



**Windermere Lake
Foreshore Inventory and Mapping**

**Prepared for:
East Kootenay Integrated Lake Management
Partnership**

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Executive Summary

The study area for this project is Windermere Lake, located in the southern interior of British Columbia. In August 2006, members of the East Kootenay Integrated Lake Management Partnership ([EKILMP] including staff from the Department of Fisheries and Oceans, Ministry of Environment and Wildsight) conducted a detailed inventory of the foreshore of Windermere Lake. The objective of the inventory was to provide an overview of the lake foreshore habitat condition. Information was collected on foreshore morphology, land use, riparian condition and anthropogenic alterations. The survey used Global Positioning System (GPS) technology and detailed digital shoreline video to capture foreshore characteristics. In October 2006, Wildsight obtained additional information, through a detailed field survey of retaining walls around the lake. Interior Reforestation Co. Ltd. was provided with the data from these two surveys and was commissioned to report and map the findings.

The results show that railway, residential, private recreational, parks and commercial uses have compromised the integrity of over half of the foreshore area of Windermere Lake. Anthropogenic alterations include riparian vegetation removal and construction of foreshore modifications (including retaining walls, docks, groynes, boat houses, marinas and boat launches). Retaining walls in particular have been built along substantial portions of the residential and private recreational areas, with nearly half of these constructed below the high water mark. There are concerns that these modifications are fragmenting and degrading foreshore habitats that are relied on by a variety of aquatic and terrestrial species. Despite these foreshore impacts, nearly half of the foreshore of Windermere Lake remains undisturbed. The undisturbed areas present management with both challenges and opportunities.

The information collected will aid all levels of government and organizations overseeing foreshore and upland developments. It serves as a benchmark by documenting land use and riparian habitat changes, necessary for the development of regulations, standards, policies and education materials. The ultimate goal of raising public awareness to ensure community stewardship to protect the inherent values of Lake Windermere is passionately desired. Several recommended actions are proposed, including: developing a foreshore protection plan, determining carrying capacity, conducting additional inventories to determine sensitive species and habitats, addressing modifications, conducting monitoring and further involving the community.

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1 Introduction

Windermere Lake is an attractive tourist, recreation and retirement area, with its 36 km of shoreline and warm waters. The lake's popularity has resulted in a steady increase in the density of shoreline dwellings and in the area leading the East Kootenays in growth and development (RDEK 2007a). Alberta's strong economy has particularly fuelled the increased development around the lake, and this growth trend is anticipated to continue into the future (RDEK 2007a). Although tourism derived from the lake is important to the growing local economy, the community's dependence on the lake for drinking water and recreation has resulted in concerns being raised about the influences of human activities (Masse and Miller 2005, Fedrigo 2006). Observations from lake users and interview data collected indicates serious concerns with crowding at the lake, and serious impacts on lakeshore habitats from shore land development (Fedrigo 2006).

The East Kootenay Integrated Lake Management Partnership (EKILMP [See Appendix A]) formed in early 2006 in response to concerns made by the public, resource agencies and non government organizations over the very fast pace of foreshore development in the East Kootenays (EKILMP 2006). The EKILMP's aim is to protect lakes in the East Kootenays by producing land use and development guidance, encouraging more integrated and coordinated approaches, as well as providing guidance on best practices and restrictions of use where necessary (EKILMP 2006). Due to the intensity of new development pressure, the EKILMP decided to use Windermere Lake as a pilot for a Sensitive Habitat Inventory Mapping (SHIM) project of the shoreline. The shoreline inventory and analysis would provide a framework upon which ecologically based long term lake management guidelines could be developed (EKILMP 2006). EKILMP personnel conducted Field reviews in the summer of 2006, and Interior Reforestation Co. Ltd. (IR) was commissioned by the EKILMP to use the data and prepare a comprehensive SHIM report. This SHIM report is to be used by EKILMP to help develop science-based coordinated management guidance for land and water uses associated with Windermere Lake, and promote the application of this guidance in decision-making by all levels of government, developers, planners and all other interests (EKILMP 2006).

1.1 Foreshore Significance

The foreshore area of Windermere Lake is the primary focus of this report. The foreshore is defined as the part of the shore between the high and low watermarks and is an important link between the aquatic and terrestrial environments. The foreshore is known to have important biological and ecological significance and is extremely sensitive to disturbance (RDCO 2005). These areas also hold important social significance for their residents (human and otherwise) (RDCO 2005). Foreshore ecosystems function upon intricate relationships, provide living space for permanent and transitory species, and support primary production and food webs (Batelle 2001).

Often, shoreline development results in alterations of the foreshore environment. When the natural shoreline is altered, the intricate balance between the creatures, plants and processes can easily be toppled (Department of Fisheries and Oceans [DFO] 2007). Urban Systems (2001) identifies a number of possible impacts that developments along the foreshore may have on the environment including:

- 1) the habitat may be totally altered (e.g. by draining marshes) impacting waterfowl and spawning/rearing ground for fish;
- 2) structures along the foreshore may alter natural patterns of erosion (removal of land) and accretion (deposition of land), potentially negatively impacting fish and wildlife habitat;
- 3) potential fuel spills (e.g. from marinas) could contaminate the water affecting drinking water and recreation areas, and impact insect larvae; and

- 4) increases in nutrient supply could cause algal blooms, impacting water quality for human consumption, fish and other species dependant on the water.

Protecting the foreshore environment is often a difficult task for land managers. The Regional District of Central Okanagan, in their SHIM report for Central Okanagan Lake (2005), provided the following synopsis of difficulties faced with providing protection to the foreshore:

Historically, the long-term effects of foreshore disturbance were not well understood, resulting in inadequate protection, a cumulative loss of foreshore habitats, and ultimately, public and agency frustration over management of the foreshore. There are numerous reasons for such widespread frustration: the difficult task of coordinating a large-scale effort in managing resources over multiple jurisdictions and agencies; lack of inter-agency cooperation and program integration; limited funding resources; and limited consequences for foreshore degradation. These challenges often lead to further frustration by landowners, developers, and government staff alike. Foreshore ecosystems continue to be the subject of development pressure, which further compromises ecosystem function. The lack of comprehensive information on foreshore ecosystem relationships makes foreshore management difficult.

1.2 Foreshore Management

Currently, the Upper Columbia Valley Zoning Bylaw (RDEK 2007a) administers development within the Regional District of East Kootenay (RDEK), in the Lake Windermere area. Although this zoning bylaw determines what can occur on an individual parcel of land, it does not provide an overall plan guiding land use change or implement a community vision (RDEK 2007a). To address this, the development of an Official Community Plan (OCP) is currently underway (RDEK 2007a). The foreshore concerns the OCP is to consider include local environmental and natural resource issues, local parks trails and green spaces, and protection from and potential constraints against development within environmentally sensitive areas (RDEK 2007a).

A Foreshore Policy document was adopted in 1993 for the east side of Windermere Lake (RDEK 1993). The Foreshore Policy provides background on the area, jurisdictional responsibilities, authorizations required, and lake status (RDEK 1993). The policy also identifies key issues such as the need to protect water quality, a need for improved public access planning, foreshore development issues and erosion and accretion problems (RDEK 1993). The Foreshore Policy requires updating, as it was only meant to provide interim guidance for development in advance of the OCP being developed (RDEK 1993). It is recommended that it also consider current standard practices, and include the whole foreshore of Windermere Lake.

As a result of a steady increase in the number of people moving to the area, development pressures on natural resource values in the Columbia River valley area in the East Kootenays have been substantial over the past decade (EKILMP 2006). In association with preparing the OCP, management agencies have been striving to better deal with the increased numbers of development proposals by improving coordination of efforts and communications, and providing consistent policy information and direction. The EKILMP, which is made up of stakeholders with common concerns and joint responsibilities, have combined resources to address issues of concern in an integrated way (EKILMP 2006). Due to the combined pressures of providing timely and cost effective reviews of proposals to determine cumulative impacts, and interests in sustaining water quality in the lake (for aquatic life, recreation and drinking water), the EKILMP decided to use Windermere Lake as a pilot for demonstrating the advantages of an integrated and collaborative approach to lake management (EKILMP 2006).

1.3 Purpose of the Foreshore Mapping and Inventory Project

The purpose of the Windermere Lake Foreshore Inventory and Mapping project is to provide baseline information for future decision-making about development of the Windermere Lake foreshore. The project is intended to help partnering agencies identify the ecological condition of the foreshore, evaluate resource values, and explore conservation and restoration opportunities associated with lakeshore habitats. The information will be useful for local, regional, provincial, and federal organizations when addressing development issues related to foreshore sensitivity.

The project will also provide agencies with an easily accessible inventory of land use, shore type, existing riparian condition, and anthropogenic alterations along Windermere Lake. It will aid in developing land use policies, regulations and standards; and is intended to increase long-term environmental capabilities for the protection of aquatic and riparian habitat within existing local government land use planning programs. The project will serve as a benchmark for regulatory agencies by documenting current foreshore condition, and it will also provide evidence for regulatory investigations and will assess objectives set out in foreshore protection initiatives.

1.4 Objectives of the Foreshore Mapping and Inventory Project

The objectives of this project are to:

- provide an overview of foreshore habitat condition on the lake;
- inventory foreshore morphology, land use, riparian condition and anthropogenic alterations;
- obtain spatially accurate digital video of the shoreline of the lake, made available through Geographic Information Systems (GIS);
- develop an easily accessible GIS database on the ecological integrity of the lake foreshore;
- collect information that will aid in prioritizing critical areas for conservation and or protection;
- make the information available to planners, politicians and other key referring agencies that review applications for land development approval; and
- integrate information with upland development planning, to ensure protection of sensitive foreshore areas; so that lake management planning is watershed based.

2 Known Environmental Conditions and Sensitive Areas Associated with the Windermere Lake Foreshore

Windermere Lake is located within the Columbia River Valley. The Columbia River Valley is a physically diverse area characterized by a mixture of coniferous and deciduous trees and substantial marshlands (Urban Systems 2001). Due to this physical diversity, the watershed has a considerable variety of plant and animal species. Upland and foreshore development has been concentrated at the north end of Windermere Lake, both on the west side in the District of Invermere and on the east side within the RDEK. A review of pertinent Windermere Lake literature has provided the following overview of information relating to current understandings of environmental conditions associated with the foreshore. The overview includes water quality, wildlife, fish, aquatic plants and sensitive species.

2.1 Water Quality

Water quality was monitored by the Ministry of Environment annually from 1971 to 1989 and then again in 1999 (Urban Systems 2001). Both Urban Systems (2001) and Masse and Miller (2005) reviewed the monitoring results; however they had contradictory conclusions. Urban Systems (2001) identified that the lake had excellent ambient (whole lake) water quality and a low sensitivity to nutrient inputs (due to the large volume of water that enters the lake and its rapid turnover). Masse and Miller (2005) identified that nutrient enrichment is a concern in Windermere Lake, and there is evidence of the lake becoming more enriched or eutrophic with time, particularly at the northern end. Significant negative trends were evident in the following parameters: oxygen, pH, total organic nitrogen and total dissolved phosphorus (Masse and Miller 2005).

A 1985 Leachate study found numerous locations along the shore where nutrient levels were higher than average, which suggests localized sources of nutrient inputs could have fairly rapid and noticeable impacts on the nearshore (Urban Systems 2001). Data suggested that the intensive use of domestic septic fields might be causing the nearshore water quality 'hot spots'. The problem is exacerbated by many septic systems (along the eastern shore) located on soils with limited or poor drainage capability (Urban Systems 2001). Non-point sources of pollution, such as storm drain run-off and contaminants from lakeshore properties are also potential sources of concern (Urban Systems 2001).

2.2 Wildlife

The north and south ends of Windermere Lake are known to have particularly valuable wildlife habitat. The wetlands at the inlet (south) and just downstream of the outlet (north) of the lake are classified within the Columbia River Wetlands. These wetlands are known to provide internationally significant staging and breeding areas for a multitude of waterfowl species (Living Lakes 2007). In 2005, the Columbia Wetlands were designated under Ramsar (Holmes 2007). The Convention on Wetlands, signed in Ramsar, Iran, in 1971, is an intergovernmental treaty which provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources (Holmes 2007). There are presently 154 Contracting Parties to the Convention, with 1674 wetland sites (36 in Canada), totaling 151 million hectares, designated for inclusion in the Ramsar List of Wetlands of International Importance (Holmes 2007). The Columbia Wetlands, Columbia Lake and Lake Windermere serve as a critical part of the Pacific Flyway migration route for large numbers and varieties of bird species (Living Lakes 2007, Holmes 2007). A census of the Columbia wetlands identified that more than 20,000 swans, geese and ducks use the area throughout the migratory periods (Living Lakes 2007). Some details on species using the Windermere Lake area are as follows (Urban Systems 2001):

- Trumpeter swans (*Cygnus buccinator*) and tundra swans (*Cygnus columbianus*) commonly migrate through the area;
- Common loons (*Gavia immer*) breed in the shallow lagoons;
- Dabbling ducks that commonly breed in the Windermere watershed include: mallards (*Anas platyrhynchos*), American wigeon (*Anas Americana*), blue-winged teal (*Anas discors*), green-winged teal (*Anas crecca*), cinnamon teal (*Anas cyanoptera*), as well as most other dabbling species that pass through the valley;
- Common diving ducks include: common goldeneye (*Bucephala clangula*), redheads (*Aythia Americana*) and canvasback (*Anas valisineria*);
- Older stands of cottonwood provide important habitat for cavity nesters such as the wood duck (*Aix sponsa*), bufflehead (*Bucephala albeola*) and hooded merganser (*Lophodytes cucullatus*); and
- Production of Canada goose (*Branta canadensis*), great blue heron (*Ardea herodias*), and several birds of prey (including osprey [*Pandion haliaetus*], and 8 owl species) is also significant in these areas. The north and south ends of the lake have at least 24 active nesting pairs of osprey and provide valuable feeding habitat to these birds. Osprey inhabit this area from late April to early October.

The Windermere Lake wetland areas are also known to have important muskrat and beaver habitat (Urban Systems 2001).

2.3 Fish

Windermere Lake has an extremely high diversity of fish species present because of its continuity with the Columbia River (Urban Systems 2001). The wetlands at the north and south ends of Windermere Lake provide good to excellent sport and course fish habitat (Urban Systems 2001). In response to possible boat launch and marina developments, some specifics on fish and habitat usage along the foreshore at the north end of the lake were provided by Urban Systems (2001). These details are included below alongside the listing of fish species known to inhabit Windermere Lake (Urban Systems 2001). The Field Key to the Freshwater Fishes of British Columbia (RIC 1994) was used to designate native versus introduced species.

Native Fish

- bull trout (*Salvelinus confluentus*);
- rainbow trout (*Oncorhynchus mykiss*); most abundant species captured in gill netting survey (Griffith 1994);
- mountain whitefish (*Prosopium williamsoni*), north end provides good spring, summer and fall habitat;
- westslope cutthroat trout (*Oncorhynchus clarkii. lewisi*);
- burbot (*Lota lota*), north end provides good year round habitat;
- chislemouth chub (*Acrocheilus alutaceus*);
- lake chub (*Couesius plumbeus*), north end provides excellent year round habitat;
- peamouth chub (*Mylocheilus caurinus*), north end provides good year round habitat;
- torrent sculpin (*Cottus rhotheus*);
- largescale sucker (*Catostomus macrocheilus*), north end is excellent spring summer and fall habitat;
- longnose sucker (*Catostomus catostomus*);
- longnose dace (*Rhinichthys cataractae*), north end provides good year round habitat.
- redbside shiner (*Richardsonius balteatus*); and
- northern pike minnow (*Ptychocheilus oregonensis*), north end provides good spring, summer and fall habitat.

Introduced Fish

- kokanee (*Oncorhynchus nerka*);
- eastern brook trout (*Salvelinus fontinalis*);
- largemouth bass (*Micropterus salmoides*); and
- pumpkinseed (*Lepomis gibbosus*).

Although Windermere Lake has a high diversity of sport and coarse fish species present, total numbers of individual fish, particularly sport fish, are generally low (Urban Systems 2001). The lack of success of sports fish has been attributed to competition and predation by coarse fish, limited availability of spawning and recruitment habitat, and possible angler effort/catch (Urban Systems 2001). Windermere Lake itself is reported to provide good spawning, rearing and over wintering habitat; good cover and food sources associated with the high aquatic macrophyte populations; and to have water chemistry that is optimal for fish survival (Urban Systems 2001). When Griffith (1994) surveyed major tributary streams entering Windermere Lake, Windermere Creek was found to be the main system providing fish recruitment/production for the lake. While kokanee production was particularly high; rainbow trout, bull trout and westlope cutthroat trout were also found in Windermere Creek (Griffith 1994). Goldie Creek showed some bull trout spawning / recruitment potential. Fisheries production in the other tributaries reviewed was likely limited by excessively steep and swift water flows (Griffith 1994).

2.4 Aquatic Plants

The warm, shallow waters of Windermere Lake provide good growing conditions for plant growth. Over 95% of the lake's surface area is at a depth that light can penetrate to a sufficient degree to support plant growth (Urban Systems 2001). This coupled with the frequent winds and nutrient availability, makes Windermere Lake susceptible to highly productive aquatic plant growth (Urban Systems 2001). Urban Systems (2001) summarized that aquatic plant surveys conducted in 1971, 1989 and 1995 showed little change in species composition or distribution with time. Lake Windermere Project (a partnership program organized by Wildsight) is conducting a macrophyte survey in August 2007 to document densities and types of aquatic plants (Leschied 2007).

2.5 Sensitive Species

The BC Conservation Data Centre "BC Species and Ecosystems Explorer Internet Tool" (CDC 2007) was used to generate a list of sensitive species known to the Rocky Mountain Forest District (RMFD) in the Interior Douglas Fir (IDF) biogeoclimatic zone, of which Windermere Lake is situated. This search identifies that there are 123 species of plants and animals that are either endangered or vulnerable in the area (See Appendix B1). This list reveals that many of these species are associated with lacustrine (lake) and palustrine (wetland) habitat types, and are thus likely to be associated with the Windermere Lake foreshore. In addition, a number of these sensitive species are identified as being associated with both aquatic and terrestrial habits, which additionally suggests that they could be found in the foreshore area.

A more refined search of the CDC archives using the 'Mapped Known Locations Tool, provides that there are 12 species of concern that have been mapped in the immediate vicinity of Windermere Lake (associated with the foreshore). Details on these plants and animals identified in the vicinity of Windermere Lake are provided in Table 1 (See map in Appendix B2). In addition to this, a cross reference of fish and bird species identified during other field inventories (See Sections 2.2 and 2.3) and the CDC list of species in the IDF zone of the RMFD, reveals that there are four additional blue-listed species known to inhabit the Windermere Lake area: chislemouth chub (*Acrocheilus alutaceus*), bull trout (*Salvelinus confluentus*), westslope cutthroat trout (*Oncorhynchus clarkii. lewisii*), and great blue heron (*Ardea herodias herodias*).

Table 1. Blue and red listed species associated with the Windermere Lake area (BC CDC 2007)

CDC Map ID #	Common Name	Scientific Name	Status			Occurrence Information
			Global	Prov.	BC	
Vascular Plants						
4132	Nuttall's sunflower	<i>Helianthus nuttallii</i> var. <i>nuttallii</i>	G5T5	S1	Red	Habitat: Terrestrial, Riparian. Wet ground and wet area in marshy field, roadside ditches and fields.
3658	Plains reedgrass	<i>Calamagrostis mintanensis</i>	G5	S2	Red	Habitat: Terrestrial; Grassland/Herbaceous. Dry south slopes
14353	Water marigold	<i>Megalodonta beckii</i> var. <i>beckii</i>	G4G5 T4	S3	Blue	Lacustrine; Shallow Water.
3754	Stiff-leaved pondweed	<i>Potamogeton strictifolius</i>	G5	S2S3	Blue	Lacustrine; Shallow Water.
4270, 6740	Hooker's townsendia	<i>Townsendia hookeri</i>	G5	S2	Red	Terrestrial; Grassland/Herbaceous. Dry rolling land above lake; and in disturbed grassland seeded with domestics and mowed on shore of lake, west aspect.
1840	Saltwater cress	<i>Arabidopsis slasuginea</i>	G4G5	S1	Red	Terrestrial. Dry ground probably with some alkali
2140	Scarlet globe-mallow	<i>Sphaeralcea coccinea</i>	G5?	S1	Red	Terrestrial. South slope of hill near Indian Reserve.
2256	Alkali plantain	<i>Plantago eriopoda</i>	G5	S1	Red	Terrestrial; Aluvial Flats.
2370	Booth's willow	<i>Salix boothii</i>	G5	S2S3	Blue	Lacustrine; Swamp. Low alluvial swamp area.
Vertebrate Animals						
23251	Badger	<i>Taxidea taxus</i>	G5	S1	Red	Terrestrial; Grassland; Roadside.
13732, 14353	Lewis's Woodpecker	<i>Melanerpes lewis</i>	G4	S2B	Red	Terrestrial; Grassland/Herbaceous. <i>Purshia</i> grass with scattered snags and live ponderosa pine. Sharptail Prairie, south of Goldie Creek. Nests sites also found in large burn area with Douglas fir snags and adjacent riverside riparian cottonwood woodland and golf course.
11268	Chiselmouth	<i>Acrocheilus alutaceus</i>	G5	S3S4	Blue	Lacustrine; Deep water; Shallow Water.
Global Rank: G1= Critically Imperiled G2= Imperiled G3= Vulnerable G4= Apparently Secure G5= Secure		Provincial Rank: S1= Critically Imperiled S2= Imperiled S3= Vulnerable S4= Apparently Secure S5= Secure B= Breeding		BC Status: Red= Extirpated, endangered, threatened, or candidates for such status Blue= Sensitive or vulnerable		

3 Methodology

The methods used to obtain the information in this report include EKILMP field assessments, retaining wall field assessment, and data compilation of the field assessments. Inventory and mapping of Windermere Lake were conducted according to standard SHIM procedures (Mason and Knight 2001).

3.1 Study Area

Windermere Lake is located in the southern interior of British Columbia in the Rocky Mountain Trench. The lake forms part of the Columbia River Valley and is a widening of the Columbia River rather than a “true lake” (Urban Systems 2001). The study area includes the entire shoreline perimeter (36.3 km) of Windermere Lake. The North West end is under the jurisdiction of the District of Invermere, while the remainder of the Lake is within the RDEK's administrative boundary. Table 2 provides a summary of Windermere Lake's physical parameters and Figures 1 and 2 depict Windermere Lake.

Table 2. Windermere Lake physical characteristics (Urban Systems 2001)

Parameter	Amount
Volume	55.19 x10 ⁶ m ³
Surface Area	1610 ha
Littoral Area	~1530 ha
Drainage	1340 km ²
Maximum Depth	6.4 m
Mean Depth	3.4 m
Length	17.7 km
Average Width	1.1 km
Shoreline Perimeter	36.3 km



Figure 1. View towards north end of Windermere Lake, showing the District of Invermere along the North West boundary of the lake (area left of the lake outlet).

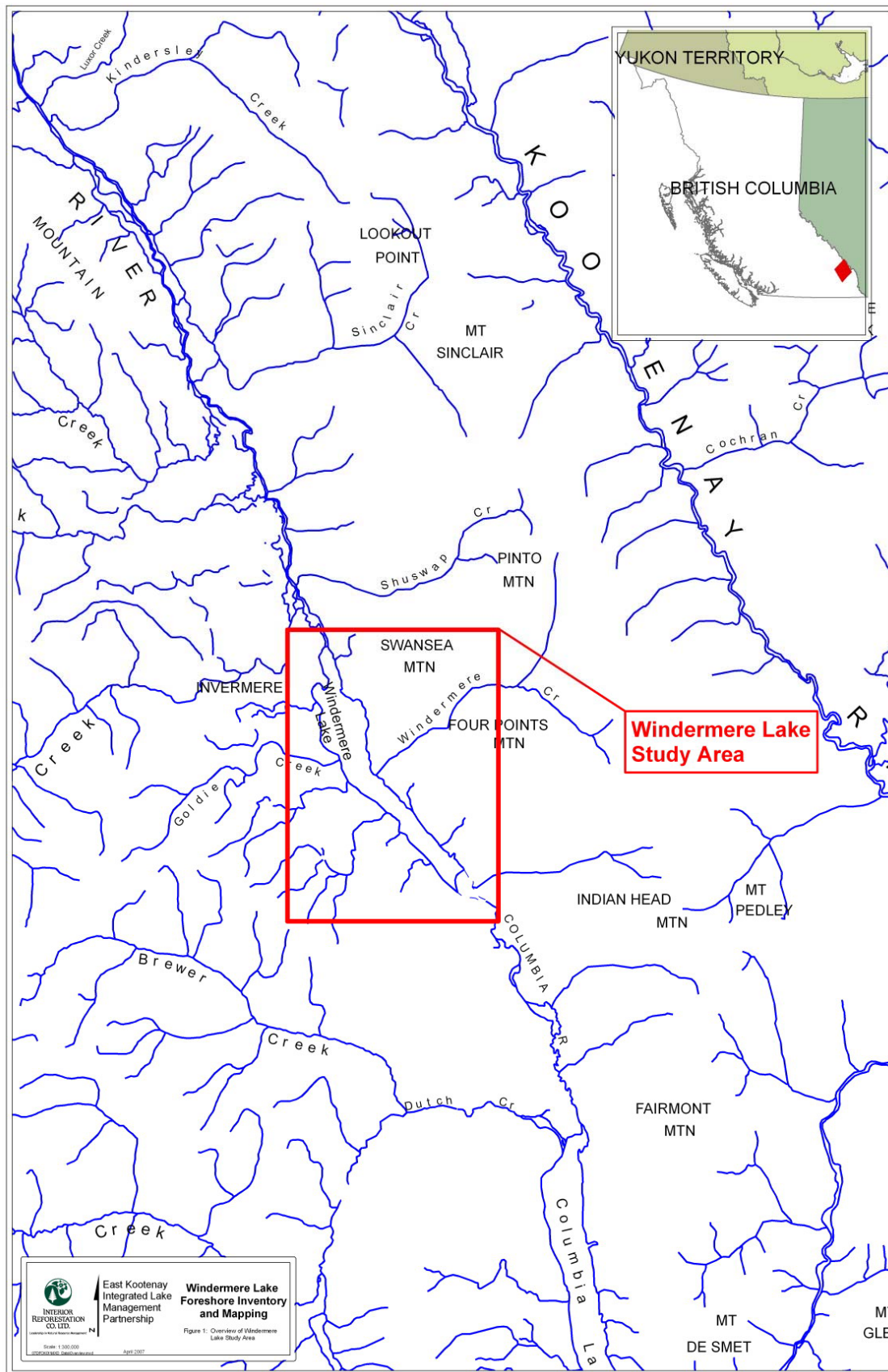


Figure 2. Overview Map of Windermere Lake Study Area

3.2 EKILMP Field Assessment

Field assessments were conducted on August 15-16, 2006, aboard the Joe C (DFO Nelson's sampling boat) by EKILMP members. Individuals involved included: Tola Cooper, Brad Mason, Louise Porto (Department of Fisheries and Oceans [DFO]); Peter Holmes and Kristin Murphy (Ministry of Environment [MoE]); and Amanda Fedrigo (Wildsight). The survey team followed the shoreline from a set distance (optimally 60m) and at a speed of 4 knots. The entire shoreline was recorded using digital video, as well as still photos. A GPS unit was used to delineate foreshore Segments, which are contiguous sections of shoreline that are determined by similar foreshore characteristics. These characteristics include land use designation adjacent to the foreshore, shore type, foreshore condition and modification, and disturbance (see Tables 3-6 and Figures 3-4 for detailed descriptions). DFO personnel input all of the information collected into a database via field cards and the GPS unit.

