

MANAGEMENT PLAN

August 2007



Skwelwil'em Squamish Estuary Wildlife Management Area



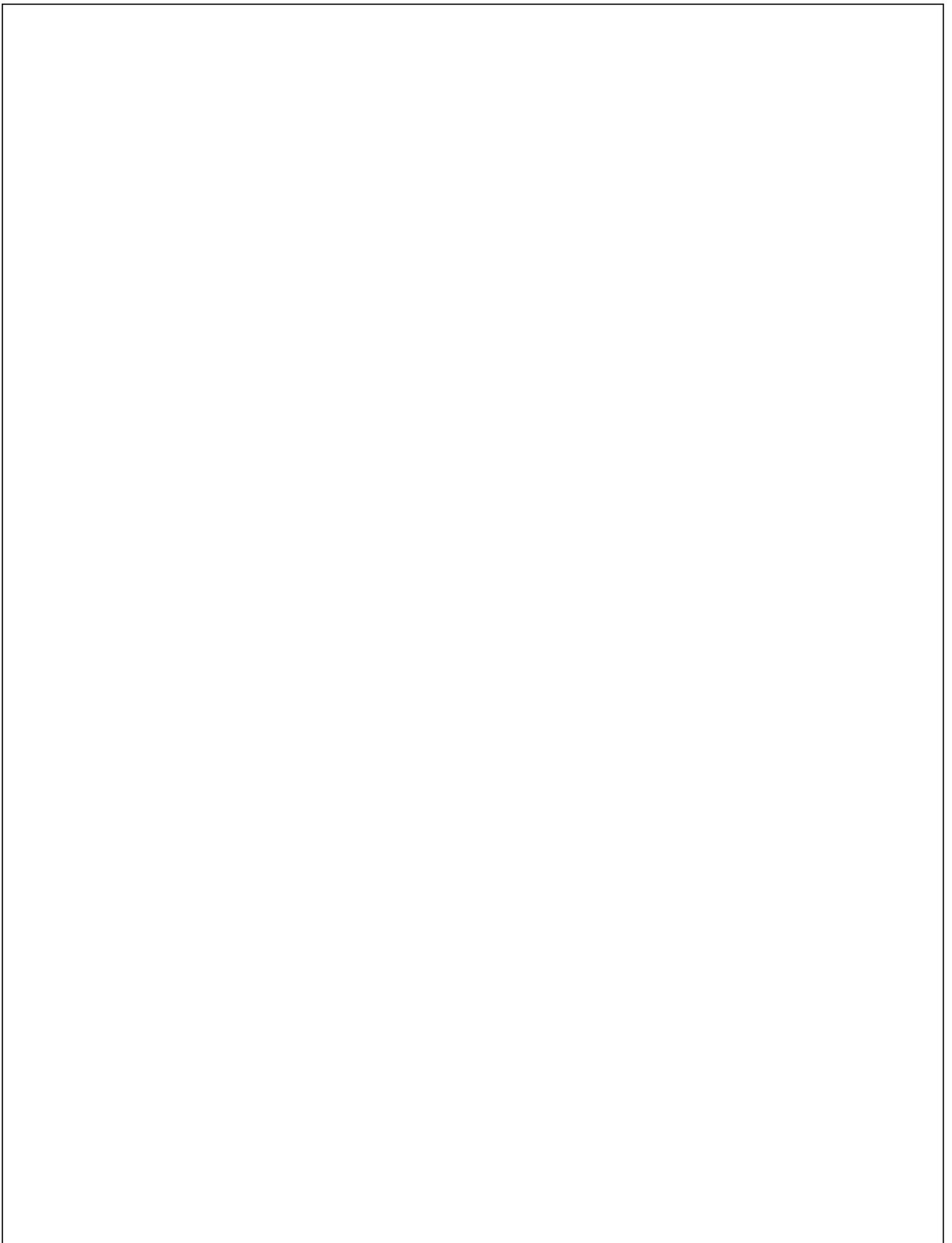
Ministry of Environment,
Environmental Stewardship
Division

Front cover photo provided by Edith Tobe.

Skwelwil'em Squamish Estuary
Wildlife Management Area

MANAGEMENT
PLAN

Prepared by
Lower Mainland Region
Environmental Stewardship Division



Skwelwil'em Squamish Estuary Wildlife Management Area

Management Plan

Approved by:

Date: _____

Regional Manager
Environmental Stewardship Division

Table of Contents:

| | |
|--|--------|
| Acknowledgements..... | - 3 - |
| Executive Summary | - 4 - |
| 1.0 Introduction..... | - 5 - |
| 1.1 WMA Planning Process..... | - 5 - |
| 1.2 Background Summary | - 6 - |
| 1.3 Relationship to Other Planning Processes | - 8 - |
| 1.4 Management Issues..... | - 8 - |
| 1.5 Zoning/Management Units | - 9 - |
| 2.0 Role of the Wildlife Management Area..... | - 10 - |
| 2.1 Context Setting..... | - 10 - |
| 2.2 Vision Statement..... | - 13 - |
| 2.3 WMA Goals..... | - 13 - |
| 3.0 Community Context..... | - 14 - |
| 3.1 Squamish Nation..... | - 14 - |
| 3.2 Community Involvement | - 15 - |
| 3.3 Relationship with Adjacent Land Owners | - 16 - |
| 4.0 Land Uses, Tenures, and Interests | - 18 - |
| 4.1 Mercury Contamination | - 18 - |
| 4.2 Former Dredge Spoils Site..... | - 19 - |
| 4.3 Log Sort Phase Out | - 20 - |
| 4.4 Dyke Management..... | - 20 - |
| 4.5 Site A Management..... | - 21 - |
| 4.6 Squamish Estuary Management Plan Topics..... | - 22 - |
| 4.6.1 Role of SEMC and SERC..... | - 22 - |
| 4.6.2 Sewage Outflow & Pedestrian Corridor | - 23 - |
| 4.6.3 Buffer on Crescent Slough..... | - 23 - |
| 4.6.4 Tidal Channel in Crescent Slough | - 23 - |
| 4.7 New Tenure Applications | - 24 - |
| 4.8 2006 Oil Spill..... | - 24 - |
| 5.0 Natural Values Management..... | - 26 - |
| 5.1 Sedimentology and Soils..... | - 26 - |
| 5.2 Water..... | - 27 - |
| 5.3 Vegetation | - 27 - |
| 5.4 Fish..... | - 29 - |
| 5.5 Wildlife | - 32 - |
| 5.6 Species at Risk | - 34 - |
| 5.7 Biodiversity..... | - 36 - |
| 5.8 Inventory, Monitoring, and Research | - 37 - |
| 6.0 Human Use Management..... | - 38 - |
| 6.1 Outdoor Recreation & Tourism | - 38 - |
| 6.1.1 Walking Trails | - 38 - |
| 6.1.2 Hunting & Fishing | - 42 - |
| 6.1.3 Wind Sport Activities | - 42 - |
| 6.1.4 Canoeing & Kayaking..... | - 45 - |

| | |
|---|--------|
| 6.2 Motor Vehicle Access..... | - 45 - |
| 6.3 Interpretation & Nature Appreciation..... | - 46 - |
| 6.4 Regional Manager’s Order..... | - 47 - |
| 7.0 Plan Implementation..... | - 49 - |
| 8.0 References..... | - 55 - |
| Appendix I..... | - 57 - |
| Appendix II West-Barr Contracting Ltd. Clean-Up Schedule..... | - 59 - |
| Appendix III..... | - 70 - |

List of Figures:

| | |
|--|--------|
| Figure 1 - Location Map..... | - 11 - |
| Figure 2 - WMA Overview Map..... | - 12 - |
| Figure 3 - Squamish Estuary Management Plan Zones..... | - 17 - |
| Figure 4 - Fish Habitat Restoration Areas..... | - 31 - |
| Figure 5 - Conceptual Trail Options..... | - 41 - |
| Figure 6 - Recreation Zones..... | - 44 - |

List of Tables

| | |
|---|--------|
| Table 1 Compatible Activities and Uses..... | - 48 - |
|---|--------|

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Executive Summary

The Skwelwil'em Squamish Estuary Wildlife Management Area (WMA) is a 673 hectare area located at the head of Howe Sound in Squamish, BC. The estuary is a highly productive ecosystem and provides significant winter migratory bird habitat. The designation of the WMA is a result of 25 years of planning under the Squamish Estuary Management Committee (previously the Squamish Estuary Coordinating Committee). Upon completion of the 1999 Squamish Estuary Management Plan, a land exchange between the Province, BC Rail and the Squamish Nation along with a management agreement between the Ministry of Environment and Squamish Nation pertaining to the management and planning of the WMA and Site A (Squamish Nation WMA) paved the way to the designation of the WMA. This management plan sets appropriate objectives and management strategies for maintaining and restoring fish, wildlife and their supporting habitat in the WMA.

1.0 Introduction

British Columbia is the most biologically diverse province in Canada. A wide range of ecosystems supports some 142 mammals, 488 birds, 22 amphibians, 18 reptiles and 468 fish species along with an estimated 2790 native vascular plant species (BC Conservation Data Centre, 2001). The British Columbia Ministry of Environment aims to maintain and restore the province's ecological diversity of fish and wildlife species and their habitats, and to provide and enhance fish and wildlife services to British Columbians and others. One way the Ministry of Environment meets these goals is through the management of the province's protected areas system and various types of conservation lands.

The Ministry of Environment has acquired conservation lands for fish and wildlife in a number of ways including purchase, long-term lease, and legislative designation. All conservation lands are intended to give priority to the conservation of specific wildlife and/or fish species and their habitats, while often providing for other resource uses. These sites are established where the wildlife, fish and/or related habitat values are of regional, provincial, or national significance. They may be used for a variety of purposes including the conservation and management of:

- Habitat for endangered, threatened, sensitive, or vulnerable species
- Habitat required for a critical life-cycle phase of a species, such as spawning, rearing, nesting, or winter feeding
- Migration routes or other movement corridors
- Areas of very high productivity or species richness

Some conservation lands are designated as Wildlife Management Areas (WMA) under the *Wildlife Act*. The WMA designation provides the Ministry of Environment with tools to assist in managing important fish and wildlife habitats.

The Skwelwil'em Squamish Estuary Wildlife Management Area meets all of the conservation land purposes described above, and is a vitally important estuarine ecosystem in the Squamish area. In collaboration with the Squamish Nation, this management plan will set appropriate management objectives and strategies for maintaining and restoring fish, wildlife and their supporting habitats in the WMA.

1.1 WMA Planning Process

The Ministry of Environment prepares management plans to guide the management of WMAs over the next 20 years. These plans set forth objectives and strategies to manage fish and wildlife species and their habitats, along with various human uses. A management plan relies on current information relating to such subjects as natural and cultural attributes and human uses of the WMA, together with land management activities occurring on surrounding lands. It is recommended that a management plan be

reviewed every five to ten years as environmental, social, and economic conditions change.

The process for preparing a management plan involves a careful analysis of the overall goals of the WMA, use patterns, and possible sources of conflict with fish, wildlife and their habitats. The intent is to ensure management decisions maintain and restore fish and wildlife habitats, and that human use within the WMA does not have negative impacts. Identifying potential impacts from adjacent land uses is also an important aspect of the planning process.

A management plan not only establishes long-term management direction for a WMA, it also identifies immediate issues. Because the Ministry of Environment is unable to address all issues simultaneously, the management plan prioritizes the numerous management strategies it identifies.

A management plan is prepared after thorough stakeholder input into the resolution of major issues. A public process is then undertaken to provide comments on a draft plan. Once all comments have been assessed, the Regional Manager of the Ministry of Environment approves the final document.

For the Skwelwil'em Squamish Estuary Wildlife Management Area, the management planning process has relied on a variety of background information and sources, including:

- Squamish Nation collaboration
- Input from the Squamish Estuary Management Committee
- Squamish Estuary Management Plan 1999
- Ministry of Environment goals for fish and wildlife
- Conservation Priorities for the Squamish Estuary (commissioned by the Squamish Estuary Conservation Society)
- *BC Wildlife Act*
- *Federal Migratory Birds Convention Act*

1.2 Background Summary

The Squamish Estuary, located at the head of Howe Sound, is a fjord head estuary draining 3650 km² of coastal rainforest. Typical of an estuarine environment, the Squamish Estuary is a highly productive ecosystem. It provides wintering, migration, feeding and/or breeding habitats for waterfowl and shore birds, as well as raptors, passerines and other species. It is also a feeding, spawning and rearing ground for a variety of fish species, including provincially significant species such as eulachon, steelhead and salmon (Note: pink salmon generally only use the estuary as a transportation route to the tributaries of the Squamish River). The estuary also provides good habitat for a number of mammal species including blacktail deer, black bear, cougar, coyote, moles, voles, and rabbits.

The estuary also acts as a critical flood control mechanism for the Squamish town site. It purifies water and filters pollutants. The estuary has been significantly altered by past and present human use. The most significant alterations include massive amounts of fill that were deposited to construct dykes, railway corridors, and industrial platforms. Despite these alterations, and low levels of mercury contamination in the southeast portion of the WMA, the Squamish Estuary remains a highly productive and valuable ecosystem.

In the 1970's, development proposals threatened the remaining functional fish and wildlife habitats of the estuary. As a result, the Federal Minister of Fisheries and Oceans and the Provincial Minister of Environment commissioned a management plan for the entire estuary. The aim was to establish a balance between protecting the area's biological productivity and achieving the full economic potential of the region. A 1982 plan resulted in the formation of the Squamish Estuary Coordinating Committee, comprised of federal, provincial and municipal agencies, whose purpose it was to guide land and water uses in the Squamish Estuary by balancing government, industry and private interests. The plan set aside an area for conservation, an area for industrial development and an area requiring further assessment.

In 1992, the Squamish Estuary Coordinating Committee brought forth a revised plan for the entire estuary. In this plan, the conservation area and the industrial development area (including transportation corridors) increased in size. However, this plan was never implemented and the estuary continued to be managed in accordance with the 1982 plan. The major concern with the 1992 plan was the designation of the environmentally and culturally sensitive "Site A" in the industrial development area.

In 1999, all parties including stakeholders, the public and the Squamish Nation, endorsed a revised Squamish Estuary Management Plan (SEMP). In this third plan, Site A was included in the conservation zone, which reflected input from the Squamish Nation and the Squamish community. The conservation zone increased to 579 hectares while the industrial/commercial zone decreased to 350 hectares. The 1999 estuary plan also identified that most of the conservation area should become a Wildlife Management Area under the *Wildlife Act* and that Site A be transferred to the Squamish Nation with a restrictive covenant attached to ensure that Site A be managed in a manner consistent with WMA objectives.

