports are not needed for building or other activities that takes place outside the 30m riparian assessment area.

including any mitigation required if a property owner proposes to build or alter land with the riparian assessment area. If the proposed building is outside the 30m riparian assessment area, a report or Development Permit is not required for habitat protection. (A DP may still be required for natural hazards).

Justification: Habitat Protection

Habitat protection is a primary purpose of DPA 2. Sechelt contains numerous fish-bearing watercourses, and all streams, creeks, ponds and other waterbodies support a diversity of aquatic and wildlife species. These habitats provide higher complexity and structural diversity of vegetation and wildlife than any habitat found in upland areas. Both the watercourse and the adjacent lands (riparian area) provide habitat for fish, waterfowl and migratory mammals that play a vital role in Sechelt's natural environment. Other small drainages, whether natural or constructed, may provide important habitat for young fish, or may discharge into streams with important habitat.

Wetlands, swamps, and bogs also provide important functions in the aquatic ecosystems by buffering the effects of storms, modifying nutrient loadings and water chemistry, and by providing habitats for many plants and animals. When retained in a natural state, they have dense and complex

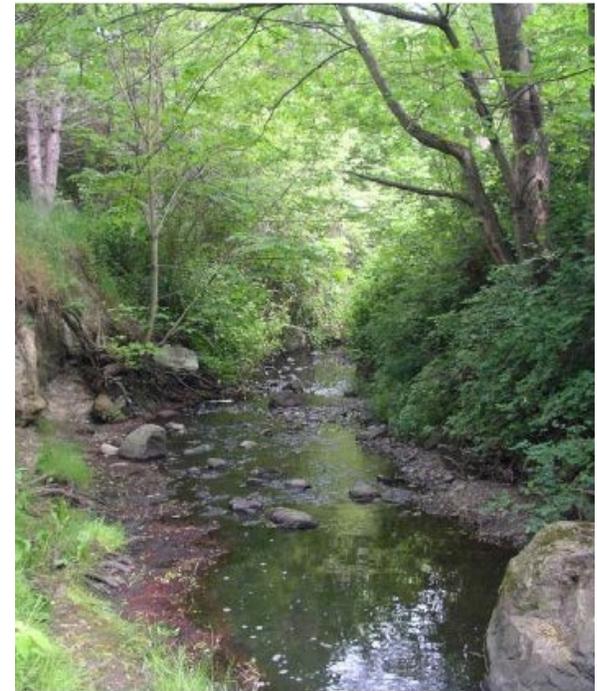
vegetation that has high biodiversity value.

As well as providing valuable fish habitat, non-fragmented riparian areas provide critical migratory habitats for terrestrial wildlife, amphibians and birds. Migratory bird abundance and diversity is greater in riparian areas, and small mammal communities are more numerous along streams than any other habitat type. Large mammals, such as deer and bears, use riparian areas as migratory corridors to search for food and mates, and for traveling to breeding areas or between summer and winter ranges. Interruption of these migration corridors reduces habitat function and value, and may cause greater human-wildlife conflict and reduced wildlife survival. Riparian areas also are usually highly susceptible to flooding and potential loss of land due to channel erosion and instability.

Healthy streamside conditions and functions require:

- Sources of large organic debris, such as fallen trees and tree roots;
- Areas for stream channel migration;
- Vegetative cover to help moderate water temperature and stabilize banks;
- Provision of food, nutrients and organic matter to the stream; and,
- Buffers for streams from excessive silt and surface runoff pollution.

Land development and building can contribute to the loss of riparian vegetation and greatly diminish the ability of riparian areas to function. Surface runoff from construction areas may result in silt laden waters entering sensitive watercourses and marine waters. Similarly, changes in drainage patterns can have significant impacts on marshlands or wetlands.



- ✓ *Streams left in their natural state have riparian areas that provide shade, shelter, temperature regulation and food sources essential for fish, as well as essential habitat and migratory corridors for birds, amphibians and mammals. Large unfragmented areas provide greater habitat value than smaller dispersed or disconnected areas.*

The Watercourse DPA (Habitat) is intended to minimize the impacts of development along watercourses, and to restore or maintain important riparian functions and ecosystems to support both fish and wildlife populations. The estuaries of major creeks, such as Chapman Creek, Wilson Creek, Gray Creek and Angus Creek are particularly sensitive. The following streams and their tributaries provide habitat for fish populations⁶: Angus Creek, Burnett Creek, Burton Creek, Chapman Creek, Cook Creek, East Wilson Creek (including the creek adjacent to Canadian Tire), Gray Creek, Husdon Creek, Irgens Creek, Irvine Creek, Lamb's Brook, Mission Point Creeks (Wilson Creek), Sechelt Marsh, Shannon Creek, Wakefield Creek and Wilson Creek.

