Final Total Maximum Daily Loads

in the Waters of Silver Bay, Alaska

Part I:

Residues and Toxic Substances

Part II:

Rationale for Removing the listing for Dissolved Oxygen

Alaska Department of Environmental Conservation
Division of Air and Water Quality
Water Programs
410 Willoughby Avenue, Suite 303
Juneau, Alaska 99801

June, 2003

In compliance with provisions of the Clean Water Act, 33 United States Code 1251 et seq., as amended by the Water Quality Act of 1987, Public Law 100-4, the Alaska Department of Environmental Conservation is issuing total maximum daily loads (TMDLs) that establish water quality targets, loading capacities, load allocations, and wasteload allocations for residues and toxic substances in the waters of Silver Bay, Alaska.

These TMDLs are effective immediately. Subsequent actions that may affect water quality for the pollutant parameters identified must be consistent with these TMDLs.

Signed this __ day of _____, 2003.

_____
Tom Chapple, Director

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, WA 98101

Reply To
Attn of: OW-134

JUN 26 2003

RECEIVED
JUN 30 2003
DEPARTMENT OF
ENVIRONMENTAL CONSERVATION
ANCHORAGE

Tom Chapple
Department of Environmental Conservation
Division of Air and Water Quality
555 Cordova St.
Anchorage, AK 99501-2617

Re: Approval of the Total Maximum Daily Load (TMDL) for Residues and Toxic Substances in Silver Bay, Sitka, Alaska

Dear Mr. Tom Chapple:

The U.S. Environmental Protection Agency (EPA), Region 10 is pleased to approve this TMDL for impaired waters addressed in the Silver Bay Residue and Toxic Substances Total Maximum Daily Load (TMDL) that was submitted to EPA on May 30, 2003, and received on June 3, 2003. This approval covers the following waters:

Alaska ID Number	1998 303(d)Waterbody	Location	Pollutant Parameters
10203-601	Portions of Silver Bay	Sitka	Toxic Substances and Residues

This TMDL addresses current conditions of the "impaired waterbody" which was originally identified in 1992 due to discharges from a pulp mill operation. Since the closing of the mill in 1993, and subsequent environmental investigations and monitoring, this TMDL further defines the areas that remain impaired and defines the source of the impairment as wood residues. This TMDL defines areas within Sawmill Cove and Herring Cove. Since a TMDL was approved by EPA for Herring Cove on October 1, 1999, this TMDL supercedes that action.

This submittal also included a rationale for removing the listing for Dissolved Oxygen (DO) from Silver Bay and for changing the size of the residue and toxic substance area requesting delisting outside the impaired area. This approval only includes those waters for which a TMDL was completed and does not constitute approval for de-listing from the Alaska 1998 303(d) list. Any proposed de-listing will be considered at the time of submission of the next 303(d) list of impaired waters.

EPA commends Michael Crotteau and Dave Sturdevant for providing EPA with a very well articulated document that clearly illustrates the research and data that help define this TMDL and resulting in a TMDL to address residues, toxic and other deleterious substances that remain on the bottom of Silver Bay. We look forward to implementation of this TMDL and to continue to collaboratively work together.

By EPA's approval, this TMDL is now incorporated into the State's Water Quality Management Plan under Section 303(e) of the Clean Water Act. If you have any questions, please feel free to contact me at (206) 553-1261, or Martha Turvey of my staff at (206) 553- 1354.

Sincerely,

Randy Smith

Randall F. Smith
Director
Office of Water

cc: Michael Crotteau, ADEC
Kent Patrick-Riley, ADEC
Lynn Kent, ADEC
Jonne Somners, ADEC
Dave Sturdevant, ADEC

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Part I: Total Maximum Daily Loads for Residues and Toxic Substances in the Waters of Silver Bay, Alaska

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TMDLs at a Glance

Water-Quality Limited?	Residues: Yes. Toxic substances as sediment toxicity: Yes.
Hydrologic Unit Code:	19010203 (latitude 57°03'N; longitude 135°12'W).
Standards of Concern:	Residues (floating solids, debris, sludge, deposits, foam, scum, or other residues). Toxics and other deleterious organic and inorganic substances.
Pollutants of Concern:	Residues: Pulp residues, wood waste, logs, bark. Sediment toxicity: Hydrogen sulfide, ammonia, resin acids.
Designated Uses Affected:	Aquaculture water supply; seafood processing water supply; industrial water supply; contact water recreation; secondary water recreation; growth and propagation of fish, shellfish, other aquatic life, and wildlife; harvesting for consumption of raw mollusks or other raw aquatic life.
Major Source:	Alaska Pulp Corporation pulp mill permitted wastewater discharge and associated log handling activities; all operations and discharges ceased in 1993.
Loading Capacities:	Residues: Zero (0) residues that could accumulate on the bottom, other than from natural sources. Sediment toxicity: Addressed by residues loading capacity.
Wasteload Allocations:	Residues: Zero (0) discharge of residues that could accumulate on the bottom, other than from natural sources. Sediment toxicity: Addressed by residues wasteload allocation.
Load Allocations:	Residues: Zero (0) discharge of residues that could accumulate on the bottom, other than from natural sources. Sediment toxicity: Addressed by residues load allocation.
Margin of Safety:	Implicit in zero (0) loading capacities and zero (0) load and wasteload allocations.
Seasonal Variation:	No seasonal variation because input of residues has ceased.
Monitoring:	Continuation of in-place monitoring program with some additional monitoring suggested to fill data gaps.
Reasonable Assurance:	Not required because there are no existing sources and loading capacity and load allocations are zero (0).

Part II: Rationale for Removing the Listing of Dissolved Oxygen in the Waters of Silver Bay, Alaska, from the Clean Water Act 303(d) List

Rationale:	Monitoring data show that Silver Bay is no longer water-quality limited for dissolved oxygen (DO) for surface waters or in the water column. Although DO levels below the limits of the WQS have been observed in deep water between Sawmill Cove and Herring Cove, there appears to be no correlation between these levels and the presence of wood waste, and no current source of DO depression is known.
Conclusions:	No TMDL is developed for DO. ADEC will propose to remove the listing for **surface water** DO from the 303(d) list.

Acronym List

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
AET	Apparent Effects Threshold
AOC	Area of Concern
APC	Alaska Pulp Corporation
BMP	Best Management Practice
BOD	Biological Oxygen Demand
CBS	City and Borough of Sitka
CFR	Code of Federal Regulations
CWA	Clean Water Act
DO	Dissolved Oxygen
EPA	United States Environmental Protection Agency
ERA	Ecological Risk Assessment
EVS	EVS Environmental Consultants
F	Fahrenheit
FS	Feasibility Study
FWENC	Foster Wheeler Environmental Corporation
m^2	Square Meters
mg/L	Milligrams per Kilogram
mph	Miles per Hour
m/s	Meter per Second
OU	Operable Unit
RAO	Remedial Action Objective
RI	Remedial Investigation
ROD	Record of Decision
SPI	Sediment Profile Imaging
STP	Sewage Treatment Plant
SWL	Sulfite Waste Liquor
TMDL	Total Maximum Daily Load
WQS	Water Quality Standards

TMDL Terminology *(terms are italicized in the text upon first usage)*

Apparent effects threshold (AET) – The concentration above which adverse biological impacts would always be expected.

Epifauna – Benthic fauna living on the surface of the sea floor or on other marine organisms.

Fjord – Long, narrow, deep, U-shaped coastal inlet that usually represents the seaward end of a glaciated valley that has been partially submerged.

Infauna – Benthic fauna living in the substrate on the sea floor.

LD_{50} concentration – The concentration determined to be lethal to 50% of the population of a *receptor group*.

Load allocation – The portion of the loading capacity allocated to an existing or future nonpoint source or to natural background.

Loading capacity – The greatest amount of pollutant loading that a waterbody can receive without violating water quality standards.

Nonpoint source – Any diffuse source that discharges wastewater, usually as surface runoff, such as agricultural or urban runoff.

Organism-sediment index (OSI) value – A statistic calculated using several parameters derived from sediment profile imaging data. The highest value represents a mature benthic community in relatively undisturbed conditions (EVS Environmental Consultants [EVS] 2001).

Point source – Any discernible, confined, and discrete conveyance that discharges wastewater, such as a pipe, ditch, channel, tunnel, conduit, discrete fissure, vessel, or container.

Receptor group – A group of ecological entities exposed to a stressor.

Sediment profile imaging (SPI) – A technique for taking cross-sectional photographic images of the upper 20 centimeters of bottom sediments (EVS 2001). The images can reveal the presence of fauna in the sediments, as well as the redox potential discontinuity, a feature that is used to assess the presence of dissolved oxygen in the sediment pore water.

Side-scan sonar – A method for producing sonar images of the sea floor. The instrument is towed behind a ship, maintaining a position close to the bottom. Side-scan sonar is useful for identifying larger objects such as logs, but not for smaller debris such as bark.

Stage 1 benthic assemblage – The first invertebrate assemblage to appear after an area of the sea bottom is disturbed. It is characterized by dense populations of small, tube-dwelling marine polychaetes (EVS 2001).

Stage 2 benthic assemblage – The start of the transition from polychaetes to head-down deposit feeders (EVS 2001).

Stage 3 benthic assemblage – The mature, equilibrium community of deep-dwelling, head-down deposit feeders (EVS 2001).

TMDL (total maximum daily load) – A pollution budget for a listed impaired waterbody that provides assessment of water quality problems, identification of pollution sources, and pollutant discharge allocations for those sources.

Wasteload allocation – The portion of the loading capacity allocated to an existing or future *point source*.

Zone of Deposit – A regulatory exception permitted by the Alaska Department of Environmental Conservation, allowing deposit of residues on the bottom of marine waters within limits set by the department.

Executive Summary

Under Section 303(d) of the Clean Water Act (CWA), states must identify and list waterbodies that do not meet state Water Quality Standards (WQS). A waterbody must be listed for each parameter for which it fails to meet WQS. The CWA and United States Environmental Protection Agency regulations require the formulation of *total maximum daily loads (TMDLs)* for all listed waterbodies.

A TMDL presents a "budget" for the parameter of concern. The *loading capacity* quantifies the maximum amount of a substance the waterbody can receive while still meeting WQS. The *wasteload allocation* and *load allocation* assign portions of that loading capacity to the various *point sources* and *nonpoint sources*, respectively, that impact the waterbody.

This document contains TMDLs for Silver Bay, located near Sitka, Alaska. Since 1993, Silver Bay has been included on Alaska's 303(d) list as water-quality limited for three parameters: residues, toxic and deleterious substances, and dissolved oxygen (DO). In the years since the listing, circumstances have changed. In some instances, the original reasons for listing the Bay as water-quality limited are no longer valid.

TMDLs were developed for two of the three listed parameters: residues and toxic and deleterious substances. The Bay is no longer water-quality limited for the third parameter (DO), although isolated instances of concentrations below the WQS have been reported. Therefore, no TMDL was developed for DO, and it is recommended that Silver Bay be delisted for this parameter.

The TMDL for residues sets the loading capacity, wasteload allocation, and load allocation at zero residues. Zero residues was selected because Alaska WQS prohibit the deposition of residues on the sea floor, and mandate that residues may not make the water unfit for the growth of marine organisms. However, the physical removal of the wood wastes (to achieve the zero-residues criterion) previously was determined to be technologically, fiscally, and ecologically infeasible. Therefore, as a performance measure, the TMDL sets a water quality target of 75% recovery of the benthic community in the wood waste areas over 40 years, to be determined through ongoing monitoring. Suggested supplements to the current monitoring plan are included.

Because the effects of toxic and deleterious substances arise from the presence of wood waste residues on the sea floor, all of the requirements of the toxic and deleterious substances TMDL are addressed in the residues TMDL. The residues were deposited during operation of Alaska Pulp Corporation's Sitka pulp mill and log handling facility, which operated from 1959 to 1993, and there are no existing sources of toxic effects other than those wood wastes. As a result, the loading capacities, load allocations, and other TMDL requirements are addressed by the residues TMDL.

Although all of Silver Bay originally was listed, the area actually impaired by residues and toxic effects is substantially smaller. This document identifies an area of pulped wood waste, and areas containing a medium to high density of logs and woody debris, which continue to be water-quality limited. It concludes that the listing should be amended to reflect the new boundaries of the impaired waterbody.

1 Introduction

1.1 TMDL Definition and Scope

Section 303(d) of the federal Clean Water Act (CWA) requires states to identify waterbodies that do not meet state clean water goals, called *water quality standards (WQS)*. The list of identified waterbodies is called *the state's 303(d) list*. A waterbody on this list often is referred to as an "impaired" or "listed" waterbody.

The 303(d) listing is related specifically to the particular standard that is exceeded. This means that if a waterbody contains a pollutant in excess of the standard, then the waterbody must be listed for that pollutant. Section 303(d)(1)(C) of the CWA and the United States Environmental Protection Agency (EPA) implementing regulations (40 Code of Federal Regulations [CFR] Part 130) require the establishment of a total maximum daily load (TMDL) to achieve state WQS when a waterbody is water-quality limited.

A TMDL is a written report that contains three main features:

- Assessment of water quality problems,
- Identification of pollutant sources, and
- Pollutant discharge allocations for the sources.

For a given pollutant, a TMDL identifies the maximum amount of pollutant or loading capacity that can be received by a waterbody while still meeting WQS. A TMDL also establishes load allocations and wasteload allocations that allocate shares of the loading capacity to various nonpoint sources and point sources, respectively, for the given pollutant. It also must include a margin of safety, and account for any seasonal variation that might affect the budgeted allocation. A TMDL also may include an implementation plan that describes mechanisms for sources to achieve allocations. These mechanisms can include effluent limits in state and federal discharge permits, Best Management Practices (BMPs), monitoring requirements, and other measures.

The TMDL program does not establish any new implementation authority. TMDLs are to be implemented using existing federal, state, and local authorities and under voluntary programs.

1.2 Protected Uses of the Waters of Silver Bay

The Alaska WQS establish pollution limits for all fresh and marine waters in the state, and establish designated uses that the standards are intended to protect. According to the WQS (18 Alaska Administrative Code [AAC] 70), the waters of Silver Bay are protected for the following designated uses:

1) Water supply for aquaculture,
2) Water supply for seafood processing,
3) Water supply for industry,
4) Contact water recreation,
5) Secondary water recreation,
6) Growth and propagation of fish, shellfish, other aquatic life, and wildlife, and
7) Harvesting for consumption of raw mollusks or other raw aquatic life.

Exceedance of WQS in Silver Bay most directly affects the designated use *growth and propagation of fish, shellfish, other aquatic life, and wildlife*. The most stringent standards generally apply to this designated use; therefore, this designated use is the focus of these TMDLs. The WQS that apply to each pollutant parameter are described in the respective sections.

1.3 Silver Bay 303(d) Listing History

In 1992, the Alaska Department of Environmental Conservation (ADEC) identified Silver Bay as an "impaired waterbody" on the state's 303(d) list. Under the federal CWA and EPA implementing regulations, a waterbody on the 303(d) list requires preparation of a TMDL.

Silver Bay initially was listed as "water-quality limited" for two pollutant parameters under the Alaska WQS: dissolved oxygen (DO) and sludge. In 1994, dioxin was added to the listing. In 1998, the listing terms were modified to residues, dissolved gas/DO, and toxic substances.

All of Silver Bay was included in the impaired listings for two reasons. First, the pulp mill discharge into the water, through current distribution and mixing, could affect much of Silver Bay. Second, information was not available to more accurately delineate specific impaired areas.

The pulp mill ceased operation and discharge of effluent in 1993. The removal of that discharge has allowed some subsequent recovery of water quality in the ocean water. Pollutant concerns now focus on the legacy of wood residues on the ocean bottom.

1.4 Organization of This Document

This section discusses the organization and content of the two main sections of this document.

1.4.1 Part I: TMDLs for Residues and Toxic Substances

Section 3 focuses on residues, which are the source of the water quality impairments currently found in Silver Bay. It presents the applicable water quality standards; current conditions, including types and locations of residues found on the ocean floor; and the sources of those residues. It develops a water quality target, a loading capacity, load/wasteload allocations, and various other features required to be included in TMDLs.

Section 4 discusses the "toxic and other deleterious substances" criterion. It presents the applicable water quality standards for this parameter, discusses the regulatory history behind the toxic substances listing, and describes the current conditions as they relate to toxic substances in Silver Bay. No target, loading capacity, or allocations are presented in this section because they are addressed by the residues TMDL.

1.4.2 Part II: Rationale for Removing the 303(d) Listing for Dissolved Oxygen

Section 5 includes the applicable WQS and listing history for DO. It discusses current conditions and concludes that Silver Bay is not water-quality limited for DO. It further presents rationale for removing DO as one of the 303(d) listed parameters for Silver Bay. No TMDL is developed for DO.

2 Site Background

2.1 Site Location

Sitka is located on the west coast of Baranof Island on Sitka Sound, in Southeast Alaska (see Figure 2-1). Silver Bay is a narrow *fjord*, with the entrance located 3.5 miles southeast of the City of Sitka. The former Alaska Pulp Corporation (APC) pulp mill is located on the west shore of Sawmill Cove near the mouth of the Bay. Logs destined for the pulp mill were stored in Herring Cove, 1 mile east of Sawmill Cove, and along the shoreline between the two coves.

2.2 Climate

The Sitka area is characterized by a maritime climate with frequent and heavy precipitation. Low-lying fog, overcast skies, rain, and drizzle can dominate weather conditions. Average annual precipitation, some of which falls as snow, is approximately 86 inches at the Federal Aviation Administration Sitka Japonski Airport (ADEC 1999a). It is believed that the average annual precipitation at Silver Bay is more than this because of orographic effects. Orographic effects are climatic events that result from air streams crossing mountains. Normal summer air temperatures range from 49.9° Fahrenheit (F) to 60.2°F, while normal winter air temperatures range from 30.8°F to 39.3°F (ADEC 1999a). Winter winds mostly originate from the north. In summer, winds usually are southerly. Monthly average wind speeds range from approximately 3 miles per hour (mph) to 6 mph (ADEC 1999b).

2.3 Physical Setting

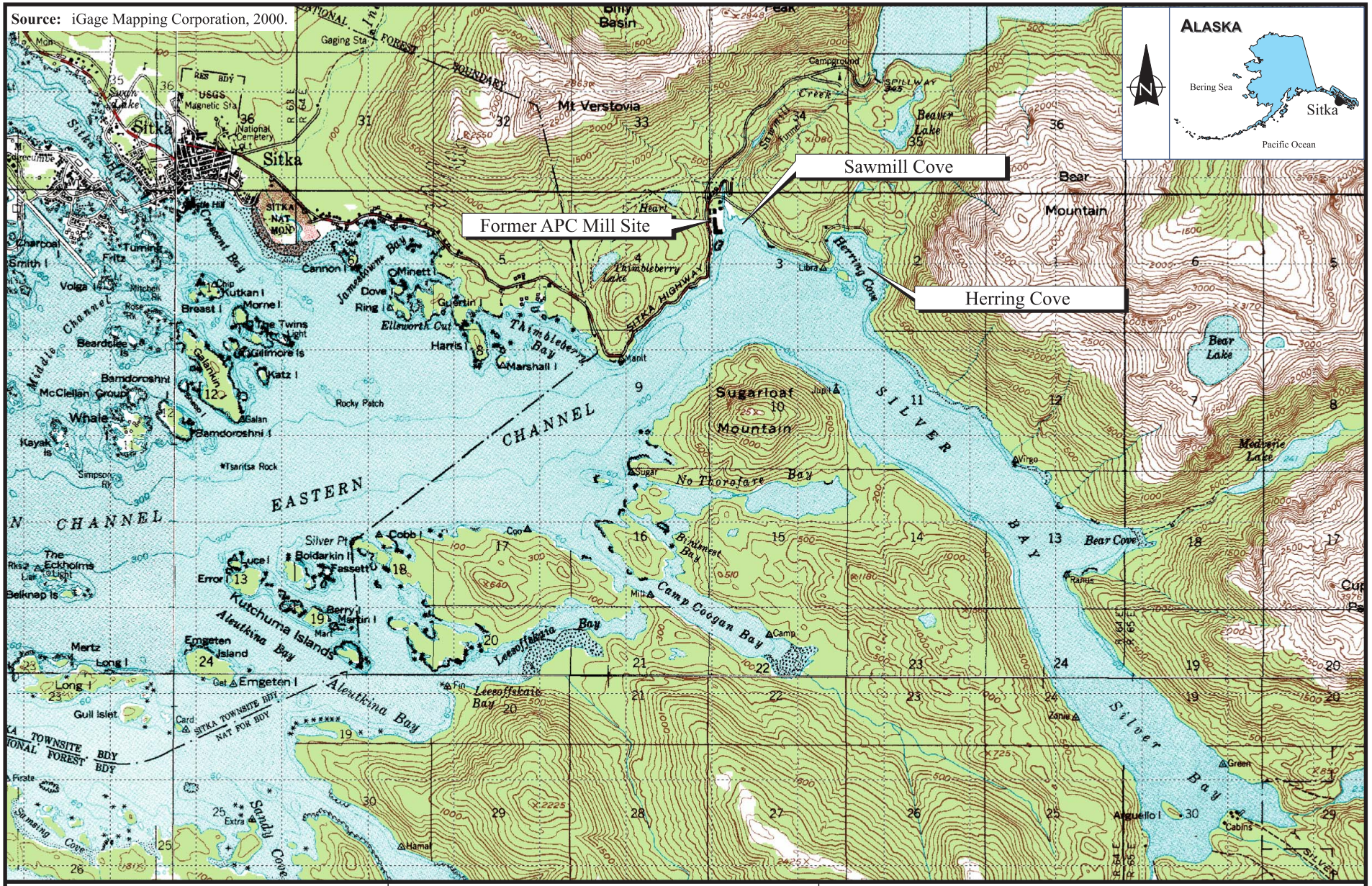
Silver Bay empties into Sitka Sound through the Eastern Channel. The Bay is approximately 6.8 miles long, varying in width from 0.4 mile to 0.9 mile, and is L-shaped. Sawmill Cove lies in the corner of the *L*, near the mouth of the Bay. Herring Cove is adjacent, approximately 1 mile to the east (see Figure 2-1). Silver Bay is approximately 400 feet deep at its mouth and decreases to approximately 150 feet near its head. The surface area of the Bay is approximately 4.2 square miles, with approximately 30 miles of shoreline (EPA 1971).

The shoreline of the Bay is narrow, steep, and rocky, with slopes typically exceeding 50°. The nearshore environment of Silver Bay consists of steep bedrock, as is typical of a fjord environment. In a few coves, the slope is less steep, allowing for the deposition of sand and silt. Several creeks enter the bay, the principal being Sawmill Creek, which enters at the head of Sawmill Cove (EPA 1971).

2.4 Oceanography

Fresh water from Sawmill Creek enters Sawmill Cove and mixes with the underlying marine water to form a shallow, warm, brackish surface layer. As surface water moves out of Silver Bay, it is replaced with low-velocity subsurface flows that move into the Bay and upward to replace the surface water near the coast. Circulation within the Bay increases as the density gradient increases. The difference in density between the surface water inside and outside Silver Bay is greatest when freshwater runoff is greatest (EPA 1971).

Studies conducted in Silver Bay in 1956 and 1957 indicated that circulation patterns are determined by: 1) the amount of freshwater runoff; 2) density differences between Silver Bay and Sitka Sound; 3) wind; and 4) tidal forces. From June to October, which is the high-runoff period, the circulation pattern is typical of a fjord, with a strong outflow in the shallow surface layer and inflow immediately below the surface layer. In July 1956, the surface layer of Silver Bay was 6 meters thick, and it had a maximum outward current of 0.15 meter per second (m/s). The lower layer was 15 meters thick, with a maximum inflow of 0.05 m/s. The lowest 60 meters were motionless. From January to April, runoff to Silver Bay is minimal. Southwesterly winds drive surface waters out of the Bay. The denser bottom waters move upward, replacing the surface water driven out by the wind. In March 1957, the surface layer was 30 meters thick and had a maximum outflow of 1.10 m/s, while the bottom layer was 60 meters thick with a maximum inflow of 0.02 m/s (EPA 1971).



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International Specialists in the Environment
Anchorage, Alaska

SILVER BAY DRAFT TMDL
(Total Maximum Daily Load)
Sitka, Alaska

0 .5 1
Approximate Scale in Miles

Figure 2-1
SITE VICINITY MAP

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Flushing time for Silver Bay (the time period in which constituents are likely to stay in the Bay) is estimated to be 320 days during low runoff and 87 days during high runoff (EPA 1971).

2.5 Pulp Mill History

From 1959 to 1993, APC operated a pulp mill at Sawmill Cove. The mill used a magnesium acid sulfite process on wood chips, which were digested in steam-heated tanks. Most of the spent digesting liquid (sulfite waste liquor [SWL]) was concentrated and burned in recovery boilers (ADEC 1999b); however, approximately 30% of the SWL was discharged directly into Sawmill Cove until 1976, when additional recovery boilers were constructed (ADEC 1993). The mill's wastewater stream was discharged from a short outfall on the west shore of Sawmill Cove. Until a primary treatment system was installed in 1971, wastewater was not treated before discharge. In 1978, the facility began to operate an activated sludge system, and in 1989, it began to treat some of the stronger waste streams with an anaerobic treatment system (ADEC 1993).

Logs were brought to Silver Bay in rafts and were stored in Herring Cove and along the shoreline between the two coves. As a result of log storage and handling, numerous logs sank to the bottom of the Bay. In addition, it is presumed that an unknown amount of bark was dislodged from the logs and sank to the bottom.

All pulp mill operations, including effluent discharge, ceased in 1993.

2.6 Current Operations

The only present discharge source permitted in Silver Bay is a small sewage treatment plant (STP) in Sawmill Cove. This facility operates under state and federal permits, and is authorized to discharge a small amount of suspended solids, which are not considered to be residues that could accumulate on the bottom. Therefore, no specific allocation is established for this facility under either the residues TMDL or toxic substances TMDL.

2.7 Previous Site Studies

This section summarizes the principal studies conducted in the Silver Bay area before, during, and after the APC mill operations.

The first water quality study in Silver Bay occurred in 1956-57, before commencement of mill operations, under the auspices of the Alaska Pollution Control Board (a territorial predecessor of ADEC). This study focused on gathering hydrographic information regarding circulation within the Bay, including standard data such as temperature, salinity, and DO.

In 1971, the newly created EPA produced a report that summarized the effects of mill wastes on the water quality of Silver Bay. The mill had been operating for approximately 12 years at the time of this study. It documented several significant impacts, including decreased mussel populations, bulking of gases from underwater pulp residues, fish kills resulting from toxic levels of chemicals in the residues and ocean water, and low DO in surface waters.

After closure of the mill in 1993, ADEC oversaw a comprehensive investigation of the pulp mill facility. This investigation, which began in fall 1995, focused on toxic contamination at the upland pulp mill site and in Sawmill Cove.

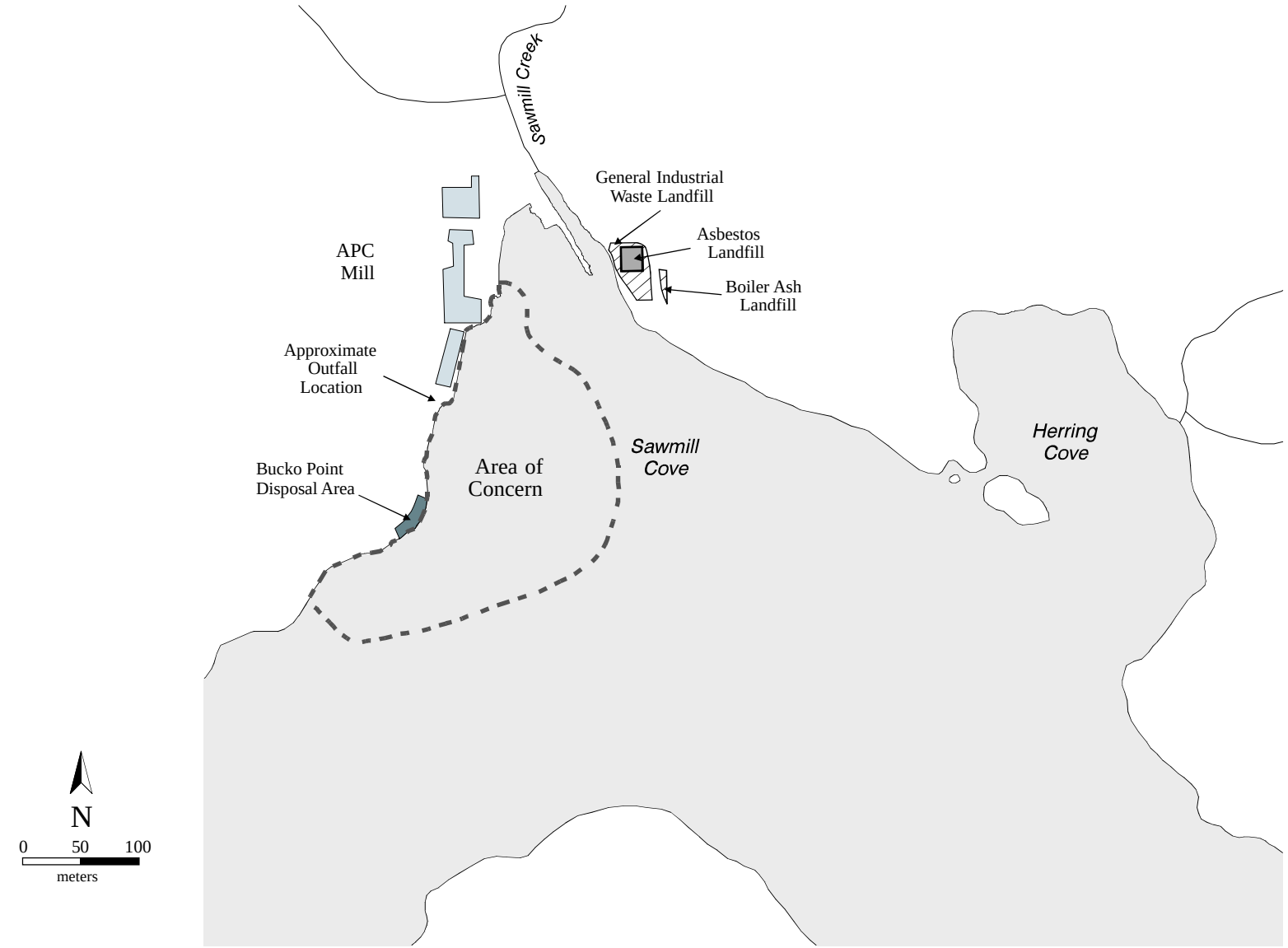
A remedial investigation (RI)/feasibility study (FS) was performed by Foster Wheeler Environmental Corporation (FWENC 1998d, 1998c) to determine the nature and extent of mill-related contaminants present at the mill site, and to identify remedial alternatives. The study area for the RI/FS included the mill site and other terrestrial locations where mill wastes may have been deposited, and the northern waters of Silver Bay and the Eastern Channel from Jamestown Bay to Herring Cove. Following the Bay Operable Unit (OU)

ecological risk assessment (ERA) (FWENC 1998a) and FS (FWENC 1998c), the study area was reduced to a 100-acre Area of Concern (AOC) within Sawmill Cove (see Figure 2-2), which was defined based on several factors, including the presence of pulp residue, wood debris, and potentially toxic substances.

A Record of Decision (ROD) (ADEC 1999b) was developed in 1999 for the APC pulp mill and Bay OU, in which a final remedial action objective (RAO) for the AOC was stated: to "reduce the ecologically significant adverse effects to populations of bottom-dwelling life in Sawmill Cove from hazardous substances, including pulp residue degradation chemicals, to acceptable levels." Of six options evaluated, "natural recovery with long-term monitoring and institutional controls" was selected as the remedial alternative (ADEC 1999b).

In April 1999, APC transferred the mill site and property to the City and Borough of Sitka (CBS). Consequently, CBS will implement all future monitoring and any remedial actions. This requirement is set forth in a 1999 memorandum of understanding between CBS and ADEC (ADEC 1999a).

A baseline environmental monitoring study was completed by EVS Environmental Consultants (EVS) on behalf of CBS in April and August 2000. The study included an underwater towed video survey*, sediment profile imaging (SPI)*, and benthic community sampling using a grab sampler. All work was performed within the AOC. During the same period, EVS completed two complementary studies. The first study included extending the video survey effort a short distance beyond the limits of the AOC in order to gain additional information regarding the sea floor adjacent to the AOC boundary, and a *side-scan sonar* survey in Herring Cove and on the eastern shore of Sawmill Cove in order to determine the nature and extent of wood waste present in those areas. The second study focused on underwater video monitoring (drop rather than towed) in Herring Cove, and conductivity/temperature/DO measurements in Sawmill Cove, Herring Cove, and portions of Silver Bay between the two coves.



Source: EVS Environmental Consultants, Inc., 2001.

ecology and environment, inc. International Specialists in the Environment Anchorage, Alaska	SILVER BAY DRAFT TMDL (Total Maximum Daily Load) Sitka, Alaska	Figure 2-2 AREA OF CONCERN Date: 11-27-02 10:001332AU0901\fig 2-2

3 Residues

This TMDL evaluates the pulp, wood waste, and log residues in Silver Bay with respect to the State of Alaska's regulatory requirements. The TMDL covers only the areas impaired by residues (see Figure 3-1); specifically, the pulped wood waste area, Herring Cove, the medium-density log area on the eastern shore of Sawmill Cove, and the area of wood chips and other wood residues within the head of Sawmill Cove. The TMDL suggests that the 303(d) listing for Silver Bay should be changed to reflect the revised area of impairment. The loading capacity, wasteload allocation, and load allocations are set at zero residues. A water quality target of 75% recovery of the benthic community within 40 years is established as a performance measure.

Because toxic effects in Silver Bay arise directly from the presence of residues on the sea floor, the TMDL for sediment toxicity is addressed by the residues TMDL.

3.1 Water Quality Standards

TMDLs are developed to meet applicable WQS. In Alaska, WQS include numeric and narrative water quality criteria. The first applicable standard is contained in Alaska's antidegradation policy (18 AAC 70.015[a][1]), which states:

> *Existing water uses and the level of water quality necessary to protect existing uses must be maintained and protected.*

The second applicable standard is Alaska's water quality criterion for residues in marine waters (18 AAC 70[2]) to support the designated use *growth and propagation of fish, shellfish, other aquatic life, and wildlife*, which reads:

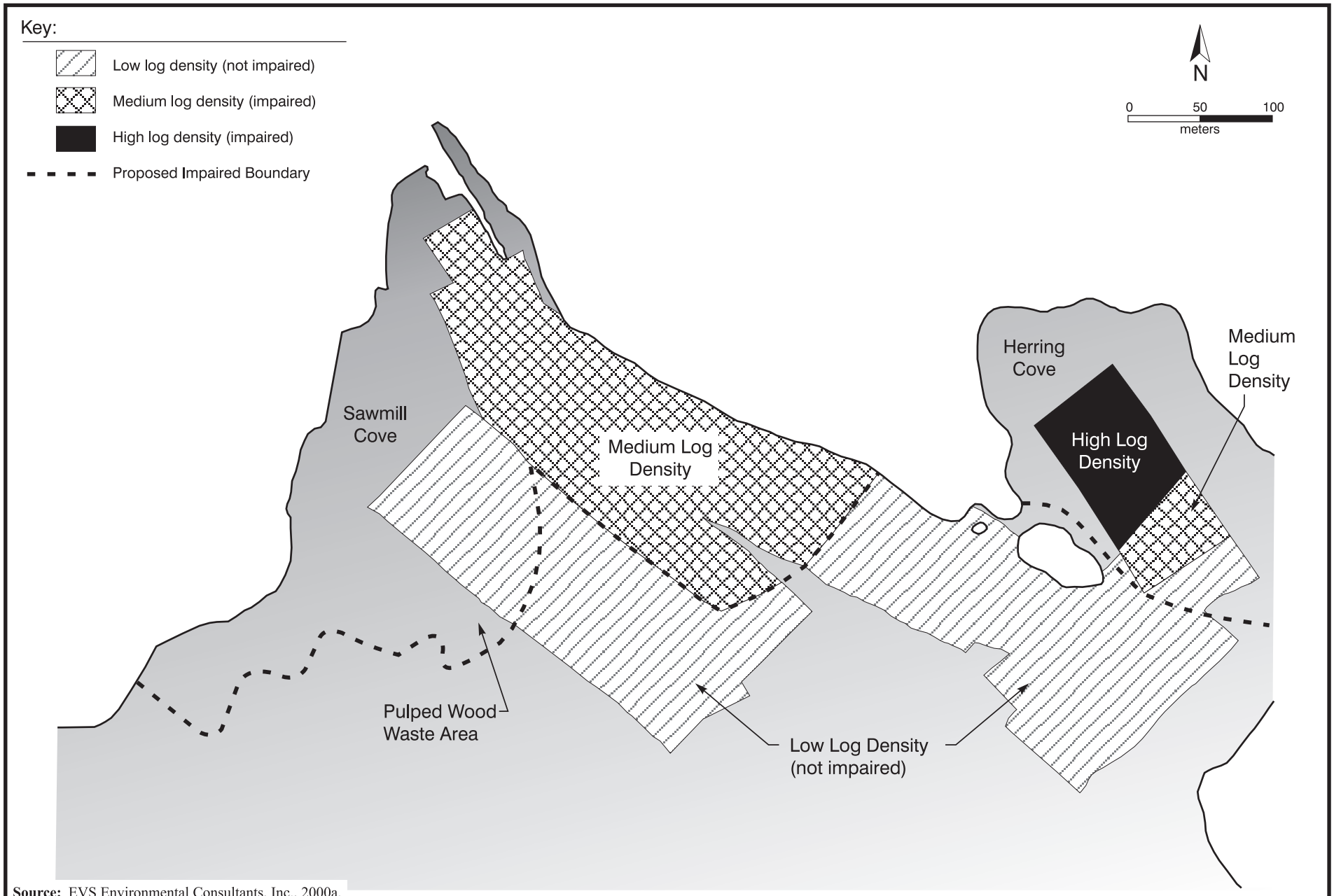
> *May not, alone or in combination with other substances or wastes, make the water unfit or unsafe, for the use, or cause acute or chronic problem levels as determined by bioassay or other appropriate methods. May not, alone or in combination with other substances, cause a film, sheen, or discoloration on the surface of the water or adjoining shorelines; cause leaching of toxic or deleterious substances; or cause a sludge, solid, or emulsion to be deposited, beneath or upon the surface of the water, within the water column, on the bottom, or upon adjoining shorelines.*

These standards establish two benchmarks that must be met in order for the residues criterion to be achieved. First, at the most basic level, residues may not be deposited. Second, residues may not make the water unfit for growth of marine biota, including making it unfit through the leaching of toxic substances.

3.2 Current Conditions

This section summarizes the information known about the nature and extent of residues present in Silver Bay, based on a variety of studies conducted over many years after closure of the APC mill (see Section 2.7). Because an assessment of the status of the marine community is integral to understanding the impact of those residues (i.e., whether they impair the fitness of the water for the growth of the constituent organisms), the current state of that community also is presented.

Two residue types occur on the ocean bottom in Silver Bay. The first is pulp residues in Sawmill Cove. The second is sunken logs and associated bark and wood debris in Herring Cove and along the shoreline between the coves, with some wood debris in the northern part of Sawmill Cove. The two residue areas are addressed separately below.



Source: EVS Environmental Consultants, Inc., 2000a.

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International Specialists in the Environment
Anchorage, Alaska

SILVER BAY DRAFT TMDL
(Total Maximum Daily Load)
Sitka, Alaska

Figure 3-1
SILVER BAY IMPAIRED AREAS

Date:
11-27-02

10:001332AU0901\fig 3-1

3.2.1 Pulp Residue in the Area of Concern in Sawmill Cove

When the pulp mill was operating, federal permits issued by EPA and certified by ADEC authorized the discharge of process wastewater through an outfall pipe into Sawmill Cove. The wastewater contained a large volume of pulp fiber residue, as well as toxic substances (including dioxins and metals) and biochemical oxygen demand (BOD). The amount of discharged pulp residue presumably was reduced as the mill added process treatment and recovery capabilities in the 1970s and 1980s.

Over the period in which the pulp mill was operating, pulp residue and other wood debris accumulated over an area of approximately 100 acres on the bottom of Sawmill Cove. An area of 4 acres near the outfall contains pulp waste 10 feet to 24 feet thick. These wastes lie in waters 20 feet to 180 feet deep (ADEC 1999b) (see Figure 3-2). The areal extent of pulp residue in Sawmill Cove was used as a criterion to shape the definition of the AOC. The pulp residue sediments were found to be watery, very light, and highly organic. Engineering tests revealed that these fine-grain sediments had very low shear strength and did not consolidate well, and a fraction stayed suspended in water for long periods of time (FWENC 1998c).

Pulp residue and bark and wood debris introduced into the marine environment may adversely affect benthic invertebrates through:

- Toxicity or toxic effects,
- Smothering,
- Displacement,
- Disruption of feeding and other activities,
- Reduction in mobility, and
- Habitat alteration.

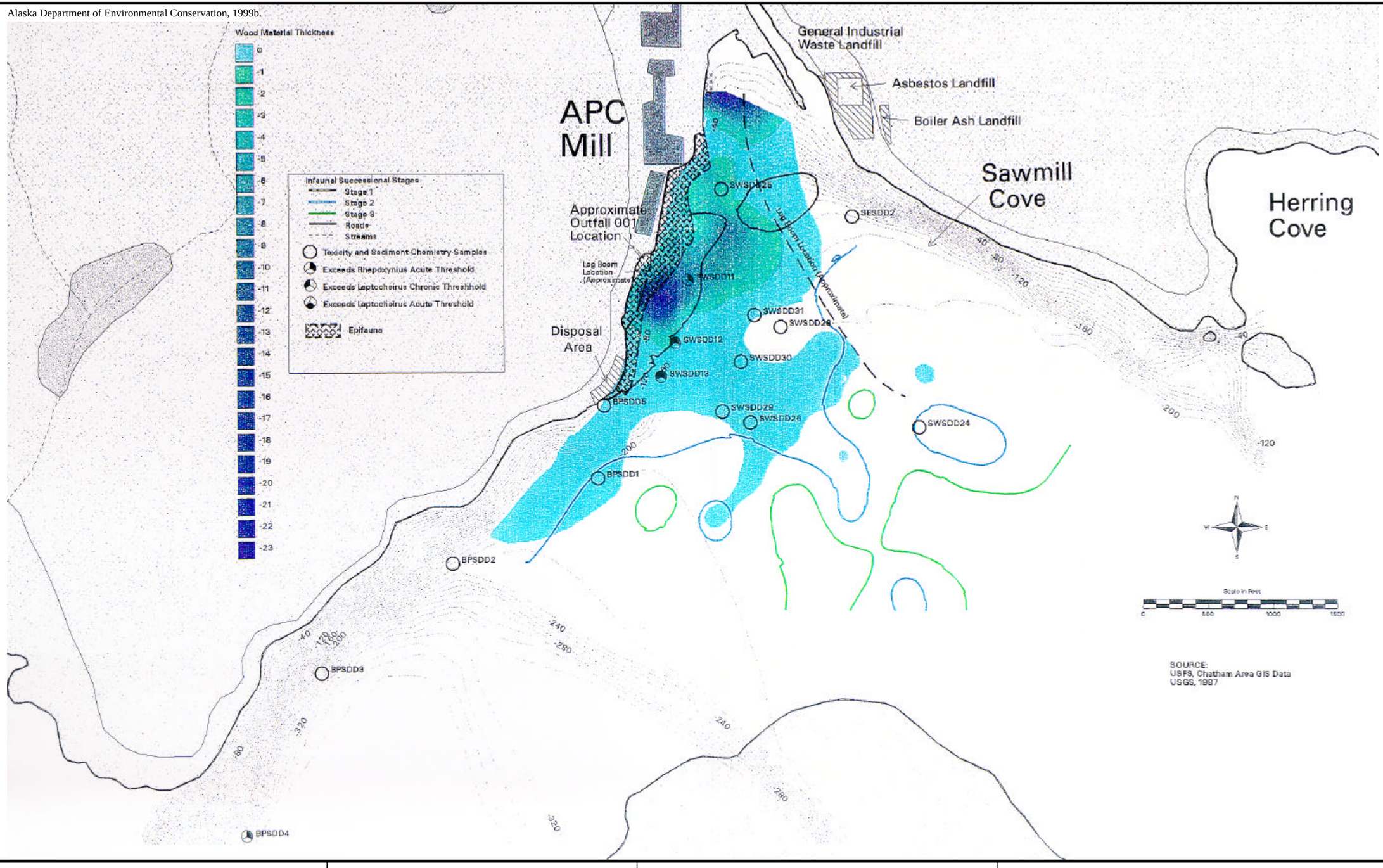
The gradual deposition of pulp residues during the 34 years of mill activity had adverse consequences for the marine community, including smothering and displacement of benthic organisms, destruction of habitat, and toxic effects. SPI conducted in 1997 indicated that within the AOC, there were three benthic zones defined by their populations of benthic macrofauna (see Figure 3-2):

- The afaunal zone: From the outfall to the base of the slope by the mill to Bucko Point, there was an area with a layer of pulp residue greater than 24 inches thick. This area, approximately one-fourth of the AOC, showed minimal evidence of macrofaunal activity, and had not begun biological recovery;
- The transition zone: This zone bordered the above area and extended from the utility dock to Bucko Point. This zone had black, low-oxygen sediment and contained surface and near-surface polychaetes, indicating the first stage of biological succession (*Stage 1 benthic assemblage*); and
- The rehabilitation zone: This area had diverse *infauna* at various successional stages, indicating advanced biological succession (*Stages 2 and 3 benthic assemblages*) (FWENC 1999c).

An underwater photography survey in 1999 found similar results. In the nearshore subtidal area, there was epibenthic activity to a depth of 60 feet, including a white microbial mat (indicating ongoing decomposition of wood waste) and various macroinvertebrate species where the microbial mat was not present. The *epifauna* included nudibranchs, anemones, tunicates, sea cucumbers, and crabs. The presence of the microbial mat implies that there are underlying anaerobic sediment, high levels of hydrogen sulfides in the sediment, and well-oxygenated sea water at the sediment-water interface (FWENC 1999c).

In 2000, EVS conducted baseline environmental monitoring throughout Sawmill Cove and Herring Cove, including SPI, video surveys, and sampling of benthic invertebrates and sediment. Sampling locations are

Source: Alaska Department of Environmental Conservation, 1999b.



ecology and environment, inc. International Specialists in the Environment Anchorage, Alaska		SILVER BAY DRAFT TMDL (Total Maximum Daily Load) Sitka, Alaska	Figure 3-2 OVERLAY OF TOXICITY RESULTS (1996) AND INFAUNAL SUCCESSIONAL STAGES ON THE WOOD DEPOSITION ZONE Date: 11-27-02 10:001332AU0901\fig 3-2

shown in Figure 3-3 (benthic sampling) and Figure 3-4 (SPI) (each symbol represents one of the 91 stations). The video transects are shown in Figure 3-5 (although the transects initially were planned on a grid, current and wind conditions resulted in the meandering pattern shown). The Herring Cove video survey and benthic community sampling in the AOC were conducted in August 2000. The remaining studies were completed earlier, in April 2000.

The SPI showed the composition of the sediment, including features such as grain size, wood chips, evidence of infauna, and plankton detritus accumulation. The images indicate that pulp residue appears to be largely anoxic, except for a thin oxygenated layer of millimeters to centimeters at the sediment surface, which contains some macrofauna (EVS 2001).

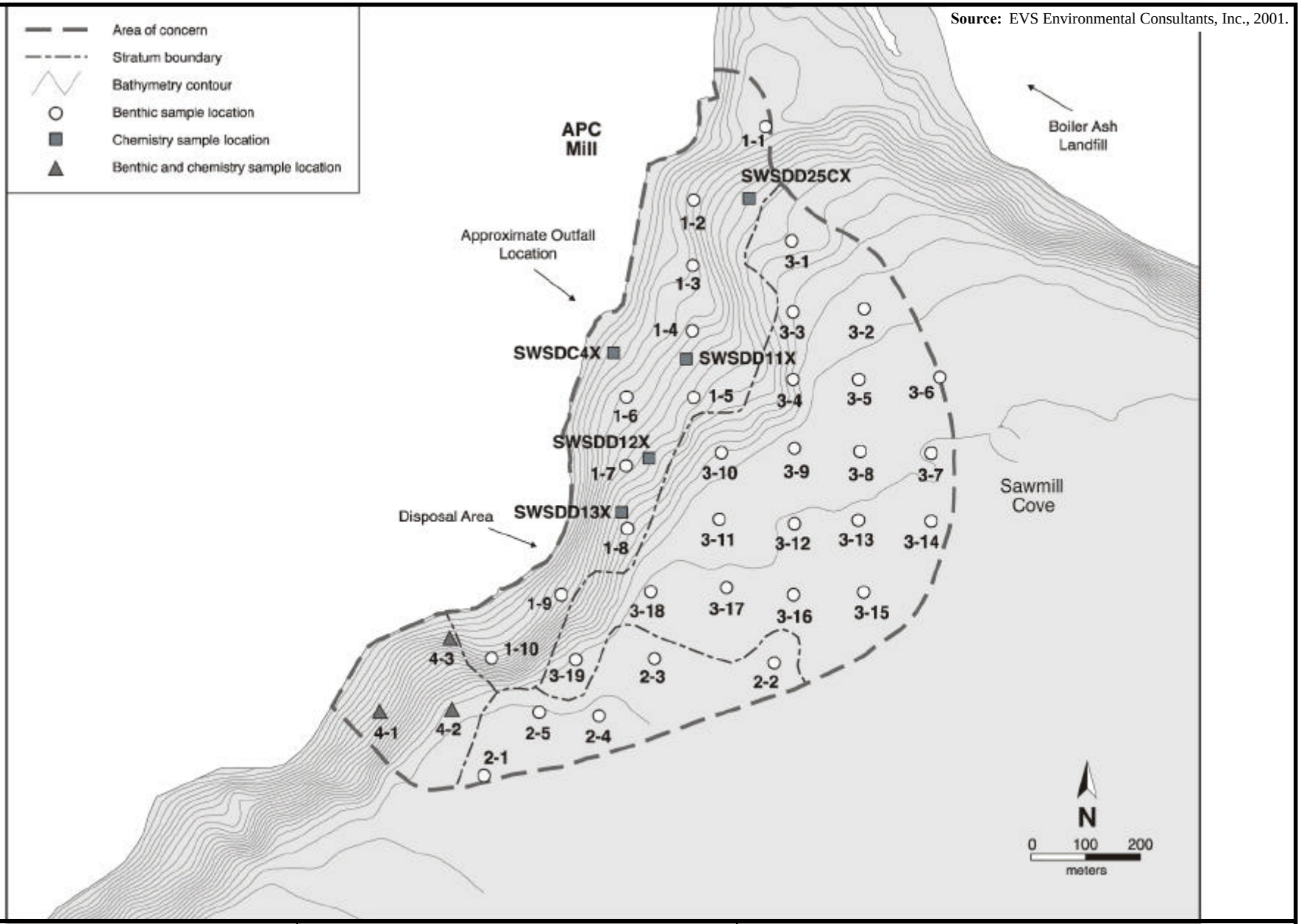
EVS' underwater video survey showed the surface sediments in Sawmill Cove as smooth and fine-grained, with a "floccular detrital layer … of dead phytoplankton cells" that had settled to the bottom following the spring plankton bloom. In addition, a suspended "snow" of detrital plankton was clearly visible in the water column. This detrital material increases the organic content of the sediments, corresponding to the intensity of the plankton bloom.

3.2.2 Analysis of the State of the Benthic Community Recovery in the AOC

The monitoring program (FWENC 1999d) sets forth the technical approach used to assess benthic community recovery. To aid in assessing recovery of the AOC, it was classified into several strata, or areas expected to be represented by distinct benthic communities (FWENC 1999d). According to the monitoring program (FWENC 1999d), "(T)here are no reference areas that can provide reliable statistical comparisons to the rate of recovery for communities in different strata." That is, because the organisms in the different strata are expected to recover to equilibrium communities different in character from those that existed before the mill, measuring that recovery against conditions in a pristine reference site would be inappropriate. In addition, unlike DO, benthic community recovery within the impaired area cannot be compared to a pre-mill reference point because no assessment of the community was performed before operation of the APC mill. Instead, "recovery (of the AOC) is predicted to follow … classical patterns of colonization and recovery documented for organically enriched areas …" (FWENC 1999d). As noted in the ROD, "(T)his approach includes an assessment of total abundance, major taxa abundance, indicator species abundance, biomass, species richness, diversity and dominance indices …" (ADEC 1999b).

As a result of the baseline monitoring fieldwork, EVS concluded that benthic invertebrates had begun recolonizing at most of the stations sampled within the AOC. Figure 3-6 depicts the benthic successional stages found in Sawmill Cove in 2000. In EVS' estimation, approximately 25% of the area near the coastline appeared to be afaunal, or, if any benthic infauna were present, they were present at low densities such that individual grab samples happened to be collected from "empty" areas. The area near the southern boundary of the AOC appeared to have benthic invertebrates representative of Stage 3 successional development (mature equilibrium communities). Figure 3-4 depicts habitat "stress" using *organism-sediment index (OSI) values*. Stations with negative values have the most severe stress, and values less than or equal to *6* show signs of disturbance. Figure 3-4 shows that conditions have improved on the south and east edges of the AOC (EVS 2001).

EVS also found that sediments within the AOC remain highly organically enriched, with carbon values of 15% to 30%, compared to the normal 1.5% to 3%. EVS also used video survey techniques to document that there was widespread distribution of Beggiatoa bacterial colonies on the sediment surface. These sulfur-reducing bacteria thrive in low-oxygen environments. However, the video survey also found shrimp, crabs, and fish on or near the bottom throughout the AOC. These organisms would not be expected in locations where DO is below a critical threshold of 2 milligrams per liter (mg/L) to 3 mg/L, or where there are no prey species such as benthic invertebrates (EVS 2001). Of the four stations measured within the AOC, the lowest DO level found was 4.5 mg/L (the WQS is 5.0 mg/L; see discussion in Section 5).



Source: EVS Environmental Consultants, Inc., 2001.

ecology and environment, inc. International Specialists in the Environment Anchorage, Alaska	SILVER BAY DRAFT TMDL (Total Maximum Daily Load) Sitka, Alaska	Figure 3-3 BENTHIC STATION LOCATIONS AUGUST 2000
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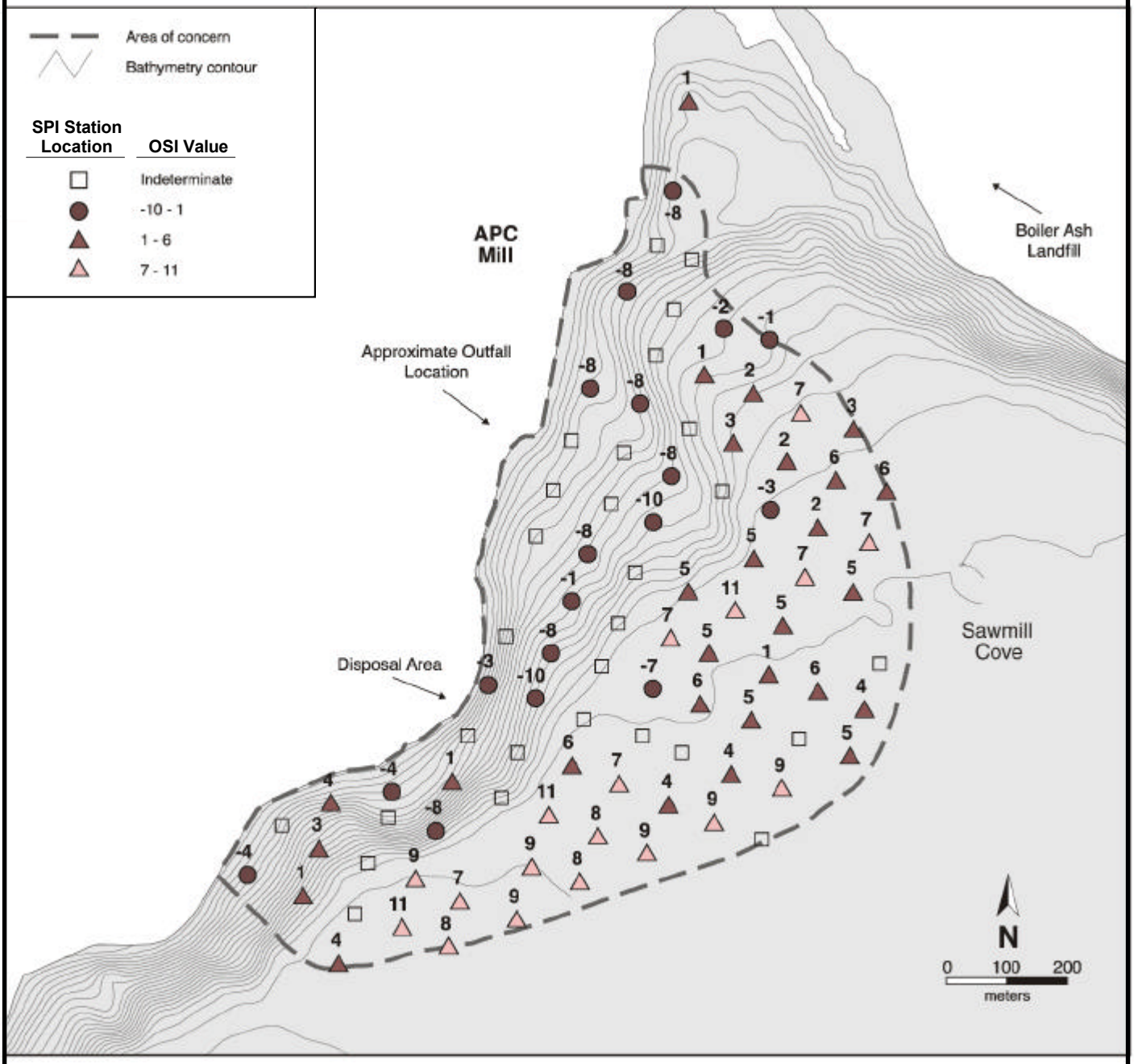
		10:001332AU0901\fig 3-3

Source: EVS Environmental Consultants, Inc., 2001.



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SILVER BAY DRAFT TMDL
(Total Maximum Daily Load)
Sitka, Alaska

Figure 3-4
SPI STATION LOCATIONS AND DISTRIBUTION OF OSI VALUES WITHIN THE AOC
APRIL 2000

Date: 11-27-02

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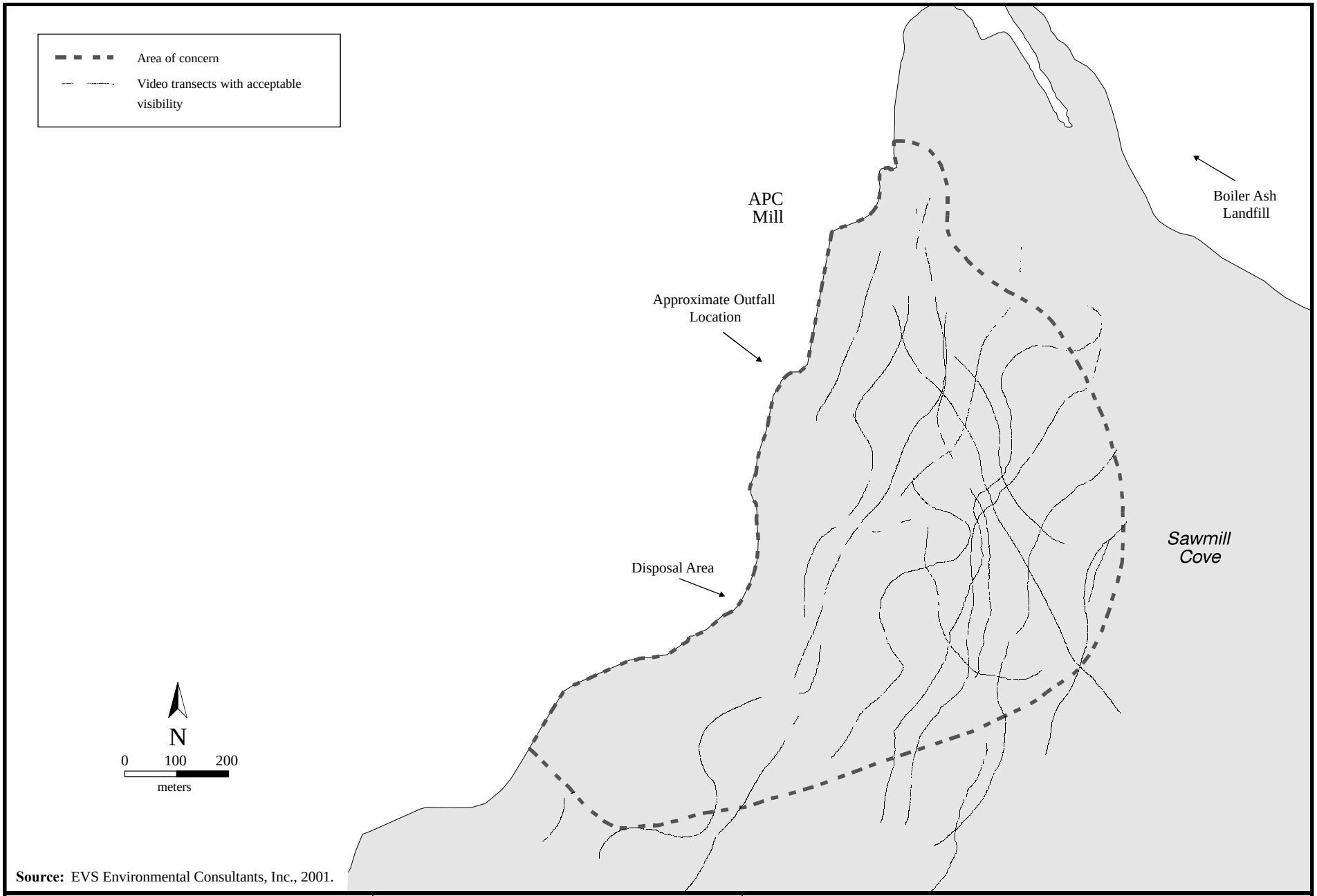

Source: EVS Environmental Consultants, Inc., 2001.

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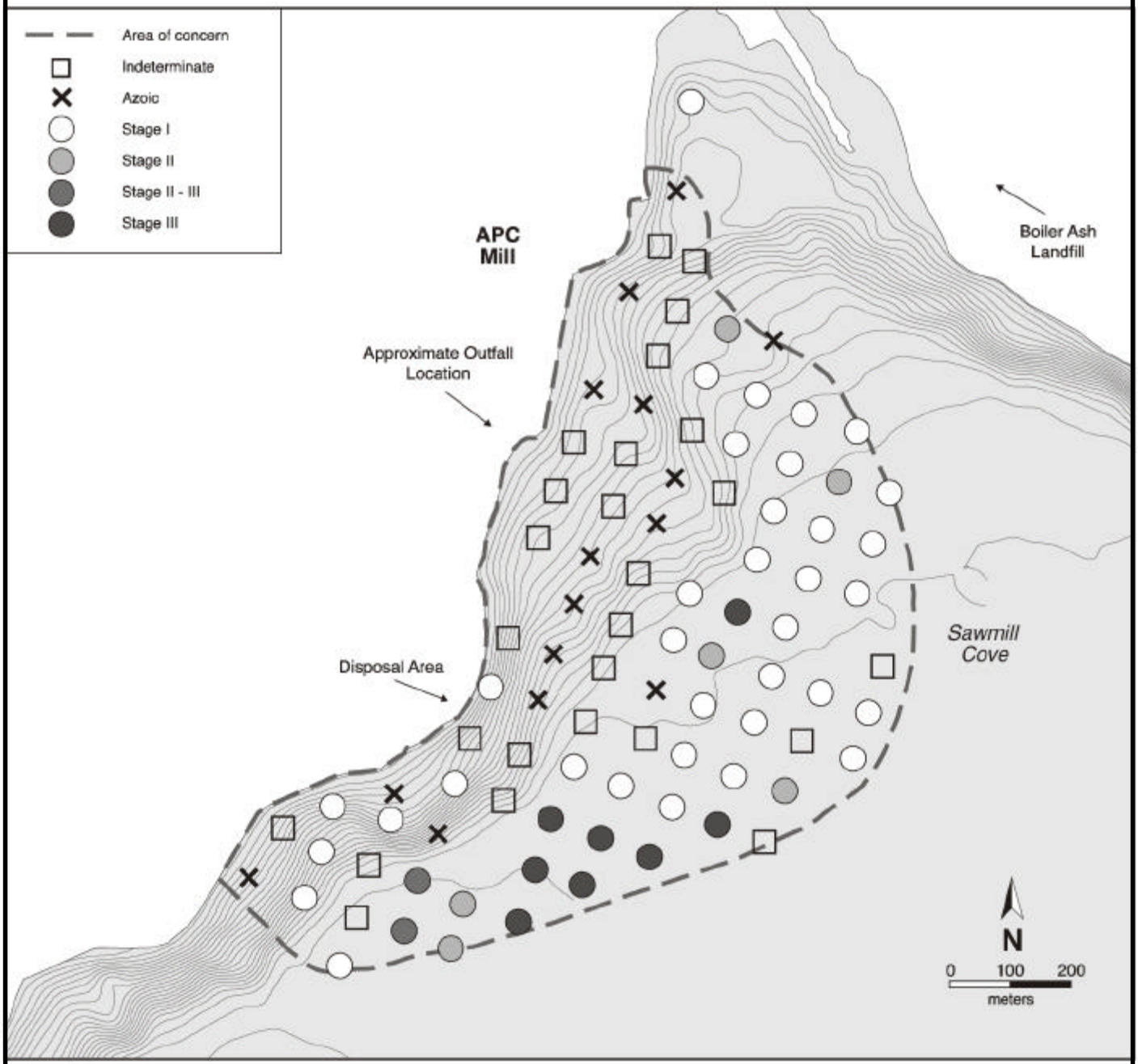
SILVER BAY DRAFT TMDL
(Total Maximum Daily Load)
Sitka, Alaska

Figure 3-5
TOWED VIDEO TRANSECTS IN THE AOC
APRIL 2000

Date:
11-27-02

10:001332AU0901\fig 3-5

Source: EVS Environmental Consultants, Inc., 2001.



ecology and environment, inc. International Specialists in the Environment Anchorage, Alaska	SILVER BAY DRAFT TMDL (Total Maximum Daily Load) Sitka, Alaska	Figure 3-6 DISTRIBUTION OF INFAUNAL SUCCESSIONAL STAGES WITHIN THE AOC AUGUST 2000 Date: 11-27-02 10:001332AU0901\fig 3-6

EVS concluded that there is an area within the AOC at water depths between 13 meters and 70 meters (43 feet and 230 feet) that still show the negative effects of pulp residue deposits through low faunal density and diversity. EVS also concluded that natural recovery is occurring on the sediment surface because 81% of the AOC is covered with decomposers such as Beggiatoa, and because primary consumers (Stage 1 benthic assemblages) were present at 89% of the sampling locations. EVS also noted that:

- Sixteen percent of the AOC has recovered fully (containing Stage 3 benthic assemblages) (see Figure 3-7);
- Twenty-two percent of the AOC is in transition to final recovery (containing Stage 2); and
- Sixty-two percent of the AOC still is seriously impaired with regard to benthic community status (containing only Stage 1) (EVS 2001).

EVS further observed that, "The seasonal inputs of excess organics from the spring and fall plankton bloom … will promote and prolong the stressed conditions within the AOC" (EVS 2001).

Although EVS concluded that 16% of the AOC had recovered fully, the improvement inferred to be recovery instead may reflect more detailed investigative methods employed during the 2000 study. In either case, as discussed in Section 3.4, this portion of the AOC is determined to not be impaired.

3.2.3 Wood Residue Outside the Area of Concern

During pulp mill operation, Herring Cove was used as a log storage area, in which log bundles were reorganized into single-layer rafts for transport to the APC pulp mill in Sawmill Cove (ADEC 1999a). Over time, numerous logs sank, and remain on the sea floor in Herring Cove and along the shore between the coves. Log storage and handling also caused bark to be dislodged from the logs and accumulate on the bottom.

The RI (FWENC 1998d) found instances of deposits of wood chips up to 22 feet thick north of the AOC (see Figure 3-2). In addition, although the area at the head of Sawmill Cove was not examined, it was concluded that "the wood chip deposits likely extend north to the head of Sawmill Cove" (FWENC 1999e).

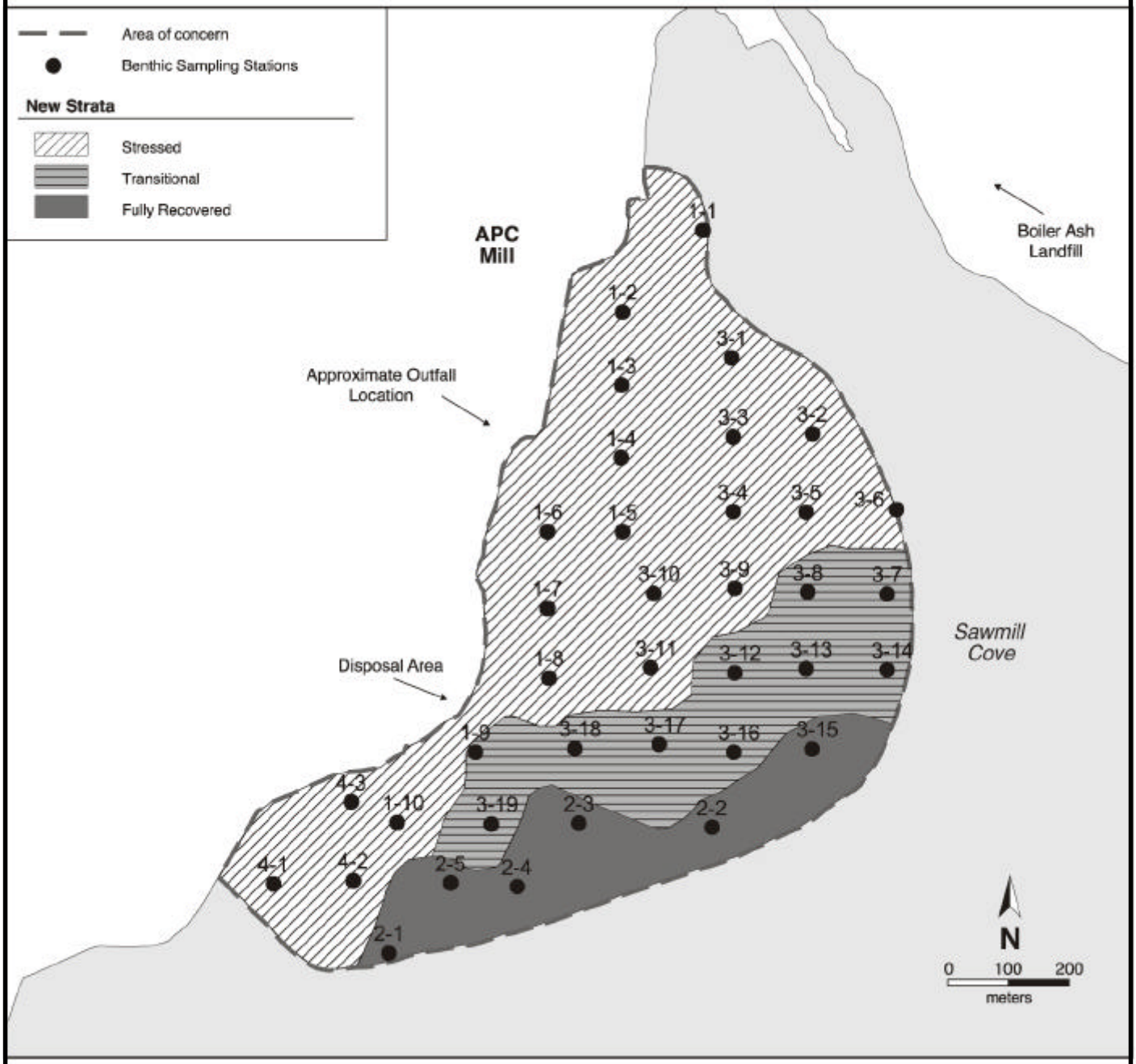
In April 2000, EVS conducted side-scan sonar and video surveys of Herring and Sawmill Coves to assess the presence of logs and other material. EVS integrated its data with SPI data collected during the 1997 RI. Log density on the ocean bottom was recorded in three classes:

High density	(>100 logs per 10,000 square meters [m^2])
Medium density	(10 to 100 logs per 10,000 m^2)
Low density	(<10 logs per 10,000 m^2)

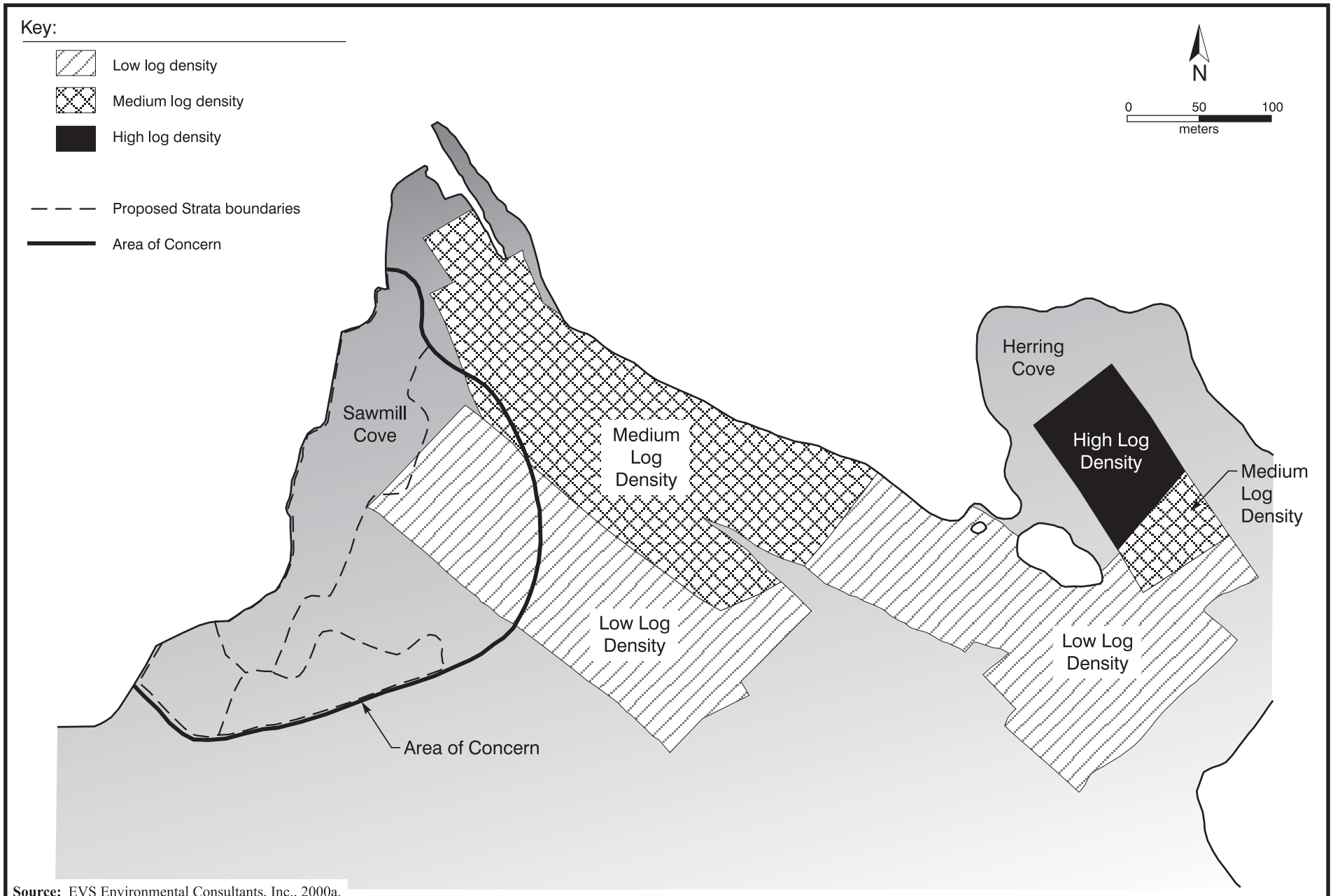
The distribution of the logs can be seen in Figure 3-8. Only a few logs and little wood debris are present south and southeast of the AOC. Anemones, crabs, shrimp, and fish were observed on the southern boundary of the AOC; therefore, the low density of logs south of the AOC apparently is not affecting the ability of these fauna to colonize the area (EVS 2000a).

EVS conducted a video survey at 22 stations in Herring Cove in August 2000. The report (EVS 2000b) noted that fine silt covers the bottom of the cove. The video shows the sediment to be powdery and flocculent. Because of the presence of the fine sediment, it was difficult to discern anything but large logs; therefore, the quantities of wood chips or bark could not be determined. This video survey documented the presence of epibenthic organisms. Beggiatoa mats were found in the area with high log density in the center of Herring Cove (see Figure 3-9). Numerous fish were present in all areas of the cove despite the density of logs (see Figure 3-10). Tunicates, in general, were present on logs only within the dense log areas. The other

Source: EVS Environmental Consultants, Inc., 2001.



ecology and environment, inc. International Specialists in the Environment Anchorage, Alaska	SILVER BAY DRAFT TMDL (Total Maximum Daily Load) Sitka, Alaska	Figure 3-7 REVISED AOC STRATA BASED ON GRAB SAMPLING AND SPI SURVEY RESULTS AUGUST 2000 Date: 11-27-02 10:001332AU0901\fig 3-7



Source: EVS Environmental Consultants, Inc., 2000a.

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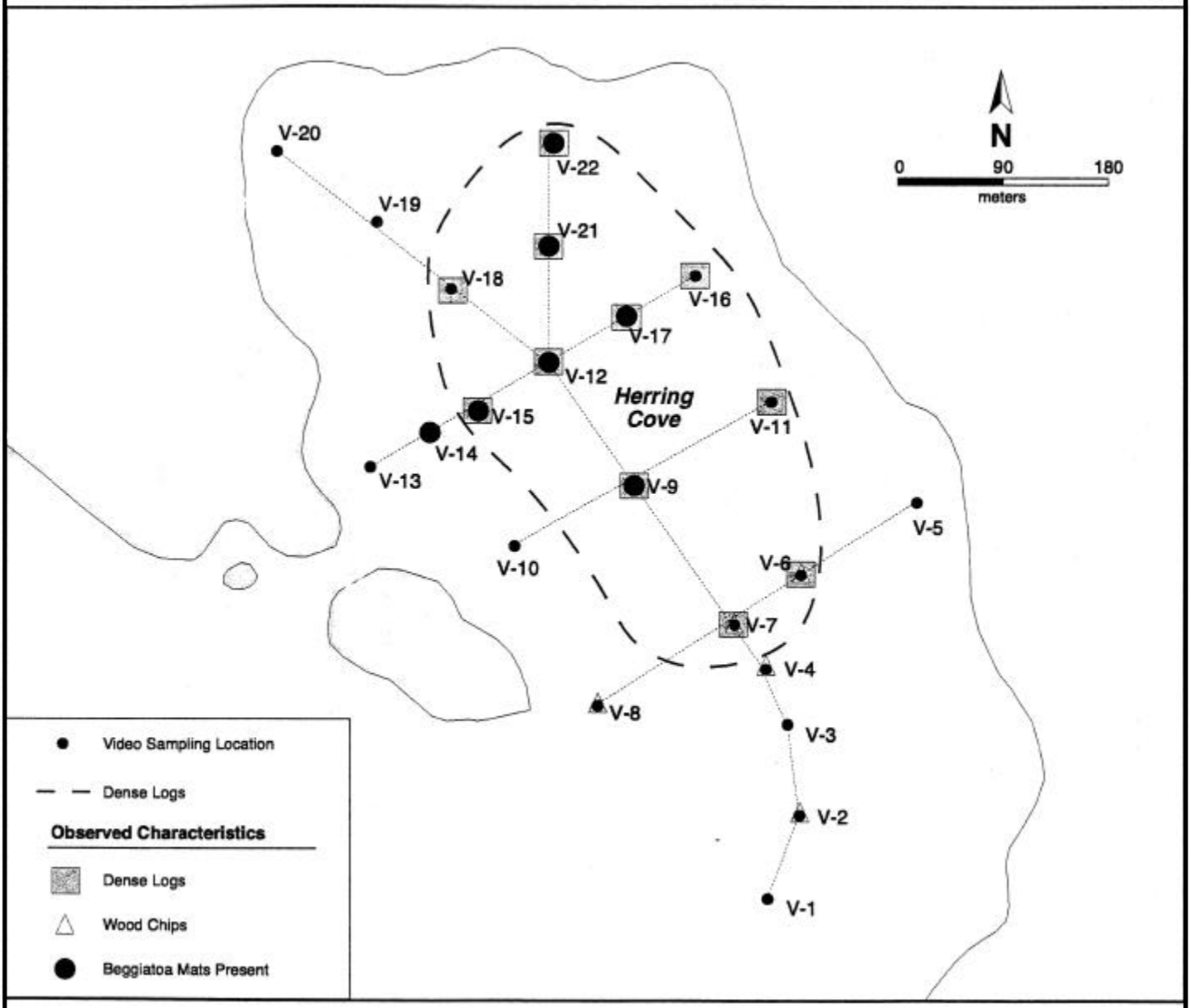
SILVER BAY DRAFT TMDL
(Total Maximum Daily Load)
Sitka, Alaska

Figure 3-8
CURRENT SIDE-SCAN SONAR AND VIDEO DATA OVERLAIN WITH WOOD CLASSIFICATIONS FROM RI SPI AND SIDE-SCAN SONAR DATA
APRIL 2000

Date:
11-27-02

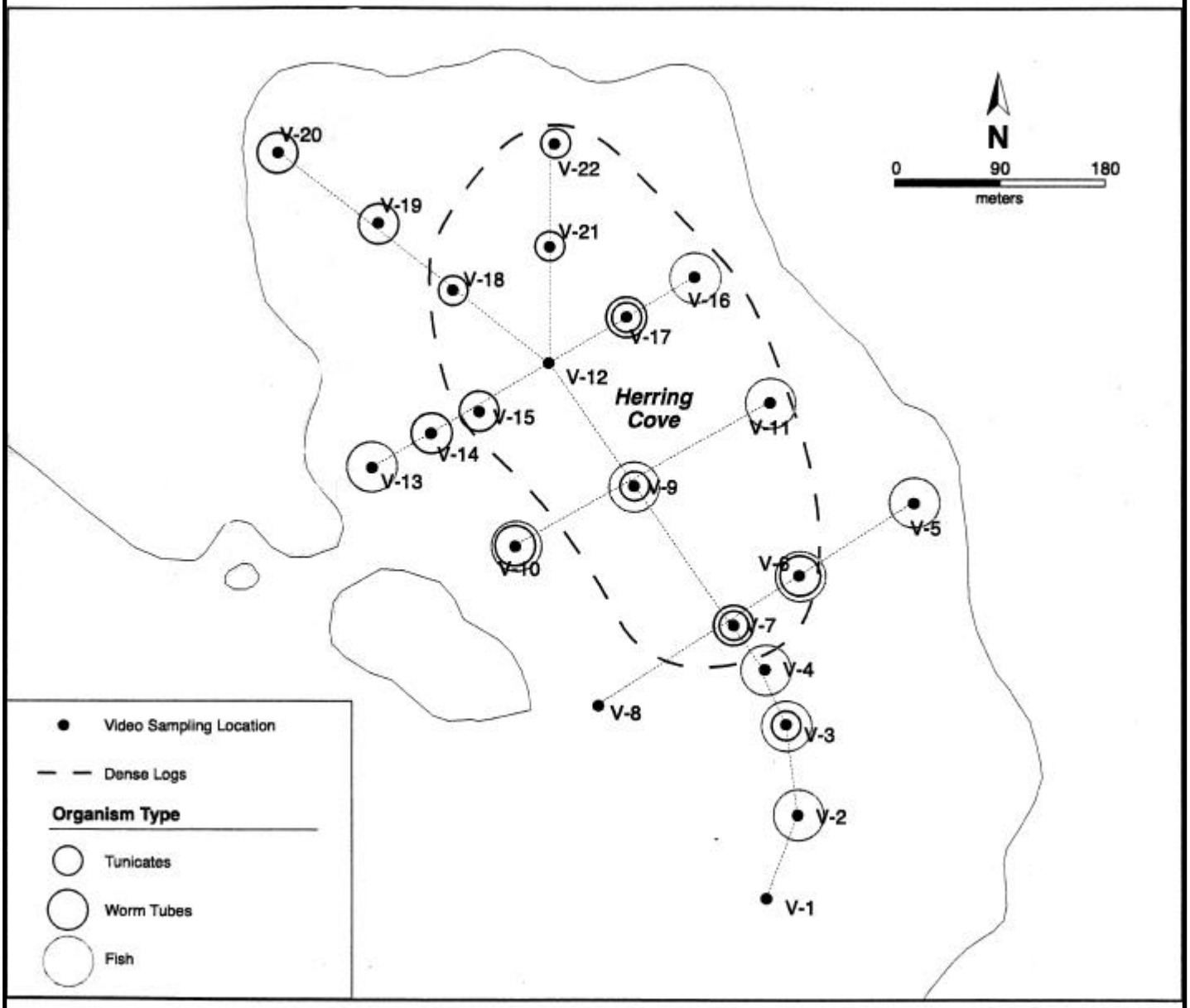
10:001332AU0901\fig 3-8

Source: EVS Environmental Consultants, Inc., 2000b.



ecology and environment, inc. International Specialists in the Environment Anchorage, Alaska	SILVER BAY DRAFT TMDL (Total Maximum Daily Load) Sitka, Alaska	Figure 3-9 HERRING COVE VIDEO RESULTS BOTTOM CHARACTERISTICS AUGUST 2000
		Date: 11-27-02 / 10:001332AU0901\fig 3-9

Source: EVS Environmental Consultants, Inc., 2000b.



ecology and environment, inc. International Specialists in the Environment Anchorage, Alaska	SILVER BAY DRAFT TMDL (Total Maximum Daily Load) Sitka, Alaska	Figure 3-10 HERRING COVE VIDEO RESULTS BOTTOM CHARACTERISTICS AUGUST 2000
		Date: 11-27-02 — 10:001332AU0901\fig 3-10

epibenthic invertebrates present (shrimp, anemones, sea stars, brittle stars, sea cucumbers, scallops, and sponges) were observed only outside the area of high-density logs, except for anemones and shrimp (see Figure 3-11). SPI and benthic sampling were not conducted in Herring Cove.

While the degree of recovery in the log areas is unknown, several studies have analyzed the impacts of bark accumulation on benthic organisms at log transfer facilities. (The volume of bark at log transfer facilities is expected to be smaller than that of the residues in Sawmill Cove.) These studies were summarized in two reports (Tetra Tech, Inc., 1996; Floyd & Snider, Inc., and Pentech Environmental, Inc., 1997). Impacts observed at log transfer facilities include reductions in the abundance, diversity, biomass, fecundity, and growth rate of benthic invertebrates. As little as 1 centimeter of debris can adversely affect the diversity of certain benthic infauna. Increasing debris thickness will affect various marine communities. Habitat alteration may adversely impact fish and mobile epifauna. Adverse effects observed in crabs include reduced fecundity and increased egg mortality. Certain sessile epifauna (e.g., sea anemones) may increase in abundance because of an increase in habitat suitable for anchoring and growth (Tetra Tech, Inc., 1996).

Because benthic biological sampling and SPI have not been conducted in the log areas, the types of infaunal communities existing there and the progress of biological succession are unknown. Monitoring is necessary to determine the biological status of the log areas with greater certainty. ADEC has determined that areas with a low density of logs will not adversely affect habitat for benthic invertebrates, but that areas with medium and high densities of logs could physically displace organisms or block access between sediment and the overlying water column.

3.3 Herring Cove TMDL

A TMDL for residues in Herring Cove was completed by ADEC in 1999 and approved by EPA. That TMDL established a loading capacity, wasteload allocation, and load allocation of zero for residues. The margin of safety applied in the Herring Cove TMDL was the assumption that the entire cove bottom is covered with logs and/or bark and wood debris, so the zero loading capacity applied to the entire cove. This overarching TMDL for Silver Bay reflects the Herring Cove TMDL, but enhances the specifications of the loading capacity, wasteload allocation, and load allocation.

3.4 Impaired Area

Because of the lack of delineating information at the time of listing, all of Silver Bay was listed as impaired. Based on more recent information, this document proposes a new boundary for the 303(d) listed portion of Silver Bay. The TMDL concludes that the actual water-quality limited areas are the pulped wood waste area, Herring Cove, and other areas of wood waste. Each area is described below and depicted in Figure 3-1.

3.4.1 Pulped Wood Waste Area ("Revised AOC")

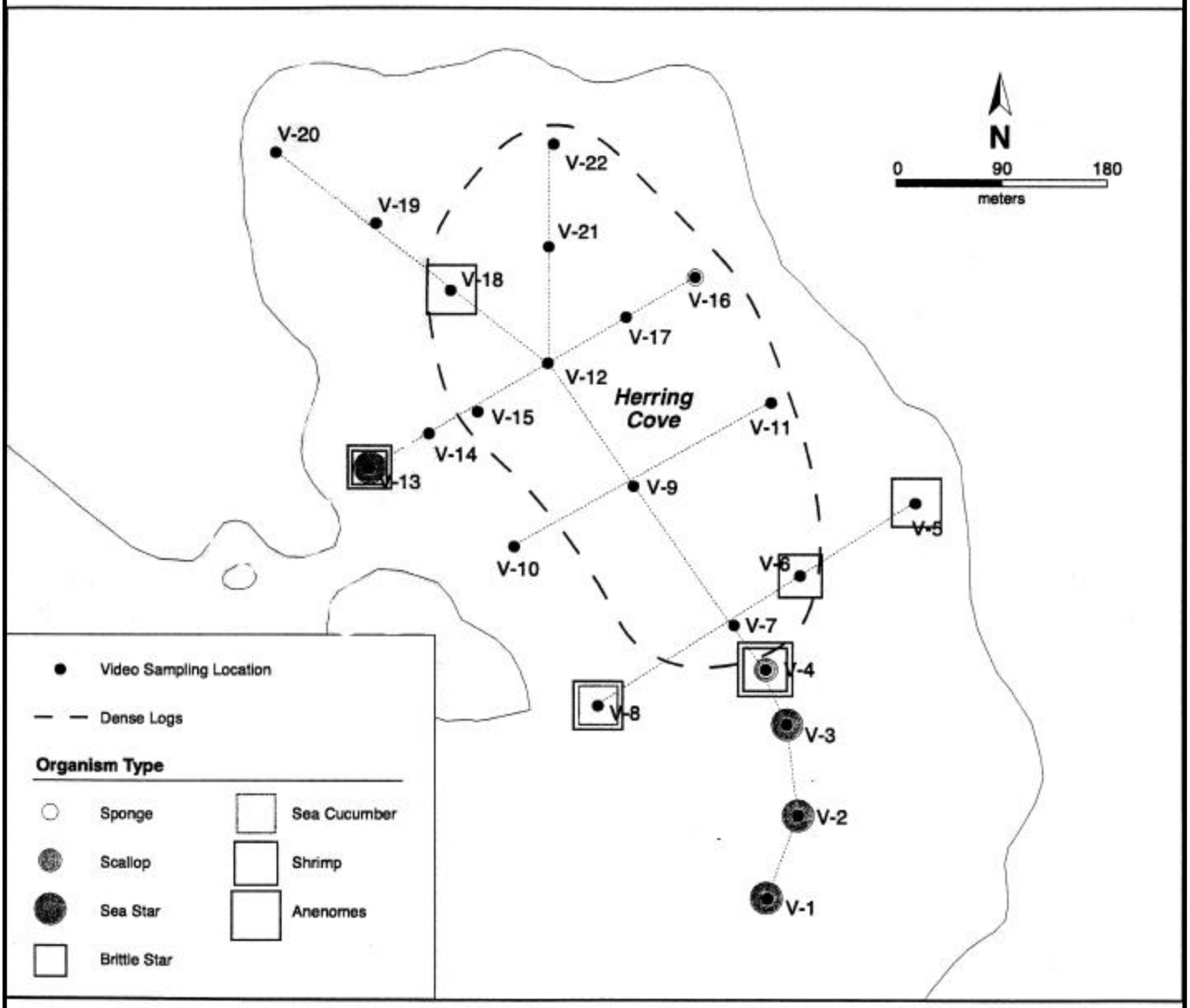
The environmental baseline monitoring conducted by EVS showed that 16% of the AOC (see Figure 3-6) can be considered fully recovered. Reflecting this new, post-ROD information, this TMDL finds that this portion of the AOC should not be included in the area of Silver Bay delineated as impaired by residues, because it has achieved the water quality target described in Section 3.6.

For purposes of measuring achievement of the RAO under the ROD, this area will continue to be included in the AOC as defined in that document. To avoid confusion between the AOC of the ROD and the more circumscribed area covered under this TMDL, the latter subsequently will be referred to as *the pulped wood waste area*.

3.4.2 Herring Cove

The side-scan sonar focused mainly on the middle of Herring Cove, and the drop video provides information only for individual locations. No evaluation of the benthic community has been performed. Because the

Source: EVS Environmental Consultants, Inc., 2000b.



ecology and environment, inc. International Specialists in the Environment Anchorage, Alaska	SILVER BAY DRAFT TMDL (Total Maximum Daily Load) Sitka, Alaska	Figure 3-11 HERRING COVE VIDEO RESULTS BOTTOM CHARACTERISTICS AUGUST 2000 Date: 11-27-02 10:001332AU0901\fig 3-11

extent of wood waste in Herring Cove, as well as the nature of the impacts associated with that waste, have not been delineated, this TMDL finds that the entire Cove should be considered impaired. This finding is consistent with the conclusions reached in the Herring Cove TMDL.

3.4.3 Other Areas of Wood Waste

The other portions of Silver Bay determined by this TMDL to be impaired are the area of medium-density logs located along the eastern shoreline of Silver Bay, and the northern part of Sawmill Cove extending from the northern boundaries of the pulped wood waste and medium-density log areas to the head of the Cove.

This TMDL does not find any other areas of Silver Bay, including those identified as having low log density (except as included in the above-described localities), to be water-quality limited. Figure 3-1 outlines the impaired area as identified by this TMDL.

3.5 Current Discharge Sources

Residues in Silver Bay are the result of the former APC pulp mill facility, which ceased operation in 1993. There are no current discharges of residues into Silver Bay, except for incidental natural discharges. There is one discharge in Sawmill Cove from a small STP that serves a few commercial facilities at the mill site. The plant uses secondary treatment, and its discharge is regulated by an ADEC permit that allows the discharge of some suspended solids. However, these solids are not considered to be capable of settling through the water column and depositing a residue on the sea bottom. Therefore, that discharge is not applicable to or covered by the residues TMDL. Although the City of Sitka plans to expand commercial use of the mill site, no specific additional sources are identified at this time. Any future sources will be subject to the load and wasteload allocations established in this TMDL, which are zero discharge of residues**.**

3.6 Water Quality Target

The water quality target establishes the specific goals for the TMDL for a given pollutant, which equate to attainment of the WQS. The water quality target may be either a numeric expression related to the WQS or a narrative goal. The target may include performance measures that are used to determine when the target is achieved.

The WQS prohibit the deposition of residues in the water or on the bottom. Strictly speaking, compliance with the standard of "no residues" in Silver Bay would require removal of all residues, followed by a period of biological recovery. As documented in the FS (FWENC 1998c), such action is not feasible in Silver Bay because of issues including disruption of benthic community recovery, resuspension of potentially toxic substances, water depths, technical feasibility, costs, and disposal of wastes.

The FS (FWENC 1998c) evaluated dredging, thick and thin capping, and natural recovery as remedial alternatives within the AOC. "Natural recovery with long-term monitoring and institutional controls" was the selected alternative. As expressed in the ROD, ADEC (1999b) determined that "no waterbody recovery activities requiring active intervention will be conducted in the Sawmill Cove AOC," because such activities would set back natural recovery processes and could resuspend potentially toxic contaminants in the water column. However, this finding does not preclude limited active remediation in selected portions of the remaining impaired area.

Because active "cleanup" of the pulped wood waste area apparently is not feasible, ADEC has determined that this TMDL, like the ROD, will rely on "natural recovery" through biological succession to establish viable benthic communities throughout the impaired area. *Natural recovery* does not mean that residues are expected to decompose in the foreseeable future. In fact, the residues may remain in place indefinitely. *Natural recovery* also does not imply that the benthic communities produced by biological succession will

resemble the communities existing before the residue accumulation, because the resultant habitat type generally will be quite different.

In line with the RAO of the ROD, this TMDL establishes the following water quality target for residues: Achievement of stable, balanced benthic communities through natural biological succession, in more than 75% of the impaired area, within 40 years from the date of the ROD (1999). Based on the ROD, *stable, balanced communities* is described as "mature equilibrium communities of burrowing, deep-dwelling, head-down, deposit-feeding organisms, or other 'Stage 3' communities" (ADEC 1999b). Because the WQS indicate that residues may not make water unfit for use by marine organisms, the target stated in terms of a stable benthic community and natural biological succession for monitoring progress is appropriate.

Because there is little basis for establishing a different target for log areas, ADEC has determined that a single water quality target will be used for the entire residue-impaired area. However, achievement of this target will be evaluated separately in the pulped wood waste and medium/high-density log areas, because they may recover at different rates. The pulped wood waste area is predicted to follow a documented pattern of recovery, based on previous studies of organically enriched areas (see Section 3.2.2). However, there is little information regarding the status of recovery in the medium- to high-density log areas from east Sawmill Cove to Herring Cove. The exact nature of biological succession and recovery in such areas is not well-understood. In order better to evaluate the recovery processes occurring in those areas, efforts should be made as part of the monitoring plan to develop appropriate reference areas to which the log-impacted areas of Silver Bay can be compared. As of the date of this TMDL, ADEC is not aware of any suitable reference sites.

3.7 Loading Capacity

The loading capacity for a given pollutant parameter is the greatest amount of pollutant discharge that a waterbody can receive without violating WQS, including a margin of safety (40 CFR 130.2[f]). The residues criteria in the WQS state that residues may not "cause a sludge, solid, or emulsion to be deposited" in the water or on the bottom, and that residues may not cause leaching of toxic or deleterious substances.

However, under the *Zone of Deposit* provision of the WQS (18 AAC 70.210), ADEC has discretion to allow deposit of certain substances on the bottom, based on assessment of impacts to human use and aquatic life. The fundamental obligation is to ensure, as required by the antidegradation policy of the WQS (18 AAC 70.015), that "the resulting water quality will be adequate to fully protect existing uses of the water."

Because much of the Silver Bay residues will remain in place indefinitely, the criteria of "no residues" cannot be achieved in an acceptable time frame. Respecting the residues criteria and the WQS, however, requires that additional residues must be avoided. Within the areas of impairment, this TMDL establishes the loading capacity as zero for residues.

3.8 Load Allocations

Load allocations allocate shares of the loading capacity to existing and future nonpoint source discharges, and to natural background sources, for the pollutant at issue. There are no known existing nonpoint sources of residues affecting the impaired area other than incidental natural sources, which are not considered to be significant. In accordance with the loading capacity, this TMDL establishes the load allocation as zero for residues.

3.9 Wasteload Allocations

Wasteload allocations allocate shares of the loading capacity to existing and future point source discharges for the pollutant at issue. Of the two sources of residues in Silver Bay, the former pulp mill process discharge was a point source discharge, but log storage was not considered a point source discharge at that time. Because both activities ceased with closure of the pulp mill in 1993, there are no current point source

discharges of residues in the impaired areas. In accordance with the loading capacity, this TMDL establishes the wasteload allocation as zero for residues*.

3.10 Margin of Safety

A margin of safety must be included in a TMDL to account for any uncertainty or lack of knowledge regarding the pollutant loads and the response of the receiving water. The margin of safety can be implicit (e.g., incorporated into the TMDL through conservative assumptions) or explicit (expressed as an allocation).

The margin of safety for this TMDL is implicit in establishing the loading capacity, load allocation, and wasteload allocation as zero. Because no further residues inputs are allowed, the load and wasteload allocations are as conservative as possible in protecting current water quality and for future achievement of WQS.

3.11 Seasonal Variation

Seasonal variation considers seasonal factors that might affect the assimilative capacity or the beneficial uses of the waterbody, or, as in Silver Bay, the natural recovery process. There is no seasonal variation of the wood waste residue input into Sawmill or Herring Cove because the sources have ceased. The residues are relatively immobile. Although decomposition of in-place residues may vary slightly during a year, decomposition and residue are not seasonal in nature. Season has no known effect on the assimilative capacity of or impact on the beneficial use (ADEC 1999a). However, natural organic detritus from seasonal plankton blooms apparently may be a significant factor that contributes residues to the substrate surface. As noted, this seasonal input of organic material may prolong the stressed condition in the residue-impaired areas. However, this factor must be considered simply as part of the natural recovery process. Likewise, physical and chemical seasonal environmental factors are part of the natural recovery process.

3.12 Monitoring

Monitoring the recovery of the benthic community is a key component of the natural recovery remedial alternative in the ROD. The approach is described fully in the monitoring program (FWENC 1999d). EVS updated this document and conducted the baseline monitoring in 2000 under contract to ADEC and CBS. The 2000 baseline monitoring (EVS 2001) included collection of sediment samples for chemical and benthic analysis, collection of water samples for water quality parameter analysis, SPI, video surveys, and side-scan sonar. The water quality parameter analysis, side-scan sonar, and video surveys were conducted in Herring and Sawmill Coves. All other parameters were conducted only in Sawmill Cove.

The proposed modifications to the existing monitoring program resulting from this TMDL are described in Section 6.

3.13 Reasonable Assurance

Reasonable assurance is required when wasteload allocations depend on load allocations, to ensure that the various nonpoint sources do not exceed the load allocated to them. In this case, because there are no existing point or nonpoint sources, and because all allocations are zero, provisions for reasonable assurance are not required.

* As allowed under Alaska law, the wasteload allocation can be changed in the future via a revision of this TMDL, which would then allow one or more permitted zones of deposit.

4 Toxic Substances

A site investigation conducted soon after the APC mill ceased operation in 1993 determined that levels of dioxin in marine waters near the mill site exceeded the WQS. As a result, Silver Bay was placed on the 303(d) list as water-quality limited for dioxin in 1994 and 1996. The listing was changed in 1998 to reflect the pollutant parameter *toxic and other deleterious substances*.

This section evaluates the presence of toxic substances in Silver Bay with respect to the State of Alaska's regulatory requirements and defines the area impaired by toxic substances as the AOC established by the ROD. The TMDL finds that Silver Bay is no longer water-quality limited by dioxin or other toxic substances formerly discharged by the APC pulp mill. Instead, it finds that sediments within the AOC may be water-quality limited for toxic substances derived from the decomposition of pulp residues. It does not find that sediments in log areas are water-quality limited for toxic substances.

Because potential sediment toxicity is directly related to the presence of pulp residues, the TMDL adopts the water quality target, loading capacity, load allocation, wasteload allocation, and other features contained in the residues TMDL.

The TMDL recommends that the 303(d) listing for Silver Bay should be changed to reflect these findings for this parameter.

4.1 Water Quality Standards

The most stringent WQS criterion for toxic and other deleterious substances applies to the designated uses *growth and propagation of fish, shellfish, other aquatic life, and wildlife*, *water supply for aquaculture*, and *harvesting for consumption of raw mollusks or other raw aquatic life*. The first portion of the criterion states:

> *Individual substances may not exceed criteria in the EPA Quality Criteria for Water. ... If those criteria are absent, or if the department finds that the criteria are not appropriate for sensitive resident Alaskan species, the department will, in its discretion, establish in regulation chronic and acute criteria to protect sensitive and biologically important life stages of resident Alaskan species, using methods approved by the EPA or alternate methods approved by the department.* (18 AAC 70(2)(c))

No alternative criteria have been established by ADEC; therefore, the EPA Quality Criteria for Water are the applicable WQS criteria for toxics. These criteria apply only to the water column. The second portion of the criterion states:

> *There may be no concentrations of toxic substances in water or in shoreline or bottom sediments that, singly or in combination, cause, or reasonably can be expected to cause, toxic effects on aquatic life, except as authorized by this chapter. Substances may not be present in concentrations that individually or in combination impart undesirable odor or taste to fish or other aquatic organisms, as determined by either bioassay or organoleptic tests ….* (18 AAC 70(2)(c))

This portion of the criterion applies to the water column and to bottom sediments. Section 3 discusses the current conditions in those two systems.

4.2 Regulatory History

All of Silver Bay originally was listed as water-quality limited for dioxin because wastewater was discharged to the water column during the pulp mill operation. The 1997 Silver Bay RI evaluated sediment and water quality from Herring Cove to Galankin Island and determined that the AOC is the main area of

contamination. Studies conducted in the years following the mill closure determined that certain substances associated with the former mill effluent, such as metals and dioxins, still were at detectable levels in the water column, sediments, and marine biota. However, the ROD determined that these substances posed no unacceptable human health and ecological risks (ADEC 1999b). Therefore, this TMDL concludes that sediments and the water column in the AOC, and by extension in all of Silver Bay, currently are not water-quality limited for metals and dioxins, which were present in the pulp mill effluent stream.

4.3 Current Conditions

4.3.1 Water Column Quality

During the Bay OU RI, water samples were collected at the surface, in the middle of the water column, and near the bottom at 32 sample stations in Sawmill Cove, at Bucko Point, and in Herring Cove (FWENC 1998d). Analysis of those samples indicated that only two sample locations exceeded federal/state WQS (ADEC 1999b). One location, in Sawmill Cove West, exceeded the WQS for copper, and the other, in Sawmill Cove East, exceeded the WQS for mercury (FWENC 1998a). No other contaminant levels exceeded the WQS. ADEC (1999b) did not consider these two isolated cases "to be a problem meriting further attention."

No elevated or unacceptable levels of contaminants were found in the tissues of birds, mammals, or fish. This finding, particularly in the case of fish, supports the conclusion that the lack of toxic substances and their attendant effects observed in surface waters of Sawmill Cove extends throughout the water column. The ROD concludes that chemicals generated by pulp residue degradation are not expected to be toxic to non-benthic marine organisms or terrestrial wildlife such as shorebirds, otters, and fish (ADEC 1999b).

Based on these data, the ROD concludes that there is no impairment of water quality in the water column with respect to toxic and other deleterious substances. No subsequent monitoring has occurred.

4.3.2 Sediment Quality

The ERA concluded that toxic effects appeared to be limited to benthic invertebrates (ADEC 1999b) as a result of their intimate association with the sediment. The results of larval toxicity tests indicated that under normal ambient conditions resulting from natural processes, contact with suspended sediment did not result in toxic effects to epibenthic fauna. However, activities resulting in suspension of unusually large amounts of sediment could result in increased mortality (FWENC 1998a).

The ROD further determined, based on sediment toxicity tests conducted in the RI, that sediment toxicity was present in the AOC, and was attributable mainly to wood waste decomposition products. The ROD states:

> *Sediments in three of 18* (toxicity) *sampling stations close to the former process wastewater outfall (outfall 001) showed toxic effects to benthic invertebrates. The toxicity was primarily attributed to chemicals associated with wood decomposition. Toxicity tests are not generally capable of discriminating which particular contaminants in the tests are responsible for the observed results. However, the results of the tests suggested ammonia to be a primary cause of toxicity. Resin acids also appear to have contributed to benthic invertebrate toxicity. The greatest toxicity was in the central portion of the pulp residue area offshore of outfall 001 where sediment contaminant concentrations were the highest.* (ADEC 1999b)

The ROD further states:

> *DEC recognizes that the area either devoid of benthic species or with only a few benthic organisms may not be caused by sediment toxicity alone. Pulp residues and other types of wood waste have significantly altered the bottom substrate in western Sawmill Cove, creating a long-term environmental*

impact. Habitat alteration, hazardous substances, and toxicity as a product of substrate decomposition contribute to changes in the abundance and diversity of the bottom dwelling community, thus potentially affecting populations of other species that use the benthic infauna as a food source.

As noted, sediment toxicity was found at only three of 18 sampling stations in the AOC, which were near the outfall. The greatest depth of pulp residues also is near the outfall. It appeared that sediment toxicity was not at issue in the remainder of the AOC.

During the 2000 baseline monitoring event, no sediment toxicity studies were conducted. However, eight sediment samples collected in the AOC were analyzed for total organic carbon, total sulfides, BOD, chemical oxygen demand, and ammonia. Results for sulfides and ammonia are summarized in Table 4-1, with the 1996 RI data included for comparison where applicable (EVS 2001; FWENC 1998d). Station locations are shown in Figure 3-3. As a point of reference, an LD_{50} *concentration* of 88 mg/L of ammonia and an *apparent effects threshold (AET)* of 4,500 parts per billion dry weight for sulfides were reported in studies using oysters and oyster larvae, respectively (Floyd & Snider, Inc., and Pentec Environmental, Inc., 1997; National Oceanic and Atmospheric Administration 1999). These values should be used only as very general benchmarks because of difficulties in applying them to other species, the effect of combinations of contaminants, and other uncertainties.

Table 4-1 Ammonia and Sulfide Concentrations in Sawmill Cove

Station ID	Ammonia (mg/kg)		Sulfide (mg/kg)
	1996	**2000**	**2000^**
SC4-1	--	14	610
SC4-2	--	90	2,600
SC4-3	--	140	4,200
Historical stations:			
SWSDC4X	20	60	3,400
SWSDD11X	94	150	3,500
SWSDD12X	89	17	3,200
SWSDD13X	460	210	12,000
SWSDD25X	50	45	1,600

^ Total sulfides were analyzed for during the 1996 remedial investigation fieldwork, but the analytical results were flagged as unusable because they were analyzed outside the holding time (Foster Wheeler Environmental Corporation 1998d).

Key:
ID = Identification.
mg/kg = Milligrams per kilogram.

Based on the previous sediment toxicity studies, as well as the 2000 sediment chemistry data, this TMDL finds that sediments within the AOC may be water-quality limited for toxic substances derived from decomposition of wood wastes.

No information regarding sediment toxicity is available for the log-only areas. Toxicity testing, benthic organism sampling, and SPI have not been conducted in those areas. Because sediment toxicity attributed to decomposition of wood wastes was found within the AOC, similar toxicity may or may not be present in areas of sediments impaired by log and bark residue. The extent of benthic infauna and biological succession in log areas is not known. In Herring Cove, video surveys documented a variety of sparsely distributed benthic epifauna, including fish, tunicates, shrimp, anemones, sea stars, brittle stars, sea cucumbers, scallops, and sponges, which indicate biological viability in water at the sediment interface.

In the absence of evidence of toxicity, because the level of toxicity in most of the AOC appears low, and because the degradation rates of log and bark residue are likely slower than those of pulp residues, this TMDL does not find that areas impaired by log and bark residues are water-quality limited for toxic substances.

4.4 Water Quality Target, Loading Capacity, Load Allocations, Wasteload Allocations, Margin of Safety, Seasonal Variation, Monitoring, Implementation Plan, and Reasonable Assurance

As indicated, this TMDL finds that sediments and the water column in the AOC, and by extension in all of Silver Bay, are not water-quality limited for toxic substances formerly discharged in the APC effluent stream, including dioxin. This TMDL finds that sediments within the AOC may be water-quality limited for toxic substances derived from decomposition of pulp residues, but does not find sufficient evidence to conclude that sediments in log areas are water-quality limited for toxic substances resulting from the decomposition of logs and other non-pulped wood waste. It further finds that the water column in Silver Bay is not water-quality limited for toxic substances from either the former effluent stream or the decomposition of wood wastes.

Because potential sediment toxicity is inherent to the presence of pulp residue, this TMDL adopts the water quality target, loading capacity, load allocations, wasteload allocations, margin of safety, seasonal variation, monitoring, implementation plan, and reasonable assurance for toxic substances entirely to the residues TMDL in Sections 3.5 to 3.13.

Future sources of toxic substances will be governed by WQS, Alaska Wastewater Discharge Permits, National Pollutant Discharge Elimination System permits, and other regulatory mechanisms.

5 Dissolved Oxygen

This section evaluates DO levels in Silver Bay and concludes that the waters of Silver Bay are not water-quality limited with respect to the original conditions for which those waters were listed. Therefore, no TMDL is developed for DO. This TMDL proposes that Silver Bay be removed from the 303(d) list for this parameter, but suggests that additional monitoring may be needed to determine whether it should be relisted for current deep water dissolved oxygen conditions.

5.1 Applicable Water Quality Standard

Alaska's WQS include two criteria for DO in marine waters (18 AAC 70[2]). The following criterion applies to the use *growth and propagation of fish, shellfish, other aquatic life, and wildlife*, and to four other uses:

> *Surface dissolved oxygen (D.O.) concentration in coastal water may not be less than 6.0 mg/L for a depth of one meter except when natural conditions cause this value to be depressed. D.O. may not be reduced below 4 mg/L at any point beneath the surface. D.O. concentrations in estuaries and tidal tributaries may not be less than 5.0 mg/L except where natural conditions cause this value to be depressed. In no case may D.O. levels exceed 17 mg/L. The concentration of D.O. may not exceed 110% of saturation at any point of sample collection.*

A second criterion applies to the use "water supply… [for] seafood processing":

> *D.O must be greater than or equal to 5 mg/L.*

The WQS provide that "if a waterbody is protected for more than one use class … the most stringent water quality criteria for all the included classes will apply." The limit in the first criterion of not less than 6 mg/L for a depth of 1 meter applies to all coastal waters, including Silver Bay. Silver Bay is considered an estuary, so the limit of not less than 5 mg/L applies to waters deeper than 1 meter. In the second criterion, the limit of greater than or equal to 5 mg/L applies to all marine waters, and supersedes the clause in the first criterion regarding natural conditions in estuaries, as well as the sentence referring to 4 mg/L at any point.

The applicable criteria for DO therefore are:

> *6.0 mg/L for a depth of one meter, and*
> *5.0 mg/L below the one-meter depth*

5.2 History of DO Impairment in Silver Bay

DO concentrations in Silver Bay are affected by various factors: inflowing sea water, inflowing fresh water, photosynthesis, temperature, and a variety of other parameters that control the mixing of waters within the Bay (Eldridge and Sylvester 1957). The lowest DO level found in studies completed before operation of the mill (Eldridge and Sylvester 1957) was 6.37 mg/L, in March 1957. That study identified March, August, and November as the months expected to have the lowest DO levels.

A report compiled by EPA in 1971 incorporated the results of an August 1965 study by the Federal Water Pollution Control Administration and subsequent studies by EPA. Surface water measurements taken during August 1970, during mill operation, showed depleted DO (as low as 4.5 mg/L) in the top meter of the water column. This condition "was attributed to the biochemical demand of pulp mill wastes and to a possible inhibition of phytoplanktonic oxygen production resulting from high concentrations of SWL" (EPA 1971).

A second EPA report produced in 1991 again cited the 1965 study, this time with reference to deep-water oxygen levels. It cited the report's conclusion that "the extreme oxygen deficit at depth is attributable to

oxygen depletion due to mill discharges exacerbating the low DO found in the up-welled oceanic water…" (EPA 1991).

A 1993 ADEC water quality assessment completed before closure of the mill identified historical documentation of reduced surface DO levels as a matter of concern.

5.3 Current Conditions

The pulp mill ceased operation in 1993 and stopped discharging SWL and solids, which had carried a high BOD load and had caused depletion of DO in the water column to levels that violated the WQS. Monitoring conducted in 1997 and 1998 found that the waters of the Bay complied with the DO criteria at all water depths surveyed (FWENC 1998d; EVS 2000b).

The August 2000 monitoring data showed an area centered between Sawmill Cove and Herring Cove in water depths of 50 meters to 80 meters where the oxygen level was below 5 mg/L, with the lowest value at 3.6 mg/L (EVS 2000b). DO in Herring Cove was above the criteria at 7 mg/L to 9 mg/L on the bottom and 11 mg/L at the surface. (The maximum depth in Herring Cove is approximately 25 meters.) In the AOC, DO at the surface was 11 mg/L to 12 mg/L. It then declined in a linear fashion to a minimum of 4.5 mg/L to 5 mg/L at approximately 55 meters to 60 meters deep.

The 1997-98 and 2000 water quality monitoring surveys were conducted at various times throughout the year (FWENC 1998d; EVS 2001). Both surveys included sampling events during late summer, when DO concentrations are expected to be lowest in deeper water. (In Alaska's coastal waters, DO near the bottom is generally lowest during late summer and fall, when the water column becomes stratified and surface waters do not mix with deeper water, and when large amounts of plankton die, sink, and decompose.)

5.3.1 Compliance with Water Quality Standards

5.3.1.1 Surface Water

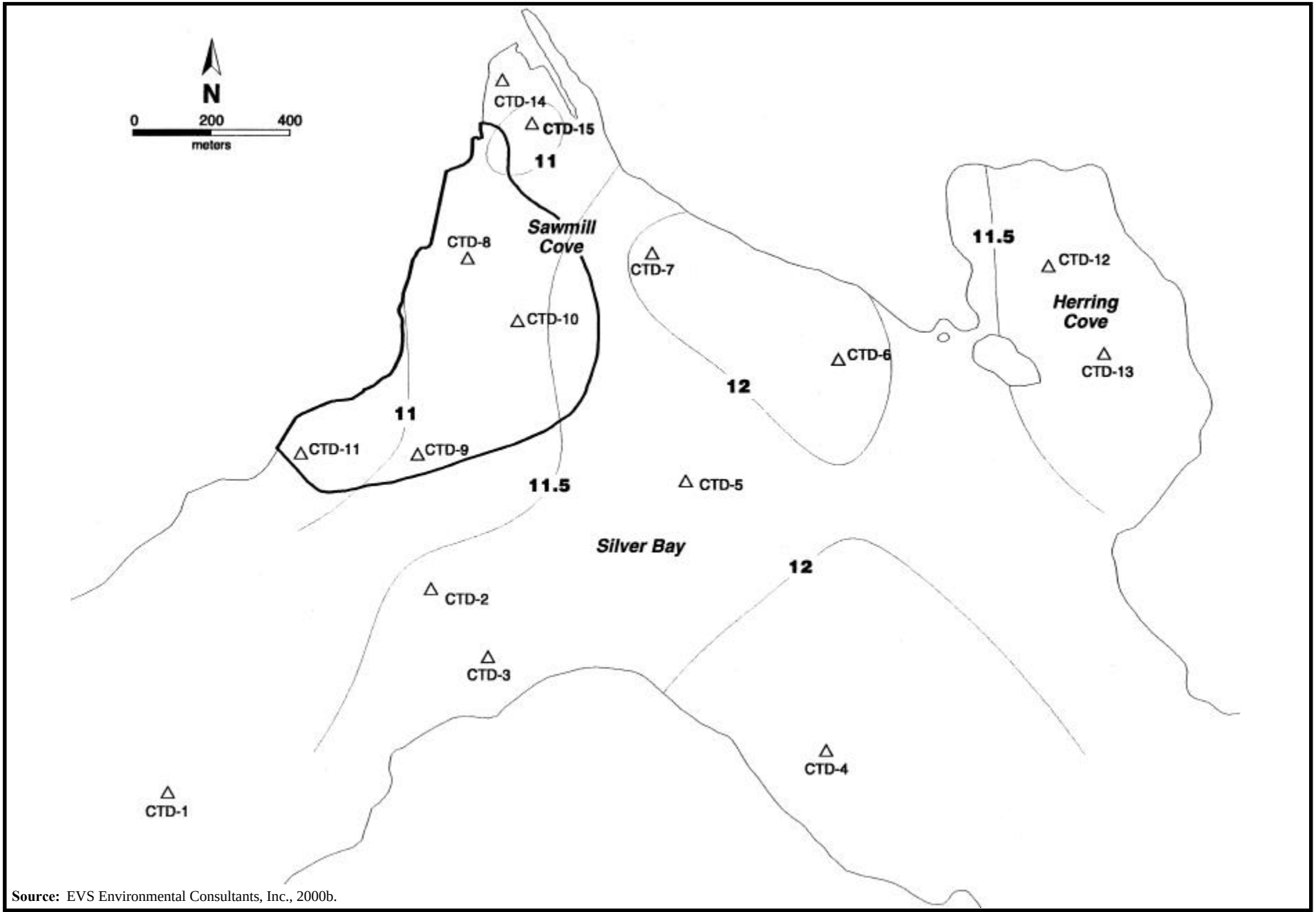
According to Alaska's WQS, surface water (to a depth of 1 meter) must exhibit DO levels of 6 mg/L or greater. In 1997-98 and 2000, the DO conditions were highest in the top 5 meters of the water column, ranging from approximately 12 mg/L to 15 mg/L during August 2000 (see Table 5-1 and Figure 5-1). In 1957, the pre-mill surface water DO ranged from 7.1 mg/L in the winter to 18.2 mg/L in the spring (EPA 1971). The 1997-98 and 2000 DO sampling data provide evidence that DO concentrations in the surface water are above the WQS of 6 mg/L in the upper meter of the water column.

Although the WQS state that DO may not exceed 17 mg/L, the 18-mg/L levels observed from 1997 to 2000 are consistent with 1957 pre-mill levels, and appear to reflect natural conditions (see Figure 5-2). In summary, the available data show that the surface DO in Silver Bay has recovered to pre-mill conditions.

Table 5-1: Dissolved Oxygen Concentrations in the Surface Water of Silver Bay (mg/L)

1957 (Winter; Spring)	1957 (August)	1959	1965 (Winter)	1970 (August)	1993	1997–98 (September, March to October)	2000 (August)
7.1; 18.2	9-11.5	SWL discharges begin	4-6	4.5-9.5	SWL discharges cease	8.5-18	15-18

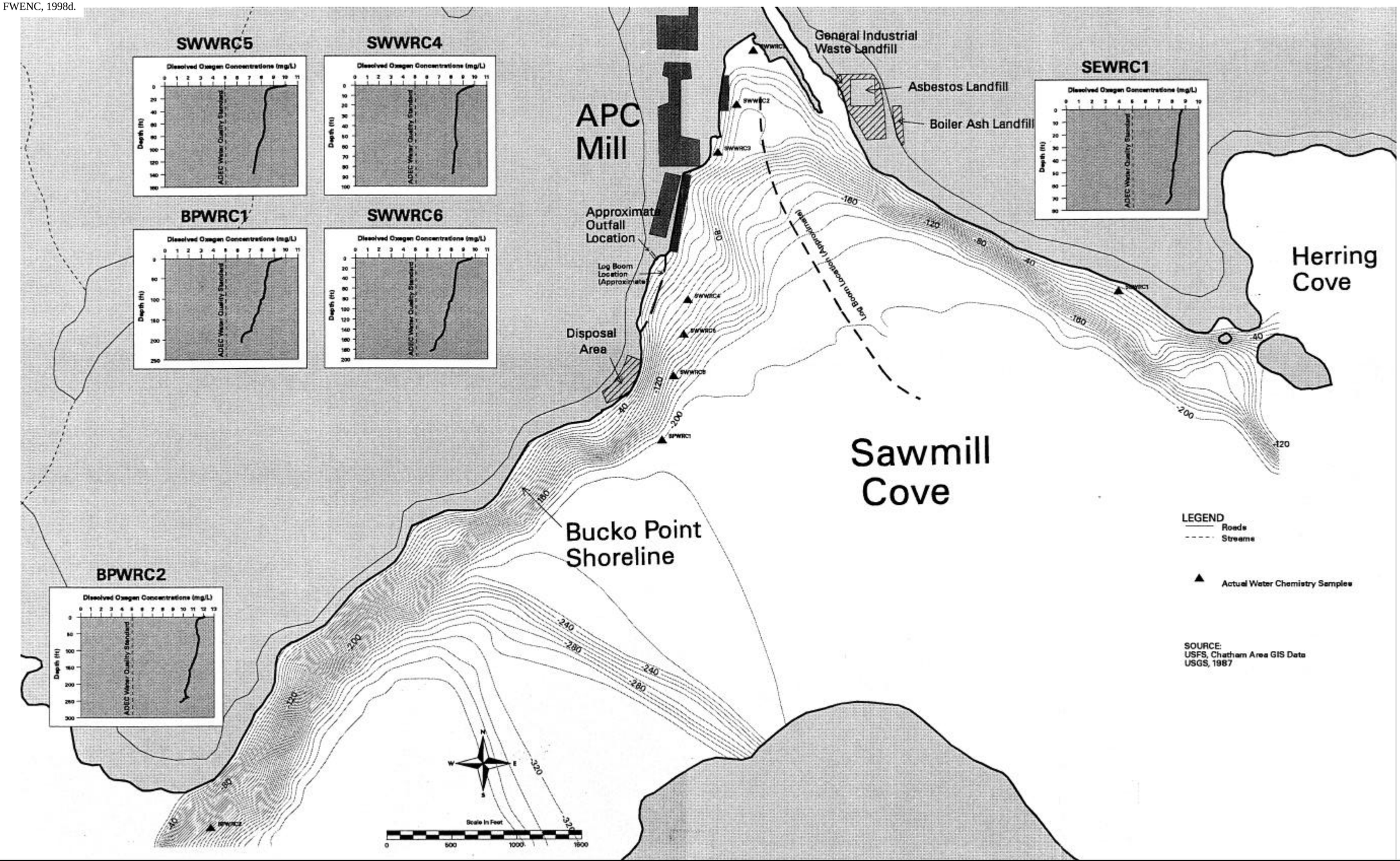
Key: mg/L = Milligrams per liter.
SWL = Sulfite waste liquor.



Source: EVS Environmental Consultants, Inc., 2000b.

ecology and environment, inc. International Specialists in the Environment Anchorage, Alaska	SILVER BAY DRAFT TMDL (Total Maximum Daily Load) Sitka, Alaska	Figure 5-1 DISTRIBUTION OF SURFACE DISSOLVED OXYGEN CONCENTRATIONS (mg/L) AUGUST 2000 Date: 11-27-02 10:001332AU0901\fig 5-1

Source: FWENC, 1998d.



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International Specialists in the Environment
Anchorage, Alaska

SILVER BAY DRAFT TMDL
(Total Maximum Daily Load)
Sitka, Alaska

Figure 5-2
DISSOLVED OXYGEN CONCENTRATIONS FOR SAWMILL COVE AND THE BUCKO POINT SHORELINE
SEPTEMBER 1997

Date: 11-27-02

10:001332AU0901\fig 5-2

5.3.1.2 Lower Water Column

For depths below 1 meter, WQS indicate that DO concentrations may not fall below 5 mg/L. The results of the 1997-98 monitoring events indicated that the DO level throughout the water column was above this criterion (see Table 5-2). In addition, the 1997-98 monitoring data demonstrated that DO concentrations were above the criterion at the mouth of Silver Bay (west of Bucko Point), in Sawmill Cove (AOC), and outside the AOC toward Herring Cove. These data showed that DO concentrations in the water column were above 5 mg/L down to sea floor depths of 85 meters (260 feet) (see Figure 5-2). In addition, similar to the surface water, the deeper-water DO levels are consistent with pre-mill conditions.

Table 5-2: Dissolved Oxygen Levels in the Water Column of Silver Bay (mg/L)

	1957 (Various)	1959	1965 (August)	1965 (Winter)	1993	1997	1998 (August)	2000 (August)
Upper 5 meters	8.1-12.5	APC mill operation begins	8.5-11	2-8	APC mill operation and SWL discharges cease	12.1	8.5-12.2	12-15
30 meters	7-9		8.1-10.8			6.2	6.7-9.9	
50-80 meters	6.37-8.62							3.6-9.1

Note: Sample sites vary within Silver Bay.
Key: APC = Alaska Pulp Corporation.
mg/L = Milligrams per liter.
SWL = Sulfite waste liquor.

5.3.1.3 Near-Bottom DO Concentrations

The 2000 monitoring data showed DO profiles that were horizontally and vertically uniform throughout the study area, with DO levels decreasing from surface to bottom (see Figures 5-3 through Figure 5-6). At five sampling locations in water greater than 50 meters deep, the DO levels at or near the ocean floor in August 2000 were lower than 5 mg/L (see Figure 5-6). These concentrations were found in a "lens" centered between Sawmill and Herring Coves in the area of low- to medium-density logs (EVS 2000b). In contrast, areas with high log density (>100 per hectare) exhibited DO levels above the WQS.

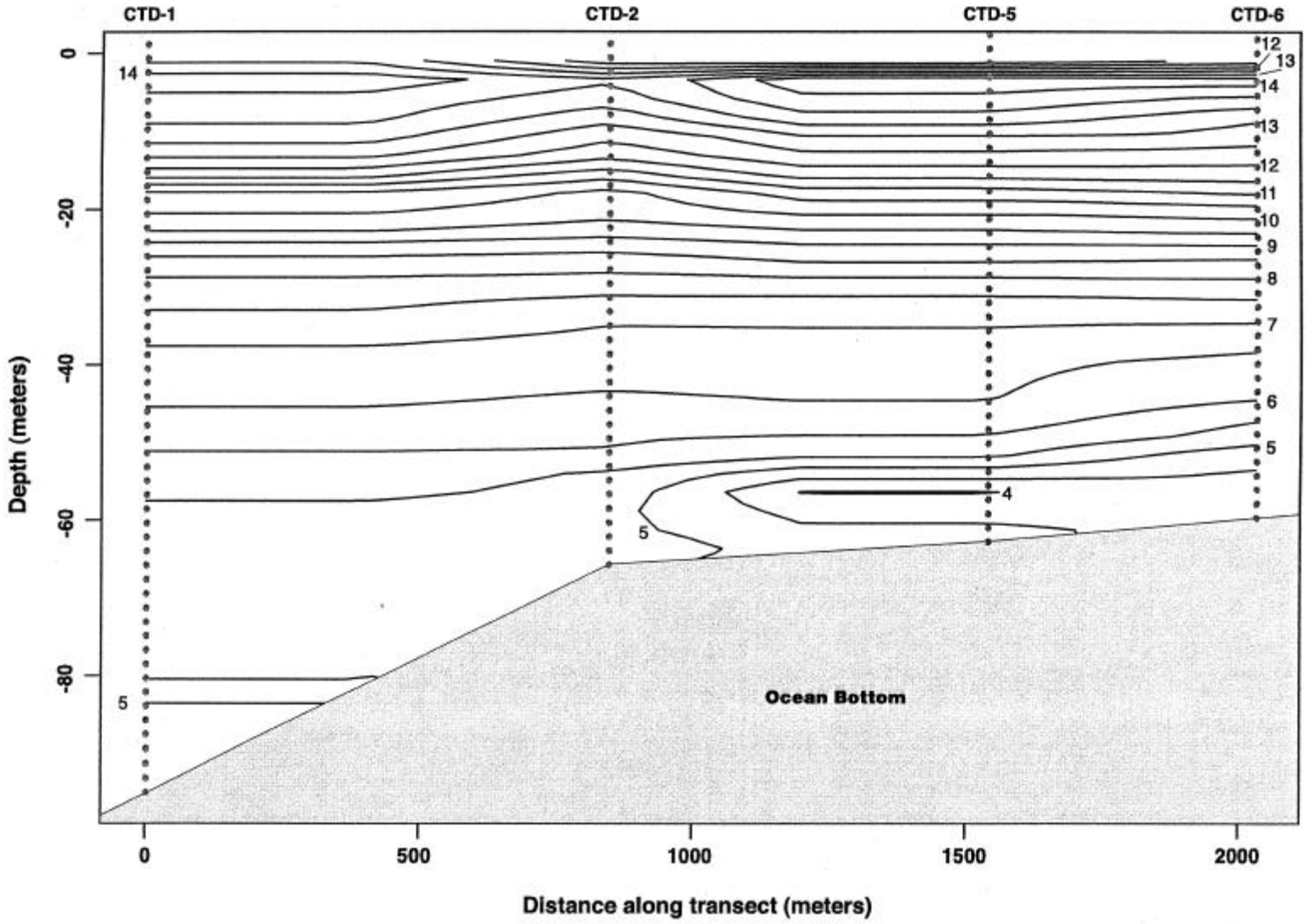
An August 1990 reconnaisance study by EPA measured DO concentrations at four locations: in Sawmill and Herring Coves, and in Eastern Channel and Thimbleberry Bay. It found that DO concentrations decreased below 40 meters in all four locations, reaching lows ranging from less than 4 mg/L in Thimbleberry Bay to approximately 1.5 mg/L in Sawmill Cove (EPA 1991).

The August 1965 federal study cited by EPA found DO concentrations from 3.9 to 5.8 mg/L in waters 60 meters deep (EPA 1991). Although the location of these sampling stations is unknown, the depths are comparable to the near-bottom depths discussed above.

The pre-mill study measured near-bottom DO concentrations at several stations in Silver Bay in March 1957 (Eldridge and Sylvester 1957). A couple of those measurements were taken at locations in the vicinity of and at depths comparable to the 2000 EVS stations. Those locations are shown in Figure 5-6. Of the sampling sites depicted, the lowest DO concentration was 7.74 mg/L at Station 1957-8. The highest concentration, 8.4 mg/L, was found at Station 1957-7.

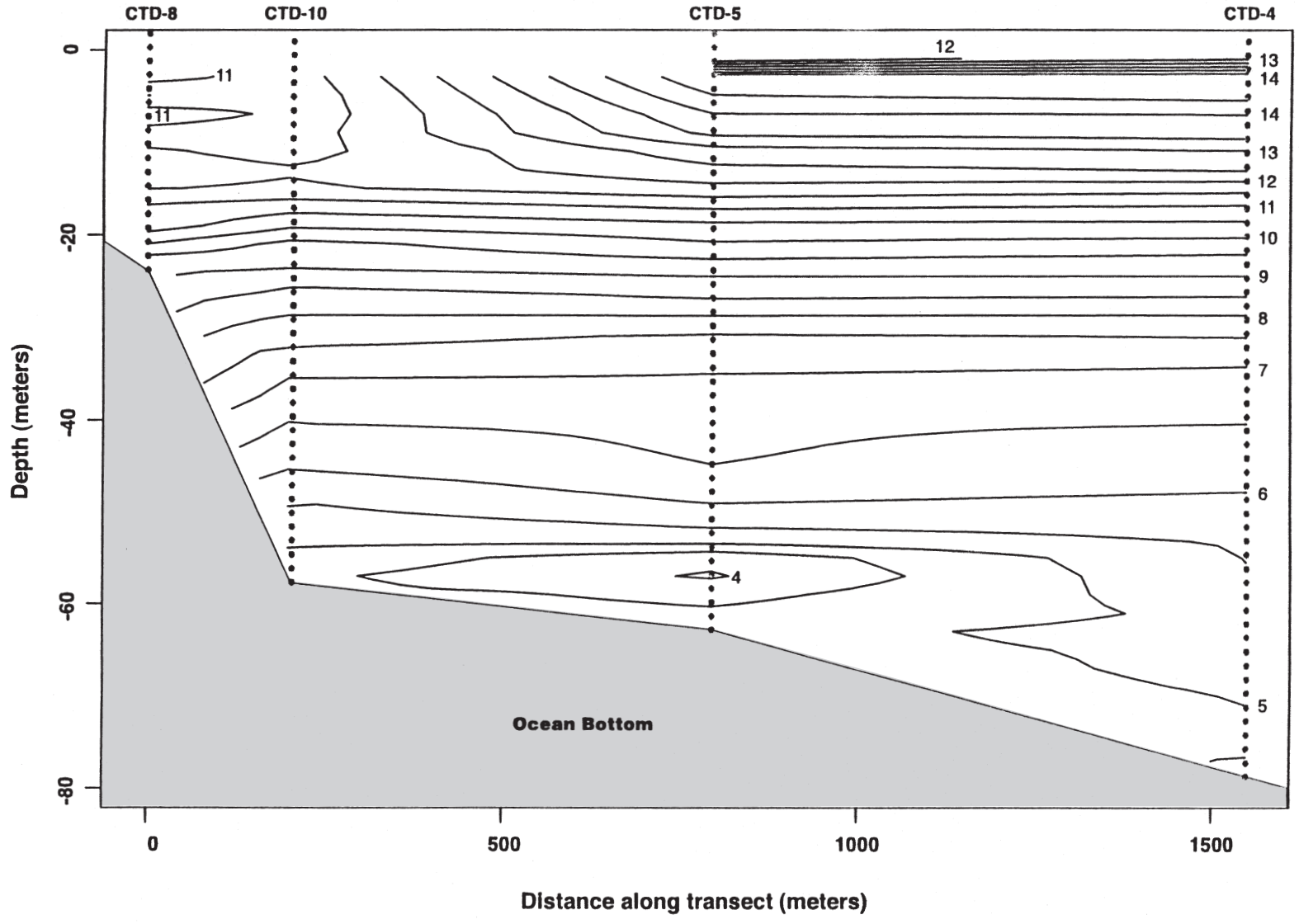
5.3.2 Rationale for Removing DO from the 303(d) List

As summarized in Section 5.3.1.1 and Table 5-1, there was a significant, demonstrated effect on surface DO concentrations during operation of the APC mill. This effect was correlated directly to the discharge of SWL and high BOD of the mill effluent.



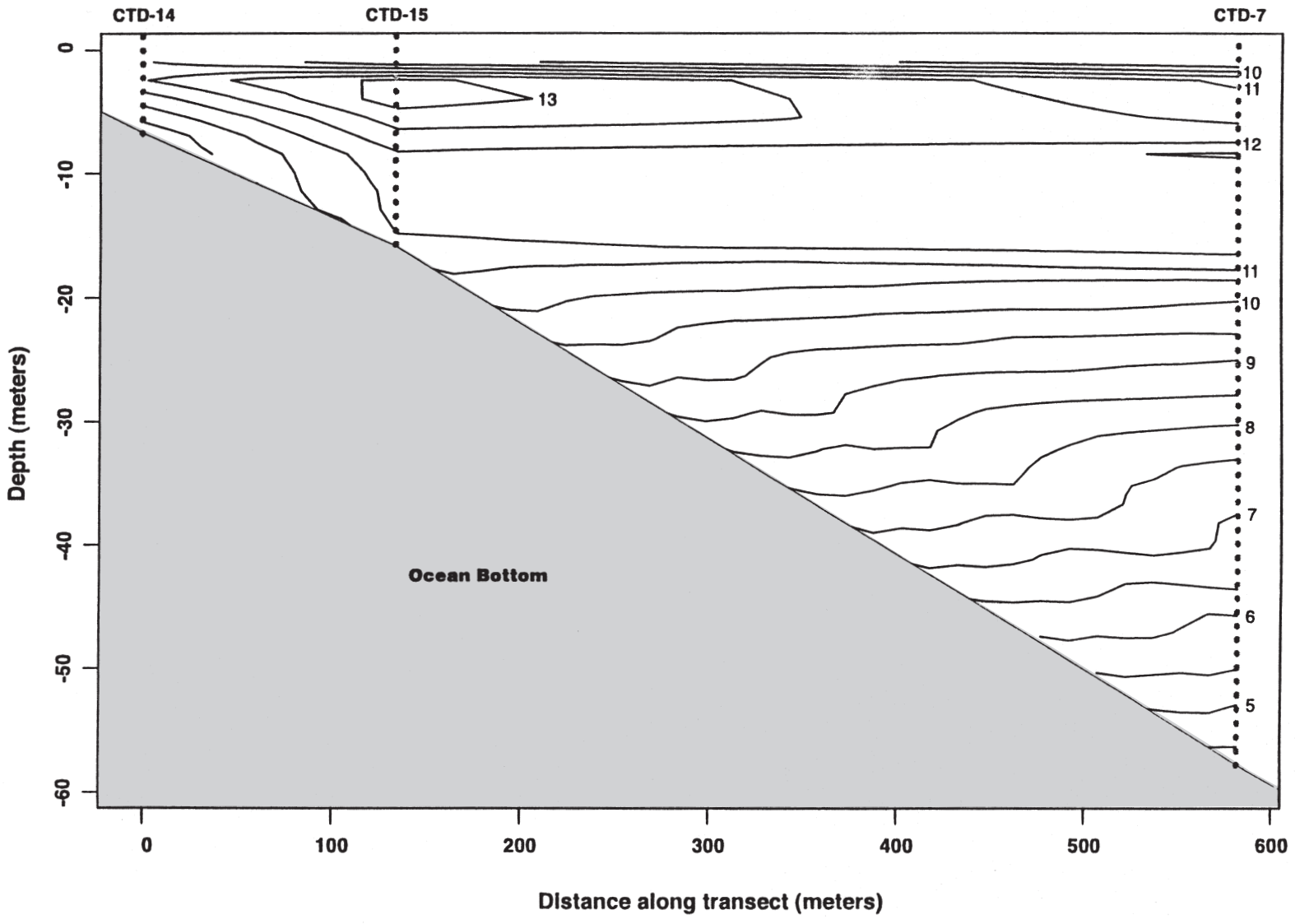
Source: EVS Environmental Consultants, Inc., 2000b.

ecology and environment, inc. International Specialists in the Environment Anchorage, Alaska	SILVER BAY DRAFT TMDL (Total Maximum Daily Load) Sitka, Alaska	Figure 5-3 TRANSECT A-DISSOLVED OXYGEN (mg/L) AUGUST 2000 Date: 11-27-02 10:001332AU0901\fig 5-3



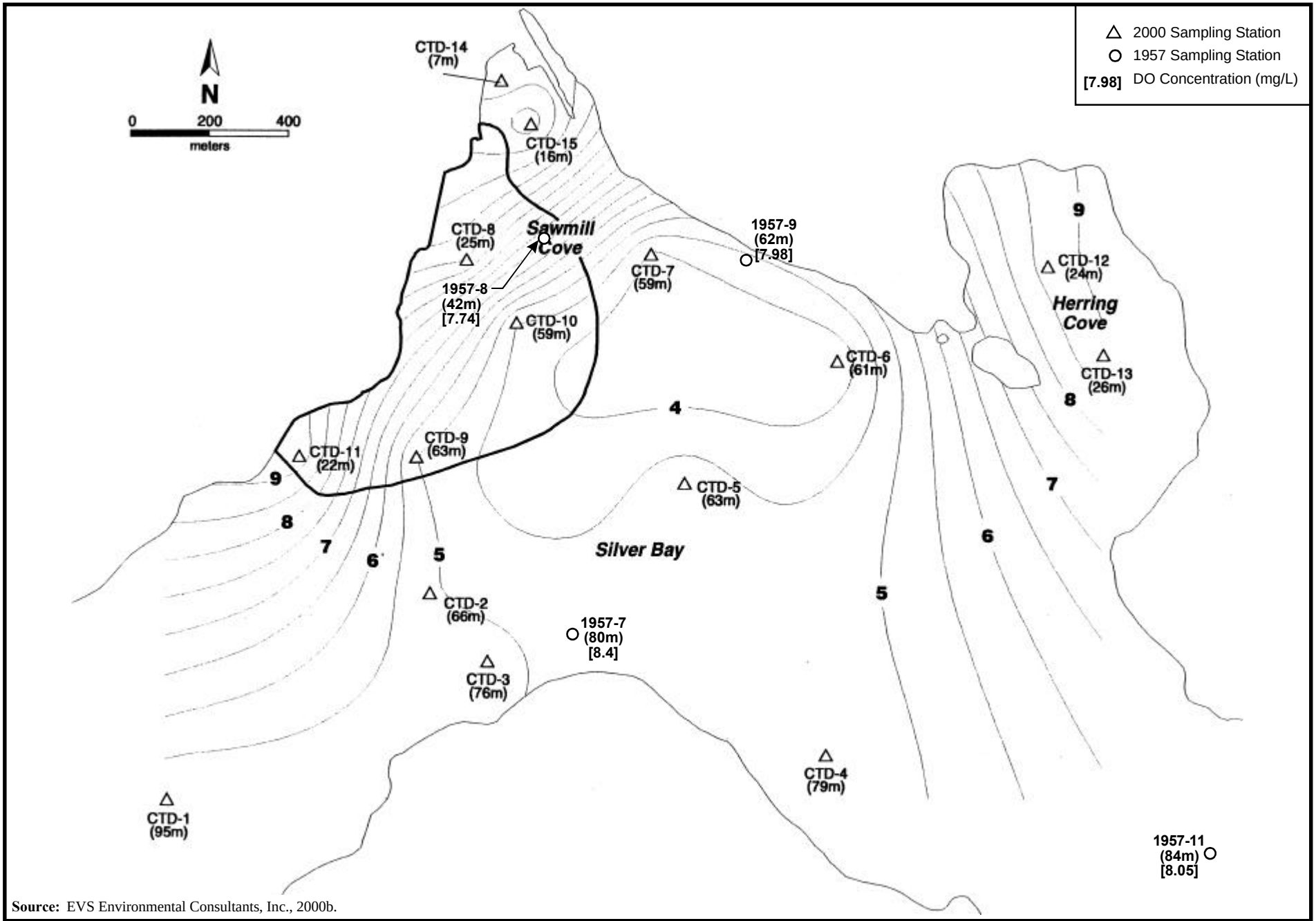
Source: EVS Environmental Consultants, Inc., 2000b.

ecology and environment, inc. International Specialists in the Environment Anchorage, Alaska	SILVER BAY DRAFT TMDL (Total Maximum Daily Load) Sitka, Alaska	Figure 5-4 TRANSECT B-DISSOLVED OXYGEN (mg/L) AUGUST 2000 Date: 11-27-02 10:001332AU0901\fig 5-4



Source: EVS Environmental Consultants, Inc., 2000b.

ecology and environment, inc. International Specialists in the Environment Anchorage, Alaska	SILVER BAY DRAFT TMDL (Total Maximum Daily Load) Sitka, Alaska	Figure 5-5 TRANSECT C-DISSOLVED OXYGEN (mg/L) AUGUST 2000 Date: 11-27-02 10:001332AU0901\fig 5-5



Source: EVS Environmental Consultants, Inc., 2000b.

ecology and environment, inc. International Specialists in the Environment Anchorage, Alaska	SILVER BAY DRAFT TMDL (Total Maximum Daily Load) Sitka, Alaska	Figure 5-6 DISTRIBUTION OF BOTTOM DISSOLVED OXYGEN CONCENTRATIONS (mg/L) AUGUST 2000 Date: 11-27-02 10:001332AU0901\fig 5-6

The studies conducted after the mill closure indicate that surface DO concentrations consistently meet WQS, and are comparable to pre-mill levels. DO levels within the water column also meet WQS.

ADEC believes that the area of depressed DO found in the 2000 study is not readily attributable to decomposing wood wastes in Sawmill or Herring Coves, for the following reasons:

- There is no correlation between the presence of wood waste and low DO. Although Stations CTD-10 in the AOC and CTD-7 in the medium-density log area had DO concentrations below the WQS, other locations with significant wood waste (Stations CTD-8, CTD-9, CTD-11, CTD-15, and CTD-12) met or exceeded WQS. The 1990 EPA study documented low DO in areas such as Thimbleberry Bay which do not have wood waste. Low DO appears to have a much stronger correlation with increasing depth;
- Water column oxygen profiles (see Figures 5-3 through 5-5) were structured very regularly horizontally and vertically across the waterbody; and
- Oxygen levels in deeper estuarine waters often can be depressed because of a combination of natural phenomena, including poor mixing, inadequate photosynthesis, and removal of oxygen by the decomposition of phytoplankton and other marine organisms that have settled to the ocean floor (Gross 1993).

The bulk of the data show that Silver Bay is no longer water-quality limited for DO for the reasons for which it originally was listed, because there is no longer any impairment to the surface waters and because neither the organically enriched sediments of the AOC nor the other types of wood waste appear to affect DO in the immediately overlying waters.

The presence of several sampling stations with low DO concentrations in the 2000 EVS study represents conditions in a limited area at one discrete point in time, and is not considered to be sufficient evidence to retain Silver Bay on the 303(d) listing with respect to DO. Although the pre-mill study showed higher DO levels at nearby stations, the two studies differ by season, by methods, and by years sufficiently to make their comparability uncertain. There is no current source to which the low DO values can be attributed.

ADEC believes that Silver Bay should be delisted for DO at this time. Permits for future discharges into Silver Bay that might affect DO concentrations can include provisions for monitoring to ensure that such discharges do not cause further depression of near-bottom concentrations. Most foreseeable future discharges likely would occur near the surface, where DO concentrations are high, and would not affect the bottom waters.

It may be advisable to conduct further monitoring of DO in and around the area where low concentrations have been observed, to resolve the effects of depth, seasonality, cyclic events such as plankton blooms, and other factors (effects that cannot be determined based on the current dataset). If subsequent monitoring points to a continued depression of DO levels and an anthropogenic cause for that depression can be determined, ADEC will have the data necessary to relist the affected waters and develop an effective TMDL to address recovery.

6 Monitoring Plan

The ROD prescribed monitoring to determine the achievement of the RAO in the AOC. The monitoring program (FWENC 1999d) sets forth the monitoring procedures and the schedule, which commenced with the 2000 baseline monitoring (EVS 2001).

The baseline monitoring included collection of sediment samples for chemical and benthic analysis, collection of water samples for water quality parameter analysis, SPI, video surveys, and side-scan sonar. It also included some changes in methodology, with prior approval by ADEC. At the request of ADEC, EVS also surveyed Herring Cove and the eastern part of Sawmill Cove with side-scan sonar; completed a drop video assessment in Herring Cove; and measured conductivity, temperature, and DO at selected locations in Herring and Sawmill Coves.

As outlined in the monitoring program (FWENC 1999d), studies planned in the AOC for the next events are as follows:

- *Year 10 (2009)*: Benthic community analysis, sediment chemistry, and a study of bioaccumulation dioxin/furan concentrations in the tissues of mussels and flatfish (if requested by ADEC);
- *Year 20 (2019)*: Benthic community analysis, sediment chemistry, and bioaccumulation study if deemed warranted by the results of the Year 10 analyses;
- *Year 30 (2029)*: Benthic community analysis and sediment chemistry; and
- *Year 40 (2039)*: Benthic community analysis and sediment chemistry (photometric survey optional to provide visual confirmation of recovery and confirmation of effectiveness of past management decisions).

The program also provides that additional studies conducted as part of the 2000 baseline monitoring, such as epibenthic video surveys and SPI, could be included as optional methods during any monitoring event. It also provides for interim sampling if lack of recovery of the benthic community or deviations from the predicted recovery model require additional information.

This document recommends that the monitoring program outlined above be continued, including the sampling methodology changes incorporated in the baseline monitoring, but that it be expanded to include all of the impaired areas covered by these TMDLs. Because the wood waste area in the head of Sawmill Cove has received little study, an additional video survey and SPI sampling of this area might be helpful in refining future monitoring efforts.

In Herring Cove and the medium-density log area, baseline monitoring should include a preliminary video survey. If towed video cannot be used, the spatial frequency of drop video locations should be increased from that performed by EVS (2000b) to provide a more comprehensive depiction of the epibenthic community. The preliminary video survey can help define areas where sampling for benthic community analysis and sediment chemistry can be performed successfully. In addition, efforts should be made to develop a suitable reference site to assess recovery in the medium- and high-density log areas, where the course of biological succession is poorly understood.

As noted above, the ROD dictates monitoring every 10 years following the baseline in 1999. This TMDL recommends that future permitted dischargers of residues or toxic substances that may affect issues addressed by the TMDLs should conduct independent monitoring at more frequent intervals.

In addition, although no TMDL is developed for DO, future permitted dischargers of substances that might

affect DO similarly should work with the regulatory agencies to ensure that such discharges do not further depress near-bottom DO concentrations. Such efforts could include permitting controls, such as the establishment of circumscribed mixing zones, or monitoring efforts by the discharger. Additional monitoring of the area of low DO identified in the baseline environmental monitoring (EVS 2001) may be desirable for delineating the extent of that area, assessing seasonal and other natural effects, and potentially identifying the cause of the depressed DO levels.

The monitoring program recommended in this document is expected to be a cooperative effort between CBS, which has responsibility for carrying out the monitoring program directed by the ROD; future permitted dischargers within the impaired areas; and the regulatory agencies responsible for ensuring compliance with these TMDLs and with WQS.

7 TMDL Implementation

Establishing an implementation plan is beyond the scope of this TMDL. However, for the TMDL to be effective, certain actions should occur. It is essential to continue gathering information, which will allow refinement of the loading analysis, and to document when restoration of beneficial uses occurs, so that those uses can resume. The TMDL can be revised upon new data, which indicate a revision in the loading capacity or deviation from anticipated load reductions. These revisions may be up or down, resulting in less or more control actions needed than originally determined

Components of the recovery plan for Silver Bay will include these items:

- Description of area: rationale for attention, priority and time-critical components; identification of relevant historical activities, agreements, impacts, conservation efforts and purposes. This TMDL and the Record of Decision for Silver Bay (FWENC 1999d) will be used, with other agreements as relevant, in establishing the recovery plan issues.
- Stakeholder involvement: coordination of public participation, identification of stakeholders; timeline for meetings. Anticipated stakeholders include, at a minimum, the City and Borough of Sitka, Sitka Tribe, Alaska Departments of Fish and Game and Environmental Conservation, Federal EPA, seafood, fishing, and timber companies with interest in using Silver Bay resources, and the local public.
- Scoping & information gathering: Outlining the process used to address stakeholder issues; meetings & workshops held to identify and agree on issues and goals; identification of remaining information gaps.
- Setting priorities & targeting resources: identification of priority areas and activities for attention; identifying resources needed to address issues; identifying additional information requirements; develop action agreements; develop a schedule of activities and responsibilities.
- Implementation of actions: Coordinating with permitting activities; implementing specific actions for restoration determined in action agreements. This TMDL prohibits the future point source discharge of residues that could accumulate on the bottom, other than from natural sources. In order to maintain progress toward the water quality target, zero (0) residues will be allowed to accumulate in the impaired area and AOC. Future permits granted by ADEC and/or EPA will not permit loading that contributes to continued impairment.
- Measurement of Success: selecting indicators and tools to measure progress; establish and undertaking monitoring scheme; analyzing monitoring information. Much of this monitoring will occur as outlined in the Record of Decision for Silver Bay (FWENC 1999d). Additional monitoring will be necessary to further evaluate recovery of the Area of Concern in the Record of Decision and the remaining impaired area. Future anthropogenic nonpoint sources of pollution would be subject to BMPs to ensure adequate protection of the AOC and remaining impaired area.
- Updating TMDL: adjusting strategy, target levels, areas of impairment, as necessary. Establishing and implementing a monitoring plan to determine when restoration of beneficial uses occurs is critical so that those uses can resume as soon as practical.
- No Disturbance Zone: As part of the Record of Decision, a six acre area adjacent to the outfall has been designated as a notice disturbance zone. In this area, use of anchors is prohibited, use of vessels is restricted, and in-water construction is controlled. These restrictions have been instituted to minimize the resuspension of pulp residues and facilitate natural recovery.

8 Public Participation

EPA regulations [40 CFR §130.7(c)(1)(ii)] require public review consistent with the ADEC continuing planning process and public participation requirements. EPA TMDL guidance calls for a description of the public participation process, including a summary of significant comments and the responses to those comments (i.e. a responsiveness summary).

The process followed complies with the State's requirements for public participation. A public notice for the meeting on the draft Silver Bay TMDL was published in the following areas:

- Sitka Daily Sentinel on April 1;
- The Department of Environmental Conservation's website at http://www.state.ak.us/dec/dawq/nps/index.htm;
- The Official Website for The City & Borough of Sitka, Alaska; and
- The Bulletin Board for Sitka.com.

These public notices included the meeting time and place, a description of issues to be discussed, the availability of the draft TMDL starting on April 1, and the schedule for public comments. Additionally, major stakeholders also received individual mailings announcing the public meeting. This list is included in the *Appendix*. The public comment period ran from April 1 through April 30, 2003. Copies of the public notice and meeting summary are attached.

The Department of Environmental Conservation also published both the notice and the draft TMDL on their website http://www.state.ak.us/dec/dawq/tmdl/tmdl/silverbay/silverbay.htm

The final TMDL will also be available on this website.

Lastly, a factsheet summarizing the draft Silver Bay TMDL was available on ADEC's website at http://www.state.ak.us/dec/dawq/tmdl/tmdl/silverbay/silverbayfactsheet.htm.

The public meeting was held in Sitka on April 23 at Harrigan Centennial Hall, 330 Harbor Dr, Sitka, Alaska to present the draft TMDL and to receive and respond to comments. A copy of the public notice, meeting agenda, and meeting summary are included in Appendix A along with the major comments received and a response to those comments (i.e. the Responsiveness Summary). Public comments made at the meeting focused on the Implementation Plan tasks in the Strategy and TMDL. No additional written comments were received during the public review period.

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Appendix A

Responsiveness Summary

RESPONSE TO PUBLIC COMMENTS ON THE PUBLIC REVIEW DRAFT OF THE SILVER BAY TOTAL MAXIMUM DAILY LOAD (TMDL)

The following summarizes the comments and responses received on the public review draft of the Silver Bay Total Maximum Daily Load (TMDL) documents. A public meeting was held in Sitka on April 23 at Harrigan Centennial Hall to present the draft TMDL. A public notice was published in the Sitka Sentinel on April 1 and included the meeting time and place, a description of issues to be discussed, the availability of the draft TMDL starting on April 1, and the schedule for public comments. The public comment period ran from April 1 through April 30, 2003. Copies of the public notice and meeting summary are included in the following pages.

The Department of Environmental Conservation also published both the notice and the draft TMDL on their website http://www.state.ak.us/dec/dawq/tmdl/tmdl/silverbay/silverbay.htm

The final TMDL will also be available on this website.

Significant comments were received on the pre-public review draft from the Environmental Protection Agency. Those comments were addressed and incorporated into the public review draft. Consistent with requirements, only those comments received on the March 28 public review draft are summarized below. Two sets of written (emailed) comments were received during the public review period. Comments made at the public meeting were responded to at the public meeting. The comments and questions posed at the public meeting and in writing (via email) and responses to those comments are summarized below.

Comments submitted in writing (via email):

Comment: When docks are reconstructed or other shoreline disturbance occurs, it will be important to minimize sediment disturbance and monitor for gas release.

Response: A "No Disturbance Zone" (NDZ) was established by the Record of Decision (ROD) in 1999 in a 5 to 6 acres area around the main outfall. In this NDZ, new construction is prohibited and specifies that maintenance to the structures existing within this area at the time of the ROD must employ BMPs "to ensure minimal re-suspension of pulp residues and disturbance of biota." An additional element was added to the Implementation section (Section 7) which states this point.

DEC does not know what the potential is for methane gas buildup and release, but there is no evidence that this is occurring.

Comment: SCS does not agree with the removal of the southern 16% of the AOC to not be included in the revised impaired area. "A TMDL of zero should apply to the original AOC."

Response: The environmental baseline monitoring conducted by EVS showed that 16% of the AOC could be considered fully recovered. Reflecting this new, post-ROD information, this TMDL finds that this portion of the AOC should not be included in the area of Silver Bay delineated as impaired by residues, because it has achieved the water quality target described in Section 3.6 of the TMDL.

For purposes of measuring achievement of the RAO under the ROD, this area will continue to be included in the AOC as defined in that document.

Comment: We are concerned that the "biological breakdown" of the woody fiber causes low Dissolved Oxygen (DO) in the AOC, then the Herring Cove log pile is a ticking time bomb.

Response: Past low levels of DO in the AOC were associated with discharge of the mill effluent. The pulped wood material contained in the effluent was processed chemically; as a result, that material was predisposed to decompose quickly and therefore had an initially high BOD. Current DO measurements in the AOC meet water quality standards; this suggests that the present rates of biodegradation of the pulped material found there are not of concern for their impact to DO concentrations. There is no evidence to suggest that either the wood fiber or the sunken logs will drive DO levels to plummet in the future. The material appears to exist in a stable mass on the ocean bottom. DEC believes it is unlikely that acceleration of decomposition of the wood waste will occur in a manner that will significantly reduce DO in Silver Bay. In addition, the material in the AOC is significantly different than the logs in Herring Cove. Unlike the pulped material found in the AOC, intact logs likely will decompose gradually over time; therefore, the BOD load will be constant over time.

Implementation of the water quality-monitoring program for Sawmill and Herring Coves will measure DO levels in Silver Bay.

Comment: We are opposed to the proposition that Silver Bay should be delisted as an Impaired Water Body. It is too early in the analytical process to make this assumption. The fact that extremely low DO levels have been found in only a few areas does not mean that Silver Bay is healthy. It simply means more testing, and more monitoring, must be done to make sure ADEC errs on the side of safety.

Response: It is unclear whether the commenter believes that Silver Bay is being delisted entirely as an impaired water body, or whether the comment is directed solely at the delisting for DO as a parameter of concern. To clarify, the TMDL suggests delisting of Silver Bay for DO only. The impaired area as defined in the TMDL will remain listed as an impaired water body with respect to the other two criteria, residues and toxic substances.

With respect to delisting for DO, Silver Bay was originally listed in 1992 for DO due to pulp mill discharges. The effluent had a high BOD, which depressed DO levels in the upper water column of Silver Bay.

The studies conducted after the mill closure indicate that surface DO concentrations consistently meet WQS, and are comparable to pre-mill levels. DO levels throughout the water column also meet WQS, with the exception of the area of depressed DO near the bottom between Sawmill and Herring Coves found in 2000.

ADEC believes that the area of depressed DO found in the 2000 study is not readily attributable to decomposing wood wastes in Sawmill or Herring Coves, for the following reasons:

- *There is no correlation between the location of wood waste and low DO.*
- *The 1990 EPA study documented low DO in areas such as Thimbleberry Bay which do not have wood waste. Low DO appears to have a much stronger correlation with increasing depth;*
- *Water column oxygen profiles were structured very regularly horizontally and vertically across the waterbody between Sawmill and Herring Coves; and*
- *Oxygen levels in deeper estuarine waters often can be depressed because of a combination of natural phenomena, including poor mixing, inadequate photosynthesis, and removal of oxygen by the decomposition of phytoplankton and other marine organisms that have settled to the ocean floor (Gross 1993).*

The bulk of the data shows that Silver Bay is no longer water-quality limited for DO for the reasons for which it originally was listed, because there is no longer any BOD source affecting surface waters and because neither the organically-enriched sediments of the AOC nor the other types of wood waste appear to affect DO in the immediately overlying waters.

The presence of several sampling stations with low DO concentrations in the 2000 EVS study represents conditions in a limited area at one discrete point in time, and is not considered to be sufficient evidence to retain Silver Bay on the 303(d) list with respect to DO. Although the pre-mill study showed higher DO levels at nearby stations, the two studies differ by season, by methods, and by years sufficient to make their comparability uncertain. There is no current anthropogenic source to which low DO values can be attributed.

ADEC believes that Silver Bay should be delisted for DO at this time. Permits for future discharges into Silver Bay that might affect DO concentrations can include provisions for monitoring to ensure that such discharges do not cause further depression of near-bottom concentrations. The future foreseeable discharges to this area would be buoyant, therefore, not affecting the ocean bottom environment.

It may be advisable to conduct further monitoring of DO in and around the area where low concentrations have been observed, to resolve the effects of depth, seasonality, cyclic events such as plankton blooms, and other factors (effects that cannot be determined based on the current dataset). If subsequent monitoring points to a continued depression of DO levels and an anthropogenic cause for that depression can be determined, ADEC will have the data necessary to relist the affected waters and develop an effective TMDL to address recovery.

Implementation of the water quality-monitoring program for Sawmill and Herring Coves will continue to measure DO levels in Silver Bay.

Comment: We are particularly concerned about Herring Cove, and the tremendous number of sunken logs that rest there. Since, according to the ADEC representative at the Sitka Public hearing on April 23 of this year, it was impossible to test bottom sediments for toxics there, or even to reach the actual bottom (in many areas within Herring Cove) to test bottom DO levels, Herring Cove must be put on an even more far-reaching testing and monitoring schedule. The presenter stated that it could take as long as 200 years for the logs in Herring Cove to biodegrade, and thus lower DO to unacceptable levels. The testing/monitoring period for Herring Cove, the AOC, and other "log -impaired" areas must have longer and more stringent testing regimes.

Response: There is no evidence that pulp residue is present in Herring Cove. The video surveys and sediment sampling between Sawmill and Herring Coves do not suggest that pulp residues migrated beyond the AOC. Therefore, it has been assumed that the sediments in Herring Cove are natural, but are covered by untreated, raw logs and bark. The decomposition of the logs is taking place gradually over time, thus the BOD levels will reflect the gradual decomposition and are not expected to increase at any one time. The decomposition process is occurring currently and there are organisms that are occupying Herring Cove.

Herring Cove continues to be listed as impaired for residues, reflecting the logs and other wood wastes on the bottom. Earlier monitoring did not assess sediments in the cove for either toxic properties or biological condition. The video survey conducted in 2000 did reveal a variety of marine organisms, including tunicates, sea and brittle stars, shrimp and anemones living near or on the bottom. At present DEC has no basis for determining either toxicity or biological condition in the sediments of Herring Cove. The recovery plan may determine that additional monitoring would be desirable to allow assessment of sediment condition. Currently, funding for such monitoring is available and is the agencies intent to . As indicated, water quality monitoring will measure DO levels in Herring Cove at 10-year intervals.

Comments from the public meeting:

Comment: Was dioxin found in the water column in 1994?

Response: No, pulp mill discharge ceased in 1993. Therefore, dioxin was only detected in the bottom sediments.

Comment: You mentioned there was low DO due to high BOD from the effluent, but why isn't there a high BOD now with the waste on the bottom?

Response: The pulp mill effluent, high in BOD which drove down the DO, is no longer an issue. The existing pulp and wood residues on the bottom have a high BOD, but is not being converted and is stabilizing itself.

Comment: What are the possibilities for a catastrophic release of hydrogen sulfide?

Response: During the pulp mill discharge period and the years to follow after ceasing discharge, the residues were "burping" hydrogen sulfide. This periodic release of the gas, in theory, should decrease the risk of building up of gases for a catastrophic release. No studies were performed on the possibility of such a release. However, given the steady release of the gas coupled with the residue stabilizing itself over the past 10 years, the likelihood of such a large, one-time release is very small.

Comment: How do you know the low DO values found on the bottom now are not due to the pulp and wood residues?

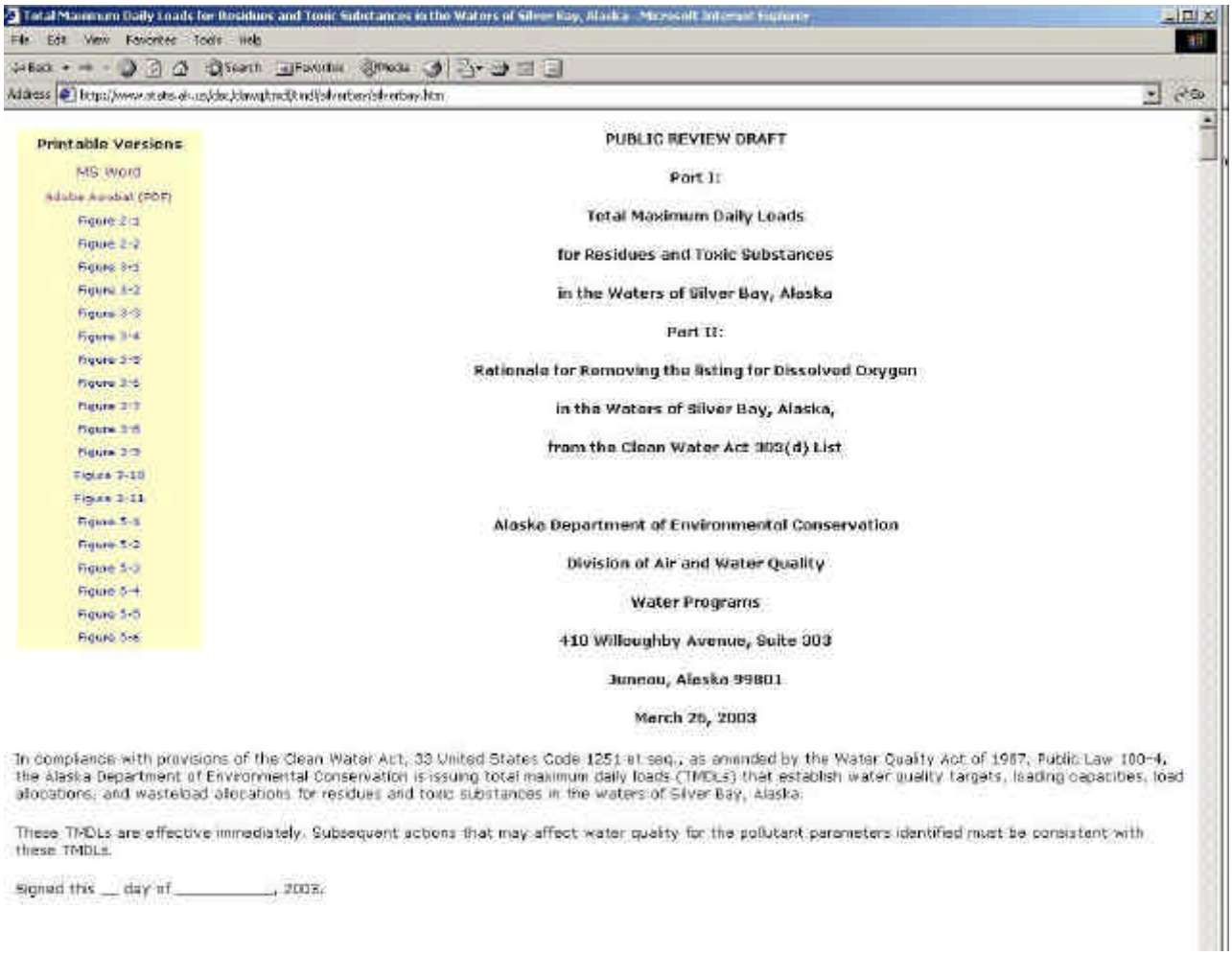
Response: First, there is no direct correlation between the location of the pulp and wood residues and the low DO area. Second, low DO is a documented phenomenon that occurs in deep marine environments. A waterbody is not placed on ADEC's 303(d) list unless it is shown that the impairment resulted from human caused actions. Silver Bay was originally listed for DO due to evidence that ongoing pulp mill discharges were causing low DO levels. As those discharge ceased in 1993 and there no evidence that clearly shows that pulp and wood residues cause DO levels at the bottom to be lower than natural, ADEC is de-listing Silver Bay for DO. This does not preclude listing Silver Bay in the future for DO if clear evidence is obtained that demonstrates human actions are causing low DO conditions to exist on the bottom.

Comment: The City & Borough will be responsible for what monitoring under the ROD?

Response: The CBS will be responsible for monitoring performed within the Area of Concern described in the ROD following the approved monitoring plan. This monitoring will occur every 10 years for 40 years, with the first session occurring in 2009. Additional monitoring, described in the TMDL, may be performed by ADEC over the entire impaired area which includes the AOC as well as the medium- and high-density log areas within both Sawmill and Herring Coves.

Appendix B

Public Participation Announcements



Printable Versions

MS Word

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Figure 2-1

Figure 2-2

Figure 3-1

Figure 3-2

Figure 3-3

Figure 3-4

Figure 3-5

Figure 3-6

Figure 3-7

Figure 3-8

Figure 3-9

Figure 3-10

Figure 3-11

Figure 5-1

Figure 5-2

Figure 5-3

Figure 5-4

Figure 5-5

Figure 5-6

PUBLIC REVIEW DRAFT

Part I:

Total Maximum Daily Loads

for Residues and Toxic Substances

in the Waters of Silver Bay, Alaska

Part II:

Rationale for Removing the Listing for Dissolved Oxygen

in the Waters of Silver Bay, Alaska,

from the Clean Water Act 303(d) List

Alaska Department of Environmental Conservation

Division of Air and Water Quality

Water Programs

410 Willoughby Avenue, Suite 303

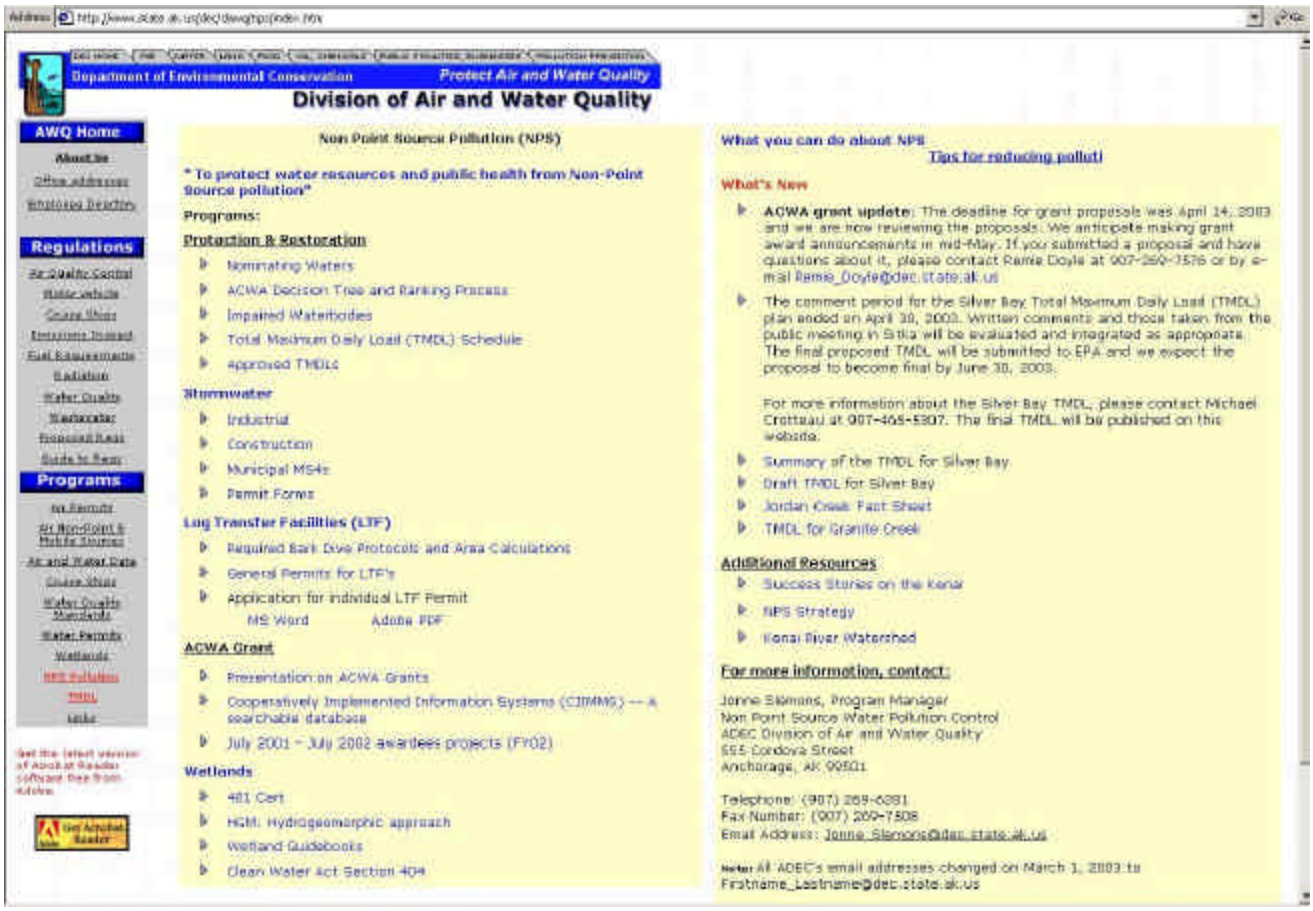
Juneau, Alaska 99801

March 26, 2003

In compliance with provisions of the Clean Water Act, 33 United States Code 1251 et seq., as amended by the Water Quality Act of 1987, Public Law 100-4, the Alaska Department of Environmental Conservation is issuing total maximum daily loads (TMDLs) that establish water quality targets, loading capacities, load allocations, and wasteload allocations for residues and toxic substances in the waters of Silver Bay, Alaska.

These TMDLs are effective immediately. Subsequent actions that may affect water quality for the pollutant parameters identified must be consistent with these TMDLs.

Signed this __ day of _____, 2003.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TMDL
Links
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* To protect water resources and public health from Non-Point Source pollution*
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Nominating Waters
ACWA Decision Tree and Ranking Process
Impaired Waterbodies
Total Maximum Daily Load (TMDL) Schedule
Approved TMDLs
Stormwater
Industrial
Construction
Municipal MS4s
Permit Forms
Log Transfer Facilities (LTF)
Required Bark Dive Protocols and Area Calculations
General Permits for LTF's
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Presentation on ACWA Grants
Cooperatively Implemented Information Systems (CIMMS) -- A searchable database
July 2001 - July 2002 awardees projects (FY02)
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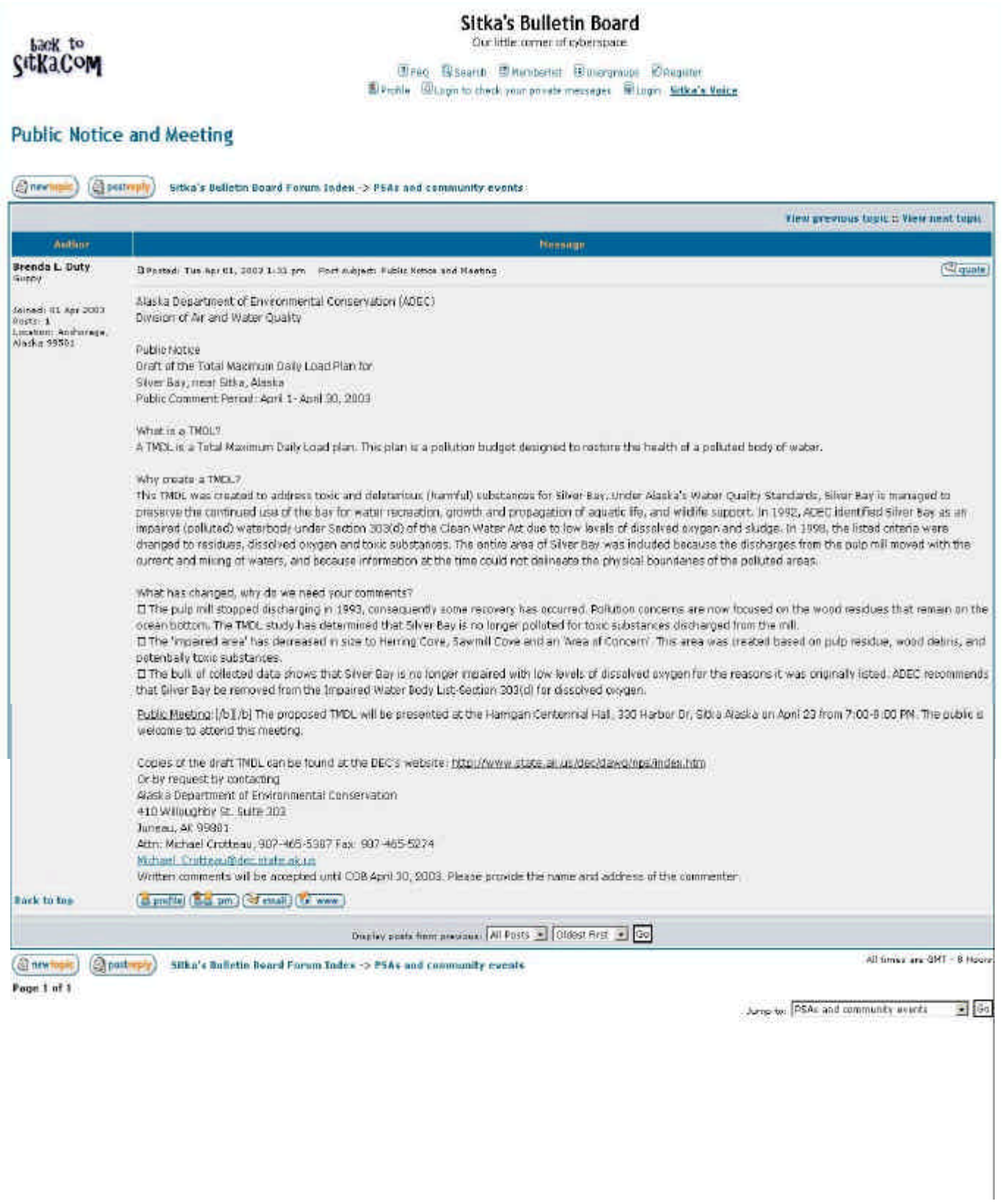
401 Cert
HGM: Hydrogeomorphic approach
Wetland Guidebooks
Clean Water Act Section 404
What you can do about NPS
Tips for reducing polluti
What's New
ACWA grant update: The deadline for grant proposals was April 14, 2003 and we are now reviewing the proposals. We anticipate making grant award announcements in mid-May. If you submitted a proposal and have questions about it, please contact Ramie Doyle at 907-269-7576 or by e-mail Ramie_Doyle@dec.state.ak.us
The comment period for the Silver Bay Total Maximum Daily Load (TMDL) plan ended on April 30, 2003. Written comments and those taken from the public meeting in Sitka will be evaluated and integrated as appropriate. The final proposed TMDL will be submitted to EPA and we expect the proposal to become final by June 30, 2003.
For more information about the Silver Bay TMDL, please contact Michael Crotteau at 907-465-5307. The final TMDL will be published on this website.
Summary of the TMDL for Silver Bay
Draft TMDL for Silver Bay
Jordan Creek Fact Sheet
TMDL for Granite Creek
Additional Resources
Success Stories on the Kenai
NPS Strategy
Kenai River Watershed
For more information, contact:
Jonne Siemons, Program Manager
Non Point Source Water Pollution Control
ADEC Division of Air and Water Quality
555 Cordova Street
Anchorage, AK 99501
Telephone: (907) 269-6281
Fax Number: (907) 269-7508
Email Address: Jonne_Siemons@dec.state.ak.us
Note: All ADEC's email addresses changed on March 1, 2003 to Firstname_Lastname@dec.state.ak.us



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Brenda L. Duty Guppy Joined: 01 Apr 2003 Posts: 1 Location: Anchorage, Alaska 99501	Posted: Tue Apr 01, 2003 1:31 pm Post subject: Public Notice and Meeting quote Alaska Department of Environmental Conservation (ADEC) Division of Air and Water Quality Public Notice Draft of the Total Maximum Daily Load Plan for Silver Bay, near Sitka, Alaska Public Comment Period: April 1 - April 30, 2003 What is a TMDL? A TMDL is a Total Maximum Daily Load plan. This plan is a pollution budget designed to restore the health of a polluted body of water. Why create a TMDL? This TMDL was created to address toxic and deleterious (harmful) substances for Silver Bay. Under Alaska's Water Quality Standards, Silver Bay is managed to preserve the continued use of the bay for water recreation, growth and propagation of aquatic life, and wildlife support. In 1992, ADEC identified Silver Bay as an impaired (polluted) waterbody under Section 303(d) of the Clean Water Act due to low levels of dissolved oxygen and sludge. In 1998, the listed criteria were changed to residues, dissolved oxygen and toxic substances. The entire area of Silver Bay was included because the discharges from the pulp mill moved with the current and mixing of waters, and because information at the time could not delineate the physical boundaries of the polluted areas. What has changed, why do we need your comments? □ The pulp mill stopped discharging in 1993, consequently some recovery has occurred. Pollution concerns are now focused on the wood residues that remain on the ocean bottom. The TMDL study has determined that Silver Bay is no longer polluted for toxic substances discharged from the mill. □ The 'impaired area' has decreased in size to Herring Cove, Sawmill Cove and an 'Area of Concern'. This area was created based on pulp residue, wood debris, and potentially toxic substances. □ The bulk of collected data shows that Silver Bay is no longer impaired with low levels of dissolved oxygen for the reasons it was originally listed. ADEC recommends that Silver Bay be removed from the Impaired Water Body List-Section 303(d) for dissolved oxygen. Public Meeting: [/b][/b] The proposed TMDL will be presented at the Harrigan Centennial Hall, 330 Harbor Dr, Sitka Alaska on April 23 from 7:00-8:00 PM. The public is welcome to attend this meeting. Copies of the draft TMDL can be found at the DEC's website: http://www.state.ak.us/dec/dawq/tps/tmdls.htm Or by request by contacting Alaska Department of Environmental Conservation 410 Willoughby St. Suite 303 Juneau, AK 99801 Attn: Michael Crotteau, 907-465-5387 Fax: 907-465-5274 Michael_Crotteau@dec.state.ak.us Written comments will be accepted until COB April 30, 2003. Please provide the name and address of the commenter.
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Welcome to a Pictorial Tour of the Herring Season by Stan Eliason. Herring Tour

Alaska DEC Silver Bay Public Notice
The Alaska Department of Environmental Conservation has proposed a Total Maximum Daily Load (TMDL) for Silver Bay. This TMDL was created to address toxic and deleterious (harmful) substances and residues from logging and pulp mill discharge for Silver Bay. Public Notice
Silver Bay Fact Sheet

Sitka Community Hospital Public Process
The City and Borough of Sitka Assembly is convening a public process to hear from Sitka residents regarding the role the Sitka Community Hospital in the future of Sitka's health care system. A public Working Group that represents the diversity of Sitka's health care interests and needs will be meeting four times in April and May to consider the future of the Hospital and to make recommendations to the Assembly. Public involvement in the process is encouraged! The meeting calendar, meeting agendas and summaries, project updates and background information will be posted on-line during the public process. Report in pdf.
Here is the Agenda for April 3, 2003.

Solid Waste and Recycling Report
This report, presented to the Assembly at the Dec. 10 meeting, is the result of formal interviews with about two dozen Sitkans and informal questioning of many more. The report contains recommendations for ways Sitka can address its solid waste issues through the "New 3R's" – Reduce, Reuse and Recycle. Report in PDF

Sitka Community Indicators 2002
The 2002 Sitka Community Indicators report is a sequel to the first Sitka Indicators report published in 1999. The 2002 report includes 40 quality of life indicators in the following categories: Demographics, Economy, Housing, Environment, Recreation, Education, Health, Crime, and Public Safety.
Report in .pdf

Waste Management Strategies Report, Community Collaboration Report
A Consensus Through Community Collaboration Report, August 2001. For the full document and attachments, go to Kettleson Library or City Public Works Offices. Report in .pdf

Alaska Department of Environmental Conservation
Division of Air and Water Quality

Public Notice
Draft of the Total Maximum Daily Load Plan for
Silver Bay, near Sitka, Alaska
Public Comment Period: April 1- April 30, 2003

What is a TMDL?
A TMDL is a Total Maximum Daily Load plan. This plan is a pollution budget designed to restore the health of a polluted body of water.

Why create a TMDL?
This TMDL was created to address toxic and deleterious (harmful) substances for Silver Bay. Under Alaska's Water Quality Standards, Silver Bay is managed to preserve the continued use of the bay for water recreation, growth and propagation of aquatic life, and wildlife support. In 1992, ADEC identified Silver Bay as an impaired (polluted) waterbody under Section 303(d) of the Clean Water Act due to low levels of dissolved oxygen and sludge. In 1998, the listed criteria were changed to residues, dissolved oxygen and toxic substances. The entire area of Silver Bay was included because the discharges from the pulp mill moved with the current and mixing of waters, and because information at the time could not delineate the physical boundaries of the polluted areas.

What has changed, why do we need your comments?
- The pulp mill stopped discharging in 1993, consequently some recovery has occurred. Pollution concerns are now focused on the wood residues that remain on the ocean bottom. The TMDL study has determined that Silver Bay is no longer polluted for toxic substances discharged from the mill.
- The 'impaired area' has decreased in size to Herring Cove, Sawmill Cove and an 'Area of Concern'. This area was created based on pulp residue, wood debris, and potentially toxic substances.
- The bulk of collected data shows that Silver Bay is no longer impaired with low levels of dissolved oxygen for the reasons it was originally listed. ADEC recommends that Silver Bay be removed from the Impaired Water Body List-Section 303(d) for dissolved oxygen.

Public Meeting: The proposed TMDL will be presented at the Harrigan Centennial Hall, 330 Harbor Dr, Sitka Alaska on April 23 from 7:00-9:00 PM. The public is welcome to attend this meeting.

Copies of the draft TMDL can be found at the DEC's website: http://www.state.ak.us/dec/dawq/nps/index.htm
Or by request by contacting
Alaska Department of Environmental Conservation
410 Willoughby St. Suite 303
Juneau, AK 99801
Attn: Michael Crotteau, 907-465-5307 Fax: 907-465-5274
Michael_Crotteau@dec.state.ak.us
Written comments will be accepted until COB April 30, 2003. Please provide the name and address of the commenter.

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ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF AIR AND WATER QUALITY
PUBLIC NOTICE

Draft to the Total Maximum Daily Load Plan for Silver Bay, near Sitka, Alaska

Public Comment Period: April 1-April 30, 2003

What is a TMDL?

A TMDL is a Total Maximum Daily Load plan. This plan is a pollution budget designed to restore the health of a polluted body of water.

Why create a TMDL?

What has changed, why do we need your comments?

Public Meeting:

SUMMARY OF PROPOSED
TOTAL MAXIMUM DAILY LOAD (TMDL)
SILVER BAY, Alaska
Located near Sitka, Alaska

Background Information:

The Alaska Department of Environmental Conservation has proposed a Total Maximum Daily Load (TMDL) for Silver Bay, located near Sitka, Alaska. This TMDL was created to address toxic and deleterious (harmful) substances and residues from logging and pulp mill discharge for Silver Bay. Under Alaska's Water Quality Standards, Silver Bay is protected for water recreation, aquatic health and wildlife uses. In 1992, ADEC identified Silver Bay as an impaired waterbody under Section 303(d) of the Clean Water Act for low dissolved oxygen and sludge. In 1998, the listing terms were modified to residues (wood pulp and bark), low dissolved oxygen and toxic substances (dioxin). The entire area of Silver Bay was included because the discharge from the pulp mill moved with the tidal currents and because information at the time of listing could not accurately delineate a specific area.

Since, 1998 some changes have occured in the waterbody. Consequently, a study was necessary to assess the waterbody's current condition. With this information DEC can propose how much if any, pollution this waterbody can sustain and still meet Alaska Water Quality Standard (WQS) goals. This will effect how this waterbody can be used in the future.

What Is a TMDL?

A TMDL is a 'pollution budget' designed to restore the health of a waterbody. A TMDL calculates the amount of a specific pollutant that a waterbody can receive and still maintain water quality standards.

What has changed, What actions are proposed?

-The pulp mill stopped discharging in 1993, so some recovery has occurred. Pollution concerns now concentrate on the wood and pulp residues on the ocean bottom. The TMDL study has determined that Silver Bay is no longer impaired for dioxin and other toxic substances formerly discharged from the mill. Instead it finds that sediments may be toxic to ocean bottom-dwelling organisms from the decomposition of pulp residues.

-The 'impaired area' has decreased to Herring Cove, Sawmill Cove and an 'Area of Concern'. This area was created based on pulp residue, wood debris, and *potentially* toxic substances.

-The bulk of collected data shows that Silver Bay is no longer water-quality limited for dissolved oxygen for the reasons it was originally listed, however there are some natural effects that create low DO readings. These effects are beyond human control. DEC recommends that Silver Bay be recategorized on the Impaired Water Body List-Section 303(d) for dissolved oxygen.

-DEC recommends that the loading capacity of the above named pollutants be set at zero to maintain the rate of recovery.

The future of Silver Bay:

Continued monitoring in the 'Area of Concern' will include sampling of sediment, water quality parameter analysis, video surveys and side-scan sonar starting in 2009 and continuing every ten years until 2039. As allowed under Alaska law, the wasteload allocation can be changed in the future via a revision of this TMDL, which would then allow one or more permitted zones of deposit.

For more information refer to the complete draft TMDL. Copies of the draft TMDL can be found at DEC's website:
http://www.state.ak.us/dec/dawq/nps/index.htm
Or request a copy at:
Alaska Department of Environmental Conservation
410 Willoughby St. Suite 303
Juneau, AK 99801
Attn: Michael Crotteau, 907-465-5307
Fax: 907-465-5274
Michael_Crotteau@dec.state.ak.us
Written comments will be accepted until COB April 30, 2003. Please provide the name and address of the commenter.

Silver Bay TMDL Stakeholders Receiving Mailout of Public Notice

Michael Stringer
Sitka Tribe of Alaska
456 Katlian Street
Sitka, Alaska 99835
Phone (907)747-3207
Fax (907)747-4915
Email: michael@sitkatribe.org

Mark Buggins, Environmental Superintendent
City and Borough of Sitka
100 Lincoln Street
Sitka, Alaska 99835
phone: (907) 966-2256 fax: (907) 966-2257
Email: markb@cityofsitka.com

Carl Schrader
Alaska Department of Fish & Game
PO Box 20020
Douglas, AK 99824-0020
(907) 465-4287
Email: carl_schrader@fishgame.state.ak.us

Bill Janes
Alaska Department of Environmental Conservation
Division of Spill Prevention & Response
410 Willoughby Ave., Suite 303
Juneau, Alaska 99801-1795
Phone: (907) 465-5307
Email: bill_janes@dec.state.ak.us

Martha Turvey
Watershed Restoration Unit
U.S. Environmental Protection Agency, Region 10 (OW-134)
1200 Sixth Ave.
Seattle, WA 98101
(206) 553-1354, fax: (206) 553-0165
Email: turvey.martha@epa.gov

Page Else
Sitka Conservation Society
Box 6533 Sitka, Alaska 99835
phone: 907-747-7509 fax: (907)747-6105
Email: gis-scs@ak.net