RECORD OF DECISION
Alaska Pulp Corporation Mill Site
Sitka, Alaska

ALASKA DEPARTMENT
OF
ENVIRONMENTAL CONSERVATION

Division of Spill Prevention and Response
Contaminated Sites Remediation Program
April 1999

ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION
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Contaminated Sites Remediation Program

Record of Decision Declaration

Site Name and Location

Alaska Pulp Corporation Mill
Sitka, Alaska
Mill Operable Unit
Bay Operable Unit

Statement of Basis

This Record of Decision (ROD) is based on information contained in the Administrative Record, including but not limited to the following documents produced by Foster Wheeler Environmental Corporation, the primary Remedial Investigation/Feasibility Study contractor.

- Final Current Situation/Conceptual Site Model Report (July 1996)
- Final Drain System and Excavation Report (March 1998)
- Final Mill OU Remedial Investigation Report (April 1998)
- Final Mill OU Ecological Risk Assessment (June 1998)
- Final Bay OU Ecological Risk Assessment (June 1998)
- Final Bay OU Remedial Investigation Report (July 1998)
- Final Bay OU Feasibility Study Report (February 1999)
- Final Human Health Risk Assessment Report (February 1999)

This ROD presents the selected remedial actions for the Mill Operable Unit (OU) and the Bay OU associated with the Alaska Pulp Corporation Mill Site in Sitka, Alaska. This ROD has been developed in accordance with Alaska Oil and Hazardous Substances Pollution Control Statutes (AS 46.03 and AS 46.09) and Regulations (18 AAC 75), Solid Waste Regulations (18 AAC 60), and Alaska Water Quality Standards (18 AAC 70). To the extent practicable, it is also not inconsistent with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 USC 9601 and Executive Order 12580 (52 Federal Register 2923), and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 Code of Federal Regulations (CFR) Part 300.

Assessment of the Site

Risks to human health were evaluated considering exposure to individuals from both the Bay and Mill OUs. DEC has determined that risks to human health are within acceptable risk ranges and no further remedial action is necessary. Risks to human health were evaluated based on an industrial/commercial land use. Therefore, a deed restriction has been placed on all Mill and Bay OU properties limiting future use to industrial/commercial activities until such time as it is demonstrated to DEC's satisfaction that other uses will not present an unacceptable risk.

DEC has determined that a portion of the Bay OU study area in western Sawmill Cove (the "Area of Concern") presents risks and impacts that, if not addressed by implementing the remedial actions selected in this ROD, could compromise Sawmill Cove's ability to support fish and wildlife dependent on bottom-dwelling invertebrates as a food source.

Contaminants of Concern that are suspected of contributing to risks and impacts to the benthic community in Sawmill Cove include, dioxin, cadmium, nickel, ammonia, 4-methylphenol, and other wood waste degradation compounds in various combinations and concentrations.

Description of the Selected Remedies

Mill OU –
Petroleum contaminated soils from various subareas at the Developed Mill Site were excavated and placed in on-site bioremediation treatment cells. Petroleum contaminated soils from the Developed Mill Site storm drains and sumps were also placed in the treatment cells. These cells will function until approved cleanup levels are achieved.

Sediments and ash containing dioxins were bagged for disposal at a permitted solid waste disposal facility. The material is not classified as "hazardous waste" using Resource Conservation and Recovery Act criteria.

No Further Action is required at any of the other land-based study areas.

Bay OU -

The selected remedy was chosen from many alternatives as the best method for attaining the Remedial Action Objective: reduce the ecologically significant adverse effects to populations of bottom-dwelling life in Sawmill Cove from hazardous substances, including wood waste degradation chemicals, to acceptable levels.

The selected remedy, Natural Recovery with Long-Term Monitoring and Institutional Controls, includes the following:

- The Sawmill Cove Area of Concern will be monitored periodically to evaluate and document natural recovery.
- The property is restricted to industrial/commercial use.
- There are limits on activities in the most heavily impacted areas to ensure that recovery proceeds with minimal further disturbances.

Because contaminants will be remaining on-site in the Bay OU an administrative review will be conducted within five years after commencement of remedial action.

Declaration and Statutory Determinations

In the best professional judgment of DEC, which is acting as statutorily authorized trustee over these resources, the selected remedies protect human health, welfare and the environment. Therefore, they achieve the goals and purposes of applicable statutes and regulations implemented by DEC.

____ ________________

Lynn J. Tomich Kent Date
Contaminated Sites Program Manager
Alaska Department of Environmental Conservation

____ ________________

James F. Clark, Robertson, Monagle, & Estaugh Date
For Alaska Pulp Corporation

APC RECORD OF DECISION
CONTENTS

Acronyms

AOC	Area of Concern
APC	Alaska Pulp Corporation
ATSDR	Agency for Toxic Substances Disease Registry
AWPCB	Alaska Water Pollution Control Board
CA	Commitment Agreement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COPC	Contaminant of Potential Concern
COC	Contaminant of Concern
CVAA	Cold Vapor Atomic Absorption
DEC	Department of Environmental Conservation
DO	Dissolved Oxygen
DMS	Developed Mill Site
DRO	Diesel Range Organics
DQO	Data Quality Objective
EPA	Environmental Protection Agency
ERAs	Expedited Remedial Actions
FDA	Food and Drug Administration
FSP	Field Sampling Plan
HI	Hazard Index
MCUL	Minimum Cleanup Level
MG/KG	Milligrams Per Kilogram (parts per million)
MDL	Method Detection Limit
NDZ	No Disturbance Zone
NG/KG	Nanograms Per Kilogram (parts per trillion)
OU	Operable Unit
PAHs	Polycyclic Aromatic Hydrocarbon
PCBs	Polychlorinated Biphenyls
PQL	Practical Quantitation Limit
RD/RA	Remedial Design/Remedial Action
RI/FS	Remedial Investigation/Feasibility Study
RL	Reporting Limit
RAO	Remedial Action Objective
ROD	Record of Decision
RRO	Residual Range Organic
SVOCs	Semi Volatile Organic Compounds
TMDL	Total Maximum Daily Load
UG/KG	Micrograms Per Kilogram (parts per billion)
VOCs	Volatile Organic Compounds

RECORD OF DECISION
Mill and Bay Operable Units
Alaska Pulp Corporation Mill Site
Sitka, Alaska

1.0 INTRODUCTION

This Record of Decision (ROD) documents the Alaska Department of Environmental Conservation's (DEC) decision regarding selected actions and supporting rationale for the Mill and Bay Operable Units (OUs) at the Alaska Pulp Corporation (APC) Mill Site in Sitka, Alaska. As defined by a Commitment Agreement between the State of Alaska and APC, the site was divided into the Mill OU and the Bay OU. The Mill OU study area consisted of the Developed Mill Site (DMS) and the other land-based units. The DMS extends from the mill wastewater treatment plant and mill filter plant to the north, and the main mill area south to Sawmill Cove. Figure 1-1 illustrates the DMS.

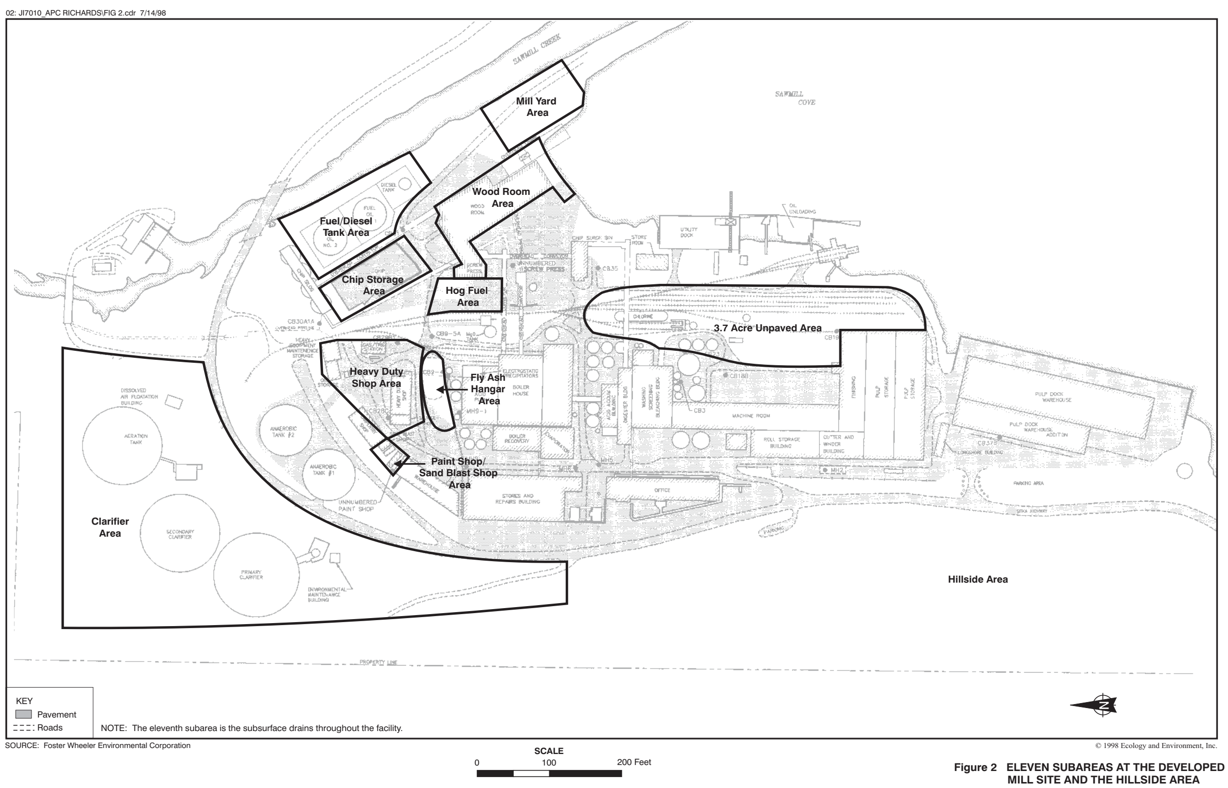

Figure 1-1

The other land-based study areas included:

Hillside Area	Blue Lake
Herring Cove Wood Waste Landfill	Bucko Point Surface Disposal Site
Industrial Mill Waste Landfill	Sitka Municipal Landfill
Fill Material at the Mormon Church	

The Bay OU study area extended from Sawmill Cove south to Bear Cove in Silver Bay, east to Herring Cove, and west through Eastern Channel to Galankin Island. The other land based study areas and the Bay OU are illustrated in Figure 1-2.