Creek Hazard Areas⁷

For creeks with potential hazard, DPA 2 hazard guidelines apply to the area within a minimum 15 m horizontal setback from each side of the creek high water mark or the crest of ravine or eroded slopes of the creeks and their tributaries as generally mapped on

⁶ Fisheries and Oceans Canada correspondence, April 8, 2010.
⁷ For additional information, refer to the *Sechelt Geotechnical and Environmental Reconnaissance Study*, 1993 (Golder Associates).

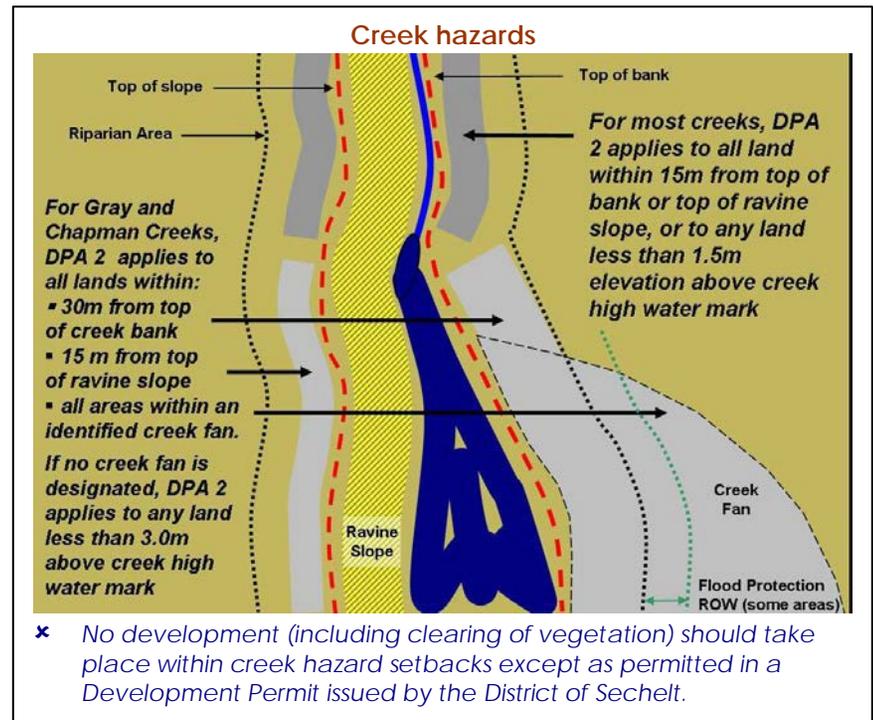
Schedules D1-D3. The DPA also applies to any land less than 1.5 metres elevation above the creek high water. (The more restrictive of the above criteria applies). Large watercourses (including Chapman and Gray Creeks) are subject to more extensive DPA limits.

Creeks with potential hazard to development include the major drainages of Chapman Creek and Gray Creek as well as:

- Cairns and Wakefield Creeks and their tributaries in West Sechelt;
- Irvine, Angus, Burnett and Irgens Creeks, Davis Brook, and an unnamed creek between Burnett and Irgens Creeks in Tuwanek, Sandy Hook and East Porpoise Bay;
- Wilson, East Wilson and Husdon Creeks in Wilson Creek/Davis Bay.

Justification – Creek Hazards

Steep ravine slopes are subject to potential shallow slope instability in granular and fine-grained soils. Erosion of creek beds is common along all creeks. All creeks designated as hazard creeks in DPA 2 are considered to be subject to a moderate or high water



flood hazard, except for Cairns Creek which has been identified as having little or no flood hazard. No debris flows or debris floods are anticipated in these creek systems. Creep and shallow soil slides on the ravine slopes of Angus and Wakefield Creeks has been observed.