Field personnel used visual observations, not direct measurements, to estimate percentages. For example, a value of 80% disturbed is an estimate rather than a physical measurement of the length of disturbed foreshore within the Segment. As a method of qualifying the overall health of the foreshore, each Segment was assigned a value describing Level of Impact (LoI) by field personnel. The LoI is a qualitative measurement of the overall health of the foreshore and can be categorized as Low, Medium, or High (Table 7 and Figure 5). The LoI is based on visual observations during the assessment, including attributes from the database such as percent disturbed and presence of man-made structures (e.g. retaining walls, docks, groynes and marinas).

Table 3. Land uses adjacent to the foreshore (adapted from RDCO 2005).

Land Use Designation	Purpose
Agricultural	To accommodate agricultural operations and related activities on parcels usually located on the Agricultural Land Reserve.
Canadian Pacific Railway (CPR)	To accommodate private land owned by CPR.
Commercial	To accommodate a mix of commercial, retail, recreation and service uses primarily intended for Town Centre areas.
Crown (other)	To accommodate land belonging to the Province of BC, such as forest and resource management lands.
Industrial	To accommodate industrial activities.
Park	To accommodate active recreation lands, community oriented cultural centres and other similar areas available to the general public.
Private Recreational	To accommodate private lands set aside for recreational purposes such as marinas, private beaches, or resorts. Resorts include strata complexes with a mix of recreational and residential uses. Also accommodates private lands that have not yet been developed.
Residential Development	To accommodate residential use (mainly single family).
Undeveloped Indian Reserve	Indian Reserve Land (Indian Reserve #3 Columbia Lake), managed by the federal government, which for the purposes of this study, remain in a natural condition.

Table 4. Predominant shore types as defined by the Resources Inventory Committee (1999).

Shore Type	Description
Cliff/Bluff	Adjacent to steeper slopes, usually indicating a steep-sided lake basin or sudden drop-off
Sand Beach	Often associated with alluvial fans or other shoreline deposition areas.
Gravel Beach	Often associated with low gradient foreshore, coves with pockets of riparian vegetation among steeper hillsides or alluvial fans.
Vegetated Shoreline	Characters of undisturbed foreshore with narrow littoral width. Vegetation is commonly shrubs and small trees. Overhanging vegetation occurs to the mean water level.
Low Rocky Shore	Cobble, boulder or bedrock substrate often prevalent along the base of steeper shorelines.
Wetland	Characteristic of wide littoral zones with fine substrates promoting abundant emergent vegetation such as sedges, reeds and cattails.



Cliff/bluff



Vegetated Shore



Sand Beach



Wetland



Gravel Beach



Low Rocky Shore

Figure 3. Examples of predominant shore types along Windermere Lake.

Table 5. Foreshore conditions (RDCO 2005).

Condition	Description
Natural	Shoreline is unmodified.
Disturbed	Foreshore has been modified through human alteration.

Table 6. Foreshore modifications (RDCO 2005).

Modifications	Description
Docks	Long, narrow structures stretching into a body of water.
Retaining Walls	Structural walls with the primary function of supporting soil from behind or any caused by wave action.
Groynes	Protective structures of stone or concrete that extend from shore into the water to prevent a beach from washing away.
Boat Launches	Sections of foreshore dedicated to launching boats and removing boats with vehicles.
Marine Railways	Railway tracks used to lift boats in and out of the water or to adjacent boat houses.
Marinas	Harbours specially designed to moor a collection of boats.


Figure 4. Examples of foreshore modifications along Windermere Lake, including boathouse, dock, retaining wall (left); and marina, dock and retaining wall (right, [photo provided by Wildsight]).

Table 7. Level of Impact (RDCO 2005)

Level of Impact	Description
Low	Segments that show little or limited signs of foreshore disturbance and impacts. These Segments exhibit healthy, functioning riparian vegetation. They have substrates that are largely undisturbed, limited beach grooming activities and no to few modifications.
Medium	Segments that show moderate signs of foreshore disturbance and impacts. These Segments exhibit isolated, intact, functioning riparian areas (often between residences). Substrates (where disturbed) exhibit signs of isolated beach grooming activities. Retaining walls (where present) are generally discontinuous. General modifications are well spaced and do not impact the majority of the foreshore Segment.
High	Segments that show extensive signs of disturbance and impacts. These Segments exhibit heavily disturbed riparian vegetation, often completely removed or replaced with non-native species. Modifications to the foreshore are extensive and likely continuous or include a large number of docks. Generally, residential development is high intensity. Modifications often impact a majority of the foreshore.



Low Level of Impact



Medium Level of Impact



High Level of Impact

Figure 5. Examples of low, medium and high Levels of Impact at Windermere Lake

3.3 Retaining Wall and Wetland Field Assessment (Wildsight)

Wildsight staff, Amanda Fedrigo and Heather Leschied, circumvented Windermere Lake in October 2006 to obtain detailed information on retaining wall structures and wetland features. Their retaining wall assessment included identification of: location, construction materials, condition, % of lot length, height, number of tiers, and photo documentation. Wetland areas were also mapped and locations were recorded using GPS. Wetlands included any areas containing features such as shallow water areas with emergent vegetation (i.e., cattails, rushes, and sedges).

3.4 Data Compilation and Report Preparation (IR Personnel)

DFO provided IR personnel with the Windermere Lake SHIM database from the EKILMP's August 2006 field assessment, the database from Wildsight's October 2006 retaining wall field assessment, and corresponding GPS data. IR was responsible for providing a written report on the data and summary map product(s).

3.4.1 Updating the EKILMP Foreshore Database

In order to prepare this report, IR first reviewed the field data in detail and completed an office exercise to address any inconsistencies or omissions in the EKILMP foreshore database. A main area requiring attention was the determination of land use. Land uses for each Segment were obtained by cross-referencing Segment locations with information available on the legal map base for the area. The legal boundaries of properties around the lake were obtained from the RDEK (2007b). Confirmation of land use and other data areas also involved discussions with field staff (i.e., conference call of Feb 15, 2007) and other EKILMP individuals (i.e., Laurie Cordell, RDEK). Appropriate new land use designations were added to those defined in the Okanagan Foreshore report (RDCO 2005), to most appropriately describe the Windermere shoreline. These new land-use designations included: Canadian Pacific Railway, Undeveloped Indian Reserve, and Private Recreational areas. As well, because there was very little urban residential property around the lake, it was decided that the urban designation used in the Okanagan Foreshore report, would not be used for Windermere Lake. Instead, all residential properties (other than resort strata types) were lumped together under the residential category. Roads and access points were incorporated into the land use that was most prevalent around them, and not given their own designation.

Some additional data gaps were identified where Segment values for respective parameters did not equal 100% (i.e. for natural vs. disturbed, and shore types). Peter Holmes (MoE) assisted by conducting an office review of ortho-photos to provide the necessary updates. A key to the field headings in the EKILMP foreshore data base and a hardcopy of the database are provided in Appendices C and D, respectively.

3.4.2 Use of DFO's Digital Atlas

The Community Mapping Network (CMN), providing online natural resource information and maps, was particularly useful to this project. The digital atlas for Windermere Lake, located at <http://www.shim.bc.ca/atlas/atlas.html#windermere> (currently under development), integrates lake data and makes it accessible through a user friendly mapping system. The digital atlas was used mainly to confirm data. For example the photo-documentation (obtained both from air and boat) within the atlas was used to confirm Segment details. Many of these photos were included in this report. The compilation of ortho-photos and TRIM (Terrain and Resource Information Management) data overlain onto Segment locations were also used, in the early report development stages. The video of Windermere Lake shoreline which is linked to a coordinate system at the SHIM website was also valuable.

3.4.3 Retaining Wall Data

The fields in the EKILMP database referencing retaining wall numbers and construction materials were updated using Wildsight's information. Since the Wildsight data was referenced according to property addresses and legal lot numbers, respective Segment numbers had to be determined for each of the entries using legal maps for the area. Brad Mason, of DFO, provided assistance with this task. A hardcopy of the retaining wall data collected by Wildsight, showing associated Segment numbers is provided in Appendix E.

The Wildsight retaining wall data was summarized by providing totals (e.g., # of lots assessed, # with retaining walls, # below the high water mark) and averages (i.e., average % of lot length and average height). The percent of lot length values as provided by Wildsight were also used with lot boundary maps to calculate a total value (m) of retaining wall for each lot and for each Segment. This task was mainly completed by hand using a ruler and basic ratio calculations. Where Wildsight provided GPS locations for the north and south retaining wall end points, GIS mapping applications were used to determine retaining wall lengths.

Wetlands polygons identified in the Wildsight data base were also digitized onto the Foreshore summary maps. Wetland locations were provided by Wildsight as GPS coordinates, and in some cases as hand marked polygons on field maps. When digitizing these polygons, Wildsight's mapped polygons were used when available. For other wetlands the GPS coordinates were used.

3.4.4 Reporting

Report development involved preparation of detailed descriptions of each Segment (See Appendix F), analysis of data in order to provide a summary of results (See Section 4, and Appendix G), discussion of the results (See Section 5), and recommendations (See Section 7). Unless otherwise referenced, all photos in this report were provided by DFO.

3.4.5 GIS Products

IR GIS personnel constructed a map of Windermere Lake indicating Segment break locations, lots with retaining walls and wetland polygons (Appendix H). Segment breaks and wetlands were interpolated by overlying GPS locations onto existing TRIM line maps. Local cadastral and land use maps were also used as an aid. As a result, locations are applicable only at a large scale and may require further refinement at a smaller scale.

The SHIM procedures (Mason and Knight 2001) and the Central Okanagan Lake Foreshore Inventory and Mapping Report (RDCO 2005) provide additional technical methodology procedures including GPS and video data collection, data management, database development, and quality control. See digital shapefile data for more detailed information and accurate delineation of Segments (Appendix I).

4 Results

The foreshore of Windermere Lake totals 35,559m. The foreshore was divided into 26 contiguous Segments, according to morphology. These Segments range in length from ~150-3800m. Detailed descriptions of individual Segments are provided in Appendix F and GIS maps showing Segment locations and key Segment information are provided in Appendix H. Results are presented in a way that reviews parameter findings for the whole shoreline of the Lake (considering results of all segments). In order to provide additional detail, results also compare findings between Segments groupings. Segment groupings are based on geographic shoreline location; they separate the lake into four quadrants and are described in Table 8:

Table 8. General description of Segment groupings.

Segment Grouping Location	Segments Included	Total grouping length (m)
South East Shore	Segments 1-6	10,400
South West Shore	Segments 7-12	7,067
District of Invermere	Segments 13-19	8209
North East Shore	Segments 20-26	9017

Natural vs. disturbed areas, land use, shoreline type, modifications along the foreshore and level of impact are reviewed in detail in order to provide an inventory of the foreshore condition.

4.1 Natural vs. Disturbed Areas

Overall, results indicate that more than half (62% or 21,912m) of the lake's foreshore is disturbed (Table 9).

Table 9. Total disturbed and natural shoreline along Windermere Lake.

Foreshore	Length (m)	% of total
Disturbed	21,912	62%
Natural	13,647	38%
Total Foreshore	35,559	100%

Figure 6 shows the extent of disturbed and natural foreshore area for each of the Segment groupings. Results indicate that shoreline disturbance is the least (9%) along the South East shore, and that disturbance is highest in the Segments within the District of Invermere (94%) and along the North East shore (76%).

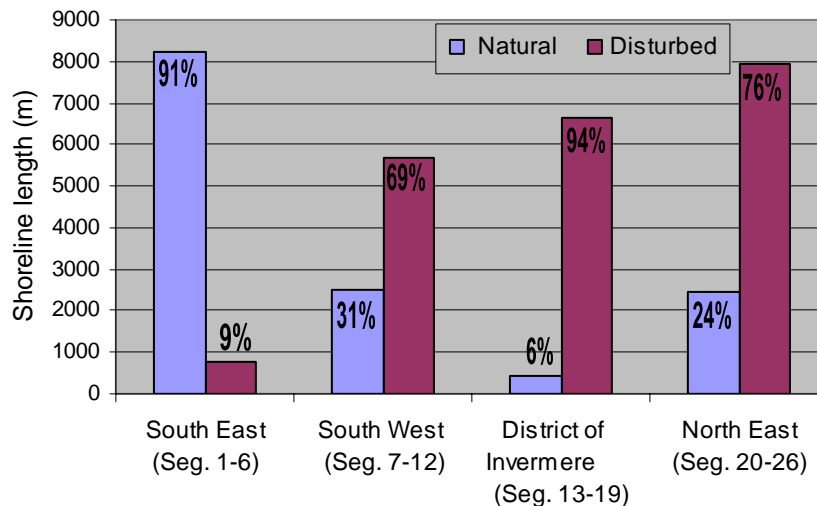


Figure 6. Natural and disturbed values for each of the Segment groupings of Windermere Lake depicted as a length (m) of the total foreshore, and a percentage (%) of each Segment grouping.

4.2 Land Use

This assessment found that there are several primary land use types around Windermere Lake (Figure 7). Some of the land uses inherently have little impact on the foreshore conditions such as crown land and undeveloped Indian Reserve areas. Other land uses, by their nature, generally disturb the foreshore including the Canadian Pacific Railway (CPR), residential areas, private recreational areas, and commercial lands. The lake also has some parkland, which appear to be approximately half disturbed and half natural.

A review of the shoreline length for each of these land uses indicates that two land uses which result in disturbance, run along the longest lengths of shore. These are the CPR (spanning 10,440m or 29% of the shoreline) and residential development (spanning 8491m or 24% of the shoreline). Undeveloped Indian Reserve lands provide the most substantial foreshore length which has not been disturbed (8,226m or 23%). Private recreational properties generally have a moderate influence around the lake as a whole (3,933m or 11%); while crown, park and commercial land uses comprise the least foreshore length (respectively at 2,164m or 6%, 1756m or 5%, and 547m or 2%).

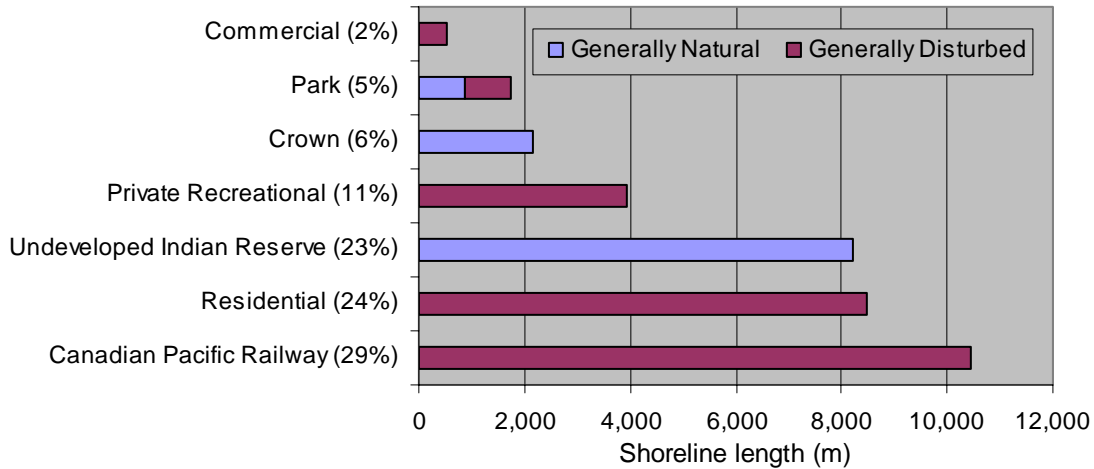


Figure 7. Land uses along the foreshore of Windermere Lake, depicted as length (m) coverage along shoreline, percentage of total foreshore length (%); with an indication of whether the land use generally maintains a natural condition or contributes to disturbance.

Figure 8 indicates where the primary land uses are generally located around the perimeter of Windermere Lake. From Figure 8, the following is evident: undeveloped Indian Reserve is concentrated in the Segments along the south east shore, the CPR runs along most of the eastern shoreline, most of the residential and private recreational areas are located along the north east shore, and that the small park areas are located in the District of Invermere and along the north east shoreline.

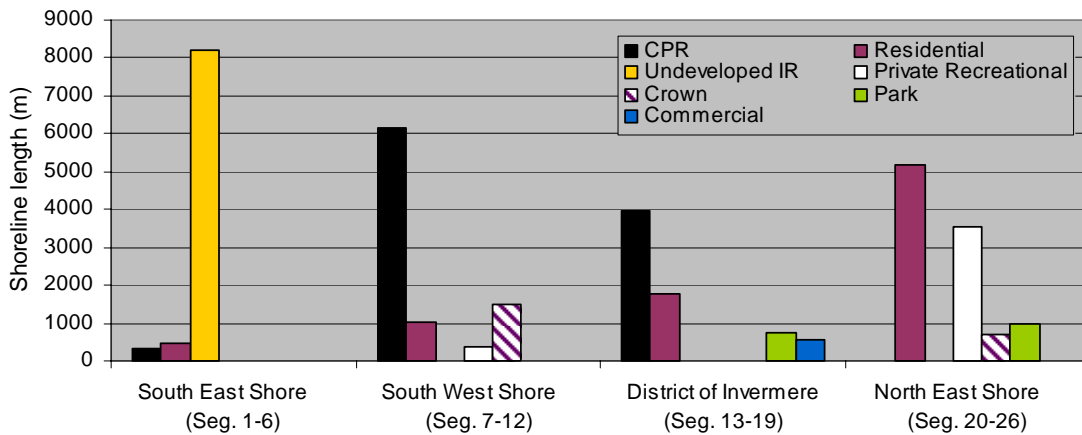


Figure 8. Land use type and extent (m) for each Segment grouping along the shoreline of Windermere Lake.

4.3 Shoreline Type

The foreshore of Windermere Lake is diverse containing vegetated, wetland, low rocky, cliff/bluff, sand beach and gravel beach types. A breakdown of the length and overall percentage of each of these shoreline types along the perimeter of the lake is provided in Figure 9. The foreshore is dominated by vegetated shoreline (10,718m, or 30%). Wetland, low rocky shore, and cliff/bluff types also make up substantial lengths of the shore at (7,240m, 6,689m, and 5,400m respectively), while sand and gravel beach areas (at 2,750m and 2,652m respectively) make up the smallest lengths of foreshore.

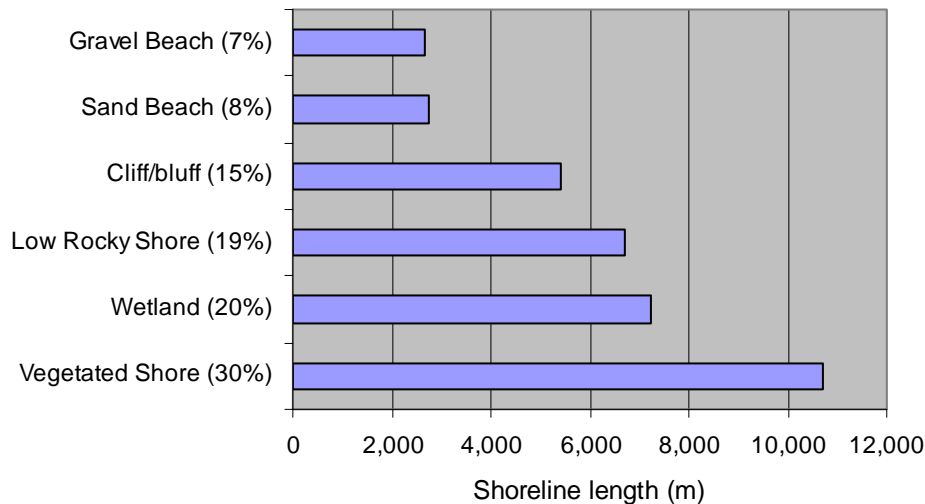


Figure 9. Length (m) and percentage (%) of total foreshore for each shore type along Windermere Lake.

Figure 10 provides detail on how these shoreline types are distributed within the four Segment groupings of Windermere Lake. Some observations from the data are as follows:

- each Segment grouping contains a variety of shoreline types;
- the south east shore contains the greatest extent of cliff/bluff (2,917m) and wetland (4,880m) areas;
- the south west shore and the District of Invermere both are mainly composed of vegetated shoreline and low rocky shoreline; and
- the north east shore is primarily vegetated shoreline type (4196m).

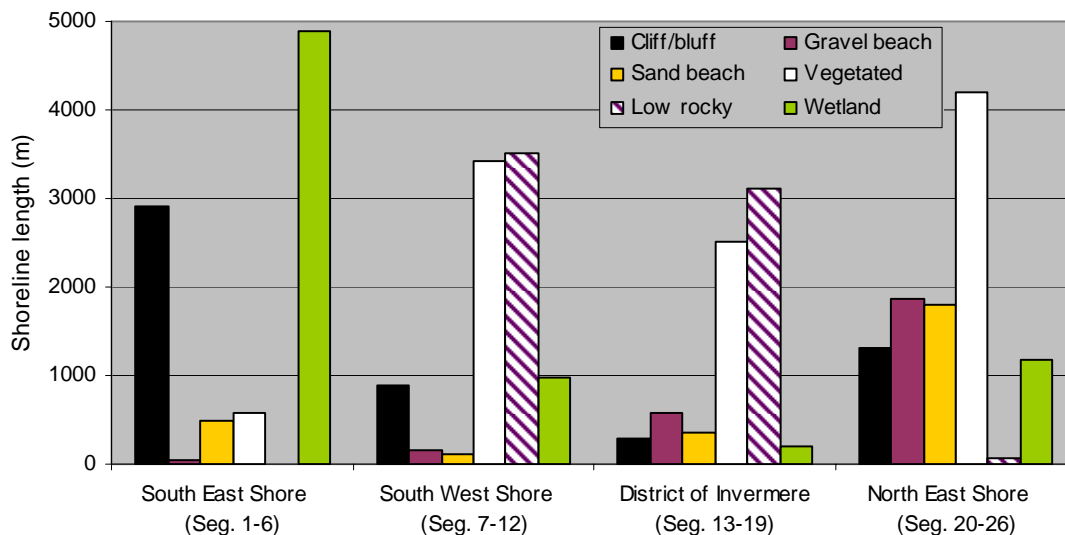


Figure 10. Shoreline Type and extent (m) for each Segment grouping along the shoreline of Windermere Lake.

4.4 Foreshore Modifications

Foreshore modifications constructed along Windermere Lake include retaining walls, docks, groynes, marinas, boat houses, and boat launches. From Figure 11, it is evident that the greatest numbers of structures are retaining walls (443), docks (202), and boat houses (107). 29 groynes, 9 marinas, and 2 public boat launches were also noted during this review. Although not recorded during this project's field assessment, 10 additional private boat launches exist along the foreshore (Leschied 2007).

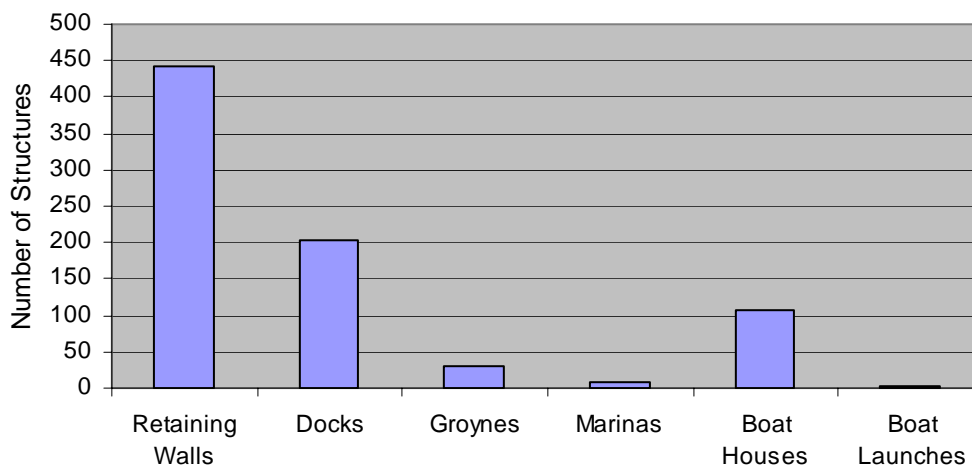


Figure 11. Total number of modifications along the foreshore of Windermere Lake.

The shoreline modifications are generally associated with residential and private recreational areas. The highest numbers of structures per kilometer occur in the North East Segment grouping, followed by the District of Invermere Segment grouping (Figure 12). A cross reference with Figure 8 confirms that these are the areas with the greatest extent of residential and/or private recreational development. Numbers of modifications per kilometer in the North East

Segment grouping are as follows: 30 retaining walls/km, 12 docks/km, 7 boat houses/km, 2 groynes/km and, 1 marina/km.

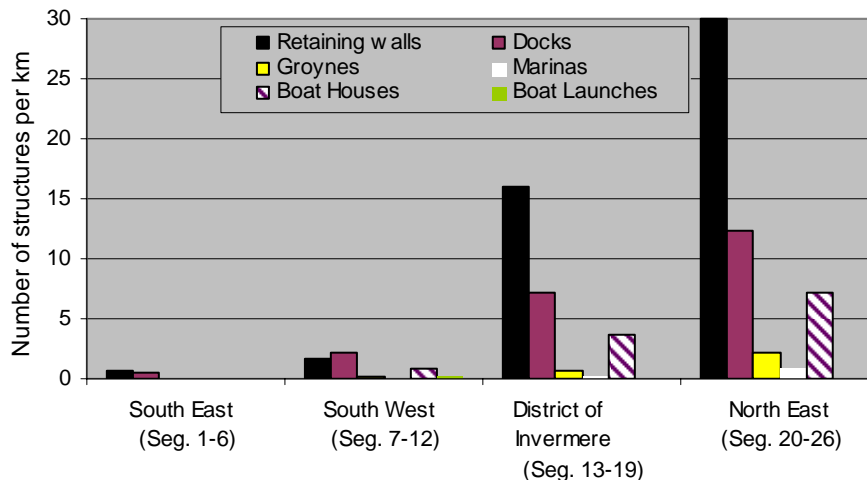


Figure 12. Number of modifications (by type) per kilometre for each Segment grouping along the shoreline of Windermere Lake.

4.4.1 Retaining Walls

Retaining walls have been analyzed in greater detail due to the specific data collected by Wildsight. Table 10 provides a summary of the retaining wall data collected by Wildsight (2006) and identifies that there are a total of 443 retaining walls constructed along the foreshore of Windermere Lake. Nearly half of these (201) are located below the high water mark. Of the lots with retaining walls, the retaining walls span an average of 89% of the lot length and are of an average height of 1.3m. It is typical for lots to have multiple retaining walls on them, with usually 1 (and sometime 2) below the high water mark and often at least 1 (and as many as 7) above the high water mark.

Table 10. Summary of Wildsight (2006) retaining wall data for Windermere Lake.

Total # of lots		Total #of retaining walls	High water mark			Average % of lot length	Average height (m)
Assessed	With retaining walls		# Above	# Below	# Not assessed		
278	195	443	201	226	16	89	1.3

When the total length of retaining walls along each Segment is considered (Figure 13), there are several Segments with extensive coverage along their shorelines. For example, Segments 14, 16, 20, 21, 22, 23, 24, and 26 all have retaining walls along more than 50% of their total lengths. Segments 16, 21 and 24 have the greatest lengths of retaining walls at 1255m, 1048m, and 1051m respectively.