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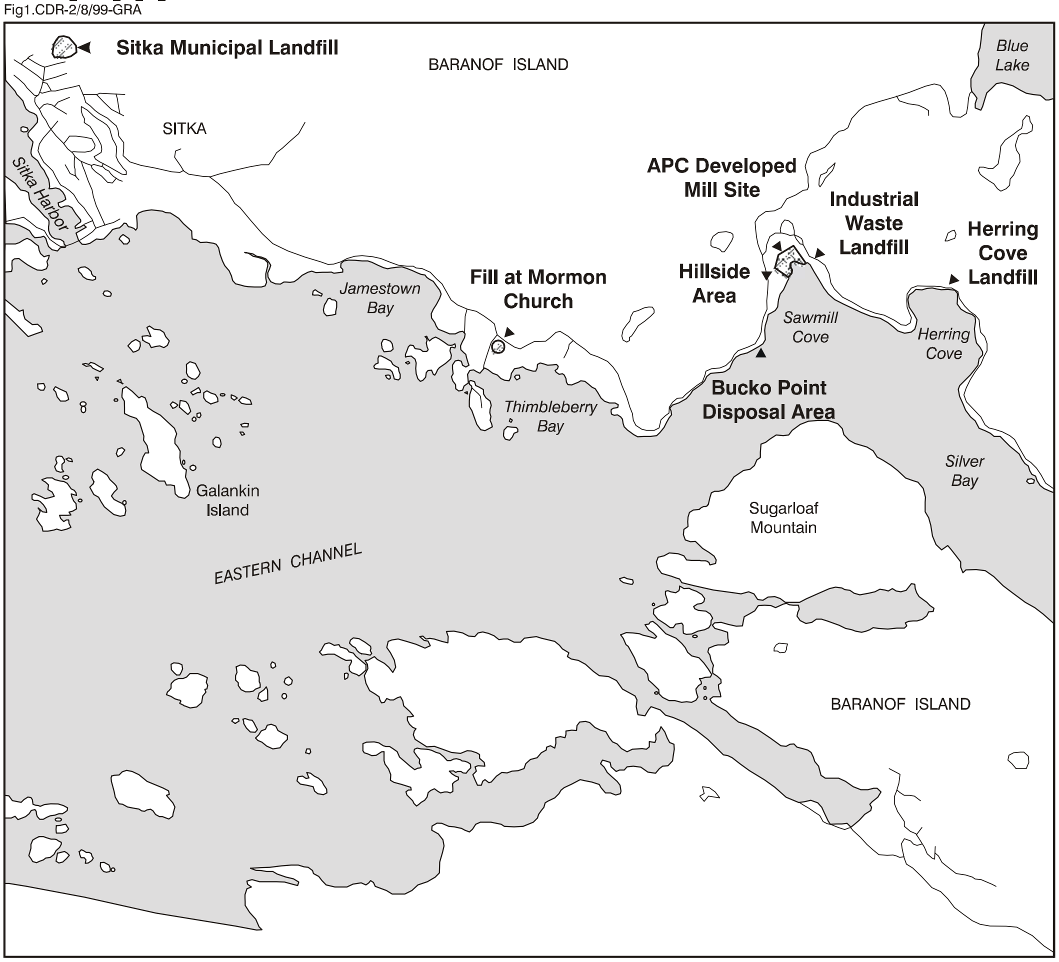


SOURCE: Ecology and Environment, Inc. 1998

Figure 1-2 DEVELOPED MILL SITE

This ROD was developed in accordance with State of Alaska statutes and regulations governing the rotection of human health and the environment from hazardous substances (AS 46.03, AS 46.09, and 18 Alaska Administrative Code, Chapter 75, Article 3). The decisions in this ROD are based on the

Administrative Record for the APC cleanup project, which is located in the offices of the Alaska Department of Environmental Conservation (DEC) in Juneau, Alaska. This ROD serves as the basis for Remedial Design and Remedial Action (RD/RA). RD/RA will be implemented by the City and Borough of Sitka under a Memorandum of Understanding with DEC entitled *Management Plan for the Sawmill Cove Property*, which will be adopted by DEC as an appendix to this ROD upon signature.

This ROD is not inconsistent with procedures set forth by the federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (42 U.S.C. 9601 et seq.), and as modified by Attachment 2 to the Commitment Agreement[1]. EPA has recognized the site as a state-lead site, conducted milestone reviews, and stated its acceptance of the State's approach to the site, as documented in a March 15, 1999 letter to DEC.

Selection of the remedy and any institutional and site controls may affect future redevelopment, and, likewise, future redevelopment may affect the integrity of the remedy. Consequently, DEC has taken this into consideration in developing a remedy where protection of human health and the environment and future site use will be compatible with each other.

2.0 SITE INFORMATION AND BACKGROUND

A description of the site background is provided in the *APC Current Situation/Site Conceptual Model Report* (Foster Wheeler 1996).

2.1 Background

The mill is located on the north and west shores of Sawmill Cove, approximately 5 miles east of Sitka, in southeast Alaska. Ownership of the site has changed since APC began operation in 1959. When APC originally received title to the land, the United States Government held the right to take some of the land back if the company stopped producing wood products on the site. This was known as a "reversionary interest." However, APC gained full ownership of the site in 1998 with the passage of the Hood Bay Land Exchange Act. Recently, the City and Borough of Sitka has entered into a property transfer agreement with APC to take ownership of the site and the adjacent tidelands and submerged lands owned by APC.

The mill used a magnesium acid sulfite process to produce high-grade wood fiber pulp. Wood chips were digested in stream-heated tanks using magnesium acid sulfite. Spent cooking “liquor” was drained and concentrated in multi-effect evaporators, and burned in recovery boilers. Chemicals used at the facility included sulfur, magnesium oxide, sodium hydroxide, and chlorine gas.

Waste streams generated in the process included wood waste, boiler bottom ash, fly ash, wastewater, and wastewater treatment sludge. Wood waste or hog fuel was burned in the facility's power boilers, and was also disposed in the Herring Cove Wood Waste Landfill. Over the lifetime of the mill, ash was disposed in several ways, including discharge through the mill stacks, on-site burial, and off-site burial at the

[1] Attachment 2 described the process to be followed by APC. It is entitled “The Superfund Remediation Process with Modifications Applicable to the APC Deferral Project.”

Industrial Mill Waste Landfill and the Sitka Municipal landfill. For three months in 1990, ash was slurried with mill wastewater for discharge into Silver Bay. Wastewater was discharged via the facility's two, permitted wastewater outfalls. One of the permitted outfalls discharged process wastewater and 90% of the mill's stormwater into Sawmill Cove (outfall 001). The other permitted outfall discharged filter backwash water from the APC filter plant to Sawmill Creek. Other outfalls were used to discharge stormwater runoff**.** Process effluent contained pulp process waste and, potentially, any chemicals used in or resulting from the manufacturing process. Stormwater discharges may have contained any chemical used at the site that spilled or leaked onto the ground. Other sources of contamination included spills and incidental releases of chemicals, including petroleum products, PCBs, and solvents.

In 1990, EPA assessed potential exposure via water, sediment, soils, and marine biota to various chemicals related to mill discharges in Silver Bay. EPA returned in 1994 and 1995 to conduct additional Superfund screening assessments for potential contamination at both the mill and in the adjacent marine environment. These investigations revealed that metals, semivolatile organic compounds (SVOCs), volatile organic compounds (VOCs), and petroleum compounds were present in the soils around the Paint Shop and Heavy Duty Shop. The most likely sources of this contamination were paints, solvents, and petroleum products used in these areas. Sediments in sumps contained detectable levels of dioxins, metals, petroleum compounds, PCBs, VOCs, and SVOCs.

DEC assumed oversight of a more comprehensive investigation of the facility from EPA in the fall of 1995. The Commitment Agreement (CA) signed by APC required APC to investigate and remediate "constituents of concern" determined to be a threat to human health and the environment to levels and standards established by DEC based upon a variety of criteria. The CA also defined the general boundaries of the Mill and Bay OU study areas, and established an advisory Site Investigation and Remediation Team (SIRT). The team consisted of representatives from DEC, APC, National Oceanographic and Atmospheric Administration, U.S. Fish and Wildlife Service, the City and Borough of Sitka, EPA, and the Sitka Tribe of Alaska. EPA relinquished its role on the SIRT in 1997.

The goal DEC stated early in the project was a thorough and timely investigation and cleanup protective of human health and the environment so that the property could be returned to economic reuse. In the event that any hazardous substances had come to be located on the property through non-permitted releases, an appropriate action would be required. Through the CA, APC contracted Foster Wheeler Environmental Corporation to conduct a Remedial Investigation/Feasibility Study (RI/FS) of the Mill and Bay OUs on behalf of the State.

2.2 Physical Setting

The mill site is bordered by Sawmill Creek to the northeast and Sawmill Cove to the south. The Tongass National Forest borders all other sides of the Mill OU. Steep slopes border the facility to the west, north, and east. Slopes reach 300 to 600 feet to the west and east. To the north, slopes reach 2,500 feet. Sawmill Creek borders the northeastern portion of the mill site and drains into Sawmill Cove.

The mill was constructed on fill material from the surrounding hillsides. The fill material consisted of bedrock broken into pieces and minor amounts of glacial drift and volcanic ash. Finer materials were used on the surface to facilitate grading. The majority of the surface was asphalt or concrete, except for the 5.8-acre open area between the plant buildings and Sawmill Cove. The surface elevation of the mill is approximately 15 to 19 feet above mean sea level. The mean high tide level at Sawmill Cove is 9.1 feet above mean sea level; high tide therefore reaches within 6 feet of the ground surface.