Oversteepened and potentially unstable slopes have been developed as a result of gravel pit operations on both sides of Burnett Creek. A portion of Wilson Creek, extending about 200 m. south from the northern District boundary, has been identified as having a moderate instability and very high to high erosion potential. A number of

properties adjacent to lower Wakefield and Irvine Creeks, and on the flood fans of Angus and Wilson Creeks, are subject to a potential flood hazard; some localized bank protection is in place. It is estimated that a high annual probability of shallow slope instability, erosion or flooding hazard exists south of Anchor Place along Wakefield Creek and along lower Angus Creek.

It is estimated that a moderate to low annual probability of shallow slope instability, erosion, deposition or flooding exists along the creeks as follows:

- along Cairns, Irvine, Burnett, Irgens, Husdon and East Wilson Creeks and along the unnamed creek between Burnett and Irgens Creeks;



✘ *Stream flows can undercut banks, creating instability and hazard for adjacent slopes and upland areas.*

- to the north of Anchor Place along Wakefield Creek, along its tributaries, and within the 15m setback from the crest of ravine slopes of Wakefield Creek south of Anchor place; and
- along Wilson Creek and within the 15m setback from the crest of the west bank of Wilson Creek.

Gray and Chapman Creek Hazards

For the higher hazard Gray and Chapman Creeks, DPA 2 applies to areas located a minimum 30 metre horizontal setback from each side of the natural boundary of the creek high water mark, or a 30 metre horizontal setback from the crest of the ravine or eroded slopes of Gray and Chapman creeks and their tributaries. The DPA hazard guidelines also apply to any land lower than 3.0m above the creek high water mark. There does not appear to be a potential for debris flows or debris floods impacting OCP lands within the Gray Creek or Chapman Creek systems. A more detailed engineering study may update and supersede the area of application for DPA 2 in a local area. Based on a recent flood hazard study of lower Chapman Creek (Kerr Wood Leidal 2010), DPA 2 applies to all areas within the designated boundaries of the Chapman Creek fan.

Chapman Creek - There is a great potential for riverbank erosion, local overbank inundation and deposition and flooding on the alluvial fan.

Channel bars and point bars are common in the stream channel zone, and stream bed geometry is subject to frequent change. Ongoing bank erosion is occurring along Chapman Creek. This is evident along the west bank approximately 100 m upstream of the bridge, where erosion has necessitated relocation of portions of the hiking trail. Erosion has also produced several larger erosional scars in unconsolidated materials within the steep ravine slopes.

Active undercutting of the sandy ravine slopes that are located on the west side of the creek approximately 200 m upstream of the bridge has resulted in loss of land from the upper terrace. Rip rap that has been placed along this portion of the creek as a preventative measure is inadequate for long term bank protection. There is a history of flooding on the fan of Chapman Creek. A serious flood in the early 1980's resulted from a combination of high creek flows, high tide levels and storm waves, and caused widespread inundation of the fan.

A high annual probability of shallow slope instability, erosion or flooding hazards is estimated to exist on the steep ravine slopes, creek valley bottom and alluvial fan of Chapman Creek. Steep ravine slopes are subject to potential shallow slope instability in granular and fine grained soils. Creep and shallow soil slides on the ravine slopes were observed.

Chapman Creek is also potentially subject to debris floods caused by outburst failures of landslide-generated dams in the steep middle reaches of the watershed. A debris flood involves higher flows and more transport of sediment and woody debris than a typical flood. A debris flood can also induce greater erosion, deposition, and other changes within the stream channel. It is estimated that a low annual probability of major debris flood exists on the steep ravine slopes, valley bottom and creek fan of Chapman Creek.

It is estimated that a moderate to low annual probability of shallow slope instability or erosion exists within the 15 m setback zone behind the crest of steep ravine slopes of Chapman Creek. Continued forest harvesting and associated logging road construction in



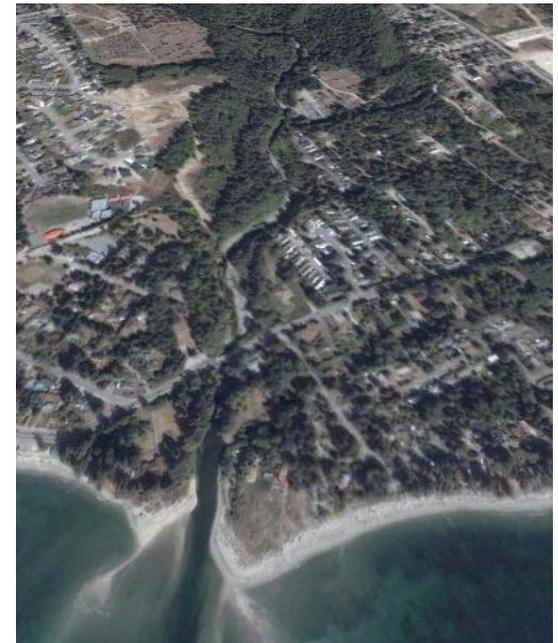
✘ *Gray Creek fan has a high annual probability of flooding.*

the mid and upper basins of Chapman Creek could affect stream flow characteristics such as annual runoff and peak flows, sediment load and water quality.