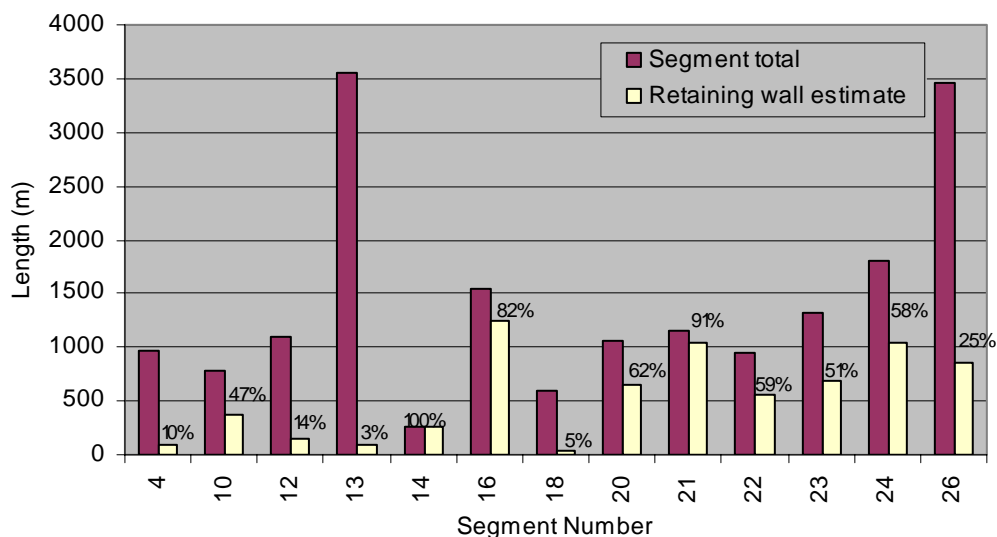


Figure 13. Total Segment length (m) and retaining wall length (m and % of total) for Segments with retaining walls present.

Retaining walls are generally associated with residential and private recreational land use. The foreshore summary maps (See Appendix H) further depict this by identifying individual lots around Windermere Lake, which have retaining walls. The maps do not account for percentage of lot coverage (i.e., if the lot has a retaining wall of any length, it is highlighted). All lots identified have retaining walls located below the high water mark (and often as well above the high water mark). The total extent of foreshore alteration could certainly be reported higher for most of these Segments if coverage with the other structures such as boathouses, docks, marinas etc. were considered.

4.5 Wetlands

The foreshore summary map (Appendix H) shows wetland features identified during Wildsight's field review. A total of 32 individual wetland areas exist, and are found in many of the Segments. The southern half of the lake has particularly extensive wetland features. The depicted wetlands represent features evident during low water conditions, as reviews were conducted in October.

4.6 Level of Impact (Lol)

Lol provides a qualitative indication of the overall health of the foreshore and considers the land use, level of disturbance, and modification information presented above. Figure 14 provides a summary of the Lol ratings for Windermere Lake, and reveals that 58% (20,666m) of the shoreline has a low Lol, 25% (8,820m) has a medium Lol, and 17% (6,072m) has a high Lol.

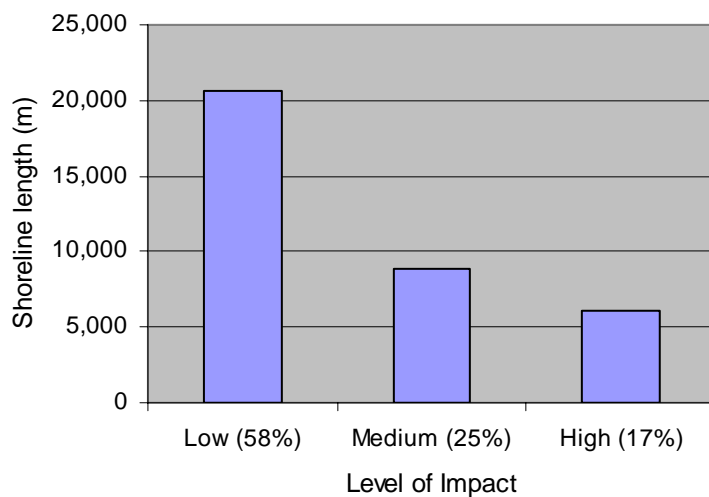


Figure 14. Length (m) and percentage (%) of total foreshore area for each Level of Impact type (high, medium, low) along the foreshore of Windermere Lake.

When Lol is compared for each of the Segment groupings (Figure 15), it is evident that the South East shore has been impacted the least (100% low Lol), followed by the South West shore (82% low Lol, and 18% medium Lol). The greatest impacts on Windermere Lake are evident along the North East shoreline, where 39% of the shore length is determined to have a high Lol, and 55% a medium Lol.

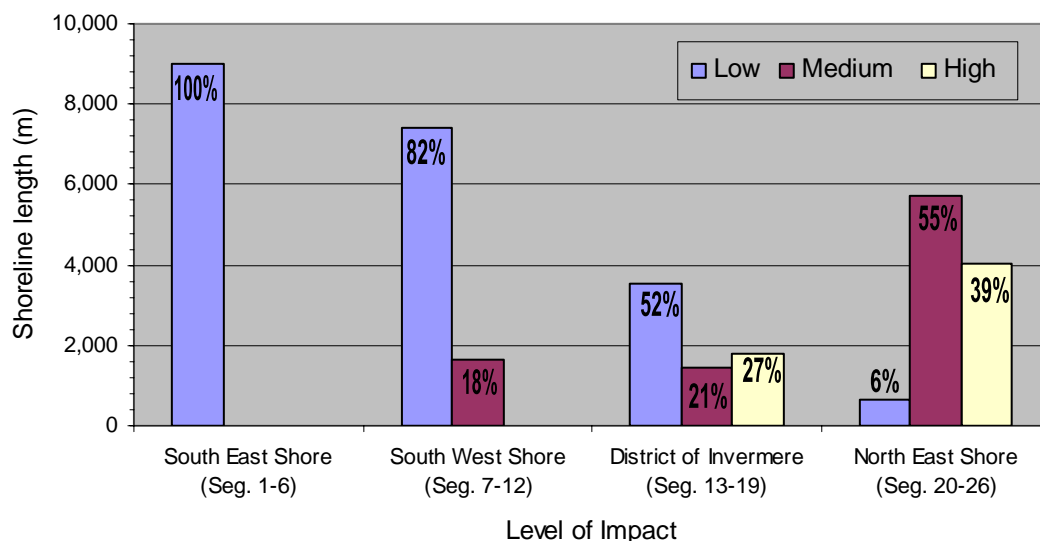


Figure 15. Level of Impact for each of the Windermere Lake Segment groupings, depicted as length (m) of the total shoreline, and as a percentage (%) of each Segment grouping.

The break down of Lol ratings for each of the Segments of Windermere Lake are provided in Table 11. Additional key information (including primary shore type, primary land use, and percent disturbed) for each Segment has been presented in order to compare Segments and provide generalities between the low, medium and high level of impact areas.

Table 11. Level of Impact ratings for each Segment and associated primary shore type, primary land use and % disturbed information.

Segment Number	Segment Grouping	Primary Shore Type	Primary Land Use	% Disturbed
Low Level of Impact				
1,2	South East	Cliff/Bluff	Undeveloped Indian Reserve	0
3	South East	Cliff/Bluff & Wetland	Undeveloped Indian Reserve	0
4	South East	Sand Beach	Undeveloped Indian Reserve/ Residential	50
5	South East	Cliff/Bluff	Undeveloped Indian Reserve	0
6	South East	Wetland	Undeveloped Indian Reserve	10
8	South West	Vegetated Shore & Wetland	CP Rail	100
9	South West	Vegetated Shore	Crown	0
11	South West	Low Rocky Shore	CP Rail	85
12	South West	Vegetated Shore	CPR/Private recreational/Residential	40
13	District of Invermere	Low Rocky Shore	CP Rail	100
25	North East	Vegetated Shore	Park	20
Medium Level of Impact				
7	South West	Cliff/Bluff & Low Rocky & Wetland	CP Rail	100
10	South West	Vegetated Shore	Residential	50
15	District of Invermere	Gravel Beach & Sand Beach	Park	100
17	District of Invermere	Low Rocky Shore & Vegetated shore	CPR/Commercial	70
18	District of Invermere	Gravel Beach & Sand Beach	Park	60
22	North East	Cliff/Bluff	Private Recreation	50
23	North East	Vegetated Shore/Sand beach	Residential	75
26	North East	Vegetated Shore/Gravel Beach/Wetland	Private Recreational/Residential	70
High Level of Impact				
14	District of Invermere	Gravel Beach	Residential	100
16	District of Invermere	Vegetated Shore	Residential	100
19	District of Invermere	Vegetated Shore	Commercial	100
20,21	North East	Vegetated Shore	Residential	100
24	North East	Vegetated Shore	Private Recreation/residential	95

4.6.1 Low Lol Segments

The Segments rated as a low Lol are located in areas with low levels of development (Figure 16). Most of the low Lol Segments are located along the southern parts of the Lake, many of which have undeveloped Indian Reserve or CPR as their primary land use. Development along the shoreline of cliff/bluff shore type areas is generally inhibited and less than in other shore type areas, leading to low (or medium) Lol's in most of the Segments with cliff/bluff shore type being predominant.

It is important to note that when Lol was determined for the foreshore areas of Windermere Lake, some areas were deemed to have a high disturbance level but an overall low Lol. This occurred mainly in Segments where the CPR was the primary Land Use Type, such as in Segments 11, 12 and 13. For these Segments, the railway was assessed to be a disturbance; however, the railway's presence did not affect the overall shoreline integrity to the same extent that other land uses, such as residential development would. Figure 16 portrays some examples of Segments with disturbance, but overall a low Lol.



Segment 5



Segment 13

Figure 16. Examples of Segments ranked with Low Level of Impact at Windermere Lake.

4.6.2 Medium Lol Segments

Segments with a medium Lol are dispersed around the lake, other than in the South East Segments. They include a variety of land use and shore types. Generally these Segments have been developed to some extent, but have not been disturbed as much (i.e. with shoreline modifications) or have not been developed as densely as those Segments rated with a high Lol. Figure 17 depicts example Segments with a medium Lol.



Segment 10



Segment 17

Figure 17. Examples of Segments ranked with Medium Level of Impact at Windermere Lake.

4.6.3 High Lol Segments

Residential and commercial areas associated with the Town of Invermere generally were determined to have a high Lol (Segments 14, 16 and 19). The densely populated residential areas and private recreational areas associated with the north east side of the lake also have high Lol's (Segments 20, 21 and 24). These areas are all primarily on low gradient shore types (vegetated or gravel beach). Figure 18 shows some of the high Lol areas around Windermere Lake.



Segment 16 (residential area in foreground)



Segment 24

Figure 18. Examples of Segments ranked with High Level of Impact at Windermere Lake.

5 Discussion

5.1 State of the Foreshore of Windermere Lake

The foreshore (and adjacent upland areas) of Windermere Lake has undergone substantial alteration. Over half of the lake foreshore area studied has been disturbed through anthropogenic alterations. Alterations are concentrated around the north and northeast ends of the lake, and are a factor of both topography and proximity to infrastructure. Areas found to have the highest impacts from development generally are located along low gradient shoreline areas within the District of Invermere and along the northeast shore proximal to the highway infrastructure and the Town of Windermere. A large portion of the shoreline in these areas is made up of fine substrate materials that are easily moved and built on, such as vegetated, low rocky, gravel and sand beach shore types.

The southeast shore of Windermere Lake has had the least development, while development along much of the western shore (south of the District of Invermere) has been moderate. Development along the southeast shore appears to have been limited by a prevalence of cliff/bluff and wetland topographies, and possibly by the Indian Reserve land use designation (Indian Reserve #3 Columbia Lake). In the case of the western shore, pre-existing CPR infrastructure along the shoreline and distance from major amenities appears to have limited growth and thus alteration of the shoreline. Although these conditions may have constrained foreshore development in the past, evidence of encroaching development is visible, due to the extensive growth pressures and popularity of the area.

The main foreshore modifications along Windermere Lake include construction of foreshore structures (particularly retaining walls, docks and boat houses), riparian vegetation removal, and modifications to the land base (including building of a railway and road ways/ lake access points). As was found at Okanagan Lake (RDCO 2005), foreshore modifications along Windermere Lake tend to be similar for adjacent properties throughout the study area, especially in residential areas. RDCO (2005) discovered that it is typical for neighbours to conduct similar activities that cause foreshore impacts. For example, where one resident had built a house immediately adjacent to the foreshore, the others appeared to do the same. This is particularly evident at Windermere Lake, where retaining walls constructed below the high water mark are typical of most residential and private recreation properties. Docks and boathouses are also often constructed along the foreshore of these properties. These activities pose a special challenge to regulatory agencies when dealing with precedence, consistency, and the manner in which development and redevelopment are viewed and managed (RDCO 2005).

Provincial and Federal agencies have worked together to develop policies to protect and improve fish habitat. Constructions of foreshore retaining walls that affect fisheries habitat are no longer an acceptable practice (Coopper 2005). The agencies are also striving to avoid the reconstruction of damaged retaining walls within the high water mark (Coopper 2007). Retaining walls are instead to be moved back and/or be reinforced using methods that preserve the natural shoreline and improve fish habitat conditions (such as using shoreline planting or other soft bioengineering structures) (Coopper 2007). The hope is that once a few good examples are in place, a trend may begin of the foreshore area being left more natural, and of modifications being designed in manner that is more sensitive to the environment.

With guidelines such as those outlined above and community plans under development, it is apparent that there is a strong desire on the part of government regulators to provide clear direction for sustainable development along Windermere Lake. The finding of the 2005 Lake Use Survey (Fedrigo 2006) reveal that the communities too, are ready to embrace a stewardship initiative on Lake Windermere, and that they see the bigger picture and are asking for a long-term development strategy for the region. The integration of agencies into the EKILMP and the development of an OCP for the area are expected to facilitate consistent lake management.

5.2 Regional Protection

Despite many foreshore impacts revealed by this project, a substantial portion of the foreshore within the study area remains undisturbed. The bulk of the undisturbed foreshore is located along the southeast shore (Figure 19). From the background review of species information for Windermere Lake, it is apparent that there are sensitive species/habitats associated with the undisturbed foreshore areas (i.e., south western grasslands and southern wetland areas) as well as the foreshore areas that have already been disturbed or that are in the vicinity of development (i.e. lake outlet at north end and outlet of Windermere Creek). These areas present a unique challenge to governing agencies responsible for balancing unprecedented growth with environmental protection. It is important to have preservation as a goal for the remaining intact ecosystems that exist along Windermere Lake.

Intact ecosystems have biological, social, and economic value, and the cost of protecting these areas may be low compared to the cost of restoration (Battelle et al. 2001). Additionally, the effectiveness of restoration is often unclear (RDCO 2005). At Okanagan Lake, for example, most foreshore restoration efforts are recent and have not been monitored for long-term effectiveness (RDCO 2005). Challenges are especially formidable when dealing with foreshore protection issues in areas where long-term visions have not been established (RDCO 2005), such as Windermere Lake, which does not yet have an Official Community Plan to guide development. However, the RDCO (2005) does warn that foreshore protection can be equally as challenging in areas where long-term visions have been established. Along Okanagan Lake, most parks are geared toward recreation and unimpeded public access, making it difficult to provide protection to natural features and ecosystems (RDCO 2005).



Figure 19. The foreshore along the south west side of Windermere Lake remains undisturbed.

Clearly defined principles and associated policies/strategies will help guide future decisions and promote a coordinated approach to foreshore management among regulatory agencies. Some guiding principles and associated policies have been outlined in the RDEK East Side of Windermere Lake Foreshore Policy (1993). The guiding principles presented in the Foreshore Policy, as well as policies relating to protection of sensitive foreshore species and habitats are as follows:

Principle 1. Protection of the water quality of Windermere Lake is the highest priority.

Policy - Works shall not have a negative impact on the quality of water which, in turn, would contribute to a health problem in the fish population.

Policy - Works constructed along the foreshore shall not have a negative impact on fish and waterfowl habitat.

Policy - All construction along the foreshore shall be structurally sound to minimize erosion.

Principle 2. The lake is a public resource for everyone to use. Maintaining access to the water for both waterfront residents and other members of the community is important.

Policy - The regional district will not generally support new construction of boathouses or other similar structure, which are located entirely on Crown Land.

Policy - Where topography or other considerations, such as lack of parking, do not permit practical public access to the foreshore, the RDEK will recommend approval of existing works [on Crown Land] provided their presence does not pose a threat to drinking water quality, cause excessive erosion or siltation, or threaten fish and wildlife habitat.

Principle 3. The natural boundary of the lake should be respected.

Policy - No additional filling of the lake will be supported except where necessary for erosion control or to protect adjacent structures from wave action.

Principle 4. The natural beauty of Windermere Lake should be respected.

Principle 5. All approved existing works and structures shall be covered by agreements with BC Lands.

These principles and policies are key to establishing a regional vision and common goals while considering provincial and federal government interests (RDCO 2005). Review and further refinement of these principles and policies are expected to be an important component of the OCP development process. Additionally, other documents reviewed during this study (such as the Lake Windermere Management Strategy [2001]) have further outlined strategies or action items required for implementation of these principles and policies at Windermere Lake. Addressing these action items (See Section 7 – Recommended Actions) will compliment this inventory by providing additional baseline information as well as identifying and prioritizing sensitive species and habitat areas. This will help guide protection of critical foreshore areas.

In summary, the RDCO (2005) provides the following valuable advice on subsequent efforts and refinement of planning tools:

Subsequent efforts should be concentrated on protecting critical habitats using tools available in the planning environment, such as regional policies, foreshore plans, and foreshore development guidelines. These tools should all be examined and updated to include science-based policy direction for conservation planning. This direction should be intent on achieving a higher quality of development that preserves the integrity of upland areas and maintains environmental attributes of the foreshore while facilitating human requirements. Other potential tools include public education, which can be used to curtail the loss of critical habitat on private property, and expanding partnerships, which can increase local government's ability to adapt to increasing development pressure.

6 Conclusions

The foreshore of Windermere Lake is dominated by vegetated, wetland, low rocky shore and cliff/bluff shoreline types. Over half of the foreshore of Windermere Lake has been disturbed by anthropogenic alterations. Although historical disturbance has resulted in changes to all shore types, development has occurred over much of the low lying easily moved shore types (i.e. vegetated, low rocky, sand beach, gravel beach). Dominant types of disturbance are dependant on the part of the lake reviewed. The CPR runs along most of the west side of the lake, while the north end and the north east sides have a combination of residential and private recreational land uses. Most of the disturbance can be characterized by the removal of native riparian vegetation and primary modifications including retaining walls (in particular), docks, boathouses, groynes and marinas (Figure 20). The south east shore, which is all located in the Indian Reserve, contains the greatest extent of undisturbed foreshore area, including substantial wetland and cliff/bluff shore types. The undisturbed wetland area at the south end of the lake is known to provide valuable fish and waterfowl habitat.

The results of this inventory are intended to increase the effectiveness and coordination of foreshore management activities at Windermere Lake, leading to improved ecosystem structure and function and integration of human use with environmental protection (RDCO 2005). Specifically, this study will help identify where significant impacts have and have not occurred in order to provide information that guides decisions on future works, areas requiring protection, and suitable areas for enhancement (Coopper 2007). In making decisions about future works, the intention is to use what is already disturbed or of low value to continue to allow sustainable development (Coopper 2007), while providing protection to undisturbed critical habitat areas.

In order to adequately address foreshore protection issues, it is important to examine the way residents and stewards view foreshore ecosystems (RDCO 2005). The key to protection is our ability to recognize and acknowledge our influence on these systems and the role they play in the health and vitality of Windermere Lake (Battelle 2001). Preservation of these ecosystems is critical in maintaining the environmental, social, and economic values that have drawn people to the East Kootenay Region (RDCO 2005).



Figure 20. Foreshore modifications include removal of riparian vegetation, construction of retaining walls, docks, and boat houses.

7 Recommended Actions

The Central Okanagan Lake foreshore inventory and mapping report (RDCO 2005) was provided as a template to use in completing this Windermere foreshore inventory report. Due to its relevance, this Recommended Actions Section reflects much of what was provided in the Okanagan Report, with some modifications. In addition to the Okanagan Report, additional items requiring attention were identified from a review of Windermere Lake planning documents; namely the Lake Windermere Management Strategy (Urban Systems in 2001) and the 2005 Windermere Lake Water Quality Monitoring Program and Literature Review (Masse and Miller 2005). The recommendations from these documents are referenced accordingly below.

Decisions regarding the management of the Windermere Lake foreshore should be based on the best available science and should reflect policies set out in regional strategies and guidelines as well as those of senior levels of government (RDCO 2005). Based on the current state of the foreshore, measures should be taken to conserve areas that contribute to maintaining and restoring sensitive foreshore ecosystems and to preserving the ecological integrity of Windermere Lake. Regional and local governments possess a variety of means to ensure development is sensitive to environmental values, including Official Community Plans, zoning, and bylaws. These are useful in many situations, provided the baseline information on which decisions are made is both current and accurate. Action items recommended to help further understand and protect the natural integrity of Windermere are as follows:

Action #1. Develop a Foreshore Protection Plan (RDCO 2005). This action is being initiated by EKILMP this year.

- Set objectives, which should consider shore type and disturbance level for the management of Windermere Lake.
- Address specific zoning of the foreshore of Windermere Lake.
- Include regulations and guidelines for new development, re-development and management of existing developments (e.g., riparian area regulations).
- Designate protection of critical areas in policies.
- Explore a memorandum of understanding with all levels of government regarding foreshore management roles and responsibilities.
- Develop jointly with all partnering agencies.
- Consider lakeshore development guidelines being developed elsewhere (e.g., Lindros Project Development, Urban Systems 2004).
- Link foreshore activities to upland portions of the watershed.

Action #2. Determine carrying capacity

- Obtain necessary shoreline data to determine carrying capacity (the impact of foreshore modifications and activities on shore zone ecosystems).

The carrying capacity of a lake is defined as a *'lake's ability to accommodate recreational use (e.g. boating, skiing, bathing) and residential occupation of the foreshore and adjacent upland areas without excessive overcrowding, pollution and consequent danger to human health and safety'* (RDCO 2005). Although not easily measured, carrying capacity may be useful in assessing cumulative loss of foreshore habitats resulting from human disturbance (RDCO 2005). Urban Systems (2001) completed preliminary calculations for Windermere Lake and determined that the carrying capacity was 40,250 user days (based on water quality). Shoreline data was not available, thus affecting the validity of the assumptions and the accuracy of the results (Urban Systems 2001). Some of the shoreline data gaps identified included: how often cottage/permanent residents use the lake, number of boats per cottage/permanent residence, occupancy rates for hotels/lodges/campgrounds, and average number of vehicles per day at boat

launch. The 2005 Lake Use Survey (Fedrigo 2006) may provide some of this information.

Action #3. Identify critical areas for protection, restoration and enhancement (RDCO 2005)

- Use the information presented in this report to help identify critical habitat areas (e.g., areas without retaining walls, low Lol's, undeveloped land, etc).

Action #4. Conduct additional inventories to determine sensitive species and habitats associated with the foreshore. This action is being initiated by EKILMP this year.

- Identify critical habitat areas for species through further analysis and future addition to the project database.
- Determine fisheries sensitive zones for the variety of fish species in Windermere Lake, including identification of spawning, migration and rearing areas for fish (Masse and Miller 2005).
- Conduct inventories of reptile, amphibians, small birds and small mammals (Urban Systems 2001).
- Conduct plant inventories in undisturbed foreshore areas, to identify whether provincially listed "at risk or sensitive" species or plant communities are present.

Action #5. Protect critical and natural areas (RDCO 2005)

- Protect undeveloped areas adjacent to the foreshore. This is especially important when dealing with ecosystems that are threatened or endangered.
- Protect substrates from alteration. Beach grooming, lake infilling, importation of sand, armouring, and dredging all have the potential to negatively impact substrate materials.
- Pursue agreements between local governments and provincial agencies about foreshore management. "Head lease" agreements give one party control over the management of the foreshore and have been obtained by local governments such as the District of Peachland. This will reduce difficulties in coordinating inter-agency management strategies.

Action #6. Address modifications (RDCO 2005)

- Restore or enhance foreshore areas affected by past modifications, such as armoring, infilling, beach grooming, etc., if restoration or enhancement is likely to benefit habitat quality.
- Prevent or mitigate further modifications to foreshore areas where they are likely to reduce habitat quality. For example, in kokanee spawning areas modifications should not disrupt wind and wave action.
- Make technical guidance available to agencies and the public regarding alternatives to traditional shoreline modifications such as armoring. Such guidelines should be developed in conjunction with senior government agencies to ensure consistency with regulatory requirements and resource management objectives.

Action #7. Monitor habitat losses and gains to measure success (RDCO 2005)

- Develop and produce indicators, actions and timelines.
- Initiate a detailed habitat monitoring program on Windermere Lake.
- Develop a coordinated enforcement protocol with all levels of government to respond to foreshore habitat impacts.
- Compare results from a monitoring program to the original inventory data to determine compliance with best management practices and effectiveness of protection activities.

Action #8. Continue to make inventory data and habitat information available (RDCO 2005)

- Provide federal, provincial, and local jurisdictions with inventory data.
- Provide partnering agencies with inventory data.

- Continue to make the inventory data available to the public via the Internet through continued partnership with the Community Mapping Network.
- Update the Community Mapping Network with data revisions identified in this report.

Action #9. Establish a citizen-based group to manage Lake Windermere (Urban Systems 2001). This item has been implemented by the Lake Windermere Project.

- Establish a citizen-based group to manage Lake Windermere and coordinate the implementation of recommendations. The group should include residents living around the lake, staff from the District of Invermere and Regional District, as well as representatives of the Shuswap and Columbia Lake First Nations. Involvement of people living around and using the lake would aid in successful implementation of monitoring programs and managing water quality and recreation concerns.

Action #10. Monitor water quality. This item has been implemented by the Lake Windermere Project.

- In cooperation with the Ministry of Environment and with the involvement of the citizen based group, initiate a 5 year program to monitor Windermere Lake's water quality (Urban Systems 2001, Masse & Miller 2005).
- The water quality program should focus on lake productivity and assess the overall water quality state in Windermere Lake and determine trends (Masse & Miller 2005).
- Update the 1985 fluorometry study for the entire lakeshore affected by development to detect leachate inflows from onsite wastewater disposal (Urban Systems 2001, Masse & Miller 2005).

Action #11. Address septic issues

The use of septic fields around Windermere Lake is a key issue to local government (Cordell 2007). Concerns with nutrients entering the lake from septic systems built on poor soils will likely intensify with time in association with trends of increasing populations, increasing numbers of permanent residents and larger building footprints (Urban Systems 2001). To address this issue, Urban Systems (2001) recommends the following:

- efforts be continued to develop a community sewerage strategy for the entire east side of Lake Windermere; and
- subdivision and development around the Lake be prohibited (but allowing redevelopment) until a community sewage system is provided.

Action #12. Restrict marinas, boat launches and foreshore improvements in sensitive and significant habitat areas (Urban Systems 2001)

- Where the habitat is sensitive only during critical periods (e.g., during bird breeding/nesting and rearing/fledgling periods), marinas and boat launches should remain closed. Motorized and non-motorized recreation should also be restricted in sensitive and significant habitat areas, particularly during critical periods.
- Prohibit the establishment of new or the expansion of existing marinas until the environmental inventory of the lake and foreshore has been conducted, and the calculation of the lake carrying capacity has been refined.
- Review the status of Pete's marina to determine whether it negatively impacts the osprey feeding area and fish habitat at the north end of the lake and Columbia River.
- All marinas should maintain a code of practice to reduce the potential for hydrocarbon or other pollutant introduction.
- Close the boat launch north of the Columbia River Bridge, as it is in an environmentally sensitive and significant area.