In 2001, Site A was transferred to the Squamish Nation with this restrictive covenant attached. At the same time, a management agreement between the province and the Squamish Nation was signed establishing the cooperative management of Site A and the WMA. On February 28, 2007, the remainder of the conservation area outlined in the 1999 estuary plan became the Skwelwil'em Squamish Estuary Wildlife Management Area designated under the *Wildlife Act*. The WMA encompasses 673 hectares and provides exceptional habitat for fish and wildlife as well as hunting and fishing opportunities for people. Other recreational opportunities occur within the WMA and management must focus on minimizing recreation impacts to fish and wildlife.

1.3 Relationship to Other Planning Processes

The SEMP divided the entire Squamish Estuary into three zones: a conservation area; an industrial/commercial area; and a transportation corridor. The Skwelwil'em Squamish Estuary Wildlife Management Area is part of the conservation zone of the estuary and this plan will ensure the WMA is managed in a manner consistent with the SEMP. Relationships with the Squamish Estuary Management Committee and the Squamish Estuary Review Committee (both functions under the SEMP) will be identified along with the roles of the government and Squamish Nation in the management of both the WMA and Site A.

The Skwelwil'em Squamish Estuary WMA is within the traditional territory of the Squamish Nation. The Squamish Nation is currently involved in treaty negotiations over traditional lands that include the WMA. The management plan will be subject to any future treaty and will not limit treaty negotiations. This management plan is also closely connected to the management plan for Site A prepared by the Squamish Nation. The Site A management plan contains a history of the Squamish Nation's use of the Squamish River Estuary. These documents are consistent with the 1999 estuary plan and should be referenced when managing the site.

1.4 Management Issues

The key management issues in the Skwelwil'em Squamish Estuary WMA are summarized as follows:

Land Uses, Tenures and Interests

- West-Barr Contracting Ltd. log sort
- Mercury contamination from Nexen site
- Community partnerships

Integrating Management of Adjacent Lands

- Site A (Squamish Nation land)
- Role of Squamish Estuary Management Committee and Review Committee
- Dyke management - District of Squamish
- Transportation corridor

Maintaining and Restoring Fish & Wildlife Habitats

- Fish and wildlife habitat restoration projects
- Vegetation management (invasive species/re-vegetation planning)
- Inventory, monitoring and research activities

Recreational Use

- Trail designation & use
- Wind sports

- Hunting and fishing
- Vehicular access

This management plan will address all of the stated issues and provide management direction for each.

1.5 Zoning/Management Units

Zoning is a process of dividing an area into management units based on consistent management objectives. Unlike provincial parks, WMAs do not have a standardized zoning system. However, management units can be established to identify areas with similar objectives. Two recreational use zones are identified within the Skwelwil'em Squamish Estuary WMA. These are a hunting zone and a wind sports zone (see Section 6.0 Human Use Management). A comprehensive list indicating the extent to which activities are considered compatible with the Skwelwil'em Squamish Estuary WMA objectives is in Table 1.

2.0 Role of the Wildlife Management Area

2.1 Context Setting

The Skwelwil'em Squamish Estuary Wildlife Management Area is found in the Squamish Estuary located at the head of Howe Sound, approximately 50 kilometres north of Vancouver, British Columbia (Figure 1). It is a 673-hectare area that contributes significantly to the biodiversity of the Squamish area. An overview of the location names in the WMA is in Figure 2.

Internationally, the Squamish Estuary provides significant habitat for fish, waterfowl and other migratory birds. The 1916 Migratory Bird Convention between Canada and the United States is a bilateral agreement to protect and conserve migratory birds and their habitat. A wide range of migratory birds use the Squamish Estuary on their annual migrations between summer and winter habitats.

Provincially, wetlands account for only 5.6% percent of British Columbia's land base and are one of the most rare and biologically productive ecosystem types on the British Columbia coast. As such, the Skwelwil'em Squamish Estuary WMA is a very important addition to wetland protected areas.

Regionally, the Skwelwil'em Squamish Estuary WMA fits into a network of protected areas including: Brackendale Eagles Provincial Park, Baynes Island Ecological Reserve, Tantalus Provincial Park, and Stawamus Chief Provincial Park. This collection of protected areas, along with others nearby, contributes significantly to biodiversity.

The Skwelwil'em Squamish Estuary WMA also plays a role in a number of regional, provincial and national environment strategies and recovery plans including:

- Greater Georgia Basin Steelhead Recovery Plan
- Squamish River Salmon Recovery Plan
- Peregrine Falcon Recovery
- Protection and Recovery of Species at Risk
- Migratory Bird Convention between Canada and United States

All agencies with environment strategies and plans are encouraged to work closely with the Ministry of Environment in the management of the WMA.

Figure 1 Location Map

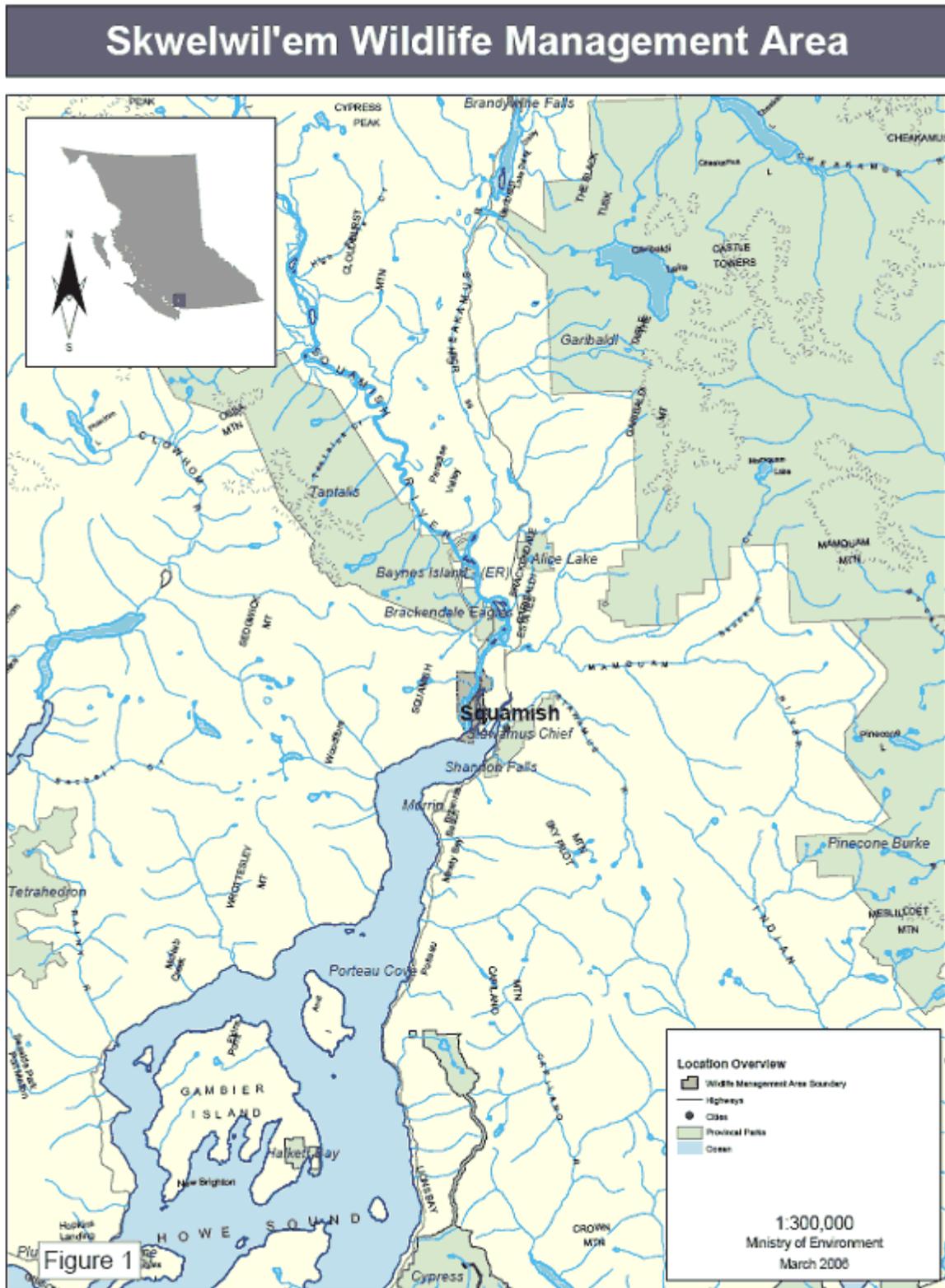
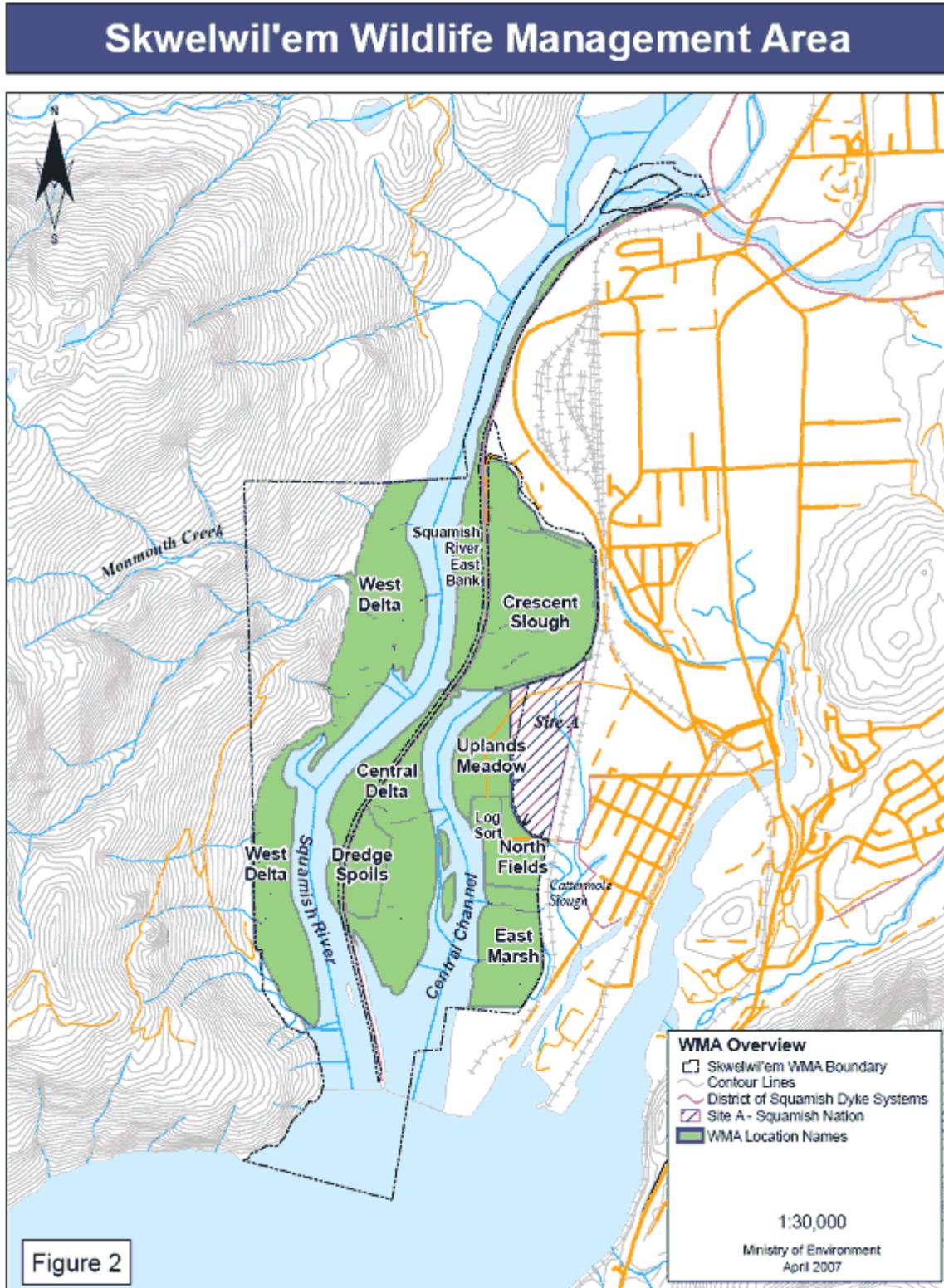


Figure 2 WMA Overview Map



2.2 Vision Statement

The primary vision of the Skwelwil'em Squamish Estuary Wildlife Management Area will be to maintain and restore the productivity of the fish and wildlife habitats in the WMA. Important habitats for species at risk, waterfowl and migratory birds will be given the highest management priority followed by the protection and restoration of fish and wildlife habitats. An integrated management approach involving stakeholders and all levels of government will be used to achieve the goals and strategies outlined in this management plan.

2.3 WMA Goals

Management of the Skwelwil'em Squamish Estuary WMA will be based on four main goals:

- 1. Maintain and restore fish and wildlife species and their habitat.**
- 2. Use an integrated management approach in managing activities and uses compatible with WMA objectives.**
- 3. Improve the understanding of the estuary's composition, structure and function by encouraging inventory, monitoring and research activities.**
- 4. Raise awareness of the cultural significance of the WMA to the Squamish First Nation.**

These goals are intended to be the guiding principles for the Ministry of Environment, the public and stakeholders in the management of the WMA.

3.0 Community Context

3.1 Squamish Nation

The Squamish Nation is comprised of Salish peoples, descended from the aboriginal peoples who lived in the present day Greater Vancouver area, Gibson's Landing and Squamish River Watershed (Squamish Nation Network, 2000). The Skwelwil'em Squamish Estuary Wildlife Management Area is within the Squamish Nation's traditional territory and has significant historical and cultural value to its people. Three Indian Reserves (No. 21 Skwawmish Island, No. 22 Skwulwailem, and No. 23 Ahtsann) used to cover much of the WMA but were sold o in the early 1920's. The Squamish River estuary continues to be an important fishing, hunting and spiritual place for the Squamish Nation people. Any development proposals not covered in this management plan should be reviewed cooperatively with the Squamish Nation.

The province and the Squamish Nation have entered into an agreement regarding the management of the WMA and Site A (see Section 4.5 Site A Management). The purpose of the agreement is to provide for the development of management plans for the WMA and Site A and to recognize that both parties agree to manage the areas collaboratively and in a manner consistent with the 1999 estuary plan. The Squamish Nation has completed a management plan for Site A which contains a history of the Squamish Nation's use of the Squamish River Estuary. The Site A and WMA management plans should be referenced when managing the site.