Gray Creek - There is potential for local erosion and deposition hazards along lower Gray Creek and flooding on the Gray Creek fan. Old channel scars observed on the fan are evidence of creek instability and volatility. Cobbles and boulders on the bed of Gray Creek are an indication of the creek's rapid runoff rate and high load carrying capacity. Steep soil slopes along the margins of Gray Creek fan are subject to shallow slope instability. It is estimated that high annual probability of flooding and erosion hazard exists on the alluvial fan of Gray Creek. It is estimated that a moderate to low annual probability of shallow slope instability or erosion exists on the unconsolidated slopes flanking the alluvial fan of Gray Creek and on the steep bedrock slopes to the north of Gray Creek along the eastern boundary of the District.

Exemptions

General exemptions for natural hazard/environmental protection DPA's 1-5 apply.



✘ *Chapman Creek is a major watershed, providing water supply to much of the Sunshine Coast. The lower section is a prominent geographic feature of the Davis Bay/Wilson Creek area. The estuary and alluvial fan have a history of flooding.*



✘ *Residential uses should not be located in flood prone area*

Guidelines: Habitat Protection

The following DPA guidelines apply to all watercourses and their tributaries:

1. Development within the DPA should be avoided wherever possible. Development Permits for work in or adjacent to these areas must meet the requirements of provincial and federal agencies.
2. No buildings, structures or other uses of land, including clearing, placement of fill, removal of soil, trees or vegetation, or other alteration of the land is permitted within the riparian assessment area unless a development permit has been issued or the use specifically exempted by the District of Sechelt.
3. Retaining and/or enhancement of native vegetation is the priority for all riparian areas.
4. Development within DPA 2 should be planned to avoid encroachment into the streamside enhancement and protection area (SPEA) and to minimize the impact of development on the streamside area.
5. Buildings and permanent structures, including roads, septic systems and drainage systems are not permitted in the SPEA unless adverse impacts can be prevented or mitigated to meet the requirements of provincial and federal regulations.
6. There should be no net loss of habitat due to development.

7. No net increase in stormwater/drainage flow or velocity should result from any development on lands within this DPA. Owners may be required to install stormwater works to control the release of runoff and to buffer streams from sediment or nutrient loading.

QEP Report

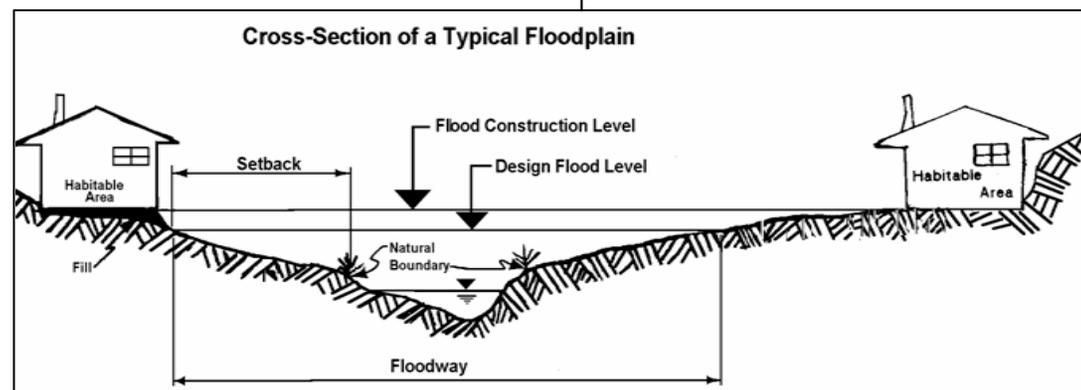
8. Any development proposed within the riparian assessment area requires an assessment report prepared by a qualified environmental professional (QEP) in support of the development permit application. The report shall identify the width of the streamside protection and enhancement area (SPEA), appropriate building setbacks and any measures necessary to protect or restore the integrity of the streamside area.
9. The QEP report shall outline how harmful alteration, disruption or destruction (HADD) of fish habitat will be avoided.
 - (a) Where HADD is avoided by assessment results, the QEP will

submit the report to the Ministry of Environment, and the District may authorize the development permit, subject to the QEP report conditions.