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Appendix A. East Kootenay Integrated Lake Management Partnership (EKILMP) Participant List (2006)

Core Group

- Regional District of East Kootenay
- Fisheries & Oceans Canada
- Integrated Land Management Bureau
- Transport Canada: Navigable Waters and Office of Boating Safety
- Interior Health Authority
- Canadian Columbia River Intertribal Fisheries Commission (CCRIFIC) representing A'kisk'nuq First Nation (AFN), Shuswap Indian Band and Ktunaxa Land and Resource Council
- BC Ministry of Environment (Water Stewardship, Environmental Protection & Environmental Stewardship divisions)
- Wasa Lake Land Improvement District
- Wildsight

Windermere Interest Participants

- District of Invermere
- Wildsight: Lake Windermere Project
- Others as identified
- Village of Canal Flats

Appendix B. Species of Concern in the Interior Douglas Fir Biogeoclimatic Zone of the Rocky Mountain Forest District (B1), and Mapped Known Locations of Sensitive Species in the Windermere Lake Area (B2)(CDC 2007).

Appendix B1. Species of Concern in the Interior Douglas Fir Biogeoclimatic Zone of the Rocky Mountain Forest District (BC Conservation Data Centre 2007)

Scientific Name	Common Name	Global Rank	Prov Rank	COSEWIC	BC Status	Identified Wildlife	National GS	Class	Habitat Type
Invertebrate Animal									
<i>Anguispira kochi</i>	Banded Tigersnail	G5	S3		Blue			Gastropods	TERRESTRIAL
<i>Argia vivida</i>	Vivid Dancer	G5	S2		Red		3 - Sensitive	Insects	RIVERINE
<i>Gastrocopta holzingeri</i>	Lambda Snaggletooth	G5	S3?		Blue			Gastropods	TERRESTRIAL
<i>Glaucopsyche piasus</i>	Arrowhead Blue	G5	S4		Blue		4 - Secure	Insects	TERRESTRIAL
<i>Hemphillia camelus</i>	Pale Jumping-slug	G4	S3		Blue			Gastropods	TERRESTRIAL
<i>Lycaena dione</i>	Dione Copper	G5	S2		Red		4 - Secure	Insects	PALUSTRINE; TERRESTRIAL
<i>Magnipelta mycophaga</i>	Magnum Mantleslug	G3	S2S3		Blue			Gastropods	TERRESTRIAL
<i>Oreohelix strigosa</i>	Rocky Mountainsnail	G5	S3S4		Blue			Gastropods	TERRESTRIAL
<i>Oreohelix subrudis</i>	Subalpine Mountainsnail	G5	S3S4		Blue			Gastropods	TERRESTRIAL
<i>Vallonia cyclophorella</i>	Silky Vallonia	G5	S3		Blue			Gastropods	TERRESTRIAL
Vascular Plant									
<i>Adiantum capillus-veneris</i>	southern maiden-hair	G5	S1	E (May 2000)	Red		1 - At Risk	Ferns	RIVERINE
<i>Agoseris lackschewitzii</i>	pink agoseris	G4	S2S3		Blue			Dicots	PALUSTRINE; TERRESTRIAL
<i>Anemone canadensis</i>	Canada anemone	G5	S2S3		Blue			Dicots	PALUSTRINE; TERRESTRIAL
<i>Apocynum x floribundum</i>	western dogbane	GNA	S2S3		Blue			Dicots	PALUSTRINE; TERRESTRIAL
<i>Arabis salsuginea</i>	saltwater cress	G4G5	S1		Red			Dicots	TERRESTRIAL

Scientific Name	Common Name	Global Rank	Prov Rank	COSEWIC	BC Status	Identified Wildlife	National GS	Class	Habitat Type
<i>Arnica chamissonis</i> ssp. <i>incana</i>	meadow arnica	G5T3T5	S2S3		Blue			Dicots	LACUSTRINE; PALUSTRINE; TERRESTRIAL
<i>Artemisia ludoviciana</i> var. <i>incompta</i>	western mugwort	G5T3T5	S2S3		Blue			Dicots	PALUSTRINE; TERRESTRIAL
<i>Aster ascendens</i>	long-leaved aster	G5	S1S3		Red			Dicots	PALUSTRINE; TERRESTRIAL
<i>Astragalus filipes</i>	threadstalk milk-vetch	G5	S3		Blue			Dicots	TERRESTRIAL
<i>Atriplex argentea</i> ssp. <i>argentea</i>	silvery orache	G5T5	S1		Red			Dicots	TERRESTRIAL
<i>Botrychium ascendens</i>	upswept moonwort	G2G3	S2		Red		3 - Sensitive		PALUSTRINE; TERRESTRIAL
<i>Botrychium simplex</i>	least moonwort	G5	S2S3		Blue		4 - Secure		PALUSTRINE; RIVERINE; TERRESTRIAL
<i>Bouteloua gracilis</i>	blue grama	G5	S1		Red			Monocots	TERRESTRIAL
<i>Calamagrostis montanensis</i>	plains reedgrass	G5	S2		Red			Monocots	TERRESTRIAL
<i>Carex crawei</i>	Crawe's sedge	G5	S1		Red			Monocots	PALUSTRINE; TERRESTRIAL
<i>Carex geyeri</i>	elk sedge	G5	S3		Blue			Monocots	TERRESTRIAL
<i>Carex lenticularis</i> var. <i>lenticularis</i>	lakeshore sedge	G5T5	S2		Red			Monocots	LACUSTRINE; PALUSTRINE
<i>Carex rostrata</i>	swollen beaked sedge	G5	S2S3		Blue			Monocots	
<i>Carex sychnocephala</i>	many-headed sedge	G4	S3		Blue			Monocots	LACUSTRINE; PALUSTRINE; TERRESTRIAL
<i>Carex xerantica</i>	dry-land sedge	G5	S2		Red			Monocots	TERRESTRIAL
<i>Castilleja cusickii</i>	Cusick's paintbrush	G4G5	S1		Red			Dicots	PALUSTRINE; RIVERINE; TERRESTRIAL
<i>Castilleja minor</i> ssp. <i>minor</i>	annual paintbrush	G5T5	S1		Red			Dicots	LACUSTRINE; PALUSTRINE; RIVERINE;

Scientific Name	Common Name	Global Rank	Prov Rank	COSEWIC	BC Status	Identified Wildlife	National GS	Class	Habitat Type
									TERRESTRIAL
<i>Cheilanthes gracillima</i>	lace fern	G4G5	S2S3		Blue		3 - Sensitive	Ferns	TERRESTRIAL
<i>Cirsium scariosum</i>	elk thistle	G5	S1S3		Red			Dicots	TERRESTRIAL
<i>Cryptantha ambigua</i>	obscure cryptantha	G4	S3		Blue			Dicots	PALUSTRINE; TERRESTRIAL
<i>Delphinium bicolor</i> ssp. <i>bicolor</i>	Montana larkspur	G4G5T4T5	S2S3		Blue			Dicots	TERRESTRIAL
<i>Eleocharis elliptica</i>	Slender spike-rush	G5	S2S3		Blue			Monocots	LACUSTRINE; PALUSTRINE;
<i>Eleocharis rostellata</i>	beaked spike-rush	G5	S2S3		Blue			Monocots	ESTUARINE; LACUSTRINE; PALUSTRINE; RIVERINE; TERRESTRIAL
<i>Epilobium glaberrimum</i> ssp. <i>fastigiatum</i>	smooth willowherb	G5T4T5	S2S3		Blue			Dicots	PALUSTRINE; RIVERINE; TERRESTRIAL
<i>Gaura coccinea</i>	scarlet gaura	G5	S1		Red			Dicots	TERRESTRIAL
<i>Gayophytum humile</i>	dwarf groundsmoke	G5	S2S3		Blue			Dicots	PALUSTRINE; TERRESTRIAL
<i>Gayophytum racemosum</i>	racemed groundsmoke	G5	S1		Red			Dicots	TERRESTRIAL
<i>Gayophytum ramosissimum</i>	hairstem groundsmoke	G5	S1		Red			Dicots	TERRESTRIAL
<i>Gentiana affinis</i>	prairie gentian	G5	S2S3		Blue			Dicots	TERRESTRIAL
<i>Glyceria pulchella</i>	slender mannagrass	G5	S2S3		Blue			Monocots	LACUSTRINE; PALUSTRINE;
<i>Glycyrrhiza lepidota</i>	wild licorice	G5	S2		Red			Dicots	LACUSTRINE; PALUSTRINE; TERRESTRIAL
<i>Hedeoma hispida</i>	mock-pennyroyal	G5	S1		Red			Dicots	TERRESTRIAL
<i>Helianthus nuttallii</i> var. <i>nuttallii</i>	Nuttall's sunflower	G5T5	S1		Red			Dicots	PALUSTRINE; TERRESTRIAL

Scientific Name	Common Name	Global Rank	Prov Rank	COSEWIC	BC Status	Identified Wildlife	National GS	Class	Habitat Type
<i>Heterocodon rariflorum</i>	heterocodon	G5	S3		Blue			Dicots	PALUSTRINE; RIVERINE; TERRESTRIAL
<i>Hypericum scouleri</i> ssp. <i>nortoniae</i>	western St. John's-wort	G5T3T5	S2S3		Blue			Dicots	LACUSTRINE; PALUSTRINE; TERRESTRIAL
<i>Impatiens ecalcarata</i>	spurless touch-me-not	G3G4	S2S3		Blue			Dicots	PALUSTRINE; TERRESTRIAL
<i>Isoetes howellii</i>	Howell's quillwort	G4G5	S1		Red			Quillworts	LACUSTRINE; PALUSTRINE
<i>Juncus confusus</i>	Colorado rush	G5	S1		Red			Monocots	PALUSTRINE; RIVERINE; TERRESTRIAL
<i>Lathyrus bijugatus</i>	pinewood peavine	G4	S1		Red			Dicots	TERRESTRIAL
<i>Lepidium densiflorum</i> var. <i>pubicarpum</i>	prairie pepper-grass	G5T4	S1		Red			Dicots	TERRESTRIAL
<i>Lewisia triphylla</i>	three-leaved lewisia	G4?	S2S3		Blue			Dicots	PALUSTRINE; TERRESTRIAL
<i>Linanthus septentrionalis</i>	northern linanthus	G5	S3		Blue			Dicots	PALUSTRINE; RIVERINE; TERRESTRIAL
<i>Lomatium sandbergii</i>	Sandberg's desert-parsley	G4	S2S3		Blue			Dicots	PALUSTRINE; TERRESTRIAL
<i>Lomatium triternatum</i> ssp. <i>platycarpum</i>	nine-leaved desert-parsley	G5T3T5	S2		Red			Dicots	TERRESTRIAL
<i>Lupinus arbustus</i> ssp. <i>neolaxiflorus</i>	spurred lupine	G5T1T3	SH		Red			Dicots	TERRESTRIAL
<i>Lupinus arbustus</i> ssp. <i>pseudoparviflorus</i>	Montana lupine	G5T2T3	S1		Red			Dicots	TERRESTRIAL
<i>Megalodonta beckii</i> var. <i>beckii</i>	water marigold	G4G5T4	S3		Blue			Dicots	LACUSTRINE; PALUSTRINE; RIVERINE
<i>Melica smithii</i>	Smith's	G4	S2S3		Blue			Monocots	PALUSTRINE;

Scientific Name	Common Name	Global Rank	Prov Rank	COSEWIC	BC Status	Identified Wildlife	National GS	Class	Habitat Type
<i>Melica spectabilis</i>	melic purple oniongrass	G5	S2S3		Blue			Monocots	TERRESTRIAL PALUSTRINE; RIVERINE;
<i>Mimulus breviflorus</i>	short-flowered monkey-flower	G4	S1		Red			Dicots	TERRESTRIAL PALUSTRINE; RIVERINE; TERRESTRIAL
<i>Muhlenbergia andina</i>	foxtail muhly	G4	S1		Red			Monocots	PALUSTRINE; RIVERINE; TERRESTRIAL
<i>Muhlenbergia glomerata</i>	marsh muhly	G5	S3		Blue			Monocots	LACUSTRINE; PALUSTRINE; RIVERINE; TERRESTRIAL
<i>Myriophyllum ussuriense</i>	Ussurian water-milfoil	G3	S3		Blue			Dicots	ESTUARINE; LACUSTRINE; PALUSTRINE; RIVERINE
<i>Orobanche corymbosa</i> ssp. <i>mutabilis</i>	flat-topped broomrape	G4T3?	S2		Red			Dicots	TERRESTRIAL
<i>Orobanche ludoviciana</i> ssp. <i>ludoviciana</i>	Suksdorf's broomrape	G5T5	S1		Red			Dicots	TERRESTRIAL
<i>Pellaea gastonyi</i>	Gastony's cliff-brake	G2G3	S2		Red		3 - Sensitive	Ferns	TERRESTRIAL
<i>Physaria didymocarpa</i> var. <i>didymocarpa</i>	common twinpod	G5T4	S2S3		Blue			Dicots	TERRESTRIAL
<i>Plantago eriopoda</i>	alkali plantain	G5	S1		Red			Dicots	PALUSTRINE; RIVERINE; TERRESTRIAL
<i>Polemonium elegans</i>	elegant Jacob's-ladder	G4	S2S3		Blue			Dicots	TERRESTRIAL
<i>Polygonum engelmannii</i>	Engelmann's knotweed	G3G5	S2S3		Blue			Dicots	TERRESTRIAL
<i>Potamogeton</i>	stiff-leaved	G5	S2S3		Blue			Monocots	LACUSTRINE

Scientific Name	Common Name	Global Rank	Prov Rank	COSEWIC	BC Status	Identified Wildlife	National GS	Class	Habitat Type
<i>strictifolius</i>	pondweed								
<i>Potentilla diversifolia</i> var. <i>perdissecta</i>	diverse-leaved cinquefoil	G5T4	S2S3		Blue			Dicots	TERRESTRIAL
<i>Potentilla nivea</i> var. <i>pentaphylla</i>	five-leaved cinquefoil	G5T4	S2S3		Blue			Dicots	TERRESTRIAL
<i>Salix boothii</i>	Booth's willow	G5	S2S3		Blue			Dicots	LACUSTRINE; PALUSTRINE; TERRESTRIAL
<i>Schizachyrium scoparium</i>	little bluestem	G5	S1		Red			Monocots	RIVERINE; TERRESTRIAL
<i>Scirpus pallidus</i>	pale bulrush	G5	S1		Red			Monocots	PALUSTRINE; RIVERINE; TERRESTRIAL
<i>Scolochloa festuacea</i>	rivergrass	G5	S2		Red			Monocots	LACUSTRINE; PALUSTRINE; TERRESTRIAL
<i>Silene drummondii</i> var. <i>drummondii</i>	Drummond's campion	G5T5	S3		Blue			Dicots	TERRESTRIAL
<i>Silene spaldingii</i>	Spalding's campion	G2	S1	E (May 2005)	Red			Dicots	TERRESTRIAL
<i>Sphaeralcea coccinea</i>	scarlet globe-mallow	G5?	S1		Red			Dicots	TERRESTRIAL
<i>Sphenopholis intermedia</i>	slender wedgegrass	G5	S3		Blue			Monocots	LACUSTRINE; PALUSTRINE; RIVERINE; TERRESTRIAL
<i>Sphenopholis obtusata</i>	prairie wedgegrass	G5	S1		Red			Monocots	LACUSTRINE; PALUSTRINE; RIVERINE; TERRESTRIAL
<i>Sporobolus compositus</i> var. <i>compositus</i>	rough dropseed	G5T5	S3		Blue			Monocots	PALUSTRINE; TERRESTRIAL
<i>Stellaria obtusa</i>	blunt-sepaled starwort	G5	S2S3		Blue			Dicots	PALUSTRINE; RIVERINE; TERRESTRIAL
<i>Stuckenia vaginata</i>	sheathing	G5	S2S3		Blue			Monocots	LACUSTRINE;

Scientific Name	Common Name	Global Rank	Prov Rank	COSEWIC	BC Status	Identified Wildlife	National GS	Class	Habitat Type
<i>Thalictrum dasycarpum</i>	pondweed purple meadowrue	G5	S2S3		Blue			Dicots	RIVERINE PALUSTRINE;
<i>Thermopsis rhombifolia</i>	prairie golden bean	G5	S1		Red			Dicots	TERRESTRIAL TERRESTRIAL
<i>Townsendia hookeri</i>	Hooker's townsendia	G5	S2		Red			Dicots	TERRESTRIAL
<i>Trichophorum pumilum</i>	dwarf clubrush	G5	S2S3		Blue			Monocots	LACUSTRINE; PALUSTRINE; TERRESTRIAL
<i>Veronica catenata</i>	pink water speedwell	G5	S1		Red			Dicots	LACUSTRINE; PALUSTRINE; RIVERINE
Vertebrate Animal									
<i>Acrocheilus alutaceus</i>	Chiselmouth	G5	S3S4	NAR (May 2003)	Blue		3 - Sensitive	Ray-finned Fishes	LACUSTRINE; RIVERINE
<i>Ammodramus leconteii</i>	Le Conte's Sparrow	G4	S3S4B		Blue		4 - Secure	Birds	PALUSTRINE; TERRESTRIAL
<i>Ardea herodias herodias</i>	Great Blue heron, <i>herodias</i> subspecies	G5T5	S3B,S4N		Blue			Birds	ESTUARINE; LACUSTRINE; PALUSTRINE; RIVERINE; TERRESTRIAL
<i>Ascaphus montanus</i>	Rocky Mountain Tailed Frog	G4	S1	E (May 2000)	Red	Y (May 2004)		Amphibians	PALUSTRINE; RIVERINE; TERRESTRIAL
<i>Asio flammeus</i>	Short-eared Owl	G5	S3B,S2N	SC (May 1994)	Blue	Y (May 2004)	3 - Sensitive	Birds	ESTUARINE; PALUSTRINE;TERRES TRIAL
<i>Athene cunicularia</i>	Burrowing Owl	G4	S1B	E (Apr 2006)	Red	Y (May 2004)	1 - At Risk	Birds	TERRESTRIAL
<i>Botaurus lentiginosus</i>	American Bittern	G4	S3B		Blue		4 - Secure	Birds	ESTUARINE; PALUSTRINE
<i>Buteo platypterus</i>	Broad-winged Hawk	G5	S3B		Blue		4 - Secure	Birds	PALUSTRINE; TERRESTRIAL
<i>Chrysemys picta pop. 2</i>	Western Painted Turtle -	G5TNR	S3		Blue			Turtles	PALUSTRINE; RIVERINE

Scientific Name	Common Name	Global Rank	Prov Rank	COSEWIC	BC Status	Identified Wildlife	National GS	Class	Habitat Type
<i>Corynorhinus townsendii</i>	Intermountain - Rocky Mountain Population Townsend's Big-eared Bat	G4	S3		Blue		2 - May be at risk	Mammals	PALUSTRINE; SUBTERRANEAN; TERRESTRIAL
<i>Dolichonyx oryzivorus</i>	Bobolink	G5	S3B		Blue		4 - Secure	Birds	PALUSTRINE; TERRESTRIAL
<i>Grus canadensis</i>	Sandhill Crane	G5	S3S4B	NAR (May 1979)	Blue		4 - Secure	Birds	LACUSTRINE; PALUSTRINE; RIVERINE; TERRESTRIAL
<i>Gulo gulo luscus</i>	Wolverine, <i>luscus</i> subspecies	G4T4	S3	SC (May 2003)	Blue			Mammals	TERRESTRIAL
<i>Martes pennanti</i>	Fisher	G5	S2S3		Blue	4 - Secure		Mammals	PALUSTRINE; TERRESTRIAL
<i>Megascops kennicottii macfarlanei</i>	Western Screech-Owl, <i>macfarlanei</i> subspecies	G5T4	S1	E (May 2002)	Red	Y (May 2004)		Birds	PALUSTRINE; TERRESTRIAL
<i>Melanerpes lewis</i>	Lewis's Woodpecker	G4	S2B	SC (Nov 2001)	Red	Y (May 2004)	3 - Sensitive	Birds	PALUSTRINE; TERRESTRIAL
<i>Numenius americanus</i>	Long-billed Curlew	G5	S3B	SC (Nov 2002)	Blue	Y (May 2004)	3 - Sensitive	Birds	ESTUARINE; PALUSTRINE; TERRESTRIAL
<i>Oncorhynchus clarkii lewisi</i>	Cutthroat Trout, <i>lewisi</i> subspecies	G4T3	S3	SC (May 2005)	Blue			Ray-finned Fishes	LACUSTRINE; RIVERINE
<i>Otus flammeolus</i>	Flammulated Owl	G4	S3S4B	SC (Nov 2001)	Blue	Y (May 2004)	3 - Sensitive	Birds	TERRESTRIAL
<i>Ovis canadensis</i>	Bighorn Sheep	G4	S2S3		Blue		4 - Secure	Mammals	PALUSTRINE; TERRESTRIAL
<i>Plethodon idahoensis</i>	Coeur d'Alene Salamander	G4	S3	SC (Nov 2001)	Blue	Y (May 2004)	2 - May be at risk	Amphibians	PALUSTRINE; RIVERINE; SUBTERRANEAN
<i>Rana pipiens</i>	Northern	G5	S1	E (May	Red	Y (May	4 - Secure	Amphibians	LACUSTRINE;

Scientific Name	Common Name	Global Rank	Prov Rank	COSEWIC	BC Status	Identified Wildlife	National GS	Class	Habitat Type
	Leopard Frog			2000)		2004)			PALUSTRINE; RIVERINE; TERRESTRIAL
<i>Salvelinus confluentus</i>	Bull Trout	G3	S3		Blue		3 - Sensitive	Ray-finned Fishes	LACUSTRINE;
<i>Sphyrapicus thyroideus nataliae</i>	Williamson's sapsucker, <i>nataliae</i> subspecies	G5TU	S1S2B	E (May 2005)	Red	Y (Jun 2006)		Birds	RIVERINE TERRESTRIAL
<i>Spizella breweri breweri</i>	Brewer's Sparrow, <i>breweri</i> subspecies	G5T4	S2B		Red			Birds	TERRESTRIAL
<i>Taxidea taxus</i>	Badger	G5	S1	E (May 2000)	Red	Y (May 2004)	3 - Sensitive	Mammals	TERRESTRIAL
<i>Tympanuchus phasianellus columbianus</i>	Sharp-tailed Grouse, <i>columbianus</i> subspecies	G4T3	S2S3		Blue			Birds	PALUSTRINE; TERRESTRIAL
<i>Ursus arctos</i>	Grizzly Bear	G4	S3	SC (May 2002)	Blue	Y (May 2004)		Mammals	PALUSTRINE;RIVERIN E; TERRESTRIAL

Global Rank:

GX = Presumed Extinct
 GH = Possibly Extinct
 G1 = Critically Imperiled
 G2 = Imperiled
 G3 = Vulnerable
 G4 = Apparently Secure
 G5 = Secure

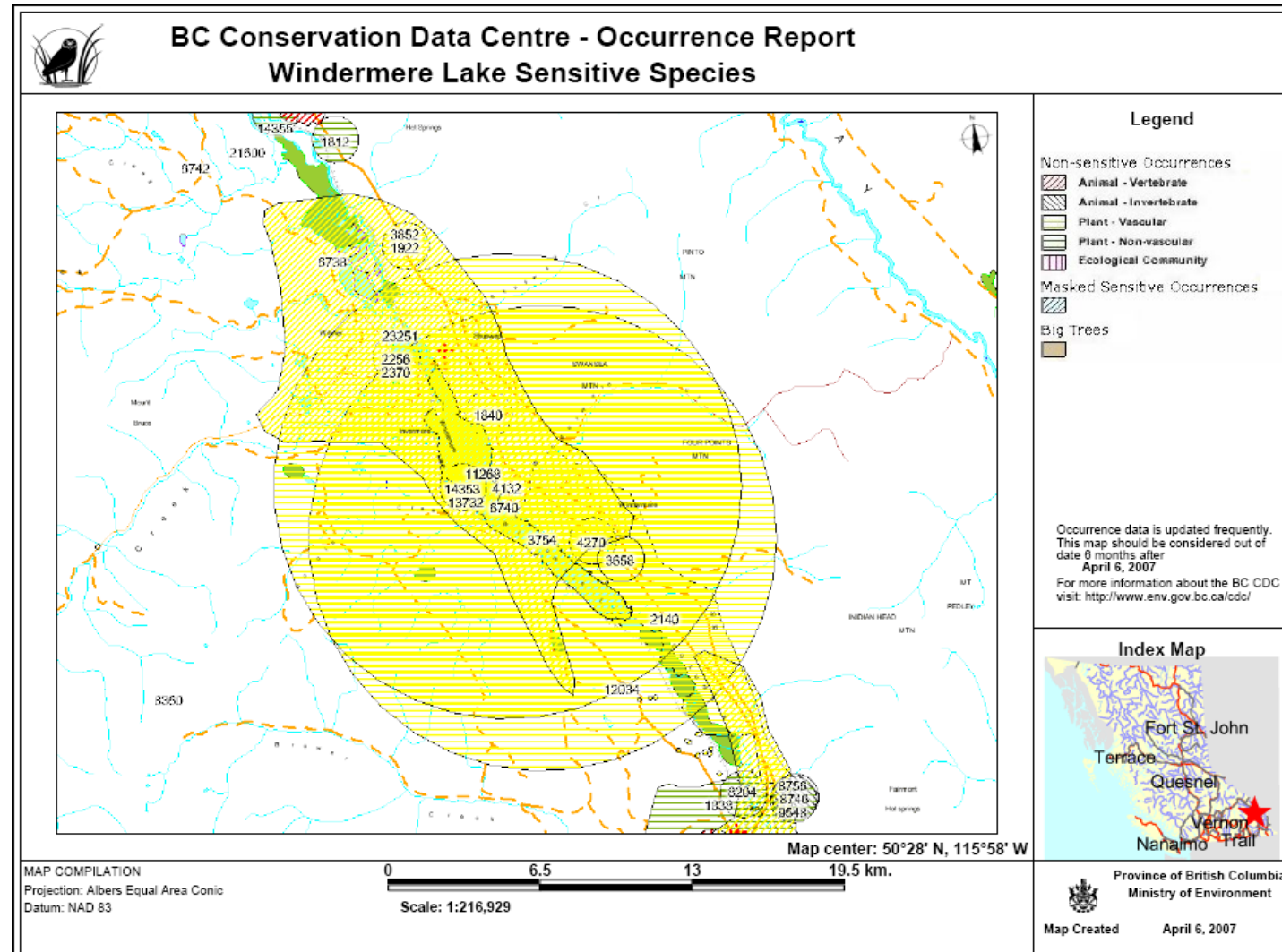
Provincial Rank:

SX = Presumed Extirpated
 SH = Possibly Extirpated
 S1 = Critically Imperiled
 S2 = Imperiled
 S3 = Vulnerable
 S4 = Apparently Secure
 S5 = Secure
 B = Breeding
 N = Non Breeding
 Z = Moving - diffuse, usually moving population

COSEWIC

E = Endangered
 SC = Special Concern
 NAR = Not at Risk

Appendix B2. Mapped Known Locations of Sensitive Species in the Windermere Lake Area (CDC 2007)



Appendix C. A Key to the Field Headings in the EKILMP Windermere Lake Arcview Foreshore Database (Adapted from Mason and Knight 2001)

Column Heading	Unabbreviated Column Heading	Heading Description / Defining Parameters
LAKE_NAME	Lake Name	Local name
ORGANIZATI	Organization	Data Collection
DATE	Date	yy/mm/dd
TIME	Time	Local Time
CREW	Crew	Initials
WEATHER	Weather	Description
AIR_TEMP	Air Temperature	Degrees Celsius
WATER_TEMP	Water Temperature	Degrees Celsius
COMMENTS	Comments	General comments regarding Segment.
SEGMENT_NUM	Segment Number	Unique identifier
SHORE_TYPE	Shore Type	Dominant shore type based on percentage of shore type which occupies the entire Segment.
LAND_USE	Land Use	Land use was interpolated for each Segment based on local land use or zoning maps in digital or hard copy format. This column designates the most abundant land use within the Segment.
LEV_OF_IMP	Level of Impact	Level of impact describes the disturbance level (low, moderate, high) that has occurred throughout the Segment. It is based on visual observations during the assessment including attributes from the database such as % disturbed, retaining wall number and type, docks, groynes, and presence of marinas.
LIVEST_ACC	Livestock Access	Describes access to foreshore.
PHOTONUM	Photo Number	Lists all photos taken in Segment.
RESIDENT	Residential	Percentage of Segment occupied by residential land use.
COMMERCIAL	Commercial	Percentage of Segment occupied by commercial land use.
AGRICULTUR	Agricultural	Percentage of Segment occupied by agricultural land use.
PARK	Park	Percentage of Segment occupied by park land use.
INDUSTRIAL	Industrial	Percentage of Segment occupied by industrial land use.
CPR	Canadian Pacific Railway	Percentage of Segment privately occupied by the Canadian Pacific Railway
UNDEV_IR	Undeveloped Indian Reserve	Percentage of Segment designated as Indian Reserve (Federal), which remains undeveloped.
PRIV_REC	Private Recreational	Percentage of Segment occupied by private recreational land use (such as marinas, recreational strata complexes, and resorts).
CROWN_OTH	Crown Land Other	Percentage of Segment designated as Crown Land (other than Park).
NATURAL	% Natural	Approximate percentage of Segment which remains natural. Based on field observations.
DISTURBED	% Disturbed	Approximate percentage of Segment which has been disturbed. Based on field observations.
CLIFF_BLUF	Cliff or Bluff shore type	Approximate percentage of Segment which is occupied by Cliff/Bluff shore type.
GRAVEL_BEA	Gravel Beach shore type	Approximate percentage of Segment which is occupied by Gravel Beach shore type.
SAND_BEACH	Sand Beach shore type	Approximate percentage of Segment which is occupied by Sand Beach shore type.
VEGE_SHORE	Vegetated shore type	Approximate percentage of Segment which is occupied by a vegetated shore type.
LW_RCKY_SH	Low Rocky shore type	Approximate percentage of Segment which is occupied by low rocky shore type.