Currently, the Squamish Nation is involved in treaty negotiations with senior levels of government. Once a final Treaty Agreement has been reached with the Squamish Nation, this management plan will be reviewed to determine whether it is in compliance with the Treaty. If it is not in compliance, then this management plan will be revised accordingly. Changes will be made through an open public review process so that all stakeholders understand what the changes mean for the WMA.

Objective

Increase the involvement of the Squamish Nation pertaining to natural and cultural features management within the WMA.

Management Strategies

- Develop ongoing communication and working relationships with the Squamish Nation.
- Discuss with the Squamish Nation areas of special spiritual and cultural significance within the WMA and establish how Ministry of Environment staff will recognize and protect these aboriginal cultural features found in the WMA.

- Develop a strategy with the Squamish Nation to protect and allow for the continued practice of traditional activities for present and future generations of the Squamish Nation people in relationship to the lands within the WMA.
- Provide opportunities for the Squamish Nation to develop interpretation signage sharing the Nation's cultural heritage values in the WMA and Site A with WMA users.
- Review all development proposals not covered in this management plan cooperatively with the Squamish Nation.

3.2 Community Involvement

The maintenance and restoration of fish and wildlife habitats and the management of compatible uses within the Skwelwil'em Squamish Estuary Wildlife Management Area relies on community stewardship initiatives and partnerships. Much of the restoration work, research, monitoring and stewardship initiatives that occur within the WMA are a result of the volunteer efforts of community members. The Ministry of Environment encourages these practices to continue under a Stewardship Working Group. This group could be a sub-committee that reports to the Squamish Estuary Management Committee (see section 4.6.1) and should include representatives from the Ministry of Environment, the District of Squamish and the Squamish Nation. The management strategies outlined below provide a framework for such a group.

Objective

Encourage community involvement in the management of the WMA based on the goals, objectives and management strategies outlined in this management plan.

Management Strategies

- Establish a WMA Stewardship Working Group that meets at least annually. This group should be open to all who have interest in the WMA and should be guided by the goals, objectives and management strategies of this management plan. All initiatives and activities will be approved by the Regional Manager or his or her designate.
- The working group should explore means to raise funds in support of stewardship initiatives.
- Some of the stewardship activities and initiatives the group could facilitate are:
 - Trail maintenance
 - Interpretation and signage
 - Inventory, monitoring and research activities
 - Compliance reporting

3.3 Relationship with Adjacent Land Owners

Squamish Nation, District of Squamish, CN Rail, and Squamish Terminals all manage lands adjacent to the WMA. Most of these landowners are active members of the Squamish Estuary Management Committee (SEMC) (see Section 4.6.1). The SEMC forum is the desired means of communication with the above mentioned land owners.

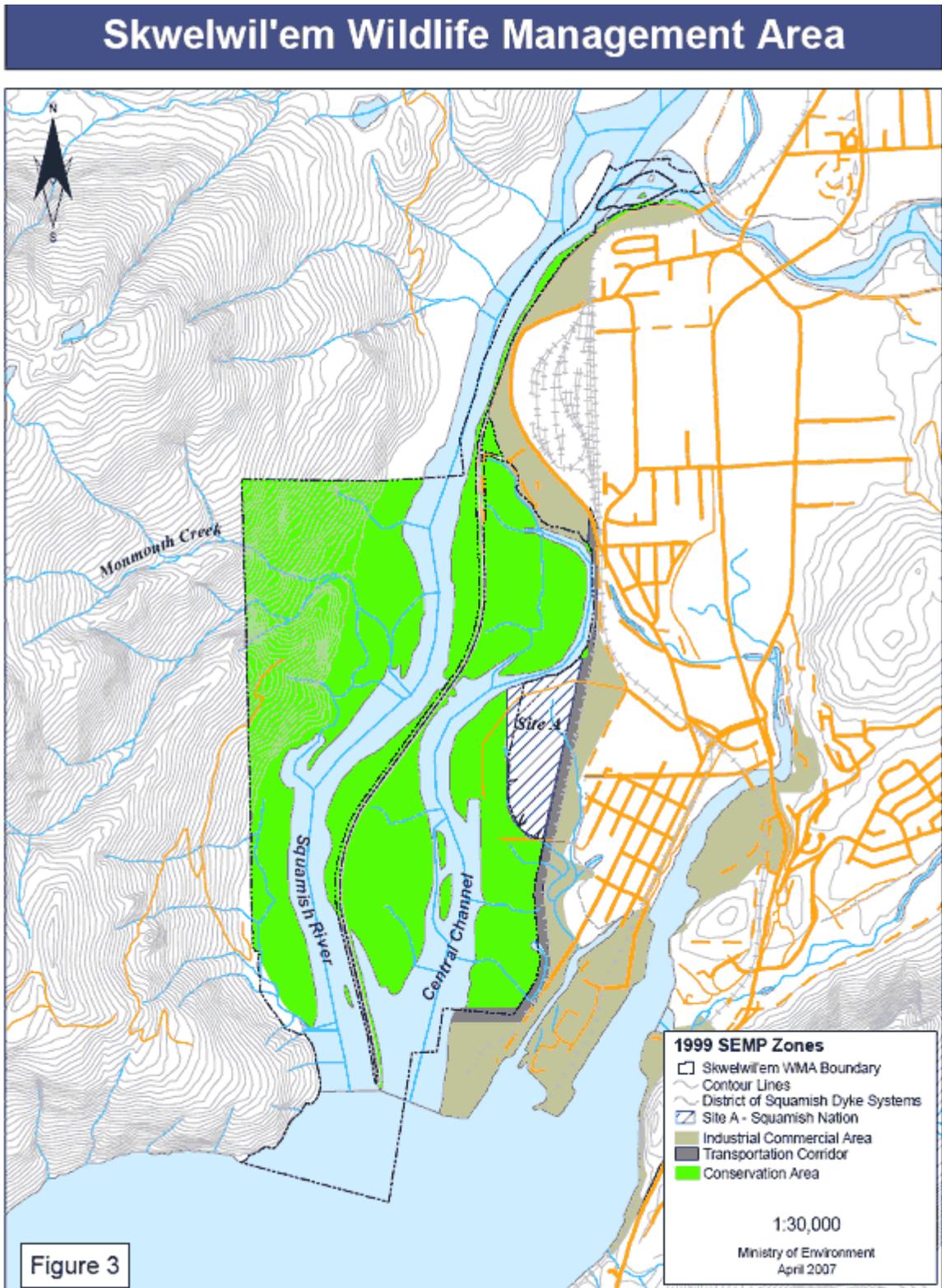
Objective

Continue communication with adjacent landowners through SEMC.

Management Strategies

- Continue Ministry of Environment's involvement in SEMC.
- Encourage all adjacent landowners to participate in SEMC.

Figure 3 Squamish Estuary Management Plan Zones



4.0 Land Uses, Tenures, and Interests

A number of existing and pre-existing human uses have impacted the natural values of the Squamish Estuary. Some of these impacts include: a former garbage dump adjacent to Site A; mercury contamination in the southeast portion of the WMA and Site A; the old Dredge spoils pile in the Central Delta; the log sort tenure in the Central Channel; and the Squamish River training dyke (refer to Figure 2 for common location names within and adjacent to the WMA). This section will discuss these existing and pre-existing land uses within the WMA along with other associated topics identified in the 1999 Squamish Estuary Management Plan and new tenure applications.

4.1 Mercury Contamination

The Squamish Estuary has mercury contamination from previous industrial use at the nearby Nexen site. Most of the contamination appears to be outside of the WMA but concentrations of mercury have been revealed on the east side of the WMA and within Site A. In a report prepared by URS Canada Inc. for the District of Squamish, Plan For Management of Mercury Contaminated Sediment at the Former Clor-Akali Plant, Squamish BC, dated July 9, 2004, sediment samples were taken in east marsh (>50 samples), Central Delta (6 samples), West Delta (3 samples), the boundary between Site A and north field (1 sample), and in Central Channel (5 samples). Of these samples, 4 locations in east marsh and the one sample taken on the boundary of Site A show mercury levels higher than the Sediment Quality Criteria for a typical contaminated site (SedQCtcs)¹. An Ecological Risk Assessment completed by Nexen Inc. found no unacceptable risks to the environment and human health in the conservation area (now the WMA) if left in an undisturbed condition. The Ecological Risk Assessment was completed using the Ministry of Environment's protocols and was approved by the Ministry's Contaminated Sites Program.

The Ecological Risk Assessment did not address proposed environmental improvement projects to restore fish habitat and ecosystem functions. These proposed projects have been developed out of a stakeholder review process through SEMC. In order to evaluate the risks associated with these projects, all projects will be carried out according to the prescribed procedures in Appendix I and reviewed by the landowner and the Squamish Estuary Review Committee. Where there are significant concerns around contamination, SERC can forward the project proposals to the Ministry of Environment's Land Remediation department for comment.

¹ More information on SedQCtcs and SedQCscs is available in the following document: British Columbia Criteria for Contaminated Sites: Criteria for Managing Contaminated Sediment in British Columbia, Technical Appendix at http://www.env.gov.bc.ca/epd/epdpa/contam_sites/standards_criteria/index.html.

Objective

Research and monitor the extent of mercury within the WMA and avoid the spread of contamination.

Management Strategies

- Ensure all proposed projects within the WMA follow the Mercury Testing Protocol in Appendix I.
- Conduct further sediment sampling throughout the WMA as resources become available.
- Set up a repository of all project assessments and mercury testing at the Lower Mainland Regional Office of the Ministry of Environment.
- Continue to share information and work collaboratively with other stakeholders to better understand and manage the mercury contamination in the Squamish area.

4.2 Former Dredge Spoils Site

In the early 1970's, a significant pile of dredge spoils material (over 150,000 truck loads) was deposited in the Central Delta with the intent of creating a coal port. The coal port was never constructed and the dredge spoils pile remained for nearly 30 years.

Starting in 1999, the Squamish River Watershed Society (SRWS) and the Department of Fisheries and Oceans Canada (DFO) began a multi-year project to remove the dredge spoils pile and to re-establish the site as a productive estuary. By 2005, the majority of the dredge spoils pile had been removed, several tidal channels had been constructed to improve fish habitat and the site was re-vegetated with sedges and indigenous plants. The dredge spoils that were left allowed for a short walking trail through the area (see Section 6.0). The project has been a remarkable undertaking by the SRWS and the DFO. They are encouraged to continue their efforts to re-establish the site.

Objective

Encourage further habitat restoration of the dredge spoils site.

Management Strategies

- Support the DFO and the SRWS to continue habitat restoration of the site especially in areas where no vegetation is growing due to poor and compacted soil.
- Increase the vegetation screening on the trail to minimize impacts to waterfowl.
- Monitor and evaluate the impacts that recreational use has on fish and wildlife in the area.

4.3 Log Sort Phase Out

The log sort site (refer to Figure 2) is the last remaining industrial use within the WMA. In an agreement between the Province and West-Barr Contracting Ltd (the lessee), the log sort site is to be phased out by October 13, 2014. Upon vacating the site, West-Barr Contracting Ltd. is required to restore the site according to the Clean-Up Plan schedule of the above-mentioned agreement. These procedures are attached in Appendix II². The rehabilitative works will enable the site to again function as a productive fish and wildlife habitat. However, further funding will be required to re-vegetate the site as West-Barr is only obligated to donate \$5,000 in cash or in kind toward re-vegetating and promoting riparian growth.

In conjunction with the restoration of the log sort site, the community will be given the option to create a trail linkage between the South Loop Trail and the North Loop Trail. The trail would be located on the east side of the site and an integrated plan needs to be developed if this is to occur. The trail concept is covered in more detail in Section 6.1 (see Figure 5).

Objective

Restore the log sort lease area back to a productive wetland habitat.

Management Strategies

- Liaise with the West-Barr Contracting Ltd. regarding the timing of their move to the new log sort site.
- Ensure West-Barr Contracting Ltd. meets their obligations under the Clean-Up Plan schedule of the lease agreement.
- Coordinate with DFO and other stakeholders to explore options for improving the restoration of the site and creating a trail linkage.

4.4 Dyke Management

The training dyke between the CN Rail bridge over the Mamquam River and the Windsurfers Spit is an important flood control mechanism for the District of Squamish. It was constructed in 1972 by BC Rail. A portion of the dyke, generally from high water mark to high water mark, will be transferred to the District of Squamish. The training dyke is located in the conservation area of the 1999 estuary plan which provides direction regarding management and use. Draft management and use guidelines (June 2005; updated March 2007) have been written in consultation with the District of Squamish and SEMC (see Appendix III). The key components of these guidelines are:

² **Note:** the clean-up document is titled: "Procedure for the Clean up of Site A" and "Site A", in this case, refers to the Log Sort Site.

- Emergency maintenance
- Vegetation management
- Motor vehicle access restrictions
- Intended allowable use and staging areas

Objective

Ensure the management and maintenance of the Squamish River training dyke is compatible with WMA objectives.

Management Strategies

- Ensure the proposed Stewardship Working Group is familiar with the dyke management and use guidelines.
- The Ministry of Environment and the District of Squamish should continue to work cooperatively to finalize the Squamish River Training Dyke Management and Use Guidelines.
- Recommend the District of Squamish construct a gate to restrict vehicular access to the north end of the dyke at the spit entrance. The purpose of this gate is to minimize impact to the fish and wildlife values along the Squamish River. Biking and walking are activities deemed compatible.

4.5 Site A Management

Site A is an area with significant cultural values for the Squamish Nation (refer to Figure 2). It is also an area within the conservation zone according to the 1999 estuary plan. The site encompasses approximately 30 hectares and was transferred to the Squamish Nation in a land exchange involving the District of Squamish, Squamish Nation, Ministry of Environment, and BC Rail Properties Ltd. A restrictive covenant was placed on the land title ensuring the site will be managed in a manner consistent with WMA objectives.

In 2001, the Squamish Nation and the Ministry of Environment entered into an agreement regarding the management of Site A and the WMA. The purpose of the agreement is to provide for the development of management plans for the two areas. In the agreement, both parties agree to manage Site A and the WMA cooperatively and in a manner consistent with the 1999 estuary plan. The estuary plan recommends Site A and the WMA be protected and dedicated to the maintenance and enhancement of fish and wildlife habitat. The Site A/WMA agreement also gave the Squamish Nation the opportunity to name the WMA. They provided the name Skwelwil'em Squamish Estuary which is the name of a reserve that encompassed a large portion of the WMA.

Aside from fish and wildlife values, there are cultural and recreational values associated with Site A. The Squamish Nation has identified the site as a possible location for the construction of a cultural centre. The cultural centre could be compatible with WMA

objectives if an appropriate environmental impact assessment is conducted and its recommendations are implemented.

There are also several recreational trails through Site A. In order for these trails to be compatible with WMA objectives, a comprehensive plan linking trails to the District of Squamish trails and the WMA trails is required. In addition, permission must be obtained from CN Rail to establish pedestrian railway crossings. Trail management is covered in more detail in Section 6.1.

One concern in Site A is the extent of mercury contamination on the site. It is imperative that the Ministry of Environment, Squamish Nation, and the District of Squamish work together on the management of mercury contamination (as per Section 4.1).

Objective

Ensure the WMA and Site A are managed in a manner consistent with the 1999 estuary plan.

Management Strategies

- Encourage the Squamish Nation to be a part of the Stewardship Working Group, which could also include Site A.
- Work with the Squamish Nation regarding the development of a cultural centre on Site A to ensure it is compatible with WMA objectives.

4.6 Squamish Estuary Management Plan Topics

The following topics are identified in the 1999 estuary plan. They are highlighted to ensure consistency between this management plan and the 1999 estuary plan.

4.6.1 Role of SEMC and SERC

The **Squamish Estuary Management Committee** (SEMC) is responsible for administering the 1999 estuary plan. The objective of the SEMC membership representation is to have balance between government and non-government members and between economic and environmental issues. SEMC is responsible for:

- Integrating the interests of all stakeholders
- Refining and administering the estuary management plan
- Overseeing the Squamish Estuary Project Review Process
- Producing an annual report on Squamish estuary management
- Minimizing impacts to the natural function of the estuary

The Ministry of Environment is a key member of SEMC as the WMA is the largest land base within the 1999 estuary plan.

The **Squamish Estuary Review Committee** (SERC) screens project proposals, directs them to the appropriate review process, and monitors their progress through that process. Most of these project proposals are development proposals outside of the WMA. A habitat restoration project is an example of a project within the WMA requiring a SERC review. SERC will review these project proposals and provide recommendations to the Regional Manager. The project review process is outlined in more detail in Appendix I and Section 4.1 Mercury Contamination.

4.6.2 Sewage Outflow and Pedestrian Corridor

The District of Squamish has a sewer line that originates from downtown and ends in the Central Channel. The line is under the South Loop Trail dyke. This is identified in Figure 12 of the 1999 estuary plan as, “existing sewer line and pedestrian corridor.” The District of Squamish has shut down the operation of this sewer line and has permanently capped it. The sewer line poses no threat to the environment while it remains capped. If a proposal to remove or alter the line is put forth, that proposal is subject to the project review process outlined in Appendix I.

4.6.3 Buffer on Crescent Slough

The buffer on Crescent Slough (known as Central Basin Slough in the 1999 estuary plan) is a 30-meter buffer between the WMA boundary and the industrial/commercial area. This is shown in Figure 12 – Buffers and Pedestrian Access (pg. 32) of the 1999 estuary plan. It is identified in this management plan to ensure stakeholders remain aware of this buffer zone.

4.6.4 Tidal Channel in Crescent Slough

A portion of Crescent Slough is in the Transportation Corridor and is owned by BC Rail Properties Ltd. and leased to CN Rail. The 1999 estuary plan allows BC Rail Properties to develop this area, which may require filling some of the existing channel. The developer will pay for a complete inventory of any habitat lost due to encroachment and compensate for that loss with the construction of a new channel known as Site 3 and identified in Figure 9 –Habitat Compensation Works on page 20 of the 1999 estuary plan. The channel construction is pending the design of road and rail facilities in the transportation corridor.

4.7 New Tenure Applications

The WMA designation gives priority to wildlife but does not necessarily exclude other future land uses. The Crown land within a WMA may be managed for integrated resource use, provided that the management goal and objectives of the current WMA Management Plan are adhered to.

All new land use proposals within the Skwelwil'em Squamish Estuary WMA require the consent of the Regional Manager of the Environmental Stewardship Division (ESD) in the Ministry of Environment. Proposed uses of land or resources within the WMA that are considered to fall within the Ministry of Environment's mandate will be tenured by the Ministry. A proposal for other uses of Crown land that the Ministry of Environment does not have a clear mandate to tenure can be tenured by the Integrated Land Management Bureau (ILMB) or another agency with the appropriate mandate, subject to consent from the Ministry of Environment. Any applications ILMB receives directly, will be referred to the Regional Manager of ESD for review and response. The Regional Manager of ESD will respond to short term proposals, such as filming, in accordance with the Ministry of Environment's filming policy. Longer term proposals are required to go through the Squamish Estuary Management Committee and Squamish Estuary Review Committee as outlined in the 1999 estuary plan.

4.8 2006 Oil Spill

On August 4, 2006 the forest products carrier M/V Westwood Anette had its hull ruptured in the vicinity of Squamish Terminals adjacent to the Squamish River estuary, Squamish, British Columbia. The incident resulted in the uncontrolled escape of IFO 380 fuel oil (Bunker C fuel oil cut with less than 5% gas oil) into Howe Sound, the adjacent estuary and terminal facility. The reported amount of fuel oil spilled was approximately 29,000 litres.

A spill response effort was immediately employed involving various agencies. A Pollution Abatement Order (the "Order") was issued on August 11, 2006 (amended August 23, 2006) by the BC Ministry of Environment to ensure the development and implementation of a Wildlife Management Plan, Waste Management Plan, and Environmental Impact Assessment (EIA) and Abatement Plan. The Order was issued to the M/V Westwood Anette and its owner(s).

Work on the EIA and long term monitoring of the estuary and impacted areas continues today. This work is being carried out by the responsible party under the direction of the Environmental Protection Division of the Ministry of Environment, via recommendation from local, provincial and federal agencies. The purpose of the EIA, abatement and monitoring work is to assess the environmental impact of the petroleum hydrocarbon spill on marine and shoreline resources and ecology and to carry out appropriate clean-up/remedial work at the spill site and areas impacted by the spill. The extent of the

impacts to the estuary resulting from this oil spill is not fully known to date. The EIA and long-term monitoring program will address this issue.

For more information on the Ministry of Environment's involvement with the spill response effort and long-term clean-up, contact the Environmental Management Section of the Environmental Protection Division.

Objective

Minimize the impact of the oil spill to fish, wildlife and their habitat in the WMA.

Management Strategies

- Encourage and support the continual long-term monitoring of the oil spill impacts in the WMA.
- Establish "oil spill update" as an ongoing agenda item at the SEMC meetings.

5.0 Natural Values Management

The primary goal of the Skwelwil'em Squamish Estuary WMA will be to maintain and restore fish and wildlife habitat. This section will summarize the natural values of the WMA and identify the key objectives and strategies necessary to achieve WMA goals.

5.1 Sedimentology and Soils

Two general sedimentary environments occur within the Squamish Estuary, the intertidal zone and the delta front. These sedimentary environments have been altered by the construction of the training dyke, dredging of navigable channels, disposal of dredge spoil and log storage/handling activities (Hoos and Vold, 1975).

Sedimentary environments of the intertidal zone include river mouth bars, tidal flats, and tidal marshes with sediments ranging from fines, silts and clays of the tidal flats and tidal marshes, to well-washed, coarse-to-fine grained sands of the river mouth. Construction of the training dyke has significantly reduced freshwater flow through the central basin; accordingly, silts and clays dominate while coarse sediments are generally absent (Hoos and Vold, 1975).

The Squamish River delta front is divided into three sectors: western, central and eastern (Bell M.A.Sc. in progress cited in Hoos and Vold, 1975). The western sector of the delta front extends from the west shoreline to the southern extent of the training dyke. This sector is dominated by sands described as fine-to-coarse grained, poorly sorted with large mixtures of silts and small amounts of clay. Dominance of sands is attributed to the high-energy environment of the western sector, an energy environment likely intensified by the training dyke. More information is required to understand how the training dyke influences the build up of sediment in the western sector of the delta front.

The central sector extends from the training dyke to the approximate alignment of Cattermole Creek; the eastern sector comprises the remaining portion of the delta and extends to the east shoreline (the eastern sector is not within the WMA). Fines and silts dominate sediments of the central and eastern sectors.

Upland soils within the Squamish area are predominantly podzolic. Podzols are associated with coarse textured, acidic parent materials and typically occur in coniferous forests of cool humid climates. They are well-drained, infertile soils that extensively leach clay, organic matter, iron and aluminum from topsoil layers into the subsoil (Farley, 1979).

Objective

Monitor the build up of sediment within the WMA.

Management Strategies

- Monitor the build up of sediment within the estuary and determine the effects the training dyke has on sediment deposits.

5.2 Water

Estuary ecosystems are highly fertile because of the abundance of nutrients from both fresh and salt-water environments, and the effective circulation of the nutrients by tidal action and river currents. The end result is brackish water, highly productive because of the elevated nutrient concentrations, and supporting a vast abundance and diversity of aquatic plants.

The Department of Fisheries and Oceans has installed several culverts under the training dyke to improve fish access to and freshwater circulation in the Crescent Slough and Central Channel. Salmon, trout and char are able to directly access the central slough, thereby increasing their chances of finding the best habitat in which to adjust to marine conditions and to avoid predators in order to better survive the ocean phase of their life cycles. The culverts also increase the flow of freshwater into Crescent Slough and Central Channel, thereby improving the temperature and oxygen content of the water. More mixing of river water with salt water means that a greater variety of plants and animals can flourish (SEMP, 1999).

Objective

Protect and maintain good water quality and nutrient circulation within the WMA.

Management Strategies

- Monitor adjacent land uses and identify potential contaminants coming into the WMA.
 - If potential contaminants are identified, frequently test water quality in the WMA and establish corrective actions immediately.
- Review additional culvert projects on a case-by-case basis. Ensuring good water quality is protected and maintained in the WMA will be the deciding factor for the Ministry of Environment.

5.3 Vegetation

Vegetation communities of the estuary can be separated into three distinct ecosystem environments: aquatic, estuarine, and terrestrial. Abundance and distribution patterns of plant communities are influenced by incoming nutrients from tides and rivers, sewage treatment plant outfalls, and municipal storm run off. Nutrient mobility is in turn affected by adjacent land uses.

The **aquatic environment** flourishes with a high concentration of nutrients, coupled with sunlight, contributing to the growth of phytoplankton (microscopic floating plants which convert sunlight into food via photosynthesis). Marine phytoplankton of the Squamish Estuary are comprised primarily of large diatoms and dinoflagellates. They are abundant in the spring and fall, during the migration of many aquatic and avian species, but less productive from mid-May until late August when there is poor light transparency and flushing associated with river water turbidity. Phytoplankton are dominant on the seaward mudflats (Kennish 2002 cited in Dupuis, 2003).

Benthic or bottom dwelling algae are in high production at tidal flat sediments of mudflats, seagrass beds and saltmarshes, particularly during June to August blooms. Concentrations of algae are seen around pilings, logs and in soft sediments in the west and Central Deltas.

The **estuarine environment** in the Squamish Estuary is the largest component of the ecosystem and is defined by the plant communities temporarily submerged in water. Salt marshes are the largest component of the estuarine environment, and are dominated by sedges (*Cyperaceae*), grasses (*Graminae*), and rushes (*Juncaceae*). Bulrush (*Scirpus sp.*) is widespread throughout the deltas; spike-rush (*Eleocharis palustris*) favours regions near the Squamish River mouth, true grasses occur along the west shores of Central and East Deltas in association with flowering plants. Members of the parsley family (*Umbelliferae*) are scattered over the estuary, particularly water parsnip (*Sium suave*) near Lynbye sedges (*Carex lyngbyei*), and water hemlock (*Cicuta maculate*) and beach pea (*Lathyrus japonicus*) on sandier substrates. Soft-stem bulrush (*Scirpus validus*) is located throughout the deltas. Cattails (*Typha latifolia*) occur in clumps in higher salt marshes and freshwater depressions in shrub meadows. Arrow grass (*Triglochin maritime*) occurs through the estuary in association with silverweed (*Potentilla pacifica*) or spike-rush. The salt marsh community is highly productive, nearly as productive as the mudflats and shallow waters (Dupuis, 2003).

The **terrestrial environment** includes shrub meadows and forests that are within the Coastal Western Hemlock biogeoclimatic zone. Vegetative species include more than a dozen species of berry-producing shrubs, willows (*Salix sp.*), rose bushes (*Rosa sp.*), sweet gale (*Myrica gale*), hardhack (*Spirea douglasii*), salal (*Gaultheria shallon*), false azalea (*Menziesia ferruginea*), Pacific crabapple (*Malus fusca*), maples (*acer sp.*), alders (*Alnus sp.*), and black cottonwood (*Populus balsamifera*). Sitka spruce (*Picea sitchensis*), western redcedar (*Thuja plicata*), Douglas-fir (*Pseudotsuga Menziesii*) and western hemlock (*Tsuga heterophylla*) are the common conifers in the estuary fringe and adjacent floodplain (Dupuis, 2003).

Non-native vegetation is a threat to the native vegetation values, however, the Skwelwil'em Squamish Estuary WMA is less impacted by non-native species than similar sites in the Lower Mainland (Terry Taylor, 2004). In order to prevent the introduction or spread of non-native vegetation, the District of Squamish and the Ministry of Environment have drafted guidelines for the maintenance of the training dyke

(Appendix III). These guidelines, along with other inventory and control activities, are needed to control non-native species.

Two plant species at risk have been identified in the WMA. These are the blue listed Henderson's checker-mallow and Vancouver Island beggarticks. The marsh pea is a yellow listed plant species that is in a Watch List category. Species at Risk is covered in more detail in Section 5.7.

Objectives:

Protect the ecological integrity of the native vegetation within the Squamish Estuary.

Management Strategies:

- Encourage the District of Squamish to manage the vegetation along the dyke as per the Dyke Management and Use Guidelines in Appendix II.
- Inventory and actively remove invasive species from the estuary. Pesticides should only be used after a thorough assessment of the potential impacts has been conducted.
- Only use native plant species for vegetation screening and restoration projects.
- Encourage the re-establishment of eelgrass and estuarine habitats.
- Encourage further research on rare plants in the estuary.

5.4 Fish

The Squamish Estuary supports a wide variety of fish species including, chinook (*Oncorhynchus tshawytscha*), pink (*O. gorbusha*), chum (*O. keta*), and coho (*O. kisutch*) salmon, Dolly Varden (*Salvelinus malma*), cutthroat (*Salmo clarki*), steelhead (*S. gairdneri*), rainbow trout (*Salmo sp.*), herring (*Clupea harengue*), C-O sole (*Pleuronichthys coenosus*), eulachon (*Thaleichthys pacificus*), sandlance (*Ammodytes hexapterus*), shiner perch (*Cymatogaster aggregate*), snake prickleback (*Lumpenus sagitta*), spiny dogfish (*Squalus acanthias*), staghorn sculpin (*Leptocottus armatus*), starry flounder (*Platichthys stellatus*), surf smelt (*Hypomesus pretiosus*), and threespine stickleback (*Gasterosteus aculeatus*) (Goodman and Vroom, 1972; Levy & Levings, 1978; Ryall and Levings, 1987; Dupuis, 2003).

Many estuarine fish are seasonal visitors from the near shore ocean, using the estuary as a migratory pathway between feeding and spawning grounds. The brackish water serves to help them transition between saline and freshwater environments. The most abundant forms of these transient species are juvenile salmonids such as chinook and coho, which use the estuary as nurseries and rearing grounds. Tidal channels provide an abundance of food as well as protection from predation. The Department of Fisheries and Oceans has recently been creating spawning and rearing channels on either side of Central Channel to increase the potential survival of juveniles until they are ready to set out for the open

ocean (see Figure 4). There are also adult salmon moving through the estuary to their spawning grounds most of the year (Dupuis, 2003).

The Department of Fisheries and Oceans have classified several sensitive fish habitat areas within the Squamish Estuary. The sensitive fish habitats within the WMA include both banks of the Squamish River channel along the estuarine areas and the entire Central Basin (Crescent Slough, Central Channel, Central Delta, East Marsh, North Fields, Site A and Upland Meadows). Sensitive fish habitats nearby include the Mamquam Channel and the Cattermole Creek area (Fisheries and Oceans Canada, 1999).

Fish species at risk or of special concern within the WMA are the bull trout and steelhead. Bull trout is blue listed and is known to transition between fresh and salt water. Steelhead stocks are declining in the Georgia Basin and significant recovery efforts are underway (see Section 5.7).

Objective

Protect and restore fish habitat within the WMA.

Management Strategies

- Continue to support the restoration of fish habitats within the WMA providing the Mercury Testing Protocol is followed.
- Support DFO and SRWS in their efforts to restore fish habitat within the WMA.
- Encourage studies of the abundance of fish species and habitat use (especially eulachon) within the WMA.

Figure 4 Fish Habitat Restoration Areas



5.5 Wildlife

Estuaries are highly productive ecosystems and as such host an abundance of wildlife species. The most conspicuous wildlife within the Squamish Estuary is birds, but mammals, amphibians and invertebrates are also present. These four wildlife types are described in more detail below.

5.5.1 Birds³

The Squamish Estuary provides critical life history functions for a myriad of bird species. The estuary serves as an important resting area for migratory waterfowl, particularly during fall and spring migrations. It also serves as an over-wintering site. There are 83 kinds of water birds occupying the outer estuary, deltaic channels and/or Squamish River, including ducks (27 species), loons, grebes, cormorants, herons, swans, geese, rails, shorebirds, gulls, alcids, terns, and the rare parasitic jaeger and American white pelican. Roughly 71% of these species are over-wintering waterfowl or migrants. The remaining 29% represents summer breeders as well as non-breeding individuals. Although water birds make up the bulk of the birds in the Squamish Estuary, 161 species of non water birds visit, breed, or inhabit its tidal meadows, shrub margins, or forest fringes (BSC data; Dupuis, 2003).

Birds in the terrestrial zones include 22 species of raptors, 10 species of swallows and swifts, five species of woodpeckers, three grouse species, three dove species, the common nighthawk, two species of hummingbirds, and 87 passerines including sparrows, finches, vireos, warblers, corvids, and others. Approximately 14% of these non-water birds frequent or inhabit the estuary year-round; the remaining 86% are migrants from the south (Dupuis, 2003).

East Marsh hosts the largest diversity of birds within the WMA. The marsh is naturally productive as it is least influenced by incoming freshwater. High concentrations of benthic algae at this location may explain why a large number of mud-probing shorebirds have been sighted in this area (Dupuis, 2003).

Central Channel hosts the largest number of birds in the WMA from September to April. Over-wintering and migrating water birds travelling in large flocks are the primary users of this area. Crescent Slough and North Field have the next highest bird biomass, likely because of the presence of multiple productive habitats, including drainage channels, low and mid-level tidal salt marshes, high shrub meadows, riparian borders, and interior floodplain forest (Dupuis, 2003).

Bird species at risk that have been observed within the Squamish Estuary include the peregrine falcon, marbled murrelet, great blue heron, green heron, northern goshawk and western grebes. These are described in more detail in Section 5.7.

³ For a more detailed summary of the birds in the Squamish Estuary see, [Conservation Priorities in the Squamish Estuary](#), by Ascaphus Consulting for the Squamish Estuary Conservation Society pg. 10-16.

5.5.2 Mammals

Large mammals that frequent the estuary for feeding include the black bear (*Ursus americanus*), cougar (*Felis concolor*), blacktail deer (*Odocoileus hemionus*) and coyote (*Canis latrans*). The only aquatic mammals known to occur within the WMA are seals. Harbour seals are present year round but are most abundant at the river's mouth during salmon runs and are often observed in the lower reaches of the Squamish River (Dupuis, 2003).

Medium-sized mammals that utilize the WMA are beaver and mink in old river channels near the estuary, muskrats in the delta, and river otters in the Squamish River and Central Channel (Dupuis, 2003).

Smaller riparian occupants include the water shrew (*Sorex palustris*), Pacific jumping mouse (*Zapus trinotatus*), and long-tailed vole (*Microtus longicaudus*). Bats rely heavily on riparian zones as foraging areas. More generalist species likely to frequent/reside in the estuary or its forested borders include the racoon (*Procyon lotor*), short-tailed weasel (*Mustela erminea*), long-tailed weasel (*Mustela frenata*), striped skunk (*Mephitis mephitis*), snowshoe hare (*Lepus americanus*), red squirrel (*Tamiasciurus douglasi*), and several species of moles, shrews, mice and voles (Dupuis, 2003).

5.5.3 Herptiles

Amphibians do not breed in brackish water but northwest salamanders (*Ambystoma gracile*), long-toed salamanders (*Ambystoma macrodactylum*), western toads (*Bufo boreas*) and Pacific treefrogs (*Hyla regilla*) will breed in ephemeral freshwater depressions within the estuary. Red-legged frogs (*Rana aurora*) and aquatic-breeding salamanders (*Ambystoma sp.*) will reside in any deeper, more permanent wetlands (e.g., Site A), and slow tributary reach sections within the Squamish River riparian zone.

The western terrestrial garter (*Thamnophis elegans*) is an aquatic snake rarely found far from fresh or marine water (Gregory & Campbell, 1984 cited in Dupuis, 2003). Although the common garter (*Thamnophis sirtalis*) frequents many habitat types it also prefers to forage along riparian edges and shorelines, and is commonly found swimming. Even the more terrestrial northwestern garter (*Thamnophis ordinoides*) is known to reside in estuaries, though it does not frequent the water as the other two species do. No hibernacula (snake over-wintering sites) have been reported yet in the Squamish Estuary, nor are there large rock outcrops for sunning on, except on the west shore of the Squamish River (Dupuis, 2003)

5.5.4 Invertebrates

Invertebrates (such as earth worms, spiders, crustaceans, insects, snails etc.) are critical components of ecosystem functions and make up approximately 90% of the total number of species worldwide (Franklin, 1993). Invertebrate species occurring within the Squamish River estuary, and found in the stomachs of salmonids in the estuary, include, but are not limited to clams (Class *Bivalvia*), unidentified worms, polychaetes (*Pygospio elegans* and *Manauyunkia aestuarina*), amphipods (*Eogammarus confervicolus* and *Corophium spinicorne*), copepods (*Aetidius pacificus*, *Calanus sp.*, *Metridia sp.*, and *Centropagea abdominalis*), barnacle cypris and nauplii (*Balanus glandula*), krill (Order *Euphausiacea*), crabs (Order *Decapoda*, prawns (*Cragnon franciscorum*), mysids (*Neomysis mercedis*, and *N. ragii*), isopods (*Gnorimosphaeroma oregonensis*), mayfly nymphs (Order *Ephemeroptera*), chironomids (Family *Chironomidae*), mosquitoes (Family *Culicidae*), stonefly nymphs (Order *Plecoptera*), true bugs (Order *Hemiptera*), beetles (Order *Coleoptera*), caddisfly larvae (Order *Trichoptera*), and dipteran adults and larvae (Order *Diptera*) (Goodman and Vroom, 1972; Levy and Levings, 1978; Habitat Work Group, 1980).

Benthic invertebrates observed within the WMA's fish habitats include, but are not limited to oligochaetes (Class *Oligochaeta*), clams, (*Macoma balthica*), amphipods (*Eogammarus confervicolus* and *Corophorium salmonis*), marine water mites (Class *Halcaridae*), isopods (*Gnorimosphaeroma oregonensis*), copepods (Family *Rhagionidae*), chironomids (Family *Heleidae*), heleidae larvae, and water mites (Order *Acarina*) (Habitat Work Group, 1980).

Objective

Maintain and restore wildlife populations and habitats, giving special attention to species at risk, waterfowl, and migratory birds.

Management Strategies

- Give species at risk, waterfowl, and migratory birds the highest management priority.
- Manage human use with the objective of minimizing impact to wildlife.
- Conduct inventory, monitoring and research activities to increase knowledge of wildlife values and the impacts to those values.

5.6 Species at Risk

British Columbia has pledged to conserve the province's species at risk under the National Accord for the Protection of Species at Risk (1996). The BC Conservation Data Centre tracks the province's species at risk and assesses the conservation risk for each

species. Species are given a rank based on their risk of extinction. The status ranks used are as follows:

| | |
|------------------------------------|-----------------------|
| X – Presumed extirpated or extinct | 4 – Apparently Secure |
| H – Historical | 5 - Secure |
| 1 – Critically Imperiled | ? - Unranked |
| 2 – Imperiled | U - Unrankable |
| 3 – Vulnerable | |

A species rank is preceded by a G (for Global rank), N (for National rank), and S (for Sub-national [provincial] rank).

In order to simplify interpretation of species ranks in British Columbia, three lists are created to sort species into groups with similar conservation risks. The three lists used in British Columbia are red, blue and yellow. The red list includes species that have been legally designated as endangered, are extirpated, or are considered candidates for such designation. The blue list includes species not immediately threatened or endangered, but of special concern due to characteristics that make them particularly sensitive to human activities or natural events. The yellow list includes all species not included on the Red or blue lists. Species in the yellow list ranked S4, are considered to be of conservation concern because they have a small range or low abundance in the province, they have shown provincial declines, or there are perceived long-term threats. Thus, yellow listed species ranked S4 are considered to be on a “Watch List” to be actively monitored and otherwise studied (BC Conservation Data Centre, 2001).

Red listed species within the Skwelwil’em Squamish Estuary WMA include peregrine falcon, marbled murrelet, and Keen’s long-eared myotis. Peregrine falcons breed on the nearby Stawamus Chief and forage in the estuary on a regular basis; marbled murrelets were common visitors in the Squamish Estuary in the 1980’s, however, the last report of a murrelet in the estuary was in December 1993 (Dupuis, 2003); little is known about the Keen’s long-eared myotis’ use of the Squamish Estuary other than the estuary provides good habitat for this species.

Blue listed species within the Skwelwil’em Squamish Estuary WMA include tailed frog, red-legged frog, Baird’s pelagic cormorant, great blue heron, green heron, surf scoter, short-eared owl, Townsend’s big-eared bat, grizzly bear, fisher, and wolverine (BC Conservation Data Centre, 2001). Blue listed plant species include the Henderson’s checker-mallow and Vancouver Island beggarticks. These plants are dispersed throughout North Field. The marsh pea is a yellow listed plant species that is in a watch list category and is also located throughout North Field. Other species such as the eulachon and the western toad are rapidly declining and will likely be listed in the near future.

Objective

Increase the knowledge and protection of species at risk and their habitats within the WMA.

Management Strategies

- Conduct further inventory and research activities regarding species at risk and their habitats within the WMA.
- Adapt management techniques, as new information and research data becomes available.

5.7 Biodiversity

Biodiversity simply means the variety of all living things. At a deeper level, it refers to the structure, function and composition of ecosystems and the interactions between abiotic and biotic components. Preserving biodiversity is a conservation priority for governments worldwide. Canada is a signatory nation to the United Nations Convention on Biological Diversity. British Columbia has responded to the Convention of Biological Diversity by establishing a vast network of protected lands, including parks, protected areas and conservation lands such as Wildlife Management Areas, strengthening the species at risk provisions in the *Wildlife Act*, and improving resource management programs throughout government.

At a local level, agencies use a multitude of approaches to preserve biological diversity. This management plan has identified that species at risk, waterfowl, and migratory birds will receive the highest management priority within the Skwelwil'em Squamish Estuary WMA. A species approach contributes to biodiversity, however, an ecosystem approach is also required to achieve biodiversity objectives. This means the health and processes of the ecosystem must be protected and maintained as well.

Some aspects of ecosystem management include maintaining clean water, maintaining and enhancing nutrient cycling, minimizing human use impacts and restoring modified landscapes to a natural state. The rehabilitation of the dredge spoils site and the future rehabilitation of the log sort to salt/brackish marshes and mudflats along with improving nutrient cycling with the installation of culverts under the training dyke contributes to preserving biodiversity within the Squamish Estuary.

Objective

Protect and maintain the biodiversity values of the WMA and build into provincial, national and international biological diversity programs and objectives.

Management Strategies

- Restore lost salt marsh, mudflat, and eelgrass communities through community partnerships.
- Identify regional, provincial and federal fish and wildlife program objectives and integrate these programs wherever possible.

5.8 Inventory, Monitoring, and Research

Inventory, monitoring and research activities can provide essential information that will allow the goals and objectives of the Skwelwil'em Squamish Estuary WMA to be accomplished. This information can increase the knowledge and awareness of natural and cultural features and processes within the WMA. It can also determine areas outside of the WMA that are important to species and habitats within the WMA. The inventory, monitoring and research activities will increase scientific knowledge that contributes to the management of the WMA and provides information for educational purposes.

The estuary working group conducted a significant amount of research in the Squamish Estuary in the early 1970's. Much of this work is outlined in the previous sections. More recently, the Squamish Environmental Conservation Society has undertaken a significant amount of research in the WMA. These research activities are important to better the understanding of the estuarine environment. Further inventory, monitoring and research through Ministry of Environment partnerships with post-secondary institutions, environmental organizations, and other agencies are encouraged. Topics of special interest include:

- Fish and wildlife inventory
- Continued monitoring of the potential impacts fish habitat restoration have on plant communities
- Species at Risk Inventory of the Central Delta, Crescent Slough and West Delta
- Continued monitoring of the impacts human use has on natural values
- Continued investigation into mercury contamination
- Impacts of wind sport activities on fish and wildlife

Objective

Increase inventory, monitoring and research activities within the WMA based on the goals and objectives of this management plan.

Management Strategies

- Establish partnerships with post-secondary educations, government and non-government organizations to conduct inventory, monitoring and/or research activities within the WMA.
- Integrate similar research activities and studies in the surrounding area whenever possible.

6.0 Human Use Management

Wildlife Management Areas are created with the primary purpose of maintaining and restoring fish and wildlife species and their habitats. These areas are also popular recreational spots for local residents and tourists alike. This section identifies some of the human uses within the WMA and which of these uses is compatible with WMA objectives. Management strategies are geared toward minimizing impacts to fish and wildlife.

6.1 Outdoor Recreation and Tourism

Providing recreation is not a focus of the WMA but it is recognized that recreation opportunities are important to the community of Squamish. Compatible outdoor recreation and tourism activities are discussed and guidelines are outlined to minimize impacts to fish and wildlife.

6.1.1 Walking Trails

Four main trails exist within the WMA. These are the South Loop Trail, the North Loop Trail, the Woodpecker Trail, and the Chelem Trail. The community and tourists alike utilize the trails. Identifying long-term management responsibilities will be required to officially designate these trails. Also, the South Loop and North Loop Trails require further planning to create official linkages to trails in Site A and the District of Squamish. Figure 5 identifies conceptual planning options for these trails and an additional option to establish a loop in the Woodpecker Trail. The following is a description of each trail and the issues associated with them.

South Loop Trail

The South Loop Trail is located in between Site A, North Fields and East Marsh and is a popular bird watching and nature appreciation area. As such, it is also valuable wildlife habitat. Raptors, passerines and waterfowl are common in this area. A formal pedestrian rail crossing is identified in the 1999 estuary plan above the sewer line (section 4.6.2).

There are several management issues that need to be resolved with regard to this trail. Many people use the trail as a loop, which results in trespassing on CN Rail property. Also, there is no management agreement for the maintenance of the trail and to ensure the trail is safe. Furthermore, an integrated trail plan with the District of Squamish and Squamish Nation is required as the access to this trail is outside of the WMA. It is anticipated that the Squamish Trail Society or the District of Squamish will initiate an integrated trail plan proposal that addresses the issues stated. Some possible options are:

Option 1

Designate a trail along the South Loop Trail to East Marsh (before the old bridge locations) and construct a small viewing area with adequate vegetation screening to minimize impact to waterfowl.

Option 2

Continue with the original alignment of the trail but complete the loop by either: working with the District of Squamish and creating a linkage via Cattermole Slough (this would require the construction of several large bridges); or, obtain permission from CN Rail to construct a trail at the toe of the rail bed (this may only be a temporary solution as the toe of the rail bed is still within the transportation corridor.)

Optional Link to North Loop Trail

In conjunction with Options 1 and 2, the North Loop Trail could be linked to the South Loop Trail via the east side of the Log Sort. This linkage would occur during the restoration of the Log Sort.

North Loop Trail

The North Loop Trail is primarily in Site A, but a section of the trail is within the WMA alongside Crescent Slough. The trail is within a mixed forest, which provides good screening to minimize impact to waterfowl. The management issues are the same as those identified in the South Loop Trail.

Woodpecker Trail

The Woodpecker Trail is located at the north end of the Central Delta and is situated in a mixed forest. The trail is in good condition on the east side of the training dyke and poor condition on the west side due to overgrowth and bank erosion. Hiking this trail poses very low impact to wildlife with the exception of off-leash dogs. The use and general upkeep of the Woodpecker Trail are encouraged and an option to establish a loop on the west side of the dyke is shown in Figure 5.

Chelem Trail

The Chelem Trail is located in the Central Delta. When the Squamish River Watershed Society and the Department of Fisheries and Oceans restored the dredge spoils pile back to a functioning estuarine habitat, a portion of the dredge sand was left to establish a trail. SRWS and DFO are responsible for the long-term management of the trail. The trail provides excellent viewing and nature appreciation opportunities. In order to minimize impact to waterfowl, vegetation screening is required on the sides of the trail.

Objective

Establish long-term management agreements for the walking trails.

Ensure trails are designed in manner that minimizes impacts to fish and wildlife.

Management Strategies

- Encourage the Squamish Trail Society and/or the District of Squamish to initiate an integrated trail plan for the WMA, Site A, and the District of Squamish with SEMC involvement.
- Develop a management agreement for long-term trail management with the Squamish Trail Society and/or the District of Squamish and ensure SRWS and DFO agreement is adequate.
- Design trails as single file walking trails (Type III - BC Parks standard) within the WMA.
- Improve vegetation screening on trails, especially on the Chelem Trail, to minimize impacts to waterfowl.

Figure 5 Conceptual Trail Plan



6.1.2 Hunting and Fishing

Hunting and fishing activities are recognized as recreational opportunities under the 1999 estuary plan. The Ministry of Environment also considers these activities as important fish and wildlife management tools. The District of Squamish recently changed a shooting by-law which removed the hunting opportunities within the WMA. The Ministry of Environment is in support of hunting in the WMA should the District decide to re-instate shooting by-laws. Generally, the hunting season would be from October 15 to January 31 in designated areas within the WMA (see figure 6).

All fishing users are required to possess a valid fishing licence. The annual BC Environment Hunting and Fishing Synopsis, available online or at the local government agent, provides a list of open seasons.

Objective

Provide and enhance hunting and fishing activities within the WMA.

Management Strategies

- Encourage the Conservation Officer Service to maintain regular patrols during hunting and fishing seasons.
- Continue to support waterfowl hunting within the WMA should the District of Squamish re-instate shooting by-laws.
- Should the shooting by-laws be re-instated, post and maintain signs designating hunting areas and informing users of regulations.
- Continue to support a partnership between the Squamish Valley Rod and Gun Club and the Squamish Environmental Conservation Society to post educational signs within the hunting area.

6.1.3 Wind Sport Activities

Wind sport activities are considered a valuable outdoor recreation and tourism opportunity within the District of Squamish. If managed correctly, wind sports will have minimal impact on fish and wildlife. The District of Squamish and the Squamish Wind Sports Society (SWS) have entered an agreement granting SWS the authority to manage and operate a windsurfing facility at the end of the Training Dyke, locally known as The Spit. This agreement identifies the windsurfing season to be between mid-May and mid-September. This is a compatible season with waterfowl and migratory bird values. Wind sport users are also required to stay within the wind sport area identified in Figure 6.

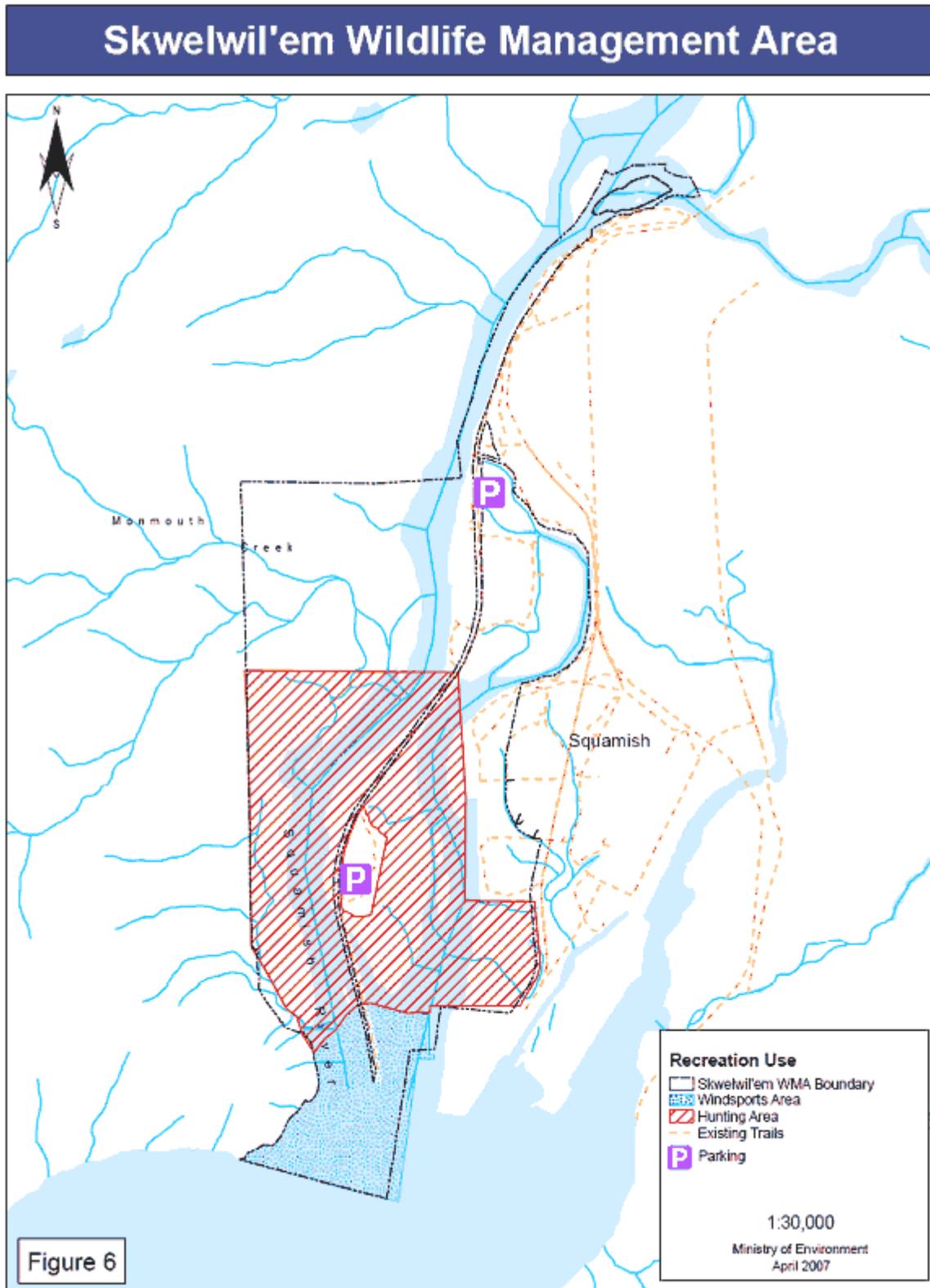
Objectives

Ensure wind sport activities are conducted in a manner posing minimal impacts to waterfowl.

Management Strategies

- Support the agreement between the District of Squamish and the Squamish Wind Sports Society providing the content of the agreement is compatible with WMA objectives.
- Wind sport activities must remain in the wind sport recreation zone as identified on Figure 6 and enter and exit the water at the designated access point.
- Further assessment is required to determine the impacts of wind sport activities on fish, wildlife and vegetation.

Figure 6 Recreation Areas



6.1.4 Canoeing and Kayaking

The Squamish Estuary is a popular location where canoeists and kayakers go to enjoy the natural features and spectacular views of the surrounding area. The majority of the use is in the summer months but some use is year round. It is important to recognize that approaching canoe and kayak users can impact waterfowl and migratory birds especially in winter and spring. Guidelines and ethics are required to minimize the impacts to waterfowl and migratory birds. Further assessment is required to determine the impacts of canoeing and kayaking on the waterfowl and migratory birds in the Central Channel and Crescent Slough.

Objective

Minimize impacts canoeing and kayaking have on waterfowl and migratory birds.

Management Strategies

- Support canoe and kayak use with the following restrictions:
 - Use in Central Channel and Crescent Slough will be discouraged from October to May;
 - Access to East Marsh is prohibited to prevent substrate disturbance;
 - Put-in and take-out locations will be restricted to the east side of Crescent Slough and at the Windsurfers Spit.
- Restrict access to land in Central Channel from February 1 to July 1 (bird nesting season);
- Install and maintain signage at put-in and take-out locations, as well as throughout the paddling areas to indicate proper procedures, placement, and timing of activities.

6.2 Motor Vehicle Access

Motor vehicles potentially threaten fish and wildlife values within the WMA, especially off-road and all-terrain vehicles. All-terrain vehicles can easily access sensitive habitats and cause extensive damage. For this reason motor vehicles will not be allowed within the WMA.

The Navigable Waters Protection Division of Transport Canada is responsible for the administration of the federal *Navigable Waters Protection Act*. The use of motorized water craft in the Central Channel, the West Delta, and the Squamish River falls under this legislation. The impacts to fish and wildlife habitat as a result of motorized water craft in Central Channel and West Delta should be monitored. If impacts are occurring, the Ministry of Environment should apply to Transport Canada for the closure of motorized water craft in Central Channel and West Delta.

Objectives

Avoid motor vehicle impacts on fish, wildlife and their habitat.

Management Strategies

- Implement a Regional Manager's Order, prohibiting the use of motor vehicles in the WMA.
- Restrict motor vehicle access to trails and habitats by blocking known trails off the training dyke.
- Gate the northern section of the training dyke to limit access to significant bald eagle and fish habitat.
- Work with the District of Squamish to establish official parking areas and staging areas for designated trails and wind sports.
- Monitor the impacts motorized water craft have on fish and wildlife habitat in Central Channel and West Delta. If impacts are occurring, apply to Transport Canada for the closure of motorized water craft in Central Channel and West Delta.

6.3 Interpretation and Nature Appreciation

It is important that people appreciate the natural values associated with the Skwelwil'em Squamish Estuary WMA. However, care must be taken so people do not detrimentally impact the natural values they have come to enjoy. All interpretation and nature appreciation activities must follow the Ministry of Environment's wildlife viewing ethics guidelines. These guidelines can be found on the ministry's website.

Objectives

Encourage nature appreciation and interpretation, providing these activities are conducted in a manner consistent with WMA objectives.

Management Strategies

- Encourage WMA stakeholders and partners to work with the province to develop interpretation signage. This signage should be geared toward the cultural and natural values of the area and suggest how people can minimize impacts on fish and wildlife.

6.4 Regional Manager's Order

Section 7 (4) of the British Columbia *Wildlife Act* allows a Regional Manager to prohibit certain uses and activities within a Wildlife Management Area. Regulations respecting use and occupation of a WMA may also be made via an OIC under Section 108(2)(b) of the *Wildlife Act*. The following are the Regional Manager's Orders or Regulations recommended for the Skwelwil'em Squamish Estuary WMA:

Regional Manager's Orders

- Dogs must be on leashes at all times;
- The use of motorized vehicles is prohibited;
- Wind sport activities must remain in the wind sport recreation zone as identified on Figure 6 and enter and exit the water at the designated access point;
- No person shall come to shore in Central Channel between February 1 to July 1 (bird nesting season);

Regulations

- Camping is prohibited.

Objective

Enact a Regional Manager's Order and Regulations prohibiting uses and activities that threaten WMA values.

Table 1 Compatible Activities and Uses

| Activities/Uses | Compatible | Comments |
|---|------------|--|
| First Nation Traditional Use | Y | |
| Hunting | M | Provided District of Squamish lifts firearms Ban |
| Fishing | Y | Valid licence required |
| Trapping | N | |
| Hiking/Walking | Y | On designated trails |
| Horse Use/Pack Animals | N | |
| Mountain Biking | N | Not in WMA but allowed on roads and District of Squamish training dyke |
| All-Terrain Vehicle Access | N | As per Regional Manager's Order |
| Guide Outfitting (hunting) | M | Valid licence/permit required |
| Guide Outfitting (fishing) | M | Valid licence/permit required |
| Guide Outfitting (river rafting) | M | Valid licence/permit required |
| Overnight Camping | N | As per Regional Manager's Order |
| Campfires | N | As per Regional Manager's Order |
| Commercial Recreation (facility based) | N | |
| Fish Restoration | Y1 | With Assessment |
| Wildlife Restoration | Y1 | With Assessment |
| Trail or Road Access | Y | In designated areas |
| Motorized Water Access | Y1 | Monitor use in Central Channel |
| Commercial Filming | M | Not in wetlands |
| Forest Insect/Disease Control | M | As approved by MoE |
| Noxious Weed Control | M | As approved by MoE |
| Exotic Insect/Disease Control | M | As approved by MoE |
| Scientific Research (Specimen Collection) | M | As approved by MoE |
| Scientific Research (manipulative activities) | M | As approved by MoE |
| Wind Sports | Y1 | As per agreement |
| | | |

Y = Compatible activity or use.

Y1 = Compatible with restrictions.

M = May be compatible under certain conditions.

N = Not compatible.

7.0 Plan Implementation

Introduction

This section compiles all of the actions listed throughout this management plan and lists them in order of priority. Implementation of these actions is dependent upon the availability of the Ministry of Environment's financial and staff resources, and will be affected by the needs of other WMAs, parks and protected areas in the Lower Mainland Region and in the rest of the province. Approval of this management plan does not constitute automatic approval of funding for implementation. In addition, the Ministry may have to seek corporate, community or interagency partnerships to implement many of the actions in this management plan.

Prioritizing the main resources is necessary to effectively implement this management plan. The following outline lists the proposed actions in three sections: Highest Priority Actions; Task or Project Oriented Actions; and Ongoing and Monitoring Actions.

The first list, Highest Priority Actions, highlights actions that are of the highest priority and require attention within the near future.

The second list, Task or Project Oriented Actions, highlights actions that require a specific task or project. Implementation of this list depends on budgets and available resources either within the Ministry or within the community and stakeholders.

The third list, Ongoing Monitoring Actions, describes actions that require ongoing or monitoring types of tasks or projects.

Highest Priority Actions

- **Increase the knowledge and protection of species at risk and their habitats within the WMA.**
 - Conduct further inventory and research activities regarding species at risk and their habitats within the WMA.
 - Adapt management techniques, as new information and research data become available.

- **Research and monitor the extent of mercury within the WMA and avoid the spread of contamination.**
 - Ensure all proposed projects within the WMA follow the Mercury Testing Protocol in Appendix I.
 - Conduct further sediment sampling throughout the WMA, as resources become available.

- Set up a repository of all project assessments and mercury testing at the Lower Mainland Regional Office of the Ministry of Environment.
- Continue to share information and work collaboratively with other stakeholders to better understand and manage the mercury contamination in the Squamish area.
- **Enact Regional Manager’s Orders or Regulations under the *Wildlife Act* prohibiting uses and activities that threaten WMA values.**
 - These should address the following:
 - Dogs must be on a leash at all times;
 - The use of motorized vehicles is prohibited;
 - Wind sport activities must remain in the wind sport recreation zone as identified on Figure 6 and enter and exit the water at the designated access point;
 - No person shall come to shore in Central Channel between February 1 to July 1 (bird nesting season);
 - Camping is prohibited.
- **Minimize the impact of the oil spill to fish, wildlife and their habitat in the WMA.**
 - Encourage and support the continual long-term monitoring of the oil spill impacts in the WMA.
 - Establish “oil spill update” as an ongoing agenda item at the SEMC meetings.
- **Increase the involvement of the Squamish Nation pertaining to natural and cultural features management within the WMA.**
 - Develop ongoing communication and working relationships with the Squamish Nation.
 - Discuss with Squamish Nation areas of special spiritual and cultural interest within the WMA and how Ministry of Environment staff will recognize and protect those aboriginal cultural features found in the WMA.
 - Develop a strategy with Squamish Nation that will protect and allow for the continued practice of traditional activities for present and future generations of First Nations people in relationship to the lands within the WMA.
 - Provide the Squamish Nation with the opportunity to develop interpretation signage sharing the Nation’s cultural heritage values in the WMA and Site A with WMA users.
 - Review all development proposals not covered in this management plan cooperatively with the Squamish Nation.
- **Encourage community involvement in the management of the WMA based on the goals, objectives and management strategies outlined in this management plan.**

- Establish a WMA Stewardship Working Group that meets at least annually. This group should be open to all who have interest in the WMA and should be guided by the goals, objectives and management strategies of this management plan. All initiatives and activities will be approved by the Regional Manager or designate.
- The working group should explore means to raise funds in support of stewardship initiatives.
- **Protect and maintain good water quality and nutrient circulation within the WMA.**
 - Monitor adjacent land uses and identify potential contaminants coming into the WMA.
 - If potential contaminants are identified, frequently test water quality in the WMA and establish corrective actions immediately.
 - Review additional culvert projects on a case-by-case basis. Ensuring good water quality is protected and maintained in the WMA will be the deciding factor for the Ministry of Environment.
- **Continue communication with adjacent landowners through SEMC.**
 - Continue Ministry of Environment's involvement in SEMC.
 - Encourage all adjacent landowners to participate in SEMC.
- **Protect the ecological integrity of the native vegetation within the Squamish Estuary.**
 - Encourage the District of Squamish to manage the vegetation along the dyke as per the Dyke Management and Use Guidelines in Appendix II.
 - Inventory and actively remove invasive species from the estuary. The Ministry of Environment has a pest management protocol document allowing the use of pesticides in parks and protected areas. Pesticides should only be used after a thorough assessment of the potential complications has been conducted.
 - Only use native plant species for vegetation screening and restoration projects.
 - Encourage the re-establishment of eelgrass and estuarine habitats.
 - Encourage further inventory of rare plants in the estuary
- **Maintain and restore wildlife populations and habitats, giving special attention to species at risk, waterfowl, and migratory birds.**
 - Give species at risk, waterfowl, and migratory birds the highest management priority.
 - Manage human use with the objective of minimizing impact to wildlife.

Task or Project Oriented Actions

- **Restore the log sort lease area back to a productive wetland habitat.**

- Liaise with the West-Barr Contracting Ltd. regarding the timing of their move to the new log sort site.
- Ensure West-Barr Contracting Ltd. meets their obligations under the Clean-Up Plan schedule of the lease agreement.
- Coordinate with DFO and other stakeholders to explore options for improving the restoration of the site and creating a trail linkage.
- **Encourage further habitat restoration of the dredge spoils site.**
 - Support the DFO and the SRWS to continue habitat restoration of the site especially in areas where no vegetation is growing due to poor and compacted soil.
 - Increase the vegetation screening on the Chelem trail to minimize impacts to waterfowl.
- **Establish long-term management agreements for the walking trails.**
 - Encourage the Squamish Trail Society and/or the District of Squamish to initiate an integrated trail plan for the WMA, Site A, and the District of Squamish with SEMC involvement.
 - Develop a management agreement for long-term trail management with the Squamish Trail Society and/or the District of Squamish and ensure SRWS and DFO agreement is adequate.
- **Protect and maintain the biodiversity values of the WMA and build into provincial, national and international biological diversity programs and objectives.**
 - Restore lost salt marsh, mudflat, and eelgrass communities through community partnerships.
 - Identify regional, provincial and federal fish and wildlife program objectives and integrate these programs wherever possible.
- **Protect and restore fish habitat within the WMA.**
 - Continue to support the restoration of fish habitats within the WMA providing the Mercury Testing Protocol is followed.
 - Support DFO and SRWS in their efforts to restore fish habitat (especially eulachon) within the WMA.

Ongoing and Monitoring Actions

- **Ensure the management and maintenance of the Squamish River training dyke is compatible with WMA objectives.**
 - Ensure the proposed Stewardship Working Group is familiar with the dyke management and use guidelines.
 - The Ministry of Environment and the District of Squamish should continue to work cooperatively to finalize the Squamish River Training Dyke Management and Use Guidelines.

- **Ensure the WMA and Site A are managed in a manner consistent with the 1999 estuary plan.**
 - Invite the Squamish Nation to be a part of the Stewardship Working Group, which could also include Site A.
 - Work with the Squamish Nation regarding the development of a cultural centre to ensure it is compatible with WMA objectives.

- **Increase inventory, monitoring and research activities within the WMA based on the goals and objectives of this management plan.**
 - Establish partnerships with post-secondary educations, government and non-government organizations to conduct inventory, monitoring and/or research activities within the WMA.
 - Integrate similar research activities and studies in the surrounding area whenever possible.

- **Ensure trails are designed in manner that minimizes impacts to fish and wildlife.**
 - Design trails as single file walking trails (Type III - BC Parks' standard) within the WMA.
 - Improve vegetation screening on trails, especially on the Chelem Restoration Trail, to minimize impacts to waterfowl.

- **Provide and enhance hunting and fishing activities within the WMA.**
 - Encourage the Conservation Officer Service to maintain regular patrols during hunting and fishing seasons.
 - Continue to support waterfowl hunting within the WMA should the District of Squamish re-instate shooting by-laws.
 - Should the shooting by-laws be re-instated, post and maintain signs designating hunting areas and informing users of regulations.
 - Continue to support a partnership between the Squamish Valley Rod and Gun Club and the Squamish Environmental Conservation Society to post educational signs within the hunting area.

- **Ensure wind sport activities are conducted in a manner posing minimal impacts to waterfowl.**
 - Support the agreement between the District of Squamish and the Squamish Wind Sports Society providing the content of the agreement is compatible with WMA objectives.
 - Enact a Regional Manager's Order stating: "Wind sport activities must remain in the wind sport recreation zone and enter and exit the water at the designated access point."
 - Further assessment is required to determine the impacts wind sport activities have on fish, wildlife and vegetation.

- **Minimize impacts canoe and kayaking have on waterfowl and migratory birds.**

- Support canoe and kayak use with the following restrictions:
 - Use in Central Channel and Crescent Slough will be discouraged from October to May;
 - Access to East Marsh is prohibited to prevent substrate disturbance;
 - Put-in and take-out locations will be restricted to the east side of Crescent Slough and at the Windsurfers Spit.
 - Wind sport activities must remain in the wind sport recreation zone as identified on Figure 6 and enter and exit the water at the designated access point;
 - Install and maintain signage at put in and take out locations, as well as throughout the paddling areas to indicate proper procedures, placement, and timing of activities.
- **Avoid motor vehicle impacts on fish, wildlife and their habitats.**
 - Implement a Regional Manager’s Order, prohibiting the use of motor vehicles in the WMA.
 - Restrict motor vehicle access to trails and habitats by blocking known trails off of the training dyke.
 - Gate the northern section of the training dyke to limit access to significant bald eagle and fish habitat.
 - Work with the District of Squamish to establish official parking areas and staging areas for designated trails and wind sports.
 - Monitor the impacts motorized water craft have on fish and wildlife habitat in Central Channel and West Delta. If impacts are occurring, apply to Transport Canada for the closure of motorized water craft in Central Channel and West Delta.
- **Encourage nature appreciation and interpretation providing these activities are conducted in a manner consistent with WMA objectives.**
 - Encourage WMA stakeholders and partners to work with the province to develop interpretation signage. This signage should be geared toward the cultural and natural values of the area and how people can minimize their impacts on fish and wildlife.
- **Ensure the WMA and Site A are managed in a manner consistent with the 1999 estuary plan.**
 - Invite the Squamish Nation to be a part of the Stewardship Working Group, which could also include Site A.
 - Work with the Squamish Nation regarding the development of a cultural centre to ensure it is compatible with WMA objectives.
- **Monitor the build up of sediment within the WMA.**
 - Monitor the build up of sediment within the estuary and determine the effects the training dyke has on sediment deposits.

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Appendix I
Project Review Process & Mercury Testing Protocol
for the
Skwelwil'em Squamish Estuary Wildlife Management Area (& Site A)

Background

The Squamish Estuary has mercury contamination from previous industrial use at the nearby Nexen site. Most of the contamination appears to be outside of the Ministry of Environment (MoE) Wildlife Management Area (WMA), but concentrations of mercury have been revealed on the east side of the WMA and within Site A. An Ecological Risk Assessment completed by Nexen Inc. found no unacceptable risks to the environment and human health in the conservation area (now the WMA) if the land is left undisturbed. This Risk Assessment did not address the ongoing and proposed environmental improvement projects to restore fish habitat and ecosystem functions. In order to manage risk, all proposed projects involving significant disturbance of sediment, whether restoration or recreation focused, will be required to follow this protocol. Works involving very low disturbance of sediment (i.e. digging a sign post hole) will not require sampling.

Purpose

This protocol is intended to avoid the spread of mercury contamination and to clearly define the process to approve projects within the WMA (and Site A). The process is designed to ensure:

- Adequate samples are collected
- Acceptable mitigation and monitoring strategies are in place
- Approving bodies are identified
- Appropriate follow-up sampling and remediation occurs
- Other impacts to the environment are addressed

Process

1. Pre-proposal approval to conduct sampling in estuary.

The proponent wanting to conduct dredging activities within the WMA or Site A must write a letter of intent to the landowner for approval to conduct mercury sampling for an identified purpose. After receiving the approval, the proponent must hire a professional experienced in contaminated sites to determine a reasonable frequency and distribution of samples and to conduct the testing activities. It is understood that a more rigorous testing regime will occur in East Marsh, North Fields and Site A.

2. Proposals submitted to land owner: Regional Manager ESD/Squamish First Nation.

Upon completion of sampling activities, the proponent will submit a proposal that includes but is not limited to:

- A description and location of project
- An assessment of potential impacts to plant communities, fish & wildlife (with special attention to species at risk, waterfowl and migratory birds)
- The sampling process, data, and distinction between receptors of concern
- The proposed sediment management practices
- The on-going monitoring activities
- The post-sampling and remediation activities

3. Proposal reviewed by the Squamish Estuary Review Committee (SERC).

After receiving the proposal, the land owner will submit the proposal to the SERC to ensure the proposal is satisfactory and to provide recommendations as to the benefit/cost of the proposed works. Should there be significant concerns around contamination, the proposal can be forwarded to the Land Remediation Department (LMD) of the Ministry of Environment for comment.

4. Land Owner Approves/Denies Proposal.

After reviewing the SERC recommendations (and possibly the LMD comments), the land owner approves or denies the proposal in writing. If it is determined the proposal is inadequate the land owner will stipulate the reasons for rejection.

5. Start-up and Ongoing Monitoring of Project.

If the project is approved, the proponent must identify when works will be completed and ensure all mitigation activities are adhered to. Notification to the LMD is required if samples are greater than quality criteria.

6. Post-Project Remediation.

All spoil areas will be re-vegetated with plant species appropriate to the Squamish Estuary and as recommended by a plant specialist.

7. Post-Project Report.

After works are completed, further samples within the project area are to be conducted by a professional experienced in contaminated sites. The proponent will supply all sample data and a project summary in a report to the landowner.

Data/File Storage

Data storage of all sampling activities will be held in the Ministry of Environment Regional Office for the WMA and Site A. This data will be made available to stakeholders to assist in planning future habitat restoration projects. **Note:** DFO has completed a Squamish Estuary Habitat Restoration Sediment Management Plan. This document provides a good example of the requirements of this protocol.

Appendix II
West-Barr Contracting Ltd. Clean-Up Schedule

COPY

**PROCEDURE FOR THE
CLEAN UP OF SITE "A"**

SQUAMISH, BC

December 23, 2003

The following is a detailed procedure for the cleanup of West-Barr's
Site A log sort in the Squamish River Estuary.



WEST-BARR CONTRACTING LTD.

Box 335, Squamish, B.C. V0N 3G0

Phone : 604-892-9390

Fax : 604-892-9852

Email: westbarr@telus.net

1/11

A handwritten signature in black ink, appearing to be the initials "CB".

PURPOSE

The purpose of this Procedure is to describe in some detail the clean-up measures that will be taken by West-Barr Contracting Ltd. upon vacating Site A (in accordance with their lease with the Province – No. 237333). The land will be left in a safe, clean and sanitary condition; consistent with a well-maintained industrial site, as it was on the date West-Barr Contracting Ltd. commenced operations (January 01, 1988). The site will revert to a river estuary reserve. Therefore at completion of this work, the land portion of the site will be able to be restored to a wildlife habitat and the adjacent waterways to productive fish habitat.

SCOPE OF WORK

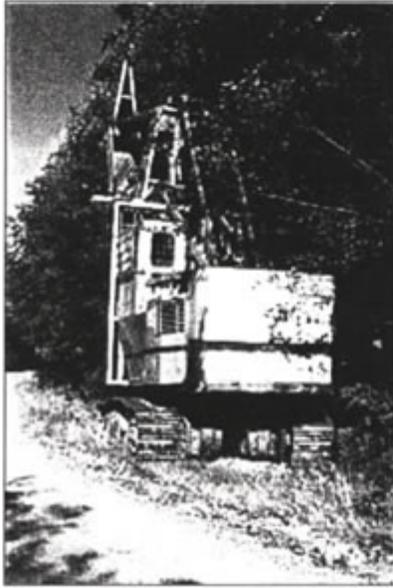
This cleanup has 6 phases:

- 1 Remove all buildings, equipment, machinery, parts, storage containers and any foundations they sit on.
- 2 Take all reasonable steps necessary to remove all loose debris, including hog material, logs, log ends, bark, wood chunks and large rocks from both the surface area and perimeter of the site.
- 3 Remove all dolphins and pilings, dump skids, boom boats, winches, air lines, fuel hoses, boom logs, chains and all other loose gear from the log boom pocket area (except the log cribbing on the west side).
- 4 Grade the site to ensure good continuous drainage to prevent the pooling of water.
- 5 Breach the berm (located at the north end of the boom pocket), in two places in order to restore two-way tidal flow in this area.
- 6 Donate \$5,000.00 in cash or in kind toward revegetating the site and promoting riparian growth.



DETAILED DESCRIPTION OF WORK

- 1** West-Barr Contracting Ltd. will remove all buildings, equipment, machinery, parts, storage containers, and any foundations they sit on including, but not limited to, the following:



I - YELLOW "LINK BELT" GRAPPLE YARDER



II - TRAILER RELOAD "A" FRAME

The trailer reloading frame will be dismantled and removed (including foundations)



III - RAILWAY CAR BULKHEADS

3/11





IV - REMNANTS OF DONKEY SKIDDER



V - LOGGING TRUCK AXLE



VI - 12" GALVANIZED PIPE



VII - ANCHOR BASES



VIII - PILE DRIVING PIPE, I BEAMS AND LOG DEBRIS

4/11
ad



IX - 1 BEAMS AND 48" GALVANIZED PIPE



X - OLD BUOY



XI - OLD BOOM BOAT/TUG



XII - 48" GALVANIZED PIPE ALONG ROAD



XIII - OLD CRANE BOOM PARTS AND DEBRIS



XIV - LOG DECK UNLOADING SKIDS (x2)

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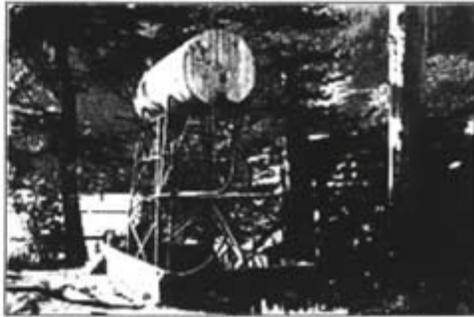
XV - LOADERS (x2)



XVI - CABLE DISPENSER



XVII - EQUIPMENT STORAGE SHED AND CREW HUT



XVIII - DIESEL TANK AND CONTAINMENT BERM
Should any hydrocarbon-contaminated soil exist, it will be removed to an approved site.



XIX - LOG BUNDLER/BOOM SKIDS (x2)



XX - CABLE, CHAINS, TOOLS & MISC. PARTS

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XXI - MISCELLANEOUS PARTS and EQUIPMENT

2 West-Barr Contracting Ltd. will take all reasonable steps to to remove all debris, hog material, logs, log ends, bark, wood chunks and large rocks from both the surface area and perimeter of the site, including but not limited to the following:



XXII - ALL MERCHANTABLE AND SCRAP LOGS



LOGS DONATED FOR JUVENILE SALMON ENHANCEMENT PROJECT



PILE OF LARGE BLAST ROCKS

7/11
AK



XXIII - LOG SORT WASTE PILE (500M³ - 2,000M³)



XXIV -
ALL BACK
STOP LOGS



XXV - ALL
LOG CUT
ENDS
AND BUTTS



XXVII - ALL WOOD AND BARK DEBRIS UNDER
AND AROUND LOG PILES

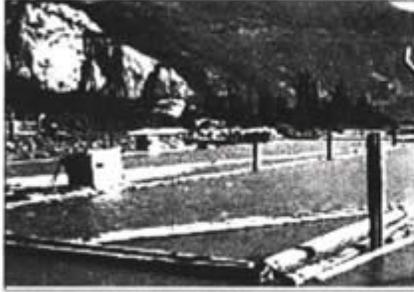


XXVI - ALL PERIMETER LOGS AND DEBRIS

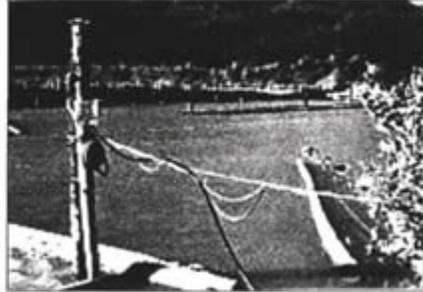
8/11

A handwritten signature or set of initials, possibly 'AD', written in black ink.

- 3 West-Barr Contracting Ltd. will remove all dolphins and pilings, dump skids, boom boats, winches, air lines, fuel hoses, boom logs, chains and all other loose gear from the log boom pocket area (except the cribbing on the west side), including but not limited to the following:



XXVIII – DOLPHINS, PILINGS, BOOM BOAT, BOOM LOGS and WINCH RAFTS



XXIX – FUEL AND AIR COMPRESSOR LINES
Care will be taken to ensure there are no contaminate spills



XXX – CRIBBING ON WEST SIDE OF BOOM POCKET LEFT AS IS



- 4 West-Barr Contracting Ltd. will grade the site to ensure good continuous drainage to prevent the pooling of water and maximize the opportunity for new plant life to grow.



XXXI - SWALES FOR DRAINAGE
The ground on the site percolates well but the site will be graded to permit additional drainage.

9/11



5 West-Barr Contracting Ltd. will tidy the area around and on the berm, which skirts the north side of the log boom pocket. The berm will be breached in two places to restore two-way tidal flow in the Blind Channel. The breaching of the berm will only be done during specified dredging windows (September 15 to October 31, or January 01 to February 28). The Squamish office of Fisheries and Oceans Canada will be notified 48 hours prior to commencement of work. The work will include but is not limited to:



XXXII - LOGS AND DEBRIS WILL BE REMOVED



XXXIII - METAL CRIBBING WILL BE REMOVED



XXXIV - ONE OF THE CHANNELS TO BE RECONNECTED WITH THE BOOM POCKET-



XXXV - PROPOSED LOCATIONS OF BREACHES IN THE BERM
(Following consultation with others)

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- 6 West-Barr Contracting Ltd. will donate \$5,000.00 in cash or in kind toward revegetating the site and promoting riparian growth. We will provide any reasonable assistance toward achieving this end.



XXXVI - REVEGETATION OF NATURAL FLORA



XXXVII - WEST-BARR, SITE 'A'
A HAPPY SITE FOR ALL TIME

CONCLUSION

The West-Barr Contracting Ltd. Site A log sort is an active working site. Material is brought in and shipped out on an ongoing basis. Included in this process is the removal of debris and waste. Therefore, some specifics of the Procedure will change as product and equipment comes and goes from the site. The essence, spirit and commitment to the Procedure will remain in place. West-Barr Contracting Ltd. will act in good faith to ensure that the Procedure remains consistent with the intent and spirit of the terms of termination. All clean up work will be completed within 180 days of the expiration of the Term or October 13, 2014, (whichever comes first). West-Barr, their employees and owners are sensitive to the care that is required relative to the location of this site, and are vigilant in maintaining a continuous sense of order and tidiness as part of their work mandate. They also understand the requirements of leaving the site in a manner whereby it can quickly return to a native-like state that functions with the surrounding estuary as a productive fish and wildlife habitat.

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Appendix III
Guidelines for Maintenance of Lower Squamish River Training Dykes -
June 2005 revised March 2006
- DRAFT -

The District of Squamish (District), the Squamish Estuary Management Committee (SEMC), and the Ministry of Environment (MoE) have a mutual interest in the effective management and maintenance of the Lower Squamish River Flood and Training Dykes (Dyke or Dykes). The District, SEMC and MoE agree that:

The areas of interest are the Dykes between the Mamquam River BC Rail bridge and the end of the Dyke near the wind sports facilities and as shown on the attached map;

The District currently owns the road surface on top of the Dyke and in the near future will own the entire Dyke from toe to toe;

The District is responsible for the management and maintenance of the Dykes;

SEMC is responsible for coordination, input and discussion between various community interests on issues within the estuary, including the Dykes and adjacent areas;

MoE is responsible for management and protection of natural values in the WMA; and

The District, SEMC, and MoE are committed to managing the Dykes to provide necessary flood protection and access in a manner that is compatible with, and in support of, the sensitive environmental values in the adjacent Wildlife Management Area.

Therefore, it is agreed that in the management of the Dykes the following guidelines will be followed by the District and supported by SEMC and MoE:

- The District will conduct emergency repairs and maintenance of the Dykes as necessary.
- The District agrees no further soils need to be added to the slopes of the Dykes for improvement of mowing conditions. The District may add smaller amounts of soils to portions of the flood Dykes to repair the mowing surfaces.
- Any soils used for the above repairs will have a known history and source, will have been confirmed by the District's Environmental Coordinator to be free of contaminants, including invasive plants.
- The District will mow the flood Dyke up to two times per year as far down the slope of the Dyke as the mower will reach. In consultation with the District's Environmental Coordinator the District will schedule mowing to provide benefits to bird species and other wildlife.
- The District will mow the majority of the training Dyke once per year one mower width down from the top of the Dyke's horizontal surface. There will generally be no mowing of the training Dyke south of, or downriver of, the gate near the wind

sports area. This area will be left wild or occasionally mowed due to excess build up of vegetation.

- Generally no vegetation will be planted along the slopes of the Dykes and seeding will occur from the adjacent vegetation. If seeding is required, native species only will be planted. This will be determined by District staff in consultation with SEMC and MoE.
- The road surface on the top of the dyke will be, over time, managed to a width of about 2.5 vehicle widths with two small pullouts or parking areas located at the trailheads (*as identified in Figure 6*).
- The District and MoE will work together to close all vehicle access from the Dyke to the river. This is done to reduce fire hazards, to protect sensitive wildlife values, and to increase public safety. MoE is responsible for identifying areas to be closed and for conducting any public or stakeholder consultations around the closures. The District will then, as feasible, work to remove or close the access points off the Dykes.
- In order to facilitate the above, it is recommended that a gate be installed to limit access to the north end of the Dyke. Bicycling and hiking activities will be encouraged on this portion of the Dyke. Keys may be provided to fish guide outfitters. A second gate will be required at the alternate access. Consultation with Squamish Nation is required for the second gate.
- The District is responsible for managing the wind sports permit that will be managed in a manner consistent with WMA objectives. Parking for wind sports users is located on the east side of the Dyke between the spit and the wind sport gate in a parallel fashion.
- As necessary, the District, SEMC, or MoE may schedule a meeting or field tour to discuss Dyke maintenance or management.
- Generally the District, prior to undertaking any initiatives around Dyke maintenance or management not described within this agreement, will consult with SEMC and will consider the SEMC's input in the planning and implementation of the initiative.