- (b) Should it not be possible to avoid HADD, an application for authorization, including compensation, must be submitted to Fisheries and Oceans Canada (DFO) for authorization before the District may authorize a development permit.

Guidelines: Creek Hazards

10. In addition to the preceding guidelines for habitat protection, the following guidelines apply to all creeks with potential hazards (see Maps D1-D3): Active creek fans do not provide good locations for development due to the potential for sudden shifts of creek channels, flooding and sediment deposition. Prior to issuance of a development permit, the stability of the natural slopes and the potential for erosion



or flooding and the impact of the proposed development on or by such natural hazards should be assessed by a site-specific investigation by a Qualified Professional.

11. Vegetation should be maintained to minimize erosion along eroding creek banks, creek valley floors and flood plains, on ravine slopes and within the 30m setback from the creek high water or 15m from the crest of ravine slope, whichever is greater.
12. In addition, the development should incorporate requirements for maintaining this vegetation, protection against erosion or sediment discharge and channel modifications which are detrimental or contrary to the environmental guidelines or requirements.
13. New subdivisions or development should not be located in floodplain areas, or where there is a flood hazard that cannot be practically alleviated, or where development may impede a natural or designated floodway.
14. Stormwater drainage (including runoff from rooftops or hard surfaces) and septic fields should not be located in a required setback area, and should not discharge onto ravine slopes and septic effluent should not be discharged into the creek. Weakening of bluffs and steep banks by saturation must be avoided. All stormwater runoff should incorporate water quality/quantity control

features to avoid impacts on watercourse and their banks.

15. Appropriate river hydraulic studies should be conducted prior to the placement of any bank protective measures to avoid shifting the problem to a different section of the creek bank. Stabilization or protective works must not transfer flood, landslide or other risks to other properties.
16. Development Permit applications shall consider and comply with the intent and requirements of any applicable Community Flood Hazard Mitigation Strategy. The District has completed a Community Flood Hazard Mitigation Strategy for lower Chapman Creek (KWL, 2010) and may develop additional Community Flood Hazard Mitigation Strategies for other areas.

Hazard Assessment Report

17. Detailed assessment of long-term flood hazard is required prior to consideration of any new development or subdivision of lands in the DPA 2 hazard areas. A report from a Qualified Professional engineer or geoscientist with specific expertise in geotechnical and/or hydrotechnical engineering is required.
18. The report shall:
 - (a) Assess the potential for creek erosion, deposition or flooding along the creeks and their tributaries and the potential for

slope instability on the ravine slopes;

- (b) Provide a comprehensive hydrological study to determine the 1:200 year flood limits and appropriate bank protection measures for any development in the fans and floodplains of Chapman or Gray Creeks;
- (c) Local bank erosion protection and flood proofing or other measures to provide suitable protection of structures must be addressed. The report and protective measures should take into consideration the channel conditions upstream of the site as well as the potential for adverse downstream impact;
- (d) The influence of tides on flooding should be addressed;
- (e) The report should consider forest harvesting activities and practices in the watershed at the time of the study in the context of potential related slope and channelized instability.
- (f) The proposed development and protective measures should include provision to accommodate stream management and development controls which may become necessary if increased development along

- the creeks or drainage channels is planned or permitted;
- (g) Assess long-term risks or changes to the defined floodplain or slope stability, including potential increases in rainfall, flood frequency or flood severity associated with climate change;
 - (h) Assess the impact of the proposed development on or by such natural hazard conditions;
 - (i) Provide detailed land use and construction recommendations, including building setbacks, construction methods, stormwater management plans or other measures needed to provide protection of structures and land;
 - (j) Identify the anticipated effects of septic and drainage systems on slope instability and water quality, as well as their vulnerability to any known flood and inundation hazards;
 - (k) Identify the protective measures required to minimize erosion of stream bank protection, and assess the potential impact of these measures on adjacent or downstream lands;
 - (l) Measures to address bank erosion protection and flood proofing, should be in accordance with the Ministry of

Environment Best Management Practices⁸ and provincial [Flood HazardAreaLandUse ManagementGuidelines](#)⁹ for floodplain recommendations.

- (m) Identify the location and extent of any riparian habitat affected by the development or proposed mitigation works;
- (n) Provide site specific recommendations on the general suitability of the proposed development;
- (o) Where applicable, reports must meet the report guidelines for *Legislated Landslide Assessments for Proposed Residential Development in British Columbia* published by the Association of Professional Engineers and Geoscientists of British Columbia, March 2006, including submission of Schedule D (Landslide Assessment Assurance Statement) to specify that the land may be safely used for the use intended.

Permit Conditions

19. Development permits issued for lands in DPA 2 will require:

- (a) areas of land to remain free of development, except in accordance with any conditions contained in the permit;

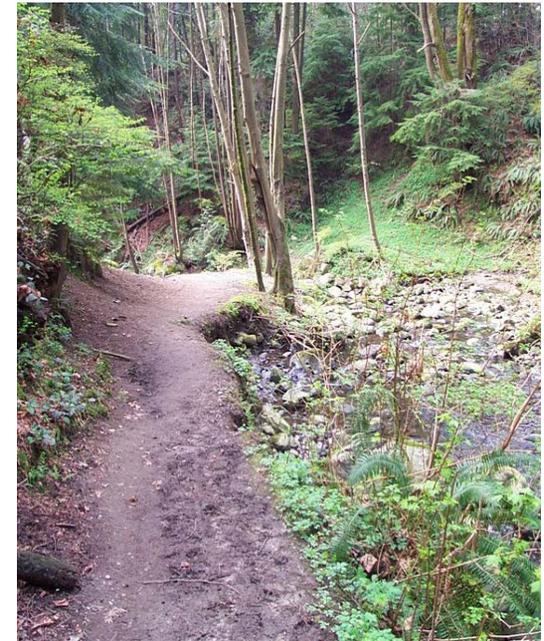
⁸ www.env.gov.bc.ca/van-island/pa/bmp_dev7.htm

⁹ http://www.env.gov.bc.ca/wsd/public_safety/flood/pdfs_word/guidelines.pdf

- (b) no alteration of land, including riparian vegetation, will occur in the riparian area identified as the SPEA;
- (c) natural features or areas to be preserved, protected, restored or enhanced;
- (d) natural watercourses be dedicated;
- (e) construction of works or other protection measures, including planting or retaining vegetation, in order to control drainage, control erosion or to protect fish habitat or riparian areas;
- (f) that no septic system, drainage or water system be constructed within the riparian area identified as SPEA;
- (g) a soil erosion and sediment control plan be prepared and followed during construction to protect the SPEA and the stream itself. Sediment control measures are to be located outside the riparian zone;
- (h) signage and fencing be erected to prevent encroachment into the SPEA during construction, and permanent fencing and signage upon completion of the project for long-term protection.
- (i) environmental monitoring with pre and post-construction reports confirming that permit conditions and DPA requirements were complied with;
- (j) removal of all non-native vegetation with the SPEA;

- (k) registration of a covenant over the SPEA or dedication of the SPEA leavestrip to the municipality as parkland;
- (l) conditions and requirements that vary the permitted use and density of land that may be subject to hazard, but only as they relate to health, safety or protection of property from damage;
- (m) impose conditions on the sequence and timing of construction;
- (n) require security to ensure completion of permit conditions. Security may be retained for one to two years to ensure survival of plantings;
- (o) designation of floodways along roads, minor watercourses and natural topographic lows where floodways are required as part of a Community Flood Hazard Mitigation Strategy, including no-fill conditions within the floodway corridor;
- (p) designation of a right-of-way for flood protection structures where such is required as part of a Community Flood Mitigation Strategy;
- (q) registration of a covenant for each parcel in flood hazard areas identifying minimum building elevations and indentifying relevant floodways where applicable.

20. In order to minimize claims on public funds and to advise future property owners of flooding hazard, covenants may be required pursuant to Section 82 of the *Land Title Act*, and Section 3(3) of the Bare Land Strata Regulations. These restrictive covenants will contain flood-proofing conditions and a waiver of liability to the province and municipality.



✘ Trails directly adjacent to streams are subject to flooding and erosion, and may cause habitat loss



✔ Trails moved back from the stream edge creates safer trails and allows restoration of streamside habitat.