WETLAND	Wetland shore type	Approximate percentage of Segment which is occupied by wetland shore type.
OTHER	Other shore type	Approximate percentage of Segment which is occupied by another shore type than those listed.
SUB_FINES	Substrate Fines	Approximate percentage (above water) that is composed of fine material.
SUB_GRAVEL	Substrate Gravel	Approximate percentage (above water) that is composed of gravel material.
SUB_COBBLE	Substrate Cobble	Approximate percentage (above water) that is composed of cobble material.
SUB_BOULDE	Substrate Boulder	Approximate percentage (above water) that is composed of boulder material.
SUB_BEDROC	Substrate Bedrock	Approximate percentage (above water) that is composed of bedrock material.
COMPACTION	Compaction	Degree of relative looseness of bed material, where feasible.
RIP_CLASS	Riparian Class	Land cover classes (i.e. based on % crown cover and dominant vegetation).
RIP_QUALIF	Riparian Qualifier	Describes type of disturbance/usage for the area.
RIP_STAGE	Riparian Stage	Structural Stage of the dominant vegetation.
SHOR_COVER	Shore Cover	Percentage of the shore that is occupied by riparian vegetation
RIP_VETER	Riparian Veteran	Number of veteran trees - mature trees that are significantly older than the dominant forest cover.
RIP_SNAG	Riparian snags	Number of snags- dead standing trees
RIP_BANDWI	Riparian Band Width	Number of metres of riparian area reviewed (up from the water line).
RIP_BANKSL	Riparian Bank Slope	Number of degrees
RIP_OVERHA	Riparian Overhang	Distance (m) that riparian vegetation overhangs within 1 m of the channel.
AQUATI_VEG	Aquatic Vegetation	Percentages of submerged and emerged vegetation
LITTORAL_Z	Littoral Zone	General depth of the littoral zone.
SPAWN_H	Spawning Habitat	Presence/absence of fish spawning habitat.
RETAIN_WAL	Retaining Wall	Number of retaining walls per Segment.
RETAIN_MAT	Retaining Wall Material	Primary material that the retaining wall(s) are constructed from.
DOCKS	Docks	Number of docks per Segment
DOCK_MATER	Dock material	Primary material that the dock(s) are constructed from.
GROYNES	Groynes	Number of groynes per Segment.
GROYNE_MAT	Groyne material	Primary material that the groynes are constructed from.
RAILWAY	Railway	Presence or absence of a railway along the foreshore of the Segment.
MARIN_RAIL	Marine Railway	Number of marine railways /trams per Segment.
MARINAS	Marinas	Number of marinas per Segment.
COMMNT_MOD	Comment Modification	Comments regarding modifications.
MAX_PDOP	Maximum PDOP	See SHIM Methodology (GPS/GIS)
MAX_HDOP	Maximum HDOP	See SHIM Methodology (GPS/GIS)
CORR_TYPE	Correction Type	See SHIM Methodology (GPS/GIS)
RCVR_TYPE	Receiver Type	See SHIM Methodology (GPS/GIS)
GPS_DATE	GPS Date	See SHIM Methodology (GPS/GIS)
GPS_TIME	GPS Time	See SHIM Methodology (GPS/GIS)
LENGTH	Length	Length (m) of Segment.
SOURCE THEM	Source Theme	See SHIM Methodology (GPS/GIS)
CMMNT_FAUN	Comment Fauna	Comments regarding fauna in the Segment.
CMMNT_FLRA	Comment Flora	Comments regarding flora in the Segment.
CMMNT_FLRA2	Comment Flora	Additional comments regarding flora in the Segment
CMMNT_FLRA3	Comment Flora	Additional comments regarding flora in the Segment

Appendix D. A Hardcopy of the EKILMP Windermere Lake Foreshore Inventory Database (DFO 2006)

Appendix D. EKILMP Windermere Lake Foreshore Database

LAKE_NAME	ORGANIZATI	DATE	TIME_	CREW	WEATHER	AIR_TEMP_	WATER_TEMP	COMMENTS	SEGMNT_
Windermere	EKILMP	08/15/06	07:44:46pm	BM TC LP AF KM LP	Clear	20.0	19.0		1
Windermere	EKILMP	08/15/06	08:08:52pm	BM TC LP AF KM LP	Clear	20.0	19.0	Large emergent veg area	2
Windermere	EKILMP	08/15/06	08:22:35pm	BM TC LP AF KM LP	Clear	20.0	19.0	Gullied seg w rip veg; emergent veg present	3
Windermere	EKILMP	08/15/06	08:59:36pm	BM TC LP AF KM LP	Clear	20.0	19.0	HOUSES	4
Windermere	EKILMP	08/15/06	09:19:48pm	BM TC LP AF KM LP	Clear	20.0	19.0	EMRGT LOWER CLIFFBLUFFS	5
Windermere	EKILMP	08/15/06	09:34:20pm	BM TC LP AF KM LP	Clear	20.0	19.0	EMRGT LOWER CLIFFBLUFFS	6
Windermere	EKILMP	08/15/06	09:47:06pm	BM TC LP AF KM LP	Clear	20.0	19.0	RES	7
Windermere	EKILMP	08/15/06	10:09:12pm	BM TC LP AF KM LP	Clear	20.0	19.0	SEG5 AND 6 DO NOT HAVE MODIFICATIONS	8
Windermere	EKILMP	08/15/06	10:29:45pm	BM TC LP AF KM LP	Clear	20.0	19.0		9
Windermere	EKILMP	08/15/06	10:54:41pm	BM TC LP AF KM LP	Clear	20.0	19.0		10
Windermere	EKILMP	08/15/06	11:21:20pm	BM TC LP AF KM LP	Over cast	20.0	19.0		11
Windermere	EKILMP	08/16/06	12:06:28am	BM TC LP AF KM LP	Over cast	20.0	19.0		12
Windermere	EKILMP	08/16/06	12:19:52am	BM TC LP AF KM LP	Over cast	20.0	19.0		13
Windermere	EKILMP	08/16/06	04:48:23pm	BM TC LP AF KM LP	Over cast	14.0	18.0		14
Windermere	EKILMP	08/16/06	05:03:12pm	BM TC LP AF KM LP	Over cast	14.0	18.0	kinsman beach	15
Windermere	EKILMP	08/16/06	05:08:08pm	BM TC LP AF KM LP	Over cast	14.0	18.0		16
Windermere	EKILMP	08/16/06	05:36:02pm	BM TC LP AF KM LP	Over cast	14.0	18.0		17
Windermere	EKILMP	08/16/06	05:49:27pm	BM TC LP AF KM LP	Over cast	14.0	18.0		18
Windermere	EKILMP	08/16/06	06:03:39pm	BM TC LP AF KM LP	Over cast	14.0	18.0	NEED TO CHANGE LENGTH TO EXCLUDE EAS	19
Windermere	EKILMP	08/16/06	06:11:54pm	BM TC LP AF KM LP	Over cast	14.0	18.0		20
Windermere	EKILMP	08/16/06	07:07:24pm	BM TC LP AF KM LP	Partly Cloudy	15.0	18.0	restart seg20	21
Windermere	EKILMP	08/16/06	07:40:00pm	BM TC LP AF KM LP	Clear	15.0	18.0		22
Windermere	EKILMP	08/16/06	07:52:57pm	BM TC LP AF KM LP	Clear	15.0	18.0		23
Windermere	EKILMP	08/16/06	08:21:47pm	BM TC LP AF KM LP	Clear	20.0	18.0		24
Windermere	EKILMP	08/16/06	08:49:41pm	BM TC LP AF KM LP	Over cast	20.0	18.0		25
Windermere	EKILMP	08/16/06	08:57:55pm	BM TC LP AF KM LP	Over cast	20.0	18.0		26

Appendix D. EKILMP Windermere Lake Foreshore Database

SEGMNT_NUM	SHORE_TYPE	LAND USE	LEV_OF_IMP	LIVEST_ACC	PHOTONUM	RESIDENTIAL	CPR	UNDEV_IR	PRIV_REC	CROWN	COMMERCIAL
1	Cliff/Bluff	Undeveloped Indian Reserve	Low	No		0	0	100	0	0	0
2	Cliff/Bluff	Undeveloped Indian Reserve	Low	No		0	0	100	0	0	0
3	Cliff/Bluff & Wetland	Undeveloped Indian Reserve	Low	No	TC05	0	0	100	0	0	0
4	Sand Beach	Undeveloped Indian Reserve/Residential	Low	No		50	0	50	0	0	0
5	Cliff/Bluff	Undeveloped Indian Reserve	Low	No		0	0	100	0	0	0
6	Wetland	Undeveloped Indian Reserve	Low	No		0	10	90	0	0	0
7	Cliff/Bluff & Low Rocky & Wetland	CP Rail	Medium	No		0	100	0	0	0	0
8	Vegetated Shore & Wetland	CP Rail	Low	No		0	100	0	0	0	0
9	Vegetated Shore	Crown	Low	No		0	0	0	0	100	0
10	Vegetated Shore	Residential	Medium	No		100	0	0	0	0	0
11	Low Rocky Shore	CP Rail	Low	No		0	85	0	0	15	0
12	Vegetated Shore	CP Rail	Low	No		25	39	0	36	0	0
13	Low Rocky Shore	CP Rail	Low	No		0	100	0	0	0	0
14	Gravel Beach	Residential	High	No		100	0	0	0	0	0
15	Gravel Beach & Sand Beach	Park	Medium	No		0	0	0	0	0	0
16	Vegetated Shore	Residential	High	No		100	0	0	0	0	0
17	Low Rocky Shore & Vegetated shore	CP Rail	Medium	No		0	60	0	0	0	40
18	Gravel Beach & Sand Beach	Park	Medium	No		0	0	0	0	0	0
19	Vegetated Shore	Commercial	High	No		0	0	0	0	0	100
20	Vegetated Shore	Residential	High	No	TC15, 16	100	0	0	0	0	0
21	Vegetated Shore	Residential	High	No	TC18	100	0	0	0	0	0
22	Cliff/Bluff	Private Recreation	Medium	No		0	0	0	87	0	0
23	Vegetated Shore	Residential	Medium	No		80	0	0	20	0	0
24	Vegetated Shore	Private Recreation/residential	High	No	TC21 22	50	0	0	50	0	0
25	Vegetated Shore	Park	Low	No	TC23	20	0	0	0	0	0
26	Vegetated Shore	Private recreational	Medium	No	TC24 25 2	25	0	0	45	20	0

Appendix D. EKILMP Windermere Lake Foreshore Database

SEGMNT_	AGRICULTU		INDUSTRI	NATUR	DISTU	CLIFF_BL	GRAVEL	SAND_BE	VEGE_SH	LW_RCKY_S	WETLAN	OTH	SUB_FIN	SUB_GRAV	SUB_COBB	SUB_BOULD	SUB_BEDR
NUM	R	PARK	AL	AL	RBED	UF	_BEA	CH	ORE	H	D	ER	ES	EL	LE	E	OC
1	0	0	0	100	0	100	0	0	0	0	0	0	100	0	0	0	0
2	0	0	0	100	0	78	0	0	12	0	0	0	100	0	0	0	0
3	0	0	0	100	0	45	0	0	10	0	45	0	100	0	0	0	0
4	0	0	0	50	50	20	5	50	0	0	25	0	90	10	0	0	0
5	0	0	0	100	0	45	0	0	15	0	40	0	100	0	0	0	0
6	0	0	0	90	10	0	0	0	0	0	100	0	100	0	0	0	0
7	0	0	0	0	100	30	0	0	10	30	30	0	100	0	0	0	0
8	0	0	0	0	100	10	0	0	40	10	40	0	30	40	20	10	0
9	0	0	0	100	0	0	0	0	100	0	0	0	20	60	20	0	0
10	0	0	0	50	50	10	0	0	85	0	5	0	10	70	20	0	0
11	0	0	0	15	85	10	0	0	10	80	0	0	0	35	35	30	0
12	0	0	0	60	40	0	15	10	70	0	5	0	0	15	80	5	0
13	0	0	0	0	100	0	0	0	15	80	5	0	0	15	80	5	0
14	0	0	0	0	100	0	90	0	10	0	0	0	0	100	0	0	0
15	0	100	0	0	100	0	50	50	0	0	0	0	0	50	50	0	0
16	0	0	0	0	100	10	0	0	90	0	0	0	30	60	10	0	0
17	0	0	0	30	70	20	0	0	40	40	0	0	10	60	10	20	0
18	0	100	0	40	60	0	45	45	5	0	5	0	0	50	50	0	0
19	0	0	0	0	100	0	0	0	100	0	0	0	80	0	20	0	0
20	0	0	0	0	100	0	30	10	60	0	0	0	30	35	30	5	0
21	0	0	0	0	100	5	40	0	50	5	0	0	10	70	10	10	0
22	0	13	0	50	50	60	0	20	20	0	0	0	50	50	0	0	0
23	0	0	0	25	75	25	0	35	40	0	0	0	50	50	0	0	0
24	0	0	0	5	95	10	0	20	65	0	5	0	80	10	10	0	0
25	0	80	0	80	20	0	33	0	35	0	32	0	50	50	0	0	0
26	0	10	0	30	70	5	25	20	25	0	25	0	45	45	5	5	0

Appendix D. EKILMP Windermere Lake Foreshore Database

SEGMNT_NUM	COMPACTION	RIP_CLASS	RIP_QUALIF	RIP_STAGE	SHOR_COVER	RIP_VETER	RIP_SNAG	RIP_BANKDWI	RIP_BANKSL	RIP_OVERHA	AQUATI_VEG	LITTORAL_Z
1	Low	Shrubs	Natural	tall shrubs 2-10m	Moderate (5-20%)	<5	No	30	70	0	35submergveg	Shallow
2	Low	Mixed forest	Natural	tall shrubs 2-10m	Moderate (5-20%)	No	>=5	30	75	0	62sub 38emergt	Shallow
3	Low	Mixed forest	Natural	tall shrubs 2-10m	Abundant (>20%)	>=5	<5	30	75	0	65sub 35emergt	Shallow
4	Low	Mixed forest	Urban Residential	mature forest	Sparse (<5%)	No	No	30	50	0	80SUB 20EMRGT	Shallow
5	Low	Mixed forest	Natural	tall shrubs 2-10m	Moderate (5-20%)	>=5	<5	30	60	0	80SUB 20EMRGT	Shallow
6	Low	Natural wetland	Natural		Abundant (>20%)			30	0	0	55SUB 45EMRGT	Shallow
7	Low	Mixed forest	Disturbed	tall shrubs 2-10m	Sparse (<5%)	<5	No	30	40	0	90SUB 10EMRGT	Shallow
8	Medium	Mixed forest	Disturbed	low shrubs <2m	Moderate (5-20%)	No	<5	30	30	0	75SUB 25EMRGT	Shallow
9	Low	Mixed forest	Natural	tall shrubs 2-10m	Abundant (>20%)	>=5	<5	30	5	25	100EMRGT	Shallow
10	Low	Mixed forest	Urban Residential	sapling >10m	Moderate (5-20%)	<5	No	30	5	25	97SUB 3EMRGT	Shallow
11	Medium	Mixed forest	Disturbed	mature forest	Moderate (5-20%)	>=5	>=5	30	60	0	92SUB 8EMRGT	Shallow
12	Low	Broadleaf forest	Natural	mature forest	Abundant (>20%)	>=5	>=5	30	0	60	68SUB 82EMRGT	Shallow
13	Medium	Coniferous forest	Disturbed	mature forest	Moderate (5-20%)	>=5	>=5	30	35	0	95SUB 5EMRGT	Shallow
14	Medium	Herbs/grasses	Urban Residential	low shrubs <2m	Abundant (>20%)	No	<5	30	5	5		Shallow
15	Medium	Broadleaf forest	Recreation	mature forest	Abundant (>20%)	No	No	30	5	5	10sub	Shallow
16	Medium	Mixed forest	Urban Residential	mature forest	Abundant (>20%)	>=5	No	30	25	15	10SUB	Shallow
17	Medium	Broadleaf forest	Disturbed	sapling >10m	Abundant (>20%)	No	No	30	60	5	10SUB	Shallow
18	Medium	Herbs/grasses	Recreation	low shrubs <2m	Abundant (>20%)	No	No	30	5	5	15SUB 10EMRGT	Shallow
19	Medium	Shrubs	Disturbed	tall shrubs 2-10m	Moderate (5-20%)	No	No	30	5	5	65SUB 35OTHER	Shallow
20	Medium	Broadleaf forest	Disturbed	mature forest	Moderate (5-20%)	<5	<5	30	8	5	50SUB	Shallow
21	Medium	Mixed forest	Urban Residential	mature forest	Moderate (5-20%)	<5	<5	30	15	10	40SUB	Shallow
22	Medium	Broadleaf forest	Recreation	mature forest	Abundant (>20%)	No	No	30	60	15	20SUB	Shallow
23	Medium	Broadleaf forest	Recreation	mature forest	Abundant (>20%)	No	No	30	60	15	10SUB	Shallow
24	Medium	Mixed forest	Urban Residential	mature forest	Abundant (>20%)	>=5	<5	30	15	10	10SUB	Shallow
25	Low	Shrubs	Natural	tall shrubs 2-10m	Abundant (>20%)	>=5	>=5	30	5	40	10EMRGT	Shallow
26	Low	Shrubs	Disturbed	tall shrubs 2-10m	Abundant (>20%)	>=5	>=5	30	40	25	60SUB 20EMRGT 20 OT	Shallow

Appendix D. EKILMP Windermere Lake Foreshore Database

SEGMNT_NUM	SPAWN_H	RETAIN_WAL	RETAIN_MAT	DOCKS	DOCK_MATER	GROYNE_S	GROYNE_MAT	RAILWAY	MARIN_RAIL	MARIN_AS	COMMNT_MOD	MAX_PDOP
1	Unknown	0		0	Wood	0		No	0	0		2.4
2	Unknown	0		0	Wood	0		No	0	0		2.5
3	Unknown	0		0	Wood	0		No	0	0		2.4
4	Unknown	6	Wood	5	Wood	0		No	0	0	AF1 PH5 " Shoreline stabilization below dwellings using	3.0
5	Unknown	0		0		0		No	0	0		3.1
6	Unknown	0		0		0		Yes	0	0	Railway along western edge of segment	3.5
7	Unknown	0		7	Wood	0		Yes	0	0		8.0
8	Unknown	0		0	Wood	0		Yes	0	0		6.0
9	Unknown	0		0	Wood	0		Yes	0	0		5.6
10	Unknown	13	Mixed	10	Wood	0		No	0	0	7 BOAT HOUSES 1 LAUNCH	6.0
11	Unknown	0		2	Wood	0		Yes	2	0		4.4
12	Unknown	2	Stonework	0	Wood	1	Stonework	No	0	0	1 LAUNCH	11.0
13	Unknown	1	Concrete	1	Wood	0		Yes	0	0		4.4
14	Unknown	1	Stonework	2	Wood	0		No	0	0	1 lg retain wall 4 entire seg	4.5
15	Unknown	0		0		0		No	0	0		5.7
16	Unknown	109	Mixed	43	Wood	4	Stonework	No	0	1	AF2 PH14 26 BOAT HOUSES	3.8
17	Unknown	0		3	Wood	1	Concrete	Yes	0	0	PH15, " Stormwater culvert (point #45) under railroad tr	3.7
18	Unknown	1	Wood	1	Wood	0		No	0	0	BOARD WALK, gulls, good overhanging vegetation local	22.7
19	Unknown	1	Wood	0		0		No	0	0		3.3
20	Unknown	65	Mixed	32	Wood	4	Stonework	No	0	0	AF3. 5 boathouses described by Wildsight	5.3
21	Unknown	75	Mixed	27	Wood	9	Stonework	No	0	0	AF4 PH 24 boat houses	8.3
22	Unknown	6	Mixed	3	Wood	1	Stonework	No	0	1	AF5 PH 12 boat houses	28.3
23	Unknown	88	Mixed	18	Wood	2	Stonework	No	0	1	AF6 PH 12 boat houses	24.5
24	Unknown	46	Mixed	17	Wood	1	Stonework	No	0	2	AF7 KM2 PH 13 boat houses	5.6
25	Unknown	0		0	Wood	0		No	0	0		3.0
26	Unknown	24	Mixed	31	Wood	6	Stonework	No	0	4	AF8 KM4 PH 24 8 boat houses Non-conforming structur	20.9

Appendix D. EKILMP Windermere Lake Foreshore Database

SEGMNT_NUM	MAX_HDOP	CORR_TYPE	RCVR_TYPE	GPS_DATE	GPS_TIME	LENGTH	SOURCETHM	CMMNT_FAUN
1	1.4	Real-time Code	Pro XR	08/15/06	09:59:47am	239.033	Segment1.shp	PH1 Swallow nests in bank, recent wildlife track
2	1.5	Uncorrected	Pro XR	08/15/06	10:23:52am	1095.556	Segment2.shp	Swallow nests, Turkey Vultures, grebes
3	1.4	Uncorrected	Pro XR	08/15/06	10:37:35am	1877.530	Segment3.shp	Large burrow, Osprey, grebes, Large diameter
4	1.6	Real-time Code	Pro XR	08/15/06	11:14:36am	962.810	Segment4.shp	PH4
5	1.9	Real-time Code	Pro XR	08/15/06	11:34:48am	1747.668	Segment5.shp	PH6 Swallows, High value wetland/ gully, Bald
6	1.8	Real-time Code	Pro XR	08/15/06	11:49:20am	3094.846	Segment6.shp	PH7
7	4.4	Uncorrected	Pro XR	08/15/06	12:02:06pm	865.183	Segment7.shp	
8	2.7	Uncorrected	Pro XR	08/15/06	12:24:12pm	1584.576	Segment8.shp	PH8 juvenile fish use of submergent vegetation
9	1.7	Uncorrected	Pro XR	08/15/06	12:44:45pm	892.178	Segment9.shp	PH9
10	1.8	Uncorrected	Pro XR	08/15/06	01:09:41pm	773.393	Segment10.shp.shp	
11	4.3	Uncorrected	Pro XR	08/15/06	01:36:20pm	3868.309	Segment11.shp	PH10 numerous wildlife trails, high value grass
12	8.1	Uncorrected	Pro XR	08/15/06	02:21:28pm	1090.485	Segment12.shp	
13	2.5	Uncorrected	Pro XR	08/15/06	02:34:52pm	3550.218	Segment13.shp	PH12 High value, isolated wetland, motorized
14	4.4	Uncorrected	Pro XR	08/16/06	07:09:48am	255.586	Segment14.shp	
15	5.6	Uncorrected	Pro XR	08/16/06	07:18:12am	163.817	Segment15.shp	
16	3.7	Uncorrected	Pro XR	08/16/06	07:23:08am	1539.490	Segment16.shp	PH14 " Extensive retaining walls in segment v
17	1.7	Real-time Code	Pro XR	08/16/06	07:51:02am	696.174	Segment17.shp	
18	22.7	Uncorrected	Pro XR	08/16/06	08:04:27am	593.690	Segment18.shp	
19	3.1	Uncorrected	Pro XR	08/16/06	08:18:39am	268.367	Segment19.shp	
20	5.2	Uncorrected	Pro XR	08/16/06	08:26:54am	1054.070	Segment20.shp	
21	8.3	Uncorrected	Pro XR	08/16/06	09:35:04am	1153.654	Segment21.shp	
22	28.3	Uncorrected	Pro XR	08/16/06	09:54:59am	940.491	Segment22.shp	
23	5.6	Uncorrected	Pro XR	08/16/06	10:07:57am	1328.182	Segment23.shp	
24	5.5	Uncorrected	Pro XR	08/16/06	10:46:43am	1800.857	Segment24.shp	
25	2.8	Uncorrected	Pro XR	08/16/06	11:04:43am	663.377	Segment25.shp	waterfowl, kingfisher, loon
26	20.9	Uncorrected	Pro XR	08/16/06	11:12:55am	3459.250	Segment26.shp	PH 24" Important riparian habitat at outlet of V

Appendix D. EKILMP Windermere Lake Foreshore Database

SEGMNT_ NUM	CMMNT_FLRA	CMMNT_FLRA2	CMMNT_FLRA3					
1	ks up clay bank between upland area and water, osprey							
2	PH2							
3	PH3							
4	" High value wetland located at tributary mouth							
5	Eagle, swallows, Canada geese							
6								
7								
8	n, waterfowl use							
9								
10								
11	land communities, wildlife lic							
12	PH11 High value riparian with cottonwood and wetland							
13	mpacts on upland grasslands							
14								
15	PH13 Gulls, erosion evidence (exposed tree roots, on eastern shore of Kinsmen Park, Anticipate contr							
16	PH14 " Numerous sheds below high water mark,							
17								
18	PH16 Osprey nest in parking lot of James Chabot Prov.Park, high value wetland in east park area							
19	PH17 high level waterfowl use, significant disturbed area beyond shoreline at future resort location							
20	PH18 Belted Kingfisher, osprey, pileated wp, nothern flicker, sandpiper, goldeneye, otters in area.							
21	PH19 Loon, mallards							
22	PH20 important wetland habitat at mouth of Holland	Wildlife tracks observed from lake to burrow on clay bank, eagle, gulls, crow, swallows, high value natural grassland slope.						
23	PH21 Exposed banks and erosion							
24	PH22 good natural vegetation on point of land,	large upland area disturbed by creation of private beach (Akiskinook) first evidence of undistrubed shoreline and intact upland forested habi						
25	PH23 very good natural shoreline vegetation on point	important isolated wetland below cem	important wetland the head of the bay, natural plant communities in the undeveloped areas and topo					
26	PH24 Only island on Windermere Lake provides imp	Non-conforming structure (boat house	Important riparian habitat at outlet of Windermere Creek, unstable bank with swallows, grebes, loons					