Sitka is dominated by maritime climatic influences with frequent and heavy precipitation. APC had an on-site meteorological tower to measure wind speed and direction, and temperature. Winter winds are mostly from the north and shift to southerly winds in the summer. Monthly average wind speeds range from approximately 3 to 6 mph.

Silver Bay is a classic fjord that empties into Sitka Sound via Eastern Channel on the western coast of Baranof Island. The Bay is approximately 6.8 miles long and varies in width from 0.4 to 0.9 miles. It is approximately 400 feet deep at the mouth, decreasing to about 150 feet near the head of the bay. The surface area of the bay is approximately 4.2 square miles, with roughly 30 miles of shoreline (EPA, 1975). The shoreline of the bay is narrow, steep, and rocky with slopes typically exceeding 50 degrees. The nearshore environment of Silver Bay consists of bedrock covered with sediments. Much of the intertidal area is very steep and rocky, which is typical of a fjord environment. In a few coves the slope is less steep, allowing for the deposition of finer-grained materials. Sands and silts have also accumulated.

Freshwater from Sawmill Creek enters Sawmill Cove and mixes with the underlying marine water to form a shallow, warmer, and brackish surface layer. The difference in density of the surface water inside and outside of Silver Bay is greatest when freshwater runoff is greatest. The greater the density gradient, the greater the circulation. As surface water moves out of Silver Bay, it is replaced with low-velocity subsurface flows that move into Silver Bay and upward to replace the surface waters near the coast.

2.3 Mill Operable Unit

The Mill OU study area consisted of the Developed Mill Site (DMS) and the other land-based study areas. *The Current Situation/Site Conceptual Model Report* (Foster Wheeler Environmental Corp. 1996) contains a description of the subareas of the DMS and other land-based study areas suspected of contamination.

2.3.1 Site Locations and Description

The DMS extends from the wastewater treatment plant and water filter plant to the north, and the main mill area south to Sawmill Cove (see Figure 1-1). The DMS was further subdivided into 11 subareas that represent different potential sources or locations of contamination. The following is a list of subareas in the DMS:

Area A - 3.7-acre Unpaved Area
Area B - Chip Storage Area
Area C - Fly Ash Hanger Area
Area D - Heavy Duty Shop Area
Area E - Paint Shop Area
Area F - Mill Yard Area
Area G –Sumps and Drains
Area H - Fuel Storage Tank Area
Area J - Wood Room Area
Area K - Hog Fuel Storage Area
Area L - Clarifier Area

The other land-based study areas, developed in conjunction with the SIRT and the public, included:

Hillside Area	Blue Lake
Herring Cove Wood Waste Landfill	Bucko Point Surface Disposal Area
Industrial Mill Waste Landfill	Sitka Municipal Landfill
Fill Material at the Mormon Church	

The Hillside Area is a portion of the Tongass National Forest directly west of the mill across Sawmill Creek Road. This area rises steeply from the mill to an elevation of approximately 180 feet and is heavily forested with exposed rocky areas. The source of potential contamination in this area was ash from the mill's power boilers that was dispersed by shifting winds.

Blue Lake is approximately 1.25 miles northeast of the mill. Blue Lake drains to Sawmill Creek, and is the source of water for the City of Sitka water treatment plant, the City of Sitka hydroelectric plant, and the APC water filter plant. The source of potential contamination in this area was ash from the mill's power boilers that was dispersed by shifting winds.

The Herring Cove Wood Waste Landfill is located adjacent to Herring Cove, approximately one mile east of the mill, and covers an approximate area of 450 feet by 480 feet. The landfill operated under a DEC permit and received wood debris from mill operations, including dredge spoils from the head of Sawmill Cove. The landfill closed officially in January 1993 and was later capped with a 2-foot compacted soil cover and re-vegetated. It currently has a thick grass cover.

Bucko Point is located along the northwestern shore of Silver Bay, approximately 1,640 feet south of the southern border of the mill. The Surface Disposal Site at Bucko Point is located on a small, flat area where the steep rock slopes to the west have been cut back for Sawmill Creek Road. The site is thought to be one of the first waste disposal sites and used for mill construction debris; however, no records and little information is available about the types and quantities of wastes disposed.

The Industrial Mill Waste Landfill is located immediately east of the Sawmill Creek intertidal area. The landfill is unlined, and is approximately 750 feet long and 250 feet wide. It is composed of an uphill segment which contains primarily boiler ash, and two downhill segments. Wastes were taken to the site prior to DEC permitting requirements. Asbestos was placed in the southeastern section of the landfill since 1987.

The Sitka Municipal Landfill is located approximately 0.8 miles north of the center of Sitka. The landfill covers 13 acres and is comprised of three areas: a 9-acre unlined fill area currently covered by two softball fields; a 2-acre metal and automobile crushing operation; and a 2-acre lined fill area currently in use. The lined portion of the landfill has a leachate collection system. APC used a portion of the lined area for ash disposal in the 1980s.

The Mormon Church is located approximately 3 miles southwest of the mill. Wood waste and debris dredged from Sawmill Cove near the wood room were used as fill material at the church between 1982 and 1987. The Mormon Church received a permit from DEC for this activity.

2.4 Bay Operable Unit

The Bay OU study area extended from Sawmill Cove south to Bear Cove in Silver Bay, east to Herring Cove, and west through Eastern Channel to Galankin Island. Sawmill Cove, located adjacent to the mill site, is the historical receiving water for effluent and stormwater discharges from the mill. Potential contamination to the Bay OU included:

- process wastewater and stormwater run-off discharged into Sawmill Cove from two outfalls located near the dock areas, and into Sawmill Creek from two outfalls located at the APC filter plant;
- runoff that may have leached through the fill material to the nearshore environment;
- spills and leaching of chemicals associated with the log storage and handling operations at the dock;
- waste associated with log rafting operations;
- degradation substances continuously being generated by pulp residue deposits in Sawmill Cove;
- fuel and other spills related to ship traffic at the dock; and
- mill power boiler flyash dispersed throughout the area by shifting winds.

Process wastewater, wood materials, and stormwater discharged from the outfalls potentially contained any chemicals used in or resulting from the pulping process. Spills at the dock may have included solvents or petroleum products. Ash from the power boilers contained metals and dioxins/furans.

3.0 REMEDIAL INVESTIGATION SUMMARY

3.1 Mill Operable Unit

The *Mill Operable Unit Remedial Investigation Report* (Foster Wheeler Environmental Corporation 1998) contains a complete discussion of the sampling results for the DMS and other land based study areas. Appendix A of the ROD presents statistical analytical summary tables from the report.

3.1.1 Developed Mill Site

During the 1996 RI fieldwork, seventy-four locations were sampled within the eleven subareas of the DMS (Table 3-1). Samples were analyzed for chemicals of potential concern for both human health and the environment. These chemicals included metals, polychlorinated dibenzo-p-dioxins and furans (dioxins/furans), polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), semi-volatile organic compounds (SVOCs), volatile organic compounds (VOCs), and petroleum compounds.

Results of the sampling indicated the presence of detectable concentrations of metals, dioxins/furans, PAHs, VOCs, and petroleum products in soils; however, metals concentrations did not exceed levels naturally-occurring in the Sitka area (B*ackground chemical concentrations in Soil near Sitka, Alaska* [Foster Wheeler 1998]).

Table 3-1 Location of Contaminants of Concern at the Developed Mill Site	
Contaminant of Concern	**Locations**
Dioxins/furans	Mill surface soils Buried ashcrete Drain sediments
Metals	Mill surface soils Drain sediments
PAHs	Mill surface and subsurface soils
Petroleum Products	Mill surface and subsurface soils Drain sediments

Soils at the Heavy Duty Shop, Paint Shop, and Wood Room Area contained petroleum hydrocarbons above DEC Petroleum Cleanup Action Levels. Soils at the Heavy Duty Shop also contained PAHs. VOCs were detected in soils at the Paint Shop. Petroleum- and PAH-contaminated soils were cleaned up during expedited cleanup actions (Section 3.2).

The surface water collection system on the DMS accumulated sediment in sumps and drains. Drain sediment contained the same contaminants as site soils (PAHs, PCBs, petroleum products, and dioxins/furans), but at higher concentrations in some instances. Sediments requiring cleanup were removed from the surface water collection system during expedited cleanup actions (Section 3.2).

Process and waste materials were sampled as potential sources of contaminants. Dioxin and furans at relatively low concentrations were found in ashcrete and flyash. A number of metals were detected in ash samples as well as in selected paint chip contaminated soils.

Given the presence of contaminants in surface and subsurface soils, the potential for subsurface migration of contaminants to Sawmill Cove was considered, as documented in the *Mill Operable Unit Remedial Investigation Report* (Foster Wheeler, April 1998). The potential was determined to be insignificant because of the extent of pavement at the mill site; the presence of compact and dry sub-surface soils; and analyses indicating very low leaching potential for dioxins/furans, metals, and other contaminants of potential concern

3.1.2 Other Land Based Units

Leachate samples were collected from several of the other land-based units. Soil and sediment samples were collected from areas that may have been influenced by airborne contaminants. Table 3-2 summarizes the samples collected during the RI at the other land-based units.

Table 3-2 Remedial Investigation Sample Summary Other Land Based Units			
Other Land Based Unit	**No. of Sampling Locations**	**Sampling Media**	**Analytical Parameters**
Sitka Municipal Landfill	2 composite	Leachate	Metals, dioxins/furans, and SVOCs
Herring Cove Wood Waste Landfill	2 composite	Leachate	Metals, dioxins/furans, and SVOCs
Mormon Church	1 composite	Leachate	Metals, dioxins/furans, and SVOCs
Industrial Mill Waste Landfill	None: No leachate present during study		
Bucko Point	3 4	Surface soil Subsurface soil	Metals and dioxins/furans
Hillside	4	Surface soil	Metals and dioxins/furans
Blue Lake	8 1	Sediment Raw water from City treatment plant	Dioxins/furans Dioxins/furans

Dioxins/furans and PAHs were detected at the Herring Cove Wood Waste Landfill, in the fill material at the Mormon Church, and at the Sitka Municipal Landfill at levels below human health risk level screening benchmarks. Table 3-3 summarizes the locations where contaminants of concern were present at the other land-based units.