Appendix D. EKILMP Windermere Lake Foreshore Database

SEGMNT_ NUM									
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24	tat encountered on eastern shoreline (point#75). This fore								
25	graphy providing protection, this area is one of the most important habitats on north-eastern shor								
26	gulls, mergansers								

Appendix E. A Hardcopy of the Retaining Wall Inventory Database (Wildsight 2006)

Appendix E. Wildsight (2006) Retaining Wall Data

Lot #	Retaining Wall? (#)	Material	Condition	Length or GPS locations	% of Lot Length	Height	High Water		# of Tiers	Photo #	NOTES	PID Number	GIS LINK	Segment
	Y/N (# on property)	C-concrete, S-stone, B-brick/square, cut stone, PTW-pressure treated wood, W-wood, L-logs, M-metal	New, Stable, Aging, Falling Apart	Meters or GPS start and end points of retaining walls / wetlands	Length of wall (+ any additional % or shoreline retained with a boat house)	Meters	Below (#)	Above (#)						
437 Lakeview Place	Y (2)	PTW, W, C	A		100	0.5 - 1.5	1	1	2	1		010-777-971		20
441 Lakeview Place	Y (3)	PTW	A (lower) N (2 upper)		100	1	1	2	3	2		014-971-801		20
445 Lakeview Place	Y (3)	C	A (lower) N (2 upper)		90	0.5 - 2.0	1	2	3	3		012-249-777		20
449 Lakeview Place	Y (2)	S, C	S		95	1	1	1	2	4		014-971-798		20
453 Lakeview Place	Y	S	S		75 (+25 BH)	1	1	0	1	5		024-839-973		20
457 Lakeview Place	N - small concrete feature below water line L1.0m x H0.5m									6		024-839-965		20
461 Lakeview Place	N - natural shoreline									7		024-839-892		20
465 Lakeview Place	Y	C	A		80 (+20 BH)	0.75	1	0	1	8		025-096-435		20
469 Lakeview Place	Y	C	A		25	0.75	1	0	1	9		014-971-755		20
475 Lakeview Place	Y (5)	PTW	N		100	0.5 - 2.0	1	4	5	10		012-840-602		20
Lakeview Access #1	N - runoff pipes upland of natural shore									11				20
483 Lakeview Place	Y (3)	PTW	N		100	1.5	1	2	3	12		009-681-230		20
487 Lakeview Place	Y (3)	S, PTW, S	N		100	0.5 - 1.5	1	2	3	13		009-796-037		20
491 Lakeview Place	Y	PTW	A		100	0.25 - 2.0	1	0	1	14		025-114-875		20
495 Lakeview Place	Y	S, C	S		90	1	1	0	1	15	House is built on retaining wall	015-068-196		20
499 Lakeview Place	Y	C	S		20	0.5 - 1.0	1	0	1	16, 17				20
503 Lakeview Place	N									18		012-229-156		20

Appendix E. Wildsight (2006) Retaining Wall Data

Lot #	Retaining Wall? (#)	Material	Condition	Length or GPS locations	% of Lot Length	Height	High Water		# of Tiers	Photo #	NOTES	PID Number	GIS LINK	Segment
	Y/N (# on property)	C-concrete, S-stone, B-brick/square, cut stone, PTW-pressure treated wood, W-wood, L-logs, M-metal	New, Stable, Aging, Falling Apart	Meters or GPS start and end points of retaining walls / wetlands	Length of wall (+ any additional % or shoreline retained with a boat house)	Meters	Below (#)	Above (#)						
511 Lakeview Place	Y	C, PTW	S		100	0.5 -1.5	1	0	1	19		024-592-561		20
515 Lakeview Place	Y (3)	PTW, C	S		100	0.5 - 3.0	1	2	3	20		011-922-265		20
523 Lakeview Place	Y (5)	PTW, S, B	S		100	0.5 - 3.0	1	4	5	21		014-242-621		20
535 Lakeview Place	Y (5)	PTW	N		100	0.5 - 2.0	1	4	5	22		025-987-623		20
541 Lakeview Place	Y (2)	B, S	S		100	0.25 - 2.0	1	1	2	23		015-082-202		20
547 Lakeview Place	Y	PTW	S		100	1	1	0	1	24		011-717-360		20
551 Lakeview Place	Y (3)	S (RIP RAP)	S		100	0.5 - 2.0	1	2	3	25	ALL TIERS RIP RAP	024-719-374		20
553 Lakeview Place	Y (5)	PTW, B	FA (PTW), S (B)		100	1.0 - 2.0	1	4	5	26	Retaining wall is brick under brush	007-380-224		20
Lakeview Access #2	N									27, 28	Has runoff pipe draining, pumphouse, piled rock on site			20
583 Lakeview Place	Y (3)	C	S		25	1.0 - 3.0	1	1	2	29, 30	Shopping cart in water 20m offshore north end of lot	015-093-701		20
593 Lakeview Place	Y (4)	PTW, C	A (PTW) N (C)		100	2	1	3	4	31		015-086-941		20
603 Lakeview Place	Y	L	A		80 (+20 BH)	2	1	0	1	32		014-741-326		20
613, 615, 617, 619, 621 Lakeview Place	Y	PTW	N		50	0.5 - 2.0	1	0	1	33, 34		009-782-737		20
623 Lakeview Place	N									34		014-970-163		20
627 Lakeview Place	N									35		010-862-790		20
631 Lakeview Place	N									36		013-288-032		20
637 Lakeview Place	Y	B	S		75 (+20 BH)	0.5	1	0	1	37	Owner has dumped sand on shore	015-093-697		20

Appendix E. Wildsight (2006) Retaining Wall Data

Lot #	Retaining Wall? (#)	Material	Condition	Length or GPS locations	% of Lot Length	Height	High Water		# of Tiers	Photo #	NOTES	PID Number	GIS LINK	Segment
	Y/N (# on property)	C-concrete, S-stone, B-brick/square, cut stone, PTW-pressure treated wood, W-wood, L-logs, M-metal	New, Stable, Aging, Falling Apart	Meters or GPS start and end points of retaining walls / wetlands	Length of wall (+ any additional % or shoreline retained with a boat house)	Meters	Below (#)	Above (#)						
641 Lakeview Place	Y	B	S		90 (+10 BH)	0.75	1	0	1	38		005-477-417		20
double lot	Y	B	S		100	0.5	1	0	1	39		007-101-325		20
651 Lakeview Place	Y	W, B	A (W) , S (B)		100	0.5 - 1.0	1	0	1	40		012-960-560		20
Lakeview Access #3	N									41				21
A, 661 Lakeview Place	Y (8)	C, S	A		100	0.5 - 1.5	1	7	8	42, 43	Madson's place	025-879-430		21
669 Lakeview Place	Y (4)	C, B	A		100	0.5 - 1.5	1	3	4	44		025-918-249		21
673 Lakeview Place	Y (2)	W, S	N		100	1.5	1	1	2	45		026-147-131		21
677 Lakeview Place	Y	W	A		100	2	1	0	1	46		015-086-909		21
683 Lakeview Place	Y (2)	B, C	A		100	1.0 - 2.0	1	1	2	47		026-181-355		21
687 Lakeview Place	Y (2)	B, C	A (B), S (C)		100	0.75	1	1	2	48		025-101-811		21
691 Lakeview Place	Y (2)	C	A		100	0.5 - 1.0	1	1	2	49		015-095-347		21
695 Lakeview Place	Y (2)	S, B	A (S), N (B)		80 (+20 BH)	1	1	1	2	50		015-081-699		21
701 Lakeview Place	Y (3)	C, B	A (C), N (B)		80 (+20 BH)	1	1	2	3	51		025-192-833		21
A Lakeview Place	Y	C	FA		100	1	1	0	1	52		025-854-283		21
711 Lakeview Place	Y	S	FA		60	0.5	1	0	1	53		025-854-305		21
110 Lakeview Place double lot	N									54		015-086-976		21
725 Lakeview Place double lot	Y (2)	PTW	FA		80 (+20 BH)	1.5	1	1	2	55		015-086-925		21
735 Lakeview Place	Y (2)	PTW, C	A		100	1.0 - 2.0	1	1	2	56, 57		018-428-452		21

Appendix E. Wildsight (2006) Retaining Wall Data

Lot #	Retaining Wall? (#)	Material	Condition	Length or GPS locations	% of Lot Length	Height	High Water		# of Tiers	Photo #	NOTES	PID Number	GIS LINK	Segment
	Y/N (# on property)	C-concrete, S-stone, B-brick/square, cut stone, PTW-pressure treated wood, W-wood, L-logs, M-metal	New, Stable, Aging, Falling Apart	Meters or GPS start and end points of retaining walls / wetlands	Length of wall (+ any additional % or shoreline retained with a boat house)	Meters	Below (#)	Above (#)						
745 Lakeview Place	Y (2)	C, S	N		50	2	1	1	2	58, 59, 60	(Irvine's place) Map indicates long lot however, calc of wall length based on a single lot but may have been subdivided with some public access bw/ lot 745 - 791	026-271-982		21
Unmarked bw/ 745-791 Lakeview Rd	Y (2)	W, C	A (W) , FA (C)		90 (+10 BH)	0.5 - 3.0	1	1	2	61	Ida's boat house	024-456-900		21
Storm drain bw/ unmarked and 791 Lakeview Rd										62				21
791 Lakeview Rd	Y (2)	C, S	N		100	0.5	1	1	2	63		024-456-900		21
795 Lakeview Rd	Y	W, S	FA		100	2	1	0	1	64		014-959-461		21
799 Lakeview Rd	Y	C	FA		100	1	1	0	1	65	House is built on retaining wall	008-700-401		21
805 Lakeview Rd	Y (2)	PTW, C	FA		100	1.0 - 1.5	1	1	2	66		015-065-375		21
811 Lakeview Rd	Y	W	A		90 (+10 BH)	1	1	0	1	67		011-029-340		21
Lakeview Access #4	N									68				21
825 Lakeview Rd	Y	C	A		100	0.5 - 1.0	1	0	1	69		012-570-184		21
829 Lakeview Rd	Y	C	A		100	0.5 - 1.0	1	0	1	70		012-873-225		21
833 Lakeview Rd	Y (2)	C, B	A		80 (+20 BH)	0.5 - 1.0	1	1	2	71		025-447-467		21
835 Lakeview Rd	Y (2)	W, S	A (W), N (S)		100	1.0 - 2.0	1	1	2	72		014-959-445		21
841 Lakeview Rd	Y (2)	C, W	FA		100	1.0 - 2.5	1	1	2	73		025-082-272		21
847 Lakeview Rd	Y (3)	C, B, S	S		100	1.0 - 3.0	1	2	3	74		025-086-294		21
Lakeview Access #5	N									75	Stone dumped on shore			21

Appendix E. Wildsight (2006) Retaining Wall Data

Lot #	Retaining Wall? (#)	Material	Condition	Length or GPS locations	% of Lot Length	Height	High Water		# of Tiers	Photo #	NOTES	PID Number	GIS LINK	Segment
	Y/N (# on property)	C-concrete, S-stone, B-brick/square, cut stone, PTW-pressure treated wood, W-wood, L-logs, M-metal	New, Stable, Aging, Falling Apart	Meters or GPS start and end points of retaining walls / wetlands	Length of wall (+ any additional % or shoreline retained with a boat house)	Meters	Below (#)	Above (#)						
857 Lakeview Rd	Y (2)	C, W, S	FA		100	1	1	1	2	76, 77		015-065-472		21
863 Lakeview Rd	Y (3)	C, B	A		100	0.5 - 1.0	1	2	3	78		024-800-465		21
867 Lakeview Rd	Y	C, B	A		80 (+10 BH)	2	1	0	1	79		014-804-808		21
875 Lakeview Rd, double lot	Y (2)	B	N		90 (+10 BH)	1.0 - 1.5	1	1	2	80		006-616-887		21
883 Lakeview Rd	Y (3)	B, W, C	N		100	0.5 - 3.0	1	2	3	81		014-959-429		21
887 Lakeview Rd	Y (3)	C, W	A		90 (+10 BH)	1.0 - 1.5	1	2	3	82		014-959-411		21
891 Lakeview Rd	Y (4)	S, W, B	A		100	1.0 - 3.0	1	3	4	83	Wood wall is stained	014-959-399		21
Lakeview Access #6	N									84	Natural bluff, stone added to shore			22
Lakeview Meadows Marina	Y (3)	B	N		75	1.0 - 6.0	1	2	3	85		024-847-941		22
Lakeview Meadows Wetland Area (Holland Creek)				North Point: N 50.29.727' - W 116.00.532'; South Point: N 50.29.705' - W 116.00.547'; East Point: N 50.29.715' - W 116.00.514						86, 87, 88, 89, 90	Mouth of Holland Ck, Kokanee swimming up Holland Ck			22
Timber Ridge Marina	Y	C	S	75m		2	1	0	1	91				22
Timber Ridge Beach Area	Y	C, S	S	IR calculated 385m from: North Point: N 50.29.638' - W 116.00.590'; South Point: N 50.29.508' - W 116.00.392'		1	1	0	1	92				22
Timber Ridge South Area	Y	C, S, W	FA (W)	IR calculated 95m from: North Point: N 50.29.485' - W 116.00.304'; South Point: N 50.29.470' - W 116.00.228'		1	1	0	1	93, 94				22
1 Nappe Rd	Y (2)	W, PTW	FA		20	1	1	1	2	95		014-868-181		23

Appendix E. Wildsight (2006) Retaining Wall Data

Lot #	Retaining Wall? (#)	Material	Condition	Length or GPS locations	% of Lot Length	Height	High Water		# of Tiers	Photo #	NOTES	PID Number	GIS LINK	Segment
	Y/N (# on property)	C-concrete, S-stone, B-brick/square, cut stone, PTW-pressure treated wood, W-wood, L-logs, M-metal	New, Stable, Aging, Falling Apart	Meters or GPS start and end points of retaining walls / wetlands	Length of wall (+ any additional % or shoreline retained with a boat house)	Meters	Below (#)	Above (#)						
1039 Nappe Rd	N									96		014-868-202		23
1045 Nappe Rd	Y (3)	C, W	S		100	1.0 - 2.0	1	2	3	97		024-389-536		23
1051 Nappe Rd	N									98		010-424-156		23
Baltac/Nappe Rd Access Pt.	N									99	Road to water edge has some vegetation			23
1033 Baltac Rd	Y	S, C	N		100	1.0 - 1.5	1	0	1	100	Shaw house	026-331-861		23
1039 Baltac Rd	N									101		014-688-174		23
1045 Baltac Rd	Y	S, C	A		60	0.25	1	0	1	102		012-960-853		23
1051 Baltac Rd	N									103		014-869-853		23
1057 Baltac Rd	Y	B	N		90	0.25	1	0	1	104		012-239-208		23
1065 Baltac Rd	Y	L	FA		95	0.5	1	0	1	105		024-442-011		23
1069 Baltac Rd	N									106		024-442-020		23
Unmarked (1075) Baltac Rd	Y (2)	S	N		100	0.5	1	1	2	107	Missed 1075 on the original tally sheet. Check 1075 and vacant lot. New house being built on vacant lot and the figures recorded on spreadsheet are for the vacant lot only	014-856-905		23
1081 Baltac Rd	Y	C	FA		80 (+20 BH)	1.0 - 2.0	1	0	1	108		014-869-403		23
Baltac Access North and Beach	Y (5)	C	S	IR calculated 42m from: North Point: N 50.29.377' - W 115.59.904'; South Point: N 50.29.369' - W 115.59.874'		1.0 - 2.0	1	4	5	109, 110		009-581-626		23
Warbler Rd Access	Y	S	FA	10m		1	1	0	1	111				23

Appendix E. Wildsight (2006) Retaining Wall Data

Lot #	Retaining Wall? (#)	Material	Condition	Length or GPS locations	% of Lot Length	Height	High Water		# of Tiers	Photo #	NOTES	PID Number	GIS LINK	Segment
	Y/N (# on property)	C-concrete, S-stone, B-brick/square, cut stone, PTW-pressure treated wood, W-wood, L-logs, M-metal	New, Stable, Aging, Falling Apart	Meters or GPS start and end points of retaining walls / wetlands	Length of wall (+ any additional % or shoreline retained with a boat house)	Meters	Below (#)	Above (#)						
1151 Baltac Rd	Y (5)	B	N		100	1.0 - 1.5	1	4	5	112		025-610-147		23
1157 Baltac Rd	Y (3)	S, C	A		100	2.0 - 4.0	1	2	3	113		025-630-962		23
1163 Baltac Rd	Y	M	S		90 (+10 BH)	2	1	0	1	114		025-802-178		23
1169 Baltac Rd	Y (2)	C, B	A		80 (+20 BH)	1.0 - 3.0	1	1	2	115	Murray's House	025-867-881		23
1173 Baltac Rd	Y (2)	C, PTW	S		80 (+20 BH)	0.5 - 2.0	1	1	2	116		025-631-012		23
1177 Baltac Rd	Y	PTW	A		100	1	1	0	1	117		025-630-997		23
1183 Baltac Rd	Y (6)	PTW	S		100	1.0 - 2.0	1	5	6	118		025-871-587		23
1187 Baltac Rd	Y (4)	PTW	S		100	0.5 - 2.0	1	3	4	119		025-767-640		23
1193 Baltac Rd	Y (6)	PTW, C	A		100	0.5 - 1.3	1	5	6	120		025-868-004		23
1197 Baltac Rd	Y (3)	W, C	FA		100	1.5 - 2.0	1	2	3	121		025-778-366		23
1205 Baltac Rd	Y (2)	W, C	A		100	1.5	1	1	2	122		025-789-139		23
Blackwing Rd Access	Y	W	A		100	1.5	1	0	1	123				23
1213 Lake Dr	Y (4)	PTW, C	S		100	1.5 - 2.0	1	3	4	124		025-871-561		23
1217 Lake Dr	Y (6)	PTW	S		100	0.5 - 2.0	1	5	6	125		025-917-099		23
1219 Lake Dr	Y (2)	W, S	S		100	1.0 - 2.0	1	1	2	126	Shared w/ 1221 house not visible but on left	025-646-176		23
1221 Lake Dr	Y (4)	W, S, C	FA		100	1.0 - 2.0	1	3	4	126		025-932-349		23
1225 Lake Dr	Y (6)	C, PTW	FA (C), N (PTW)		75 (+25 BH)	1.5	1	5	6	127		025-630-938		23
1229 Lake Dr	Y (4)	PTW, S	S		75 (+25 BH)	1.0 - 2.0	1	3	4	128, 129	Has underground stream beneath house - see pipe exiting retaining wall	025-683-616		23
1233 Lake Dr	Y (2)	L, C	S		75 (+25 BH)	1.5	1	1	2	130		025-630-989		23

Appendix E. Wildsight (2006) Retaining Wall Data

Lot #	Retaining Wall? (#)	Material	Condition	Length or GPS locations	% of Lot Length	Height	High Water		# of Tiers	Photo #	NOTES	PID Number	GIS LINK	Segment
	Y/N (# on property)	C-concrete, S-stone, B-brick/square, cut stone, PTW-pressure treated wood, W-wood, L-logs, M-metal	New, Stable, Aging, Falling Apart	Meters or GPS start and end points of retaining walls / wetlands	Length of wall (+ any additional % or shoreline retained with a boat house)	Meters	Below (#)	Above (#)						
1241 Lake Dr	Y	PTW	S		100	1.0 - 2.0	1	0	1	131		025-678-990		23
1245 Lake Dr	N									132		025-678-990		23
1251 Lake Dr	Y (2)	C, PTW	S		100	1.0 - 1.5	1	1	2	133		015-413-349		23
1257 Lake Dr	Y	C	S		100	0.5 - 1.0	1	0	1	134		010-800-433		23
1263 Lake Dr	Y	C	S		100	1.0 - 1.5	1	0	1	135		006-271-731		23
1269 Lake Dr	Y	C, B	A		100	0.5 - 1.0	1	0	1	136		015-413-381		23
Beach Dr Access	N									137	Road into lake			23
Beach Dr Wetland Area	N			North Point: N 50.28.891' - W 115.59.670' ; South Point: N 50.28.870' - W 115.59.665'						138, 139, 140				23
A Beach Dr	N									138		011-677-651		24
2 Beach Dr	N									139		008-473-935		24
1 Beach Dr	N									140		008-270-490		24
Andreen Rd Access	N									141	Runoff			24
4806 Sand Rd	Y	C	A		100	1	1	0	1	142		024-832-871		24
1317, 1319 Sand Rd	Y	C	FA		100	1.5	1	0	1	143	Duplex	006-550-142		24
1325 Sand Rd	Y	S	S		100	1.5	1	0	1	144	2 drums lay 30m offshore of property	009-070-508		24
1331 Sand Rd	Y	C	S		100	1.5	1	0	1	145		008-499-951		24
1337 Sand Rd	Y	PTW	S		100	1.0 - 2.0	1	0	1	146		010-123-911		24
1342 - 1356 Sand Rd	Y	W, L	FA		100	0.5 - 1.5	1	0	1	147		015-394-239		24

Appendix E. Wildsight (2006) Retaining Wall Data

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	Y/N (# on property)	C-concrete, S-stone, B-brick/square, cut stone, PTW-pressure treated wood, W-wood, L-logs, M-metal	New, Stable, Aging, Falling Apart	Meters or GPS start and end points of retaining walls / wetlands	Length of wall (+ any additional % or shoreline retained with a boat house)	Meters	Below (#)	Above (#)						
Terra Vista Marina	Y	W, R	S	IR calculated 75m from: North Point: N 50.28.698' - W 115.59.553' ; South Point: N 50.28.656' - W 115.59.564'		1	1	0	1	148			7043428100	24
Terra Vista Beach Area	Y	PTW	S	25m - satellite communication too weak for GPS reading		0.75	1	0	1	148		005-959-659		24
1395 Stoddard Ave	Y	W	S		100	1.5	1	0	1	150		014-463-547		24
1399 Stoddard Ave	Y	PTW	S		100	1.5	1	0	1	151		016-384-041		24
1405 Stoddard Ave	Y	PTW	S		100	1.5	1	0	1	152		015-578-470		24
1411 Stoddard Ave	Y	W	FA		100	0.5 - 1.0	1	0	1	153		012-827-941		24
1413 Stoddard Ave	Y (2)	PTW	S		100	0.5 - 1.5	2	0	2	154		014-602-890		24
1417 Stoddard Ave	Y (2)	PTW	FA		100	0.5 - 2.0	1	1	2	155		015-507-297		24
1421 Stoddard Ave	Y	W	FA		100	0.5 - 2.0	1	0	1	156		015-600-793		24
Boulevard Stoddard Access	Y	PTW, S	FA		100	0.5 - 1.0	1	0	1	157				24
1425 Stoddard Ave	Y (3)	PTW, C	S		100	1.5	1	0	1	158		006-146-066		24
1429 Stoddard Ave	Y	W, Tires	FA		100	0.25 - 1.0	1	0	1	159		011-927-101		24
1433 Stoddard Ave	Y	PTW	S		50	0.75	1	0	1	160		015-489-574		24
1437 Stoddard Ave	Y (5)	PTW	N		100	0.75 - 2.0	1	5	6	161		009-398-724		24
1441 Stoddard Ave	Y (2)	PTW	A		100	0.5 - 1.0	1	1	2	162		024-210-609		24
1449 Stoddard Ave	Y (8)	C, W	A		100	1.5 - 2.0	1	7	8	163		014-155-281		24
Calberley Beach Access - Private Trail	Y (4)	PTW	A (below water line) N (upland)		100	1.5	1	3	4	164				24

Appendix E. Wildsight (2006) Retaining Wall Data

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	Y/N (# on property)	C-concrete, S-stone, B-brick/square, cut stone, PTW-pressure treated wood, W-wood, L-logs, M-metal	New, Stable, Aging, Falling Apart	Meters or GPS start and end points of retaining walls / wetlands	Length of wall (+ any additional % or shoreline retained with a boat house)	Meters	Below (#)	Above (#)						
Akiskinook Beach	Y	C	S	IR calculated 78m from: North Point: N 50.28.377' - W 115.59.725' South Point: N 50.28.336' - W 115.59.716'		0.25 - 2.0	1	0	1	165		006-369-774		24
Akiskinook Marina	Y	S (gravel)	A	IR calculated 180m from: North Point: N 50.28.336' - W 115.59.716'; South Point: N 50.28.244' - W 115.59.670'		2	1	0	1	166			7043460000	24
Akiskinook Wetland Area				North Point: N 50.28.253' - W 115.59.673'; South Point: N 50.28.215' - W 115.59.657'						167				24
1541 N. of Yako-Naki	N									168		015-025-756		24
1557 Yako-Naki	Y (2)	C, M	A	40 m		1.0 - 2.0	2	0	1	169, 170	Ya-ko-naki	025-111-451		24
DD21688, DD21690-1, DD13184 (Yako-naki Wetland Area)	N			North Point: N 50.28.121' - W 115.59.706'; South Point: N 50.28.071' - W 115.59.699'						171	025-111-451			25
Windermere Cemetery Small Wetland	N			Small single point wetland location: N 50.27.985' - W 115.59.645'						172				25
Windermere Cemetery Cove Wetland	N			Inlet Wetland: West Point (first point along shoreline heading south): N 50.28.043' - W 115.59.601'; North Point: N 50.28.069' - W 115.59.588'; East Point: N 50.28.027' - W 115.59.567'						173				25
Hidden Bay Marina Beach & Marina Area	Y (5)	W, PTW, S, C	FA		50	0.25 - 1.0	1	0	1	174, 175, 176, 177, 178, 179				26

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	Y/N (# on property)	C-concrete, S-stone, B-brick/square, cut stone, PTW-pressure treated wood, W-wood, L-logs, M-metal	New, Stable, Aging, Falling Apart	Meters or GPS start and end points of retaining walls / wetlands	Length of wall (+ any additional % or shoreline retained with a boat house)	Meters	Below (#)	Above (#)						
DL16274 Wetland Area	Y	L	FA	Small single point wetland location: N 50.27.824' - W 115.59.563' [Length of log retaining wall - 20m]		0.25	0	1	1	180			7046241050	26
DL16274 Windermere Public Beach Area	Y	S	FA		70	0.25 - .50	1	0	1	181				26
DL16274 Windermere Island Wetland Area				Single main shoreline pt for wetland (see notes): N 50.27.730' - W 115.59.597'						182, 183	This wetland extends off of the main shoreline west around the entire Windermere Island			26
Cardiff Cove Marina (has wetland area)	N			Wetland start and end: North Point: N 50.27.718' - W 115.59.534'; South Point: N 50.27.659' - W 115.59.501'						184, 185, 186, 187				26
Shadybrook Marina & Campground Beach Area		L, C	A			1	1	0	1	188				26
Shadybrook Marina & Campground Marina Area		L	A			1.0 - 2.0	1	0	1	189				26
Shadybrook Marina & Campground Wetland Area				Wetland start and end: North Point: N 50.27.530' - W 115.59.590' ; South Point: N 50.27.370' - W 115.59.444'										
	Y	S	S		60	1	1	0	1	190				26
Windermere Creek Outflow	N									191				26
Tretheway Beach	N									192				26
Tretheway Marina	Y (+break water)	S	FA		30	1.5	1	0	1	193		015-423-883		26
Ash Street Access	N									194				26

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	Y/N (# on property)	C-concrete, S-stone, B-brick/square, cut stone, PTW-pressure treated wood, W-wood, L-logs, M-metal	New, Stable, Aging, Falling Apart	Meters or GPS start and end points of retaining walls / wetlands	Length of wall (+ any additional % or shoreline retained with a boat house)	Meters	Below (#)	Above (#)						
4644 Ash St	Y	PTW	A		50	1	1	0	1	195	This house has a boat house built over Jane Creek - the boat is stored in the actual creek outflow	014-921-588		26
Jane Creek Wetland Area	N			North Point: N' 50.27.296' - W 115.59.257 South Point: Unable to mark as inaccessible due to construction. Wetland spans approx 20 meters south along shoreline						196				26
4670 Aeneas Rd (The Beaches)	N (has breakwater)									197	Beaches' property under subdivision - formerly Coldstream Campground			26
Properties 1-20 below are in the Indian Beach Subdivision														26
1	Y	S	N		100	1	1	0	1	198				26
2	Y	W	S		75	1	1	0	1	198				26
3 - 13 on cliff bluff	N									199				26
14-17 property boundaries indescernable	Y	PTW	A	30 m	property boundaries indescernable	1	1	0	1	199, 200				26
18	Y	PTW	FA		100	1	1	0	1	201				26
19	Y	PTW	FA		100	1	1	0	1	201				26
20	Y (2)	S, W	S		100	1.0 - 3.0	1	1	2	202				26

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Lot #	Retaining Wall? (#)	Material	Condition	Length or GPS locations	% of Lot Length	Height	High Water		# of Tiers	Photo #	NOTES	PID Number	GIS LINK	Segment
	Y/N (# on property)	C-concrete, S-stone, B-brick/square, cut stone, PTW-pressure treated wood, W-wood, L-logs, M-metal	New, Stable, Aging, Falling Apart	Meters or GPS start and end points of retaining walls / wetlands	Length of wall (+ any additional % or shoreline retained with a boat house)	Meters	Below (#)	Above (#)						
Indian Beach North	N									203				26
Indian Beach Mid	Y	S	FA				1	0	1	204				26
Indian Beach Wetland Area 1	Y	C	FA	Wetland start and end: North Point: N 50.26.978' - W 115.58.709'; South Point: N 50.26.963' - W 115.58.667'			1	0	1	205				26
Indian Beach Marina / South Area	Y	S	S		10	0.5 - 1.0	1	0	1	206	3 separate retaining walls that span about 10% of the entire property			26
Indian Beach Wetland Area 2	N			Wetland start and end: North Point: N 50.26.925' - W 115.58.652'; South Point: N 50.26.910' - W 115.58.620'						no photo				1
Akiskinook First Nation (AFN) Wetland 1	N			Wetland start and end: North Point: N 50.26.808' - W 115.58.483' ; South Point: N 50.26.096' - W 115.57.557'						207, 208				1
AFN Wetland 2	N			Wetland start and end: North Point: N 50.26.047' - W 115.57.492'; South Point: N 50.25.636' - W 115.56.897'						209, 210				4
AFN Wetland 3				Wetland start and end: North Point: N 50.25.594' - W 115.56.802'; South Point: N 50.25.544' - W 115.56.756'						211				4
AFN Shoreline Lots 3-6	Y (6)	W	FA	100 m	100% of the 3 lots but no lot maps avail for AFN	0.5 - 1.0	1	5	6	212, 212B				4

Appendix E. Wildsight (2006) Retaining Wall Data

Lot #	Retaining Wall? (#)	Material	Condition	Length or GPS locations	% of Lot Length	Height	High Water		# of Tiers	Photo #	NOTES	PID Number	GIS LINK	Segment
	Y/N (# on property)	C-concrete, S-stone, B-brick/square, cut stone, PTW-pressure treated wood, W-wood, L-logs, M-metal	New, Stable, Aging, Falling Apart	Meters or GPS start and end points of retaining walls / wetlands	Length of wall (+ any additional % or shoreline retained with a boat house)	Meters	Below (#)	Above (#)						
AFN Wetland 4				Wetland start and end: North Point: N 50.25.481' - W 115.56.664' South Point: N 50.25.136' - W 115.56.044'						213, 214				5
South End Wetland				Wetland start and end: East side Point: N 50.25.082' - W 115.55.949'; West side Point: N 50.24.811' - W 115.56.754'						215, 216	Wetland wraps from east side to west side of Lake Windermere shoreline. Southern most tip of wetland too shallow to mark			6
South End Wetland										217				6
Rushmere Wetlands				Wetland start and end: South Point: N 50.24.857' - W 115.56.871'; North Point: N 50.25.334' - W 115.57.371'						218, 220	This wetland spans south - north encompassing the Rushmere subdivision			6
Rushmere Subdivision	N									219				6
Westside Wetland 1				Wetland start and end: South Point: N 50.25.336' - W 115.57.432'; North Point: N 50.25.488' - W 115.57.646'						221, 222				7
Westside Wetland 2				Wetland start and end: South Point: N 50.25.537' - W 115.57.703' North Point: N 50.25.682' - W 115.57.968'						223, 224				7
2398 Rualt Rd	Y (2)	PTW	S		100	0.5 - 1.5	1	1	2	225		012-833-061		10
2394 Rualt Rd	Y (2)	PTW	A		100	0.5 - 1.5	1	1	2	226		011-738-219		10
2388 Rualt Rd	Y	PTW	A		100	1	1	0	1	227		014-040-883		10
2384 Rualt Rd	Y (3)	PTW, W	FA		100	1	1	2	3	228		014-039-907		10

Appendix E. Wildsight (2006) Retaining Wall Data

Lot #	Retaining Wall? (#)	Material	Condition	Length or GPS locations	% of Lot Length	Height	High Water		# of Tiers	Photo #	NOTES	PID Number	GIS LINK	Segment
	Y/N (# on property)	C-concrete, S-stone, B-brick/square, cut stone, PTW-pressure treated wood, W-wood, L-logs, M-metal	New, Stable, Aging, Falling Apart	Meters or GPS start and end points of retaining walls / wetlands	Length of wall (+ any additional % or shoreline retained with a boat house)	Meters	Below (#)	Above (#)						
2376 Rualt Rd	Y	PTW, C	N (PTW), FA (C)		100	1	1	0		229		014-039-842		10
Larch Point Wetland 1				end: South Point: N 50.26.109' - W 115.58.332'; North Point: N 50.26.135' - W 115.58.358'						230, 232	This wetland is infront of lot 2370			10
2370 Rualt Rd	Y	S, W	FA		50	0.75	1	0	1	231		014-055-821		10
2366 Rualt Rd	Y	C	A		100	0.75	1	0	1	233		014-040-662		10
Larch Point Wetland 2				Wetland start and end: South Point: N 50.26.145' - W 115.58.362'; North Point: N 50.26.178' - W 115.58.386'						234, 235	This wetland is infront of lot 6			10
6	N									no photo				10
2358-2350 Rualt Rd	N									236				10
2346 Rualt Rd	Y	C	A		100	1.5	1	0	1	237		014-055-813		10
2336 Rualt Rd	Y	W, PTW	FA (W), N (PTW)		100	0.5 - 1.5	1	1	2	238		014-055-791		10
DL 21	N									239				11
Westside Wetland 3				Wetland start and end: South Point: N 50.26.548' - W 115.59.099' North Point: N 50.26.727' - W 115.59.501'						240, 241				11
Westside Wetland 4				Wetland start and end: South Point: N 50.26.816' - W 115.59.695' North Point: N 50.27.258' - W 116.00.131'						242, 243				11

Appendix E. Wildsight (2006) Retaining Wall Data

Lot #	Retaining Wall? (#)	Material	Condition	Length or GPS locations	% of Lot Length	Height	High Water		# of Tiers	Photo #	NOTES	PID Number	GIS LINK	Segment
	Y/N (# on property)	C-concrete, S-stone, B-brick/square, cut stone, PTW-pressure treated wood, W-wood, L-logs, M-metal	New, Stable, Aging, Falling Apart	Meters or GPS start and end points of retaining walls / wetlands	Length of wall (+ any additional % or shoreline retained with a boat house)	Meters	Below (#)	Above (#)						
Westside Wetland 5				Wetland start and end: South Point: N 50.27.306' - W 116.00.209' North Point: N 50.27.597' - W 116.00.555'						244, 245				11
Westside Wetland 6				Wetland start and end: South Point: N 50.27.641' - W 116.00.588' North Point: N 50.27.748' - W 116.00.578'						246, 248	This wetland is in front of lot 1616			11
1616	N									247	Red caboose house			?
Lot 3 Coy Rd	Y	R	FA		80	1.0 - 1.5	1	0	1	249, 252				12
Westside Wetland 7				Wetland start and end: South Point: N 50.27.777' - W 116.00.598' North Point: N 50.27.876' - W 116.00.627'						250, 251				12
Coy Rd Lot 2	Y	S	FA		60	0.5 - 2.0	1	0	1	253	Has 2 houses on lot / subdivided			12
Coy Rd 4404	N									254				12
Westside Wetland 8				Wetland start and end: South Point: N 50.28.037' - W 116.00.764' North Point: N 50.28.118' - W 116.00.884'						255, 256				
Dome House	N									256B				
Taynton Wetland A				Wetland start and end: South Point: N 50.29.391' - W 116.01.580' North Point: N 50.29.423' - W 116.01.618'						257				

Appendix E. Wildsight (2006) Retaining Wall Data

Lot #	Retaining Wall? (#)	Material	Condition	Length or GPS locations	% of Lot Length	Height	High Water		# of Tiers	Photo #	NOTES	PID Number	GIS LINK	Segment
	Y/N (# on property)	C-concrete, S-stone, B-brick/square, cut stone, PTW-pressure treated wood, W-wood, L-logs, M-metal	New, Stable, Aging, Falling Apart	Meters or GPS start and end points of retaining walls / wetlands	Length of wall (+ any additional % or shoreline retained with a boat house)	Meters	Below (#)	Above (#)						
Taynton Wetland B				Wetland start and end: South Point: N 50.29.503' - W 116.01.725' ;North Point: N 50.29.599' - W 116.01.783'						258				
KPOKYL	Y	C, S	FA	100m (includes KPOKYL property west towards Kinsmen properties)		0.5 - 2.0	1	0	1	259	KPOKYL beach is private property. There is a public beach area to the east with a stone retaining wall that is included in this entry as it is continuous from the KPOKYL concrete retaining			13?
Kinsmen Residential Properties	Y	S	N		100	1	1	0	1	260, 261				14
Kinsmen Public Beach	N									-				15
12	N									262				
2649	Y	W	FA		80 (+15 BH)	0.2				263				16
AB	Y (3)	W	S		75	0.2 - 1.0	1	2	3	264				16
18 668 A	Y (2)	C	A		75 (+25 BH)	1.5 - 2.0	1	1	2	265				16
NEP 20886	Y (2)	B	N		50 (+50 BH)	0.5	1	1	2	266				16
8 (1736 3rd Ave)	Y (2)	S, C	FA (S), N (C)		50 (+50 BH)	0.5	1	1	2	267				16
5	Y	W	A		60 (+15 BH)	2	1	0	1	268				16
CD, EF, GH (1752 3rd Ave)	Y (5)	M, C, S	S		90 (+10 BH)	1.0 - 2.0	1	4	5	269				16
A	Y (6)	PTW	N		100	1.5 - 3.0	2	4	6	270				16
P2649 1	Y (6)	M, PTW	S		90	1.0 - 2.0	2	4	6	271				16
P14825 A	Y	M	S		100	2.0 - 2.5	1	0	1	272				16

Appendix E. Wildsight (2006) Retaining Wall Data

Lot #	Retaining Wall? (#)	Material	Condition	Length or GPS locations	% of Lot Length	Height	High Water		# of Tiers	Photo #	NOTES	PID Number	GIS LINK	Segment
	Y/N (# on property)	C-concrete, S-stone, B-brick/square, cut stone, PTW-pressure treated wood, W-wood, L-logs, M-metal	New, Stable, Aging, Falling Apart	Meters or GPS start and end points of retaining walls / wetlands	Length of wall (+ any additional % or shoreline retained with a boat house)	Meters	Below (#)	Above (#)						
1	Y (2)	C, PTW	FA		100	1.5 - 2.0	1	1	2	273				16
IJ	Y (3)	C, PTW	FA		100	1.5 - 2.0	1	2	3	274				16
P.	Y	C	FA		100	1.5	1	0	1	275				16
A 11009	Y (6)	C, PTW	FA (below water line only)		100	1.5 - 2.0	1	5	6	276				16
MN	Y (5)	C, PTW	S		100	2.0 - 3.5	1	4	5	277				16
P.6264 'O'	Y (2)	C, PTW	A		100	1.0 - 2.0	1	1	2	278				16
P.6264 'A'	Y (6)	C, PTW, B	S		100	1.0 - 2.0	1	5	6	279				16
P.6264 'B'	Y (3)	C, PTW	A		100	2	1	2	3	280				16
P.6264 'C'	Y (2)	C	S		100	1.0 - 2.0	1	1	2	281				16
P.6264 'D'	Y	C	A		100	1.0 - 1.5	1	0	1	282				16
P.6264 'E'	Y (4)	C, S	S		90 (+10 BH)	1	2	2	4	283				16
P.6264 'F'	Y (4)	C, PTW	FA		100	1	1	3	4	284	This lot has been subdivided			16
P.2649 18	Y	C, S	A		20	0.5 - 1.0	1	0	1	285				16
P.9481 A	Y	C	A		100	1	1	0	1	285				16
P.2649 A	Y (3)	C, S	A		100	1.0 - 1.5	2	1	3	286				16
B	Y	C, B	FA		100	2.5	1	0	1	288				16
P.12034 'A'	Y	C	FA		60	1.5 - 2.0	1	0	1	289				16
P.12034 '3' (Big 3)	Y (2)	C	FA		80 (+20 BH)	0.5	1	1	2	290				16
Double Dot	Y (2)	C, S	A		80	0.5 - 1.0	1	1	2	291				16
little '3'	Y (3)	C, PTW	FA		90 (+10 BH)	1.0 - 2.0	1	2	3	292				16

Appendix E. Wildsight (2006) Retaining Wall Data

Lot #	Retaining Wall? (#)	Material	Condition	Length or GPS locations	% of Lot Length	Height	High Water		# of Tiers	Photo #	NOTES	PID Number	GIS LINK	Segment
	Y/N (# on property)	C-concrete, S-stone, B-brick/square, cut stone, PTW-pressure treated wood, W-wood, L-logs, M-metal	New, Stable, Aging, Falling Apart	Meters or GPS start and end points of retaining walls / wetlands	Length of wall (+ any additional % or shoreline retained with a boat house)	Meters	Below (#)	Above (#)						
Triple Dot Canterbury Beach	Y	C	FA		100	1	1	0	1	293				16
1 Canterbury Beach	Y	C	FA		50	1	1	0	1	294				16
11 Canterbury Beach	N									295				16
Quad Dot Canterbury Beach	N									296				16
1 Canterbury Beach	N									297				16
2 Canterbury Beach	N									297				16
15 Canterbury Beach	N									298	Canterbury Beach Properties			16
X	Y (5)	C, B, PTW	S		100	2	1	4	5	299				16
Y	Y (3)	C, S	A		100	0.5 - 2.5	1	2	3	300				16
FP 5	Y (3)	C	FA		100	2.0 - 3.0	1	2	3	301				16
P.4124 A	Y (4)	PTW	FA		100	0.5 - 3.0	1	3	4	302				16
(Unmarked under large 1)	Y (4)	PTW	FA		100	1.0 - 3.0	1	3	4	303				16
P.4124 '1' (Small 1)	Y (3)	PTW	FA		100	1.0 - 2.0	1	2	3	303				16
L3737	Y (3)	C, PTW, B	FA		100	1.0 - 2.0	1	2	3	304				16
Athalmer - James Chabot Wetland	N			Wetland start and end:South Point: N 50.30.494' - W 116.01.440' ;North Point: N 50.30.557' - W 116.01.387'						305, 306				18
P.2139 (Lakeside Pub)	Y (2)	W	S (above water) FA (below water)		20	0.5 - 2.0	1	1	2	307				18

Appendix F. Segment Descriptions

Summary descriptions and Level of Impact (LoI) of each Segment are provided below. Segment delineation was initiated mid way along the east shore of Windermere Lake (starting with Segment 1), and circumvented clockwise around the lake, ending at Segment 26. Segment locations can be found in map format in Appendix E. See Section 2 Methodology for additional descriptions of shore type designations and LoI.

In some Segments the percentage disturbed was reported as high (100%), while the LoI remained low. This occurrence was particularly seen in Segments 7, 8 and 11, located on the south west side of the lake, which have the Canadian Pacific Railway running alongside the shore. Although the railway's presence was considered to have disturbed the Segment, the overall impact (particularly relative to other development types such as commercial or urban residential) was not considered to be high.

Segment 1 (239m) – LoI Low

Segment 1, located along the Columbia Lake Indian Reserve (Indian Reserve #3), is comprised of 100% cliff/bluff that is in a natural condition. The riparian area is moderately vegetated (5-20%), and is primarily made up of tall shrubs (2-10m). The littoral zone at this site is shallow, which is characteristic of the entire lake perimeter. Thirty-five percent of the littoral zone is composed of submerged aquatic vegetation. Wildlife usage was evident here, with swallow nests in the banks, recent wildlife tracks up the clay bank from the water, and osprey sightings.

Segment 2 (1095m) – LoI Low

Segment 2 is located along Indian Reserve #3 and is in a natural condition. The shore type of this Segment is predominantly cliff/bluff (78%), with some vegetated shoreline area (12%). The riparian area is classified as a mixed forest, provides moderate cover, and is dominated by tall shrubs. There are some snags in this area (≥ 5). Sixty-two percent of the aquatic area contains submerged vegetation and 38% contains emergent vegetation. Swallow nests are evident in the banks, and turkey vultures and grebes were sighted during the field review.



Figure 1. Segment 2 is undisturbed, is mainly cliff/bluff shoreline, and has an abundantly vegetated littoral area.

Segment 3 (1878m) – Lol Low

Segment 3, is located along Indian Reserve #3. This Segment is in a natural condition. The shore type is mainly a mix of cliff/bluff (45%) and wetland (45%), with some vegetated shoreline (10%). The riparian vegetation is classified as a mixed forest, and the area is abundantly vegetated (>20%), mostly with tall shrubs. A number of veteran trees exist in this Segment (≥ 5). Much of the aquatic area is vegetated with 65% covered by submergent and 35% with emergent vegetation types. During the field review the following wildlife features/sightings were noted: a large diameter wildlife tree with a large cavity, a large burrow, osprey, and grebes.



Figure 2. The south east side of Windermere Lake remains generally unaltered. The cliff/bluff and wetland shore types as seen here in Segment 3 are found along much of this portion of the lake.

Segment 4 (962m) – Lol Low

This Segment is in the Indian Reserve #3, and includes a residential area. Although approximately 50% of this shoreline Segment has urban development, the remaining 50% is in a natural condition, and the overall impact to the shoreline remains low. This site is mainly sandy beach (50%), with some cliff/bluff (20%), wetland (25%), and gravel beach (5%) shore types. Riparian vegetative cover is sparse in this Segment with the mixed mature forest providing less than 5% cover to the area. Six wood retaining walls have been constructed along the shoreline below the dwellings. Five wooden docks are also present. A high value wetland is located at the tributary mouth in this Segment with 80% of the aquatic area estimated to contain submergent vegetation and 20% emergent vegetation.



Figure 3. Urban development in Segment 5 comprises approx. 50% of the shoreline, and the remaining area is in a natural condition.

Segment 5 (1748m) – Lol Low

This Segment, also in Indian Reserve #3, is in a natural condition. The shore type is primarily cliff/bluff (45%) but also contains some wetland (40%) and vegetated shore (15%) areas. The shoreline is moderately vegetated (5-20%), and is composed primarily of tall shrubs (2-10 m). There are a number of veteran trees (≥ 5) as well as a few snags (< 5) evident. The aquatic area contains approximately 80% submergent and 20% emergent vegetation. During the field review swallows, a bald eagle, and Canada geese were observed and the wetland/gully was noted as high value.

Segment 6 (3095m) - Lol Low

Segment 6 encompasses the southern tip of the Windermere Lake. Other than a small section (approximately 10% of area) on the western side being occupied by the Canadian Pacific Railway (CPR), most of the shoreline is in IR3 and is a natural wetland. The riparian area is aptly classified as natural wetland and riparian cover is abundant ($> 20\%$). Fifty-five percent of the aquatic area is covered by submerged vegetation and 45% by emergent vegetation.



Figure 4. Segment 6 is undisturbed wetland area.

Segment 7 (865m) – Lol Medium

The CPR runs along the entire shoreline length of Segment 7. As well, the northern part of this Segment contains a residential development immediately behind the railway (for approximately 20% of the Segment). Due to these land issues, 100% of the shoreline is estimated to be disturbed. The shore type of this section is a mix of cliff/bluff, wetland, and low rocky shore (each at 30%) as well as vegetated shoreline (10%). The riparian vegetation is disturbed, sparse (providing less than 5% shore cover), and where evident, is predominantly tall shrubs. Ninety percent of the aquatic area is vegetated with submerged plants, while 10% contains emergent vegetation. Seven wooden docks have been constructed along the shoreline.



Figure 5. The CPR runs the length of Segment 7, and some residential area lies beyond (the railway) in the northern end.

Segment 8 (1584m) – Lol Low

Segment 8 is comprised of 40% each of vegetated and wetland shore types, as well as 10% each of cliff/bluff and low rocky shore types. The CPR runs the length of the shoreline. Approximately 40% of this Segment is also impacted by residential development that is located immediately behind the railway. The riparian area shows signs of disturbance, is moderately covered, and composed primarily of low shrubs. The aquatic area contains approximately 75% submergent and 25% emergent vegetation. This is the first of the Segments reported so far (of Segments 1-8) to show signs of compaction. Juvenile fish were noted using the submergent vegetation and waterfowl were observed in the area.



Figure 6. This portion of Segment 8 has not been disturbed by residential development, but has been impacted by the railway.

Segment 9 (892m) – Lol Low

The shoreline of Segment 9 is vegetated shore type, is in a natural condition, and is located entirely on Crown Land. The riparian vegetation is classified as mixed forest, contains mainly tall shrubs, provides abundant cover, and includes several veteran trees (≥ 5). Riparian overhang along the lake is good providing 25% coverage. One hundred percent of the aquatic area is vegetated with emergent plants.

Segment 10 (773m) – Lol Medium

Segment 10 is mainly vegetated shoreline shore type (85%), but also contains some cliff/bluff (10%) and wetland (5%) areas. This Segment shows signs of disturbance related to the residential development that is located along the shoreline. The riparian area is moderately covered with a mixed forest at the sapling (>10 m) structural stage. In terms of aquatic vegetation, 97% of the area contains submerged plants, while 3% of the area contains emerged plants. The overhanging riparian vegetation is good here, providing 25% coverage along the shoreline. Thirteen retaining walls (constructed of various materials), 10 wooden docks, 7 boathouses and 1 launch exist along the shore of this Segment.



Figure 7. The attributes of Segment 10 are evident in these photos, which show moderate impacts on the shoreline as a result of residential development.

Segment 11 (3868m) – Lol Low

Segment 11 is 80% low rocky shore type, and cliff/bluff and vegetated shore type (10% of each). Approximately 85% of this Segment is impacted by the CPR while a small area is in natural condition due to a crown land outcropping which provides some buffering from the railway. Although riparian disturbance is evident, the vegetation is in a mature forest stage, and provides moderate cover. Several (≥ 5) veteran trees and snags exist in this Segment. There is an abundance of submerged aquatic vegetation (92%), as well as some (8%) emergent areas. Modifications to the shoreline include 2 wooden docks. Numerous wildlife trails were noted along the shoreline, as well as a high value grassland communities and a wildlife lick.

Segment 12 (1090m) – Lol Low

Segment 12 is comprised mainly of vegetated shore type (70%), but also has gravel beach (15%), sand beach (10%) and wetland (5%) features. Sixty percent of the shoreline is estimated to be in a natural condition, and the remaining 40% is disturbed. The primary land use here is the CPR, which runs along 48% of the shore. Twenty-five percent of the area also has residential development and 36% is undeveloped private land. Riparian vegetation here provides abundant cover, is in a natural state, and is classified as a mature broadleaf forest. This riparian area is considered to be high value, particularly due to the cottonwood and the wetland. Numerous (≥ 5) riparian veteran trees and snags exist in this Segment. A substantial part of the shoreline (60%) contains overhanging riparian cover. The aquatic area is 68% covered by submergent and 82% covered by emergent vegetation. Two stonework retaining walls, a stonework groyne and a boat launch have been constructed along the shoreline in this Segment.

Segment 13 (3550m) – Lol Low

This Segment is located on private land, and is located on the southern outskirts and just within the boundaries of the District of Invermere. It is mainly low rocky shore (80%), and also includes vegetated shore type (15%) and wetland areas (5%). The CPR runs the length of this Segment and contributes to its disturbed condition (100%). The riparian area shows disturbance, and is mainly mature coniferous forest that provides moderate coverage to the foreshore. Riparian veterans and snags (≥ 5 for each) are present. Ninety-five percent of the aquatic community is vegetated with submerged plants, while 5% has emergent plants. The isolated wetland in this Segment is considered high value, and motorized impacts were noted on the upland grasslands during the survey.



Figure 8. Segment 13, showing Taynton Bay, and the railway running along the length of the shoreline.

Segment 14 (256m) – Lol High

Segment 14 is a small area located within the District of Invermere. The shoreline is 100% disturbed as a result of urban residential development. Gravel beach predominates (90%), and some vegetated shoreline (10%) is also present. The riparian area is classified as herbs/grasses, is mainly composed of low shrubs, and provides abundant cover. One large stone retaining wall runs the entire length of this Segment and 2 wooden docks have also been erected.

Segment 15 (164m) – Lol Medium

Kinsman Beach City Park is located along the shoreline of Segment 15. The park provides recreational opportunities to the public and has altered the shoreline (100%) from its natural condition. The shore type here is half sand beach and half gravel beach. The riparian area is composed of a mature broadleaf forest, which provides abundant (>20%) cover to the area. Erosion along the eastern shoreline of the park was also evident (i.e. exposed tree roots) during the field review. There is little aquatic vegetation.



Figure 9. View inland from shore of Segment 15, which includes Kinsman Beach Park.

Segment 16 (1539m) – Lol High

Segment 16 is predominantly vegetated shore type (90%), which has been 100% disturbed by residential development. The urbanized riparian area provides abundant cover, and contains a mixed mature forest. Numerous (≥ 5) riparian veteran trees are evident. There are an extensive number of retaining walls in this Segment (109 made of a mixed variety of materials). Forty-three wooden docks, 4 stonework groynes, 1 marina and 26 boathouses are also evident along this stretch of shoreline. Numerous sheds sit below high the water mark. There is little aquatic vegetation here.



Figure 10. Urban development along the shoreline of Segment 16 includes dock and retaining wall shoreline modifications.

Segment 17 (696m) – Lol Medium

The shore type of Segment 17 is a mixture of vegetated rocky shore (40%), low rocky shore (40%), and cliff/bluff shore (20%). Approximately 70% of this site is estimated to have been disturbed. The CPR runs along 60% of this Segment, and the remainder of the shoreline (40%) is commercial development. Further disturbance to this Segment is expected since it is adjacent to downtown Invermere, and plans are in place for a resort development. Although disturbed, the

riparian area provides abundant cover to this Segment, and is primarily made up of broadleaf saplings >10m. There is little aquatic vegetation here (10% submerged). Three wooden docks and 1 concrete groyne have been built.



Figure 11. Shoreline along Segment 17, showing location for water side resort development (LHS) and downtown Invermere beyond the shoreline (RHS).

Segment 18 (594m) – Lol Medium

Segment 18 runs along James Chabot Provincial Park (100% park). The shoreline is mainly gravel beach (45%) and sand beach (45%) shore types. A valuable wetland area also comprises 5% of the shoreline. Approximately 40% of this Segment remains in a natural condition. The riparian area provides abundant cover of herbs/grasses (mainly low shrubs <2m). Approximately 15% of the aquatic area in this Segment contains submerged vegetation, while 10% contains emergent vegetation. There is 1 wooden dock, 1 wooden retaining wall, and a boardwalk in this Segment. An Osprey nest is located in the parking lot.



Figure 12. Segment 18 is bordered by James Chabot Provincial Park.

Segment 19 (268m) – Lol High

Segment 19 is located at the outlet of Windermere Lake. This Segment is vegetated shore line, which has been 100% disturbed. It is all commercial land use and has a hotel/convention centre planned for construction. Some current sources of the disturbance are 1 wooden retaining wall, and a clearing at a site of a future resort. The riparian vegetation consists of tall shrubs, which provide moderate coverage to the area. The aquatic area contains 65% coverage with submerged vegetation and 35% with other vegetation. The area is highly used by waterfowl. There is a public easement along the shoreline allowing for pedestrian access.



Figure 13. Segment 19 located at the outlet of Windermere Lake, is the shoreline area between the markers in this photo.

Segment 20 (1054m) – Lol High

Segment 20 lies at the north east end of Windermere Lake. This entire Segment has residential development, which is the primary disturbance along the entire shoreline. The shore type is mainly vegetated shoreline (60%), with some gravel beach (30%) and sand (10%) beach types. The riparian vegetation is classified as a mature broadleaf forest, and provides moderate coverage. Fifty percent of the aquatic area contains submerged vegetation. There have been a number of structures built along the shoreline including 65 retaining walls (mixed materials), 32 wooden docks and 4 stone groynes. A variety of wildlife was observed during the field review, including a belted kingfisher, osprey, pileated woodpecker, northern flicker, sandpiper, goldeneye, and otters.



Figure 14. Most of the shoreline along Segment 20 has disturbed by residential development.

Segment 21 (1154m) – Lol High

This Segment has been disturbed by residential development, which covers 100% of the area. The shore type here is predominantly vegetated (50%), although there is also a substantial amount of gravel beach (40%), as well as some cliff/bluff and low rocky shore (5% each). The riparian vegetation is composed of a mixed mature forest, which provides moderate coverage to the area. Forty percent of the aquatic area is covered with submerged aquatic vegetation. There are numerous structures built along the shoreline including 80 retaining walls (mixed construction materials), 27 wooden docks, 9 stonework groynes, and 26 boathouses.



Figure 15. Lower Lake View Road along Segment 21.

Segment 22 (940m) – Lol Medium

The land use of Segment 22 is mainly private recreational (87%), held by Timber Ridge Marina and Beach Resort. At the north end of the Segment there is a small public park (13%) at the mouth of Holland Creek. This Segment is mainly cliff/bluff shore type (60%), with some sand beach and vegetated shore type areas (20% each). The riparian area is composed of mature broadleaf vegetation, which provides abundant cover. Six retaining walls (of mixed construction materials), 3 wooden docks, 1 stonework groyne, 1 marina, and 12 boathouses have been constructed along this Segment. Wildlife notes from the field review indicate that:

- the mouth of Holland Creek provides important wetland habitat and is used by Kokanee moving in and out of Holland Creek;
- wildlife tracks were observed from the lake to a burrow located in the clay bank;
- the natural grassland slope is high value; and

- an eagle, gulls, crow, swallow were seen.



Figure 16. North end of Segment 22 showing the public park along the north side of Holland Creek, and the Timber Ridge marina and beach private recreational properties.

Segment 23 (1328m) – Lol Medium

Eighty percent of Segment 23 consists of residential properties, and the remaining 20% is private recreational property (i.e. Baltac Beach). These land uses are estimated to have disturbed 75% of the foreshore. The shore type here is a mix of vegetated shore (40%), cliff/bluff (25%), and sand beach (35%). The riparian vegetation is made up of a mature broadleaf forest that provides abundant cover to the shoreline. Structures built along the shoreline include 88 retaining walls (mixed materials), 18 wooden docks, 2 stonework groynes, 1 marina, and 12 boathouses. Bank erosion is evident along the exposed bank areas.



Figure 17. Segment 23 showing the Baltac Beach (private) on the left and the Baltac residential community on the right

Segment 24 (1800m) – Lol High

The land use of Segment 24 is composed of approximately half residential and half private recreational (50%) properties. The recreational developments include strata type complexes, such as Terra Vista, Calberley and Akiskinook resorts. These resorts are officially zoned as multi-family residential (R-3; RDEK 2007b). However, for the purposes of this review, they are described as being recreational in nature, because of their private recreational foreshore facilities such as marinas and beach access. The land uses have contributed to disturbance along most of the foreshore (95%). This Segment is mainly vegetated shore type (65%), and there is also some sand beach (20%), cliff/bluff (10%) and wetland (5%) shore types here. The riparian area

is a mixed mature forest that provides abundant cover. Riparian veteran trees are evident (≥ 5). A total of 46 retaining walls (of mixed materials), 17 wooden docks, 1 stonework groyne, 2 marinas, and 13 boathouse structures are evident along this section of shoreline. The first evidence along the eastern shore of undisturbed shoreline and intact upland forested habitat was encountered in this Segment (coming from the north).



Figure 18. Half of Segment 24 has private recreational type developments along the foreshore such as that at Terra Vista Resort and Marina and Calberley Beach (both near the centre of the photo).



Figure 19. Segment 24 Akiskinook Resort and Marina (private), located near the south end of Segment 24, has contributed to disturbance along a large upland portion of the shoreline.

Segment 25 (663m) - Lol Low

Eighty percent of Segment 25 is located in a cemetery/park and is in a natural state. The remaining 20% is located on the eastern side of the Hidden Bay and is influenced by a road right of way and residential properties (just beyond the road). The shore types here are: vegetated shore (35%), gravel beach (33%) and wetland (32%). The riparian vegetation is mainly tall shrubs, which provide abundant cover. Several (≥ 5) riparian veterans and snag trees also exist here. The overhang of riparian vegetation into the water column is also substantial, at 40%. Overall, this area is viewed as providing one of the most important habitats on the north eastern

shore. There were several additional field notes made, relating to the high quality habitat in this Segment; these are as follows:

- very good natural shoreline vegetation on the point below the cemetery;
- important isolated wetland below the cemetery and at the head of the bay;
- largest natural protected bay (Hidden Bay) on eastern shore of Windermere Lake provides an important area for waterfowl refuge;
- natural plant communities in the undeveloped areas; and
- topography provides protection.



Figure 20. Segment 25 is all park and provides one of the most important habitats on the north eastern shore of Windermere Lake. The left photo shows the cemetery and the right photo shows the isolated wetland below the cemetery (photos provided by Wildsight).

Segment 26 (3459m) – Lol Medium

The shoreline of Segment 26 is composed of 45% private recreational, 25% residential, 20% Crown (Transportation and Highway right of way), and 10% park land. The private recreational lands include properties such as Cardiff Cove Marina, Shadybrook Marina, Trethaway Beach and Marina, and Indian Beach Marina. The park-land is the Town of Windermere's public beach, and is unique in that it includes the only island on Windermere Lake. The island provides important nesting foraging and perching habitat.

The shore types of this Segment include gravel beach, vegetated and wetland (all at 25%), sand beach (20%) and cliff/bluff (5%). Approximately 30% of the foreshore is in a natural condition. The riparian vegetation is comprised of mainly tall shrubs, which provide abundant cover.

Several riparian veteran trees and snags are evident in this Segment. The aquatic vegetation is varied, covered by 60% submergent plants, and 20% each of emergent and other plant types.

Several structures have been constructed along the foreshore including 24 retaining walls (of mixed materials), 31 wood docks, 6 stonework groynes, 4 marinas, and 8 boathouses. One non-conforming boat house structure located above the outlet of Jane Creek was identified during the field review. This structure is believed to create a barrier to fish movement upstream (Figure 33). The photos provided (Figures 32- 34) progress along the shoreline of Segment 26 in a southerly direction. The riparian habitat at the outlet of Windermere Creek is considered to be important.



Figure 21. Segment 26 - Windermere public beach and the private Cardiff Cove Marina (left); right hand photo shows Shadybrook Marina (private) and valuable riparian / foreshore habitat at outlet of Windermere Creek.



Figure 22. Segment 26 – Left photo shows Trethaway Beach Marina (private), and what was previously Coldstream campground; the right hand photo depicts a closer view of a boat house which is believed to inhibit fish access up Jane Creek.



Figure 23. Southern end of Segment 26 has Indian Beach Resort and Indian Beach Marina (private).

Appendix G. Data Tables with Details for Figures in Results (Section 3)

Figure 6. Natural and disturbed values for each of the Segment groupings of Windermere Lake, depicted as a length (m) of the total foreshore, and a percentage (%) of each Segment grouping.

Segment Grouping	Natural (m)	Disturbed (m)	Sum (m)	% Natural	% Disturbed
South East (Seg. 1-6)	8227	791	9017	91	9
South West (Seg. 7-12)	2513	5696	8209	31	69
District of Invermere (Seg. 13-19)	446	6621	7067	6	94
North East (Seg. 20-26)	2461	7939	10400	24	76

Figure 7. Land uses along the foreshore of Windermere Lake, depicted as length (m) coverage along shoreline, percentage of total foreshore length (%); with an indication of whether the land use generally maintains a natural condition or contributes to disturbance.

	CPR (29%)	Residential (24%)	Undeveloped Indian Reserve (23%)	Private Recreational (11%)	Crown (6%)	Park (5%)	Commercial (2%)
Generally Natural	0	0	8227	0	2164	878	0
Generally Disturbed	10440	8491	0	3934	0	878	547

Figure 8. Land use type and extent (m) for each Segment grouping along the shoreline of Windermere Lake.

	CPR	Residential	Undeveloped Indian Reserve	Private Recreational	Crown	Park	Commercial	Total Length
South East (Seg. 1-6)	309	481	8227	0.00	0	0.00	0	9017
South West (Seg. 7-12)	6163	1046	0	393	1472	0.00	0	9074
District of Invermere (Seg. 13-19)	3968	1749	0	0.00	0	758	547	7067
North East (Seg. 20-26)	0	5168	0	3541	692	999	0	10400
								35559

Figure 9. Length (m) and percentage (%) of total foreshore for each Shore Type along Windermere Lake.

	Vegetated Shore (30%)	Wetland (20%)	Low Rocky Shore (19%)	Cliff/bluff (15%)	Sand Beach (8%)	Gravel Beach (7%)	Total Length
Shoreline length (m)	10717.80	7240.41	6688.99	5399.91	2749.91	2652.22	35449
% of Total	30.14	20.36	18.81	15.19	7.73	7.46	100

Figure 10. Shoreline Type and extent (m) for each Segment grouping along the shoreline of Windermere Lake.

	Cliff/bluff	Gravel beach	Sand beach	Vegetated	Low rocky	Wetland	Total
South East Shore (Seg. 1-6)	2917	48	481	581		4880	9017
South West Shore (Seg. 7-12)	882	164	109	3420	3513	987	9074
District of Invermere (Seg. 13-19)	293	579	349	2520	3119	207	7067
North East Shore (Seg. 20-26)	1307	1861	1810	4196	58	1167	10400

Figure 11. Total numbers of modifications along the foreshore of Windermere Lake

Retaining Walls	Docks	Groynes	Marinas	Boat Houses	Boat Launches
443	202	29	9	107	2

Figure 12. Number of modifications (by type) per kilometer for each Segment grouping along the shoreline of Windermere Lake.

Segment Grouping	Retaining walls	Docks	# Structures /km		Boat Houses	Boat Launches
			Groynes	Marinas		
South East (Seg. 1-6)	0.665	0.550	0	0	0	0
South West (Seg. 7-12)	1.65	2.100	0.11	0	0.77	0.2
District of Invermere (Seg. 13-19)	16	7.100	0.7	0.14	3.7	0
North East (Seg. 20-26)	30	12.300	2.2	0.76	7.1	0

Figure 13. Total Segment length (m) and retaining wall length (m and % of total) for Segments with retaining walls present.

Segment Number	Segment Total Length (m)	Retaining wall length (m)	% of shoreline with retaining wall
4	963	100	10
10	773	364	47
12	1090	158	14
13	3550	100	3
14	256	256	100
16	1539	1255	82
18	594	31	5
20	1054	655	62
21	1154	1048	91
22	940	555	59
23	1328	680	51
24	1801	1051	58
26	3459	848	25

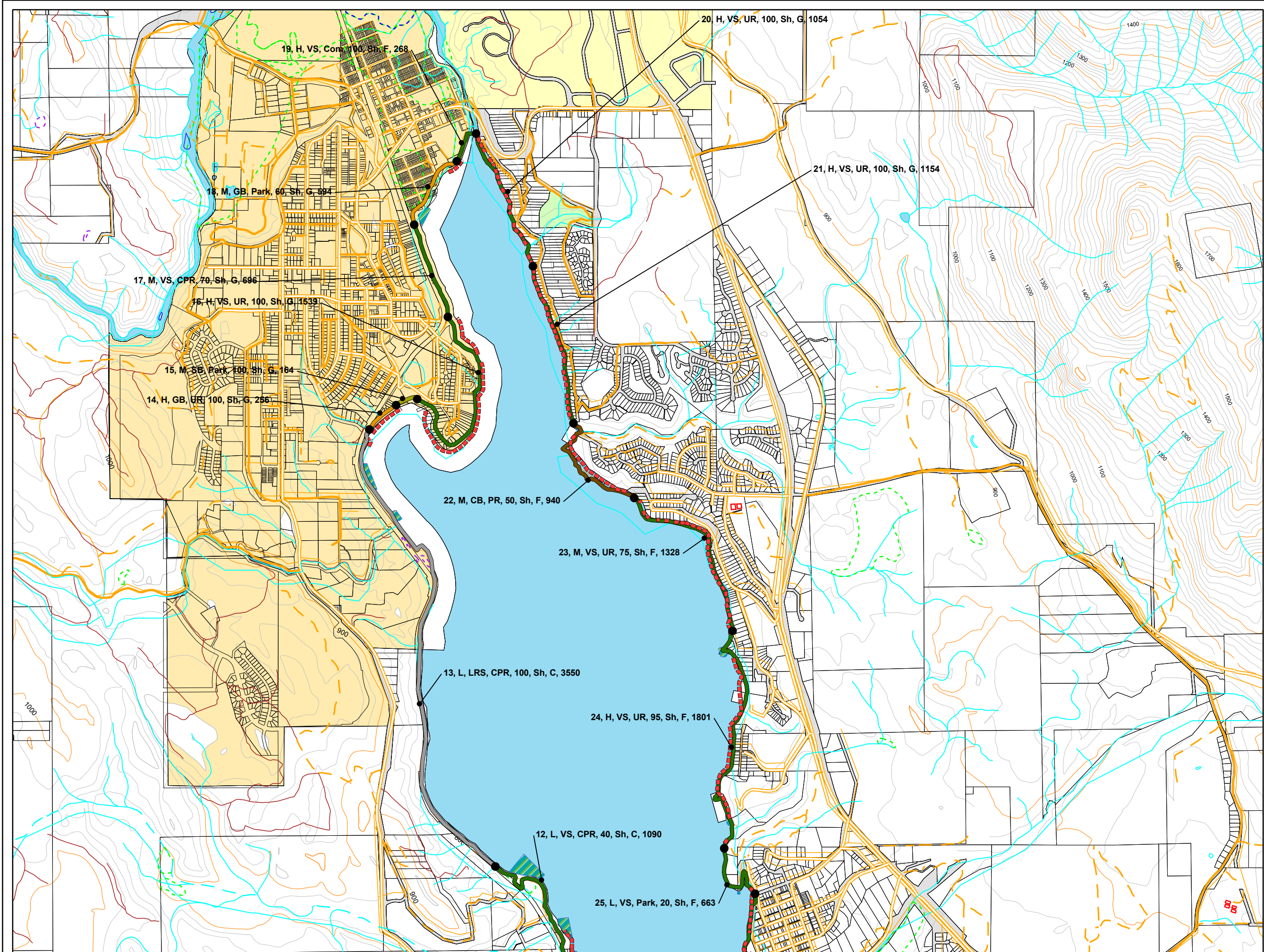
Figure 14. Length (m) and percentage (%) of total foreshore area for each Level of Impact Type (high, medium, low) along the foreshore of Windermere Lake.

	Low (58%)	Medium (25%)	High (17%)
Length (m)	20667	8820	6072
% of Total	58	25	17

Figure 15. Level of Impact for each of the Windermere Lake Segment groupings, depicted as length (m) of the total shoreline, and as a percentage (%) of each Segment grouping.

	Low	Medium	High	Sum	% Low	% Med	% High
South East Shore (Seg. 1-6)	9017	0	0	9017	100		
South West Shore (Seg. 7-12)	7436	1639	0	9074	82	18	
District of Invermere (Seg. 13-19)	3550	1454	1808	6812	52	21	27
North East Shore (Seg. 20-26)	663	5728	4009	10400	6	55	39

Appendix H. Foreshore Summary Maps



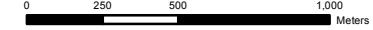
**WINDERMERE LAKE FORESHORE
INVENTORY AND MAPPING**

Appendix I: Foreshore Summary Map

Map 1 of 2

Date: 2007/04/16

Scale: 1:25,000



Fisheries and Oceans Canada
- Pacific Region

Legend

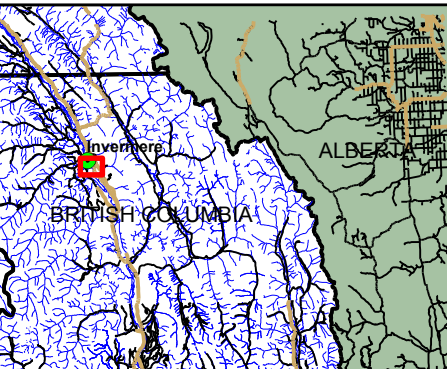
- Dominant Shore Type**
- Cliff/Bluff
 - Gravel Beach
 - Low Rocky Shore
 - Sand Beach
 - Vegetated Shore
 - Wetland
 - Segment Break (100m)
 - Intermediate Contour (20m)
 - Retaining Wall (Location Offset)
- City of Invermere**
- Indian Reserve
 - Park
 - Roads and Access
 - Waterbody
 - Wetland
 - Highway
 - Secondary Road
 - Gravel Road
 - Unclassified Road
 - Trail

Note: Retaining wall and wetland data is an interpreted overview from Wildsight's data. For detailed list of retaining walls refer to Wildsight's record.

Segment Number	Shore Type	Level of Impact	Primary Land Use	Littoral Zone	Dominant Substrate	Length (m)
1, M, CB, UR, 50, Sh, G, 1200						

- Land Use**
- Res - Residential
 - Com - Commercial
 - Ag - Agriculture
 - P - Park
 - Ind - Industrial
 - CP - Crown Provincial
 - UIR - Undeveloped Indian Reserve
 - CPR - CP Railway
- Littoral Zone Depth**
- D - (Deep)
 - M - (Moderate)
 - Sh - (Shallow)
- Level of Impact**
- Low - No or limited signs of disturbance and foreshore impacts
 - Moderate - Moderate signs of disturbance and foreshore impacts
 - High - Extensive signs of disturbance and foreshore impacts
- Dominant Substrate**
- G - Gravel
 - F - Fines
 - C - Cobble
 - B - Boulder
 - R - Bedrock
 - C/B - Cobble/Boulder (mix)
- Shore Type**
- CB - Cliff Bluff
 - GB - Gravel Beach
 - SB - Sand Beach
 - VS - Vegetated Shore
 - LRS - Low Rocky Shore
 - W - Wetland

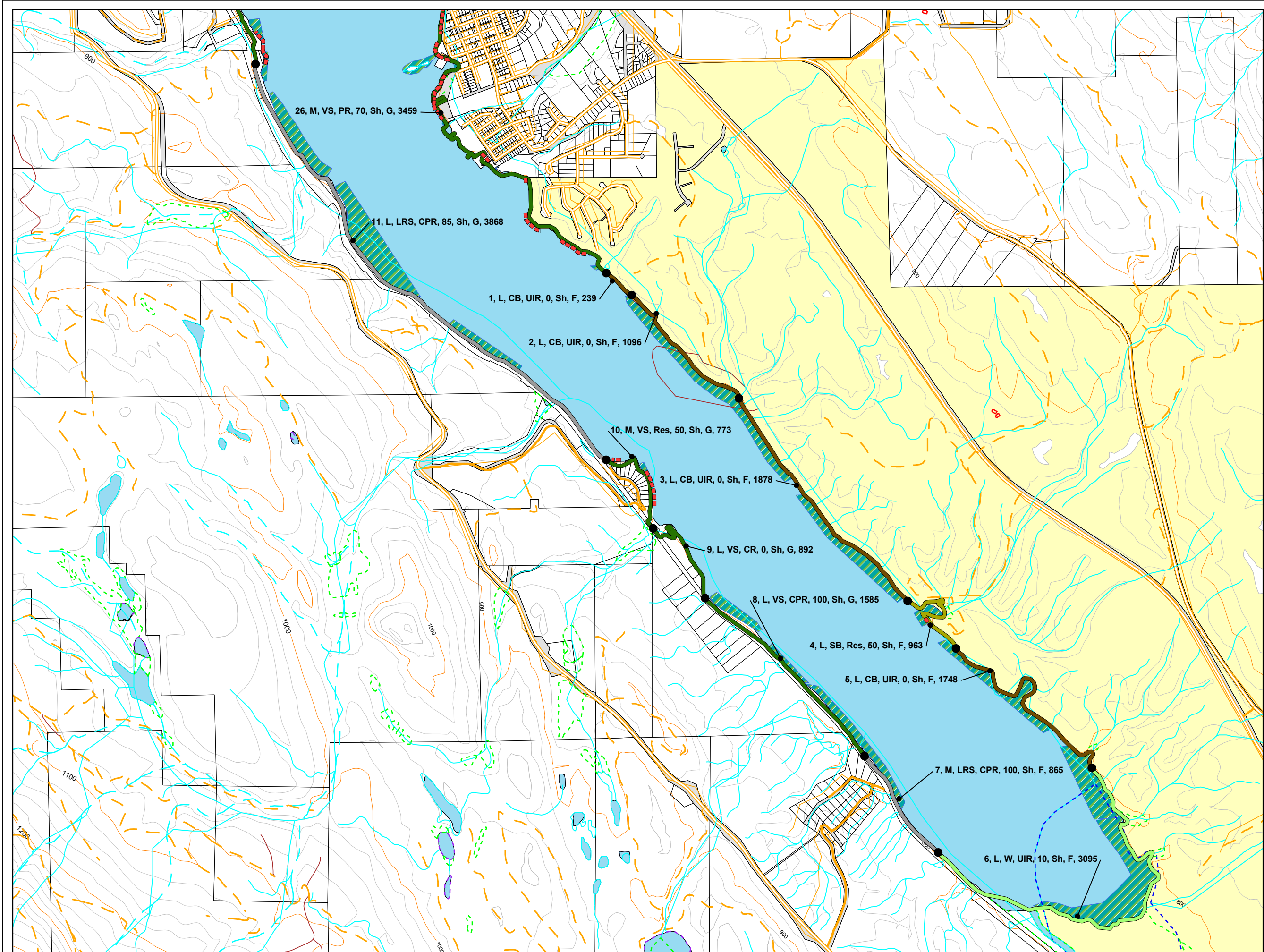
Note: This map is used for illustrative purposes only and should be used in conjunction with the Invermere Lake Foreshore Inventory and Mapping Database



Digital Mapping By:



Creation Date: April 16, 2007 By: DM Last Major Edit: By: Mapping File: 07DF0K01\SHIM_Sum.mxd



WINDERMERE LAKE FORESHORE INVENTORY AND MAPPING

Appendix I: Foreshore Summary Map

Map 2 of 2

Date: 2007/04/16

Scale: 1:25,000

0 250 500 1,000 Meters

Fisheries and Oceans Canada
- Pacific Region

Legend

Dominant Shore Type

- Cliff/Bluff
- Gravel Beach
- Low Rocky Shore
- Sand Beach
- Vegetated Shore
- Wetland
- Segment Break
- Index Contour (100m)
- Intermediate Contour (20m)
- Retaining Wall (Location Offset)

- City of Invermere
- Indian Reserve
- Park
- Roads and Access
- Waterbody
- Wetland
- Highway
- Secondary Road
- Gravel Road
- Unclassified Road
- Trail

Note: Retaining wall and wetland data is an interpreted overview from Wildsight's data. For detailed list of retaining walls refer to Wildsight's record.

Segment Number	Shore Type	% Disturbed	Dominant Substrate	Level of Impact	Primary Land Use	Littoral Zone	Length (m)
1	M, CB, UR, 50		Sh, G, 1200				

Land Use

- Res - Residential
- Com - Commercial
- Ag - Agriculture
- P - Park
- Ind - Industrial
- CP - Crown Provincial
- UIR - Undeveloped Indian Reserve
- CPR - CP Railway

Dominant Substrate

- G - Gravel
- F - Fines
- C - Cobble
- B - Boulder
- R - Bedrock
- C/B - Cobble/Boulder (mix)

Shore Type

- CB - Cliff Bluff
- GB - Gravel Beach
- SB - Sand Beach
- VS - Vegetated Shore
- LRS - Low Rocky Shore
- W - Wetland

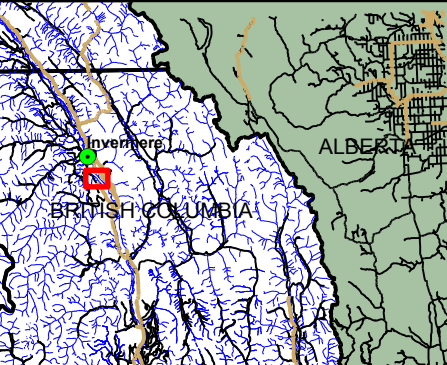
Littoral Zone Depth

- D - (Deep)
- M - (Moderate)
- Sh - (Shallow)

Level of Impact

- Low - No or limited signs of disturbance and foreshore impacts
- Moderate - Moderate signs of disturbance and foreshore impacts
- High - Extensive signs of disturbance and foreshore impacts

Note: This map is used for illustrative purposes only and should be used in conjunction with the Invermere Lake Foreshore Inventory and Mapping Database



Digital Mapping By:

INTERIOR REFORESTATION CO. LTD.

Leadership in Natural Resource Management

Creation Date: April 16, 2007 By: DM Last Major Edit: By:

Mapping File: 07DFOK01SHIM_Sum.mxd

Appendix I. Arcview Shapefiles for the Foreshore Database (on CD ROM)