Table 3-3 Contaminants of Concern at the Other Land Based Units	
Contaminant of Concern	**Locations**
Dioxins/furans	Bucko Point Hillside Area Blue Lake (bottom sediment)
Metals	Bucko Point Herring Cove Wood Waste Landfill

3.1.2.1 Herring Cove Wood Waste Landfill Leachate

Leachate samples from the Herring Cove Wood Waste Landfill contained dissolved copper at or near the surface water quality criteria (18 AAC 70). No leachate was detected at the Industrial Mill Waste Landfill during the Remedial Investigation.

Follow-up sampling conducted as part of the landfill monitoring requirements under 18 AAC 60 documented dissolved copper in Herring Cove leachate in concentrations above the applicable water quality criterion (2.9 micrograms per liter). DEC subsequently directed APC to collect samples immediately offshore of the leachate discharge point, in a small drainage seep east of Herring Cove, and in marine waters at Whale Park and Bear Cove. The purpose of the follow-up sampling was to determine whether the concentrations of copper in the leachate were potentially affecting nearshore surface waters, and to document whether dissolved copper may be naturally occurring.

Samples were collected in February 1998. The detected concentration in marine water adjacent to the leachate discharge point was 17 micrograms per liter, while the leachate copper concentration was non-detect. Offshore samples at Bear Cove and Whale Park were 47 and 50 micrograms dissolved copper per liter respectively.

DEC concluded that copper in both the nearshore marine waters and in the Herring Cove Wood Waste Landfill leachate is probably from natural sources. *Background Chemical Concentrations in Soil Near Sitka, Alaska* (Foster Wheeler, May 1998) documents background concentrations of copper in area soils.

3.1.2.2 Small Mammal Sampling
Small mammals were collected for tissue analysis in portions of the DMS and in two of the other land based units. Traps were set in the Mill Yard Area, the Clarifier Area, the 3.7-Acre Unpaved Area, the Hillside Area, and in the vicinity of Herring Cove. Two Sitka mice were caught in the Mill Yard Area, three in the Clarifier Area, none from the 3.7-Acre Unpaved Area, six from the Hillside Area, and five from the vicinity of Herring Cove. Tissues from all the mice were analyzed for the presence of dioxins/furans. Dioxins/furans were detected at low levels in three of the 16 mice collected. This data was used to evaluate impacts to potential predators.

3.2 Expedited Remedial Actions
Expedited remedial actions (ERAs) were performed at the DMS in 1997. A detailed description of the ERAs is provided in the *Final Drain System Cleaning and Excavation Report* (Foster Wheeler, March 1998).

ERAs were conducted at the following locations:

- Soils at the Heavy Duty Shop contained diesel- and residual-range petroleum hydrocarbons at concentrations exceeding DEC cleanup levels.

- Soils at the Paint Shop contained diesel-range petroleum hydrocarbons at concentrations exceeding DEC cleanup levels.

- Sediments from sumps and drains contained petroleum hydrocarbons at concentrations exceeding DEC cleanup levels. Semi-volatile organic compounds and dioxins were also present in the sediments.

- Soils at the Wood Room Area contained concentrations of residual-range petroleum hydrocarbons that exceeded DEC cleanup levels.

Table 3-4 lists where ERAs were conducted, and the quantities of contaminated materials removed from each location. Confirmation soil samples collected from the walls of the excavations showed that all the contaminated material above regulatory cleanup levels was removed. Table 3-5 presents concentrations of contaminants before and after the ERAs, as well as DEC petroleum-contaminated soil cleanup levels.

Table 3-4 Summary Of Expedited Remedial Actions		
Location	**Contaminants of Concern**	**Quantity Removed/Remediated**
Mill building floor trenches	Petroleum, dioxins/furans	Approximately 34 cubic yards
Mill storm drains	Petroleum, dioxins/furans	Approximately 20 cubic yards
Heavy Duty Shop Soils	Petroleum, PAHs	50 cubic yards
Paint Shop Area Soils	Petroleum, VOCs	305 cubic yards
Wood Room Area Soils	Petroleum	270 cubic yards

Key:
PAHs = Polynuclear aromatic hydrocarbons
VOCs = Volatile organic compounds

Table 3-5 Analytical Results Before And After Expedited Remedial Actions					
Location	**Media**	**Contaminant**	**Maximum Concentration Before ERA (mg/kg)**	**Maximum Concentration After ERA (mg/kg)**	**18 AAC 75.341 Method 1 Cleanup Level**
Drains	Sediment	DRO	4,000	NS	200
		RRO	20,000	NS	2,000
Heavy Duty Shop	Soil	DRO	7,900	145	200
		RRO	5,440	491	2,000
Paint Shop Area	Soil	DRO	1,620	40	200
Wood Room Area	Soil	RRO	4,420	95	2,000

Key:
ERA = Expedited remedial action
mg/kg = Milligrams per kilogram
NS = Not sampled
DRO = Diesel Range Organics
RRO = Residual Range Organics

3.2.1 Petroleum Cleanup Levels

In 1997, DEC approved a plan to excavate petroleum-contaminated soils and sediments and to treat them in an on-site treatment system. The approved on-site treatment cells use natural degradation processes to reduce contaminant concentrations below cleanup levels established during the expedited remedial actions, as documented in the *Final Drain System and Excavation Cleaning Report* (Foster Wheeler, March 1998) and presented in Table 3-5. Perforated pipe buried in the cells allows air to flow through the soil to enhance biodegradation and volatilization. Beginning in March of 1998, fertilizer was applied to the cells monthly to stimulate biological breakdown of contaminants. In August and October 1998, each treatment cell was tested to determine the effectiveness of the fertilizer. Additional maintenance measures included: watering the cells to maintain a moisture content of 30 to 60%; measurement of moisture content; and weekly inspections of the tarpaulins covering the cells to ensure that they are secure and that no leachate is being produced. As of the fall of 1998, diesel range hydrocarbon concentrations in the three stockpiles had achieved a 24% to 64% reduction. Oil range hydrocarbons had achieved a 35% to 62% reduction. Gasoline range hydrocarbons were already lower than cleanup levels approved at the time the stockpiles were constructed.

APC submitted a request for a revised cleanup level for the soil stockpiles in March 1999. The request was based on DEC's new regulatory cleanup levels established under 18 AAC 75.340. This request is currently under consideration. A decision on this alternative cleanup level request will be made during the completion of the expedited remedial action.

3.2.2 Storm Drain System Sediments

The storm drain system and sumps were cleaned as part of the expedited remedial actions. Petroleum-contaminated sediments were incorporated into the bioremediation cells. Four partially full bags of material from the storm drain cleaning activities conducted in Area G (sumps and drains) in 1997 remain at the site. Analytical results can be found in Appendix A of the ROD. Five partially full bags from the fly ash hanger area, generated during the 1995 EPA investigation, also remain on-site.

Samples from the source areas for this material were characterized by APC as non-hazardous according to Resource Conservation and Recovery Act criteria. The bags of ash and sediment are therefore suitable for disposal at a permitted solid waste facility in accordance with the specific terms and conditions of the permit.

3.3 Bay Operable Unit

The investigation of the Bay OU included geophysical studies, a sediment profile image camera survey, engineering field studies, water column and surface sediment characterization, toxicity testing, and biota sampling. The *Bay Operable Unit Remedial Investigation Report* (Foster Wheeler Environmental Corporation, July 1998) contains a complete discussion of the chemical and biological sampling results for the Bay OU study areas.

Appendix B of the ROD presents statistical analytical summary tables from the report.

3.3.1 Physical Studies

The physical surveys included bathymetry, side scan sonar, a still mounted video camera survey of the nearshore bottom in Sawmill Cove, and engineering evaluations. Supplemental nearshore sediment depositional measurements were taken in conjunction with the 1999 dive survey.

The purpose of the bathymetry study was to examine the bottom contours in order to provide information on which areas were most likely to receive wood waste. The side scan sonar was used to identify unique bottom features. The purpose of the sediment profile image survey was to gather physical and biological data regarding the upper 18 inches of the sediment in order to identify variations in the stratigraphy. The engineering field study was designed to determine the physical properties of deposited material located near the primary process outfall (001). This information was used in the evaluation of remedial alternatives.

Figure 5-1 in Appendix C summarizes the results of the bathymetry and side-scan sonar surveys. The bathymetry and side scan sonar confirmed that deposition of pulp process residue from outfall 001 is limited to the western portion of Sawmill Cove and the northeastern end of the Bucko Point Shoreline. There is no evidence of a processed wood debris field in the remainder of the Bay OU study area (Thimbleberry Bay, Jamestown Bay, Galankin Islands, or Herring Cove). However, logs and bark are prevalent at Herring Cove.

Pulp process residue and other wood debris covers approximately 100 acres in Sawmill Cove. Four acres in the immediate vicinity of the former process wastewater outfall (001) has pulp waste accumulation from 10 feet to 24 feet thick. The residue covers the sea floor from about 20 feet to 180 feet below the water surface. In the northern end of Sawmill Cove near the former log storage area and utility dock, the deposited wood solids consist mainly of chips or bark that will not readily decompose. The deposited wood material (pulp residue) near outfall 001 decomposes more easily. This material has become a source of the production of degradation-related chemicals such as ammonia, 4-methylphenol, and sulfides.

Evidence of benthic and epibenthic colonization was provided by an initial photographic survey (July 1997) of sediments in the western portion of Sawmill Cove. In addition, sediment profile image data shows three broad zones extending outward from outfall 001:

- an organically enriched area with minimal evidence of life within the sediments;
- a transitional zone dominated by surface and near-surface deposit feeding worms; and
- a relatively undisturbed zone characterized by brown muds and a diversity of species.

A follow-up video survey was conducted in January 1999.

The results of the engineering study tests showed that sediments in Sawmill Cove are composed of non-plastic, peat-like material. The sediments are watery, very light, and highly organic. The wood solids and sediments from west Sawmill Cove have very low shear strength, do not consolidate, and are fine-grained materials with a fraction that stays suspended in water for long periods of time. Pore water analysis revealed detectable levels of metals and dioxins/furans.

3.3.2 Chemical and Toxicity Studies

The studies relevant for determining the nature and extent of contamination in the Bay OU were the water column, sediment characterization, biota sampling, and toxicity tests. The water column chemistry and surface sediment characterization studies were designed to determine whether there were detectable impacts to either media from historical mill activities. The purpose of the biota sampling was to determine the contaminant levels in the tissues of marine organisms living near APC. Sampling was conducted immediately around the mill and in areas that potentially could have been impacted. The areas sampled included Sawmill Cove, Herring Cove, offshore from Bucko Point, Thimbleberry Bay, Jamestown Bay, and offshore of Galankin Island.

3.3.2.1 Water Column Sampling

Thirty-two water column samples were collected from 11 different locations in Sawmill Cove, Herring Cove, and Bucko Point. Conventional water quality parameters tested in these areas (such as temperature, conductivity, salinity, and dissolved oxygen), were within the normal limits for seawater and were consistent with results from historical studies conducted in Southeast Alaska. In a few instances, the concentrations of copper and mercury in isolated samples from Sawmill Cove and the concentration of copper in Herring Cove slightly exceeded the State of Alaska's ambient water quality criteria. As documented in the *Bay Operable Unit Remedial Investigation Report* (Foster Wheeler, July 1998), DEC does not consider these concentrations and isolated instances of dissolved metals to be a problem meriting further attention.

3.3.2.2 Sediment Chemistry Sampling and Contaminants of Potential Concern

Seventy-five sediment samples were collected in the Bay OU. Sediment samples were analyzed for Contaminants of Potential Concern (COPCs) to both human health and the environment. These included metals, semi-volatile organic compounds (SVOCs), dioxins, and compounds associated with pulp mill effluent and wood waste degradation products (resin acids, fatty acids, extractable organic halides, phenolic compounds, ammonia, sulfides). Metals, SVOCs and dioxins/furans were evaluated in the human health risk assessment and subsequently eliminated as human health Contaminants of Concern (COCs). In the absence of Alaska sediment standards, ecological COPCs were identified by comparing sediment concentrations to benchmarks developed by the State of Florida. Florida benchmarks were used as an initial screening tool because they are the most conservative benchmark values. The initial list of COPCs can be found in Appendix B (Table 5-20).

3.3.2.3 Sediment Toxicity Tests

Eighteen sediment toxicity tests were performed in the laboratory on sediments collected from different areas in the Bay OU to determine impacts to benthic invertebrates. The benthic community is affected by chemicals in the sediments, chemicals generated by organic decomposition, physical alteration of the habitat, and changes in the amount of dissolved oxygen in the water. Sediments in three of 18 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.

3.3.2.4 Biota Sampling

Fourteen crabs, 72 flatfish, 128 rockfish, 69 algae samples and 440 blue mussels were collected for the biota sampling. All samples were analyzed for metals and dioxins/furans. Appendix B of the ROD summarizes the bioaccumulation sampling effort.

Generally, metal concentrations in biota were low, and similar in all the areas sampled. Chromium concentrations in algae and mussels in Sawmill Cove and Jamestown Bay were slightly higher than in the other areas. Copper concentrations were slightly elevated in algae in Sawmill Cove and Jamestown Bay, and in mussels and rockfish at Bucko Point. Manganese concentrations in algae, mussels, and rockfish were slightly elevated at Bucko Point. Concentrations of chromium, copper, and manganese in mussel tissues slightly exceeded levels found in mussels collected throughout Southeast and the Gulf of Alaska.

Dioxins and Furans were detected at or above background concentrations in algae and mussels. Blue mussels in Sawmill Cove had the highest relative concentrations of the marine biota sampled.

DEC does not consider the elevations of metals and dioxins/furans in biota to be either an ecological or human health concern meriting corrective action, as documented in:

- *Bay Operable Unit Remedial Investigation Report* (Foster Wheeler, July 1998);
- *Human Health Risk Assessment Report* (Foster Wheeler, February 1999);
- *Evaluation of Risks Attributed to Chemical Releases Associated with the Alaska Pulp Corporation's Sitka Mill Site, Bay OU Ecological Risk Assessment* (Foster Wheeler, 1998);
- *Ecological Significance of Risks noted at Alaska Pulp Corporation's Sitka Mill* (Foster Wheeler, November 1999); and
- *A Summary of the Potential Health Risks from the Ingestion of Marine Biota Near Sitka, Alaska* (Foster Wheeler, February 1999).

4.0 SUMMARY OF SITE RISKS

A complete description of the human health risk assessment conducted for the APC Mill and Bay OUs is provided in the *Human Health Risk Assessment Report* (Foster Wheeler Environmental Corp. October 1998).

DEC regulations (18 AAC 75.325) provide for the use of the Superfund risk range when evaluating whether risks require further action. Superfund defines a threshold range of human health risk from hazardous substance contamination as a 1 in 10,000 (1×10^{-4}) to 1 in 1,000,000 (1×10^{-6}) excess risk of cancer. Non-carcinogenic effects are evaluated by calculating the ratio between the estimated intake of a contaminant and its corresponding reference dose; i.e., the intake level at which no adverse health effects are expected to occur. If this ratio, called a hazard index (HI) is less than 1, then non-carcinogenic health effects are not expected.

4.1 Human Health Risks

A risk assessment was conducted to evaluate the estimated human health risks and effects that could result if contamination at the Mill and Bay OUs is not cleaned up (i.e., no remedial action is performed) and current land use (industrial/commercial) continues. A human health risk assessment evaluates risks and effects at the individual exposure level based on the location and amount of contamination present, toxicity of each contaminant, and pathways by which people could be exposed to contaminants.

The APC human health risk assessment evaluated several ways that people may be exposed to contaminants, including breathing dust and vaporized chemicals, incidental ingestion of contaminated soil, skin contact, and eating wild foods that may have accumulated contaminants. The specific food types evaluated included:

- fish in Blue Lake;
- mussels, crabs, and finfish in Silver Bay;
- marine algae in Silver Bay;
- plants and berries on the hillside; and
- deer on the hillside near the mill.

Ingestion of groundwater was not evaluated in the human health risk assessment for several reasons. The DMS is not considered a present or future source of drinking water because: 1) no groundwater was documented to be present at the DMS during the RI; 2) all businesses and homes along the road system are on the Blue Lake municipal water supply system, including the APC facility; and 3) the site is located on relatively shallow fill directly over the original intertidal area of Sawmill Creek. The potential for potable drinking water is therefore very low. Drinking water from Blue Lake and incidental ingestion of marine water were evaluated.

The human receptor groups evaluated in the risk assessment included:

- Future on-site workers: individuals who would be employed at the mill site for the next 25 years

- Recreational harvesters: individuals who gather a portion of their dietary resources from the surrounding environment as part of recreational activities

- Subsistence harvesters: individuals who gather a significant portion of the dietary resources from the surrounding environment as a means of supporting themselves and their families

Chemicals evaluated in the risk assessment included dioxins/furans, metals, and various SVOCs. Chemicals from the Mill OU were screened against EPA Region III risk-based concentrations for residential soil exposures.

The results of the human health risk assessment documented that the probability of adverse health effects from contaminants in the Mill and Bay Operable Units are below levels of concern. Total cumulative cancer risks and non-cancer effects hazard indices (HIs) are presented in Table 4-1.

Table 4-1 Human Health Risk Summary		
RECEPTOR	**CANCER RISK ESTIMATE**	**HAZARD INDEX ESTIMATE**
Future On-site Worker	$5.9 X 10^{-6}$	0.05
Recreational Harvester	$1 X 10^{-6}$	0.011
Subsistence Harvester	$6.8 X 10^{-6}$ – $3 X 5^{-5}$ (footnote 2)	0.026

These risk estimates and effects (HIs) are primarily the result of potential exposures to arsenic, PAHs, and dioxins/furans. Ingestion of potentially contaminated shellfish was calculated to be the greatest risk to subsistence harvesters. The concentrations of chromium, copper, and manganese in mussel tissue slightly exceeded background levels for mussels collected in Southeast Alaska and the Gulf of Alaska. The dioxin levels in all marine biota sampled from the Bay Operable Unit were below 5 parts per trillion. Arsenic is the contaminant of concern in algae; however, there are no sources of arsenic attributable to mill operations. Arsenic is known to be a naturally occurring substance in the area.

4.2 Ecological Risks

An ecological risk assessment addresses the current and future potential risks and impacts posed by contaminants to natural habitats, including plants and animals, in the absence of remedial action. Ecological risk assessments generally focus on populations or community-level effects if no actions are taken.

Ecological risks were evaluated separately for the Mill and Bay OUs in the following documents.

- *Evaluation of Risks Attributed to Chemical Releases Associated with the Alaska Pulp Corporation's Sitka Mill Site, Mill OU Ecological Risk Assessment* (Foster Wheeler Environmental Corp. June 1998)
- *Evaluation of Risks Attributed to Chemical Releases Associated with the Alaska Pulp Corporation's Sitka Mill Site, Bay OU Ecological Risk Assessment* (Foster Wheeler Environmental Corp. July 1998)

Risks to ecological receptors are expressed as hazard indices (HIs). HIs represent the magnitude of potential adverse effects to organisms, which are calculated based on exposure to multiple contaminants through a variety of exposure routes. HIs are calculated conservatively to insure a margin of safety. DEC considers HIs below 1.0 to be safe. HIs exceeding 1.0 represent levels of potential ecological risk that may indicate the need for remedial action. However, DEC considers factors such as the uncertainty associated with determining absolute ecological risk and other site-specific factors when making risk management decisions. This is particularly true for HIs that fall in the 1 –10 range.

[2] Risk assessments typically provide a single risk number for each exposure pathway evaluated. However, DEC evaluated the Subsistence Harvester exposure scenario two ways to account for varied seafood harvest activity in Silver Bay. The lower estimate ($6.8 x 10^{-6}$) assumes that Silver Bay provides up to 15% of a harvester's salmon, but that other resources are not gathered there as intensely. The second estimate ($3 x 10^{-5}$) assumes that Silver Bay may provide subsistence gatherers with up to 20% of all marine subsistence resources that occur in the area. These two estimates are presented because Silver Bay is a Customary and Traditional Use Area for the Sitka Tribe, but may not be used as intensely by other resource gatherers.

4.2.1 Mill Operable Unit Ecological Risks

The following environmental attributes identified in the planning phases of the project were evaluated in the *Evaluation of Risks Attributed to Chemical Releases Associated with the Alaska Pulp Corporation's Sitka Mill Site, Mill OU Ecological Risk Assessment* (Foster Wheeler, June 1998).

- Maintenance of upland plant communities to provide foraging and breeding habitat for terrestrial wildlife

- Maintenance of a soil macroinvertebrate community to provide a food base for terrestrial wildlife

- Survival and reproductive success of bird populations living in upland habitats

- Survival and reproductive success of mammal populations living in upland habitats

The tundra vole, common shrew, short-tailed weasel, song sparrow, varied thrush, short-eared owl, northern goshawk, and sharp-shinned hawk were selected as representative site receptors because they were determined to be indicators of the environmental attributes listed above.

Table 4-2 lists the calculated hazard indices for the receptors mentioned above for three subareas of the Mill OU.

Table 4-2
Summary Of Terrestrial Ecological Risks
Hazard Indices

Receptor	Mill Yard	Hillside Area	Clarifier Area
Plants	NE*	455	NE
Soil Invertebrates	NE	NE	65
Tundra Vole	1.6	3.2	1.9
Song Sparrow	0.88	1	1.6
Common Shrew	36.1	28.4	7.3
Varied Thrush	0.11	0.93	0.88
Short-eared Owl	0.18	0.32	0.12
Northern Goshawk (ingestion of song sparrow and varied thrush)	0.0 0.0	0.01 0.01	0.07 0.07
Sharp-shinned Hawk (ingestion of song sparrow and varied thrush)	0.02 0.02	0.04 0.04	0.3 0.3
Weasel	0.05	1.28	0.33

*NE- Not Estimated

Most hazard indices for ecological receptors were below 1 or very close to 1. However, hazard indices in some areas for plants, soil macroinvertebrates, and the common shrew all exceeded 10. The significance of these elevated indices is discussed below.

- The concentrations of aluminum, chromium, nickel, vanadium, and zinc in hillside soils all exceeded ecological screening benchmarks for plants. Aluminum and vanadium were the greatest contributors to the elevated HI. However, plant life in the area is vigorous and diverse, which indicates that metals are not posing an ongoing toxicity problem to plant life on the hillside near the mill. This may be due to the following factors, as documented in *Evaluation of Risks Attributed to Chemical Releases Associated with the Alaska Pulp Corporation's Sitka Mill Site, Mill OU Ecological Risk Assessment* (Foster Wheeler, June 1998).

    - Actual toxicity is dependent on soil and plant characteristics found at the site. Benchmark values cannot readily account for site-specific variables.

    - Most metals in natural soils are in poorly available forms, and therefore pose less toxicity to plants in the natural environment.

Aluminum and chromium were the greatest contributors to the elevated HI for soil invertebrates. DEC does not consider the elevated hazard index for soil macroinvertebrates to be a problem meriting further evaluation for the following reasons.

- Concentrations of metals in earthworms and other soil macroinvertebrates reported in scientific literature were used in the risk calculation. These concentrations represent a more soluble form (more available for uptake by life) of the metals than was present in soils at the APC site. Additionally, known Sitka area background concentrations for two of the metals contributing to the elevated hazard index were higher than site-specific soil concentrations, as documented in *Background Chemical Concentrations in Soil Near Sitka, Alaska* (Foster Wheeler, May 1998).

- Dioxin also contributed to the elevated hazard index for soil macroinvertebrates. As with metals, dioxin values from the scientific literature for soil organisms were used in the risk calculation versus actual measurements. There is evidence that soil organisms may be less sensitive to dioxin-related effects than other animals, as documented in *Evaluation of Risks Attributed to Chemical Releases Associated with the Alaska Pulp Corporation's Sitka Mill Site, Mill OU Ecological Risk Assessment* (Foster Wheeler, June 1998)

The HI for the common shrew was elevated for the hillside and the mill yard. Shrews eat earthworms, which may contain metals and dioxins. Within the area of the mill, DEC considers risks to the shrew population to be in the intermediate risk range (HI between 1 to 10) since more than 20% of the population may exhibit reduced reproductive capability due to the effects of this contamination, as documented in *Ecological Significance of Risks noted at Alaska Pulp Corporation's Sitka Mill Site* (Foster Wheeler, November 1998). However, because the common shrew is not threatened or endangered, DEC has determined that an appropriate management goal is to sustain the species as part of the Baranof Island ecosystem. The potential effects to shrews resulting from exposure to hillside and mill yard contaminants is unlikely to significantly impact the population of shrews on the island, and will not create measurable impacts to the structure and function of the ecosystem.

A complete discussion of the uncertainties associated with the Mill OU ecological risk assessment may be found in *Evaluation of Risks Attributed to Chemical Releases Associated with the Alaska Pulp Corporation's Sitka Mill Site, Mill OU Ecological Risk Assessment* (Foster Wheeler, June 1998)

4.2.2 Bay Operable Unit Ecological Risks and Impacts

The following environmental attributes identified in the planning phases of the project were evaluated in *Evaluation of Risks Attributed to Chemical Releases Associated with the Alaska Pulp Corporation's Sitka Mill Site, Bay OU Ecological Risk Assessment* (Foster Wheeler, July 1998).

- Maintenance of a marine benthic community in the nearshore environments that can serve as a prey base for local fish populations
- Survival and reproductive success of fish inhabiting the nearshore environments
- Survival and reproductive success of marine birds within the foraging range of nearshore environments
- Survival and reproductive success of marine mammals within the foraging range of nearshore environments

A complete discussion of the uncertainties associated with the Bay OU ecological risk assessment may be found in *Evaluation of Risks Attributed to Chemical Releases Associated with the Alaska Pulp Corporation's Sitka Mill Site, Bay OU Ecological Risk Assessment* (Foster Wheeler, July 1998).

4.2.2.1 Birds and Mammals

Table 4-3 summarizes the receptors chosen to evaluate birds and mammals, and presents the results of the ecological risk assessment. To evaluate the receptors, the concentrations of contaminants of potential concern in their food sources were calculated based on the concentrations found in the sediments (known as modeling). All HIs are within the 1 to 10 range considered by DEC to be acceptable due to the inherent uncertainties associated with ecological risk science.

Table 4-3
Hazard Indices for Receptors of Concern in the Bay Operable Unit

Receptor	Herring Cove	Sawmill Cove West	Sawmill Cove East	Bucko Point	Thimbleberry Bay	Jamestown Bay	Galankin Island
Rock Sandpiper	0.51	0.99	0.74	0.83	0.50	0.64	0.53
Greater Scaup	0.40	0.42	0.37	0.66	0.74	1.47	0.65

Table 4-3 Hazard Indices for Receptors of Concern in the Bay Operable Unit							
Receptor	**Herring Cove**	**Sawmill Cove West**	**Sawmill Cove East**	**Bucko Point**	**Thimbleberry Bay**	**Jamestown Bay**	**Galankin Island**
Pelagic Cormorant (ingestion of flatfish)	0.26	0.83	0.71	0.56	0.81	0.93	1.0
Pelagic Cormorant (ingestion of rockfish)	0.84	0.99	0.34	1.26	2.57	2.40	2.83
Harbor Seal (ingestion of Flatfish)	0.1	0.2	0.28	0.05	0.05	0.05	0.02
Harbor Seal (ingestion of Rockfish)	0.01	0.01	0.01	0.02	0.09	0.07	0.04
Harbor Seal (ingestion of Pacific herring)	0.04	0.05	0.06	0.04	0.06	0.06	0.02
Sea Otter	0.3	0.7	0.31	0.83	0.62	0.69	0.32

4.2.2.2 Fish
Actual tissue levels from fish collected in the Bay OU during the Remedial Investigation were compared to concentrations of similar chemicals that occur in fish naturally, and to concentrations known to produce adverse effects. All tissue concentrations in Bay OU fish were at or below acceptable levels.

4.2.2.3 Benthic Invertebrates
Risks and impacts to invertebrates from hazardous substances and decomposing wood waste were evaluated using a laboratory bioassay approach to measure toxicity. The risks and impacts to the benthic community were assessed in a manner designed to distinguish between hazardous substances released by APC, and hazardous substances associated with wood waste degradation. Several of the test results suggested that toxicity was due to hazardous chemicals in the sediment and wood waste mixture found in a localized area near outfall 001. Other toxicity test results indicated that impacts to early life-stage organisms in the water column could occur if decomposing wood waste material was re-suspended in the water column. Chemicals generated by continued decomposition of pulp residue on the seafloor are not expected to harm fish and wildlife living near the area.

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.

5.0 SELECTION OF THE REMEDIAL ACTION

The Remedial Action DEC has selected for this site is the result of a formal process designed to ensure a specific range and depth of consideration has been given to the various elements that comprise all the alternatives appropriate for this site. The rationale for the formal process is set out below. It is followed by a discussion of the Remedial Action Objectives (RAOs) that were developed for the site. RAOs are the yardstick against which site conditions are compared in order to determine what needs to be cleaned up and how much clean up is required. Once the RAOs are defined, alternatives are considered relative to their ability to best meet the defined objective(s).

DEC modified criteria found in EPA's Superfund Program to evaluate and compare alternatives for the APC site (Table 5-3). An alternative must meet criteria 1 and 2, known as *'Threshold Criteria'*, in order to be recommended. Criteria 3 through 7, called *'Balancing Criteria'*, are used to determine which response method provides the best overall solution. Each alternative has the possibility of satisfying, partially satisfying or not satisfying a particular criterion.

Due to the minimal risks posed by site contaminants, no remedial action is necessary to reduce risks to human health or to fish and wildlife. The Sawmill Cove seafloor has been identified as an area meriting remedial consideration because the benthic community has been affected. This is due to the fact that some risks from hazardous substances may be present, coupled with the impacts associated with a modified and inhospitable bottom substrate.

5.1 Preliminary Remedial Action Objectives

DEC developed preliminary RAOs for the Mill and Bay Operable Units prior to completion of the human health and ecological risk assessments. RAOs are intended to ensure protection of human health and the environment from risks attributable to the release of hazardous substances. The preliminary RAOs were developed using DEC's regulatory risk threshold under 18 AAC 75.325. The preliminary RAOs are presented below.

> **RAO 1**: Reduce human dietary health risks attributable to hazardous substances from past mill discharges to Sawmill Cove to acceptable levels.
>
> **RAO 2**: Reduce human non-dietary health risks attributable to hazardous substances from past mill discharges to soils to acceptable levels.
>
> **RAO 3**: Reduce human non-dietary health risks to hazardous substances from past mill discharges to water and from on-going discharges of leachate to acceptable levels.
>
> **RAO 4**: Reduce ecologically significant risks to populations of non-benthic marine biota that are attributable to hazardous substances from past mill discharges to acceptable levels.
>
> **RAO 5**: Reduce ecologically significant risks to populations of benthic organisms attributable to hazardous substances and wood waste degradation chemicals to acceptable levels.

RAO 6: Reduce ecologically significant risks to populations of terrestrial wildlife attributable to hazardous substances from past mill discharges to acceptable levels.

5.2 Final Remedial Action Objective

Based on the findings of the risk assessments and completion of expedited remedial actions, DEC determined that only ecological risks associated with the depressed benthic community in Sawmill Cove warranted further attention. The following RAO is relevant to the summary of remedial alternatives presented in the next section.

- Reduce the ecologically significant adverse effects to populations of bottom dwelling life in Sawmill Cove from hazardous substances, including wood waste degradation chemicals, to acceptable levels.

The performance measure for this RAO is the observable succession of benthic species living both on and in the sediments that will result in a balanced, stable community as evaluated by measures of abundance and diversity at various locations over time.

Due to the uncertainties associated with the duration of recovery, DEC has developed management milestones to evaluate the predicted ecological succession in Sawmill Cove. A 40-year recovery goal is based on DEC's determination that the length of recovery can be commensurate with the scope of the ecological risks and impacts. Although locally significant, the compromised benthic community in western Sawmill Cove does not appear to be causing serious impacts to the rest of Silver Bay.

Progress toward this goal will be evaluated by monitoring ecological succession. The management milestones are listed in table 5-1.

Table 5-1
Ecological Recovery Management Milestones

Area	Time (years)	Successional Status
> 75% of the AOC	5-10	Presence of decomposers and primary producers
> 75% of the AOC	10-20	Presence of primary consumers
> 75% of the AOC	20-40	Presence of secondary consumers
> 75% of the AOC	>40	Climax (balanced and stable) communities

5.3 Description of the Area of Concern

Following the completion of the Bay OU Ecological Risk Assessment and the Feasibility Study, the study area was reduced to an (AOC) within Sawmill Cove relevant to the final RAO. Sediment chemistry results and the sediment toxicity evaluation provided information to identify the ecological Contaminants of Concern (COCs) listed in Table 5-2. Ecological COPCs, described earlier in this ROD, were compared to State of Washington sediment management standards and NOAA ecological benchmarks to help develop the suite of COCs. DEC considered these criteria to be appropriate benchmark values in the absence of Alaska-specific numeric sediment standards. Concentrations above these benchmark values were used to narrow the Bay OU study area to an area in Sawmill Cove warranting remedial action. No contaminants from other Bay Unit embayments (Jamestown Bay, Thimbleberry Bay, and Herring Cove) were elevated above these benchmarks.

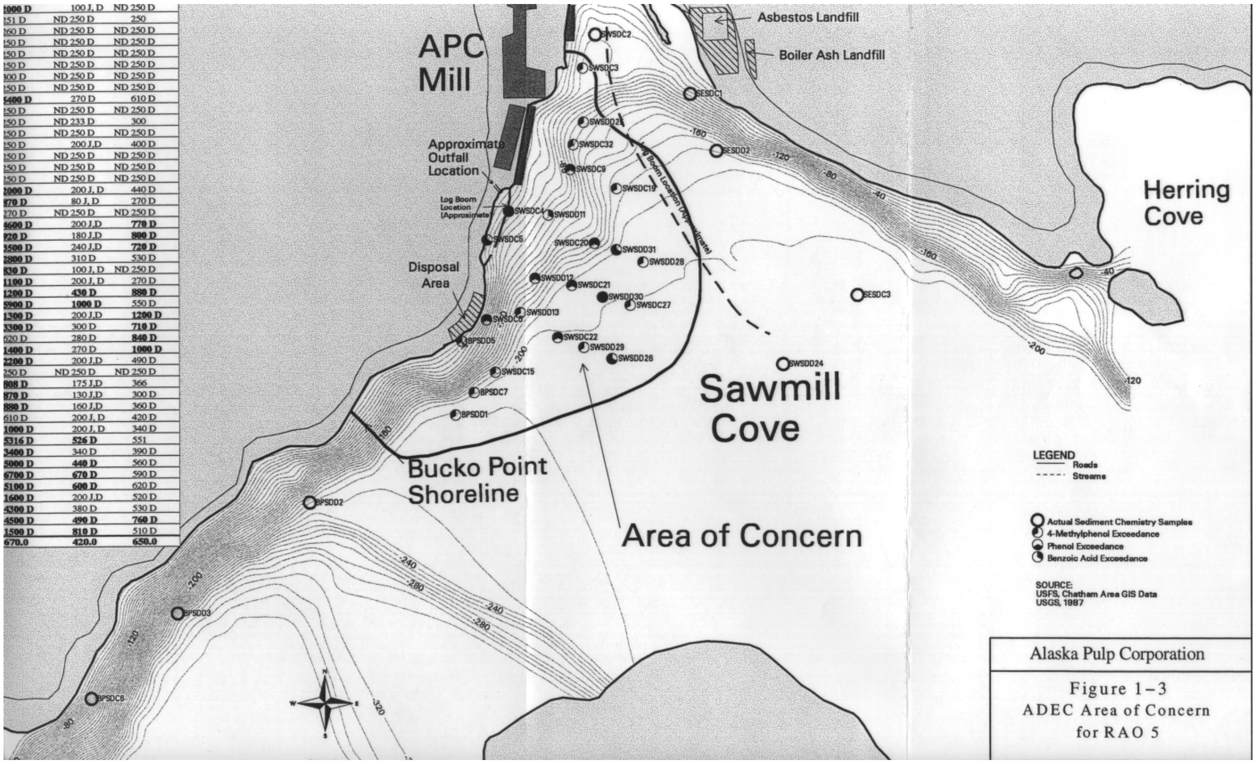
Table 5-2 Detected Contaminant Concentrations from 49 Sampling Stations Sawmill Cove and Bucko Point Shoreline					
Ecological Contaminant of Concern	**Range of Detects**	**NOAA Benchmark**	**# of Detects above NOAA Benchmark**	**Washington Benchmark**	**# of Detects above Washington Benchmark**
Nickel (mg/kg)	15 – 67.9	51.6	5	None	-
Dioxins/Furans ng/kg	2.0 – 34	10	29	None	-
4-methylphenol (ug/kg)	251 – 6,700	None	-	670	30
Benzoic Acid (ug/kg)	250 – 1,200	None	-	650	9
Cadmium (mg/kg)	0.14 – 9.33	None	-	6.7	12
Ammonia (mg/kg)	15 – 460	None	-	None	-
Resin Acids (mg/kg)	0.27 - 180	None	-	None	-

Ammonia and sulfides, associated with the degradation of organic material in the absence of oxygen, were present in Sawmill Cove and Herring Cove. Various other compounds (derived during the pulping process) were also elevated in Sawmill Cove and present in low concentrations in Herring Cove. Not all of these substances have comparative ecological benchmark values. However, both ammonia and the more persistent compounds were shown to contribute to sediment toxicity in Sawmill Cove, as documented in *Evaluation of Risks Attributed to Chemical Releases Associated with Alaska Pulp Corporation's Sitka Mill Site* (Foster Wheeler, July 1998). Because of their demonstrated toxicity, ammonia and persistent compounds were included as ecological COCs. The concentrations of these contaminants were not considered a problem in Herring Cove.

The AOC (Figure 5-1) applicable to the final ecological RAO was established by multiple lines of evidence, including:

- Chemical concentrations above benchmark sediment values;
- benthic community toxicity; and
- sediment profile images of the sediments and wood residue in Sawmill Cove.

Figure 5-1
Area of Concern



5.4 Remedial Alternatives

Many technologies were considered in order to address hazardous substances and pulp residue found in the AOC. Appropriate technologies were identified and screened for applicability to site conditions. The potential technologies were then combined into alternatives. Potential remedial alternatives for the Bay OU were identified, screened, and evaluated in the *Bay Operable Unit Feasibility Study* (Foster Wheeler Environmental 1999). Although all proposed cleanup alternatives could achieve the Remedial Action Objective within the AOC, none would attain the goal in the short-term.

5.4.1 Description of Alternatives

The following alternatives were evaluated in the Proposed Plan and the *Bay Operable Unit Feasibility Study* finalized by Foster Wheeler in February 1999. The selected alternative, ***Natural Recovery with Long-Term Monitoring and Institutional Controls***, is discussed in more detail later in this ROD.

5.4.1.1 Alternative A-1 - No Action

Cost: $0

A no-action alternative was presented as a baseline reflecting current conditions without any remediation effort. This alternative was used to compare the alternatives and does not include monitoring or institutional controls (see Alternative 2).

5.4.1.2 Alternative A2 - Natural Recovery with Long-Term Monitoring and Institutional Controls

Cost: Approximately $600,000 - $1,000,000

Natural recovery involves the natural degradation of chemicals and wood waste over time to achieve the RAO. Although Sawmill Cove will not recover to pristine or pre-mill conditions, it is expected to recover to some modified condition that reflects a new soft-bottom habitat created by the degraded wood waste.

Monitoring the recovery of the benthic community is an important component of the natural recovery alternative. The monitoring approach includes sediment chemistry, photometric surveys, and benthic community analysis. The goal is to document that the ecological recovery process is occurring, and that the performance measure will be attained. Details are presently being developed in a monitoring workplan as part of the remedial design activities. The comprehensive “adaptive management approach” for long-term monitoring will be incorporated as an integral, enforceable component of this ROD upon its approval by DEC.

5.4.1.3 Alternative A3 - Dredging with Solid-Liquid Separation and Upland Disposal of Dewatered Sediment

Cost: Approximately $6,000,000 - $8,000,000

A mechanical dredge could remove approximately 168,000 cubic yards of sediments in an area of approximately 11 acres north of outfall 001, the main pulp process discharge point immediately south of the primary dock. This area represents 11 percent of the AOC. The remaining 89 percent of the AOC would be left to recover naturally.

A clamshell dredge with a closed environmental-type bucket would be used. This type of bucket would improve the retention of solids because it remains closed while being lifted from the bottom. The total volume of dredged sediments and entrained seawater was predicted to be approximately 252,000 cubic yards. Dredged sediments would be de-watered. Discharge water from the de-watering process would be required to meet State of Alaska water quality standards. De-watered sediments would also have to meet the waste acceptance criteria of the landfill that agrees to accept them. Natural recovery and monitoring with institutional controls would also be a component of this alternative, as much of the AOC would not be dredged due to technological and cost limitations.

5.4.1.4 Alternative A4 - Enhanced Natural Recovery (Thin) Capping North of Outfall 001

Cost: Approximately $1,500,000

This alternative would apply a thin cap (enhanced natural recovery) to the sediments north of outfall 001 above the 100-foot depth contour, and on bottom slopes less than 1 foot vertical to 3 feet horizontal. This area totals approximately 158,000 square feet (3.6 acres). The area that could be capped is approximately four percent of the AOC. The remaining 96 percent would be left to recover naturally.

A potential method for capping would be to pump sand through a pipeline and diffuser. A centrifugal hydraulic pump would be mounted on a flat deck barge. Sand would be fed into the discharge line's hopper and gravity-fed into the discharge line. Seawater would be pumped by the centrifugal pump into the discharge line and mixed with the sand. The slurry would then be pumped through the 8-inch discharge line, directed upwards to disperse, and slowly fall to the sediments.

Natural recovery and monitoring with institutional controls would also be a component of this alternative.

5.4.1.5 Alternative A5 Thick Capping North of Outfall 001

Cost: Approximately $1,200,000

Under this alternative, an approximate 62,000 square feet area (1.4 acres) would be covered with a 3-foot thick sand cap (isolation cap). This area represents two percent of the AOC. The remaining 98 percent would be left to recover naturally.

Thick capping would be achieved by washing the sand off the deck of a flat-deck barge with a high pressure hose as the barge is pushed by a tug boat over the area to be capped. The areas to be capped are areas without tidal or propeller influence and without steep slopes.

Natural recovery and monitoring with institutional controls would also be a component of this alternative.

5.4.1.6 Alternative A6 - Dredging, Enhanced Natural Recovery (Thin Capping), and Thick Capping

Cost: Approximately $8,000,000 - $10,000,000

This alternative would include components of both dredging and capping. The area immediately surrounding outfall 001 would be dredged and then thin capped. Dredged sediments would be de-watered and taken to an approved disposal site. A thin cap would be placed over the area where the sediments were dredged and over other appropriate locations within the AOC. A thick cap would be placed north of outfall 001 (as described in Alternative A-5). This alternative would address approximately 12 percent of the AOC.

Natural recovery and monitoring with institutional controls would also be a component of this alternative.

5.5 Alternatives Evaluation

All practicable remedial alternatives were evaluated, as documented in the *Bay Operable Unit Feasibility Study Report* (Foster Wheeler, February 1999). A summary analysis that compared the preferred alternative to the other alternatives was provided in the Proposed Plan. The ability of each alternative to meet the criteria described in Table 5-3 was assessed. The '*Community Acceptance'* criterion is discussed in this ROD in consideration of public comments received on the Proposed Plan.

Table 5-3 Criteria to Evaluate Cleanup Alternatives	
Criteria	**Description**
Overall Protection of Human Health and the Environment	Determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.
Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)	Evaluates whether the alternative meets state and federal environmental statutes and regulations.
Long-term Effectiveness and Permanence	Considers the ability of an alternative to maintain protection of human health and the environment over time, and the reliability of such protection.
Reduction of Toxicity, Mobility, or Volume through Treatment or Recycling	Evaluates the alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment and the amount of residual contamination remaining.
Short-term Effectiveness	Considers how fast the alternative reaches the cleanup goal and the risk that the alternative poses to workers, residents, and the environment during the construction or implementation of the alternative.
Implementabilty	Considers the technical and administrative feasibility of implementing the alternative, such as relative availability of goods and services. This criterion also considers whether the technology has been used successfully at other similar sites.
Cost	Includes estimated capital and operation and maintenance costs.
Community Acceptance	This criterion considers community interests and concerns as a factor in selecting a cleanup plan.

5.6 Community Acceptance

The City and Borough of Sitka agrees with the site management measures and overall approach of the long-term monitoring program. The Sitka Tribe of Alaska supports the selected remedy, but requests a role in the long-term monitoring program. The Sitka Conservation Society disagrees with DEC's decision and believes active intervention is merited. One individual from Sitka commented on the Proposed Plan, stating she supported a dredging alternative instead.

5.7 Description of the Remedy

Based on the information generated by the Remedial Investigation, the comparative analysis of alternatives in the Feasibility Study, the expected completion of the expedited remedial actions performed at the DMS, the estimated site risks, and public comments on the Proposed Plan, DEC has determined that ***No Further Remedial Action with Institutional Controls*** is necessary at the Mill OU. For the Bay OU, DEC has selected ***Natural Recovery with Long-Term Monitoring and Institutional Controls*** as the remedy.

5.7.1 Mill OU

Based on the information generated in the human health and ecological risk assessments, and on expedited remedial actions conducted at DMS, DEC has determined that cleanup objectives for the eleven DMS subareas have been met. The on-site treatment of excavated soils is operating in accordance with DEC guidance. Therefore, no additional remedial action is necessary at the DMS, with the exception of continued treatment of petroleum-contaminated soils in the bioremediation cells until cleanup objectives are met. Through a deed restriction, the DMS will be maintained as a commercial or industrial facility. The purpose of the restriction is to ensure that human exposure and associated health risks do not increase as a result of residential development, unless residential risks are found to be acceptable through additional evaluation.

An evaluation of the risks from contaminants at the other land-based study areas was also conducted. Based on the finding that risks are within acceptable risk ranges in the human health and ecological risk assessments, DEC has determined that no additional remedial action is required at the other land-based study units.

5.7.2 Bay OU

As a result of the Remedial Investigation, the Bay OU study area has been reduced to an AOC in Sawmill Cove warranting remedial action. Contaminant concentrations are not at levels meriting further attention in any areas outside the AOC, as documented by the *Bay OU Remedial Investigation Report* (Foster Wheeler, July 1998) and *Evaluation of Risks Attributed to Chemical Releases Associated with the Alaska Pulp Corporation's Sitka Mill Site, Bay OU Ecological Risk Assessment* (Foster Wheeler, July 1998).

5.7.2.1 Rationale for Selection of the Alternative

The final RAO for the Sawmill Cove AOC is to **reduce the ecologically significant adverse effects to populations of bottom-dwelling life from hazardous substances, including wood waste degradation chemicals, to acceptable levels.**

After carefully weighing the possible remedial alternatives against the evaluation criteria presented in Table 5-3, DEC concluded that ***Alternative A2, Natural Recovery with Long-Term Monitoring and Institutional Controls*** is the most appropriate alternative to meet the RAO within the AOC. This alternative achieves the objective without the adverse short-term impacts and significantly disproportionate costs associated with other remedial alternatives. ***Natural Recovery with Long-Term Monitoring and Institutional Controls*** is supported by the localized nature and extent of the environmental risks and impacts related to wood waste residue, hazardous degradation by-products, and any commingled hazardous substances that may have been released by the mill.

The recent observation that recovery in the nearshore environment has begun further supports DEC's decision that ***Natural Recovery with Long-Term Monitoring and Institutional Controls*** is the most balanced approach to achieve the Remedial Action Objective. A 1999 video survey of the nearshore subtidal area documented biological activity in the area near outfall 001. Species present include areas covered by a white microbial mat (the sulfur bacteria *Beggiatoa* sp.) and areas colonized by a variety of other organisms. The sediment-water interface contains sufficient oxygen for these species to live. The predominant macroinvertebrates consist of a variety of species of sea anemones, polychaete worms, nudibranchs (shell-less snails), ascidians, crabs, shrimp, and starfish. The presence of *Beggiatoa* indicates the system has started to recover by removing hydrogen sulfide. This prepares the near-surface sediments for colonization by surface-dwelling organisms .The video observations are indicators of the chemical, microbial, and biological processes that define ecological succession, and are consistent with those documented for organically enriched benthic systems in other parts of the world.

DEC considers ***Natural Recovery with Long-Term Monitoring and Institutional Controls*** to be the most appropriate remedial alternative because:

- Contaminant levels throughout the Bay OU are low, as documented in the *Bay Operable Unit Remedial Investigation Report* (Foster Wheeler, July 1998). Risks to human health and to fish and wildlife are below the threshold of concern, as documented in the *Evaluation of Risks Attributed to Chemical Releases Associated with the Alaska Pulp Corporation's Sitka Mill Site*, *Bay OU Ecological Risk Assessment* [Foster Wheeler, July 1998], and the *Human Health Risk Assessment Report* (Foster Wheeler, February 1999).

- Natural recovery of the benthic community living on the surface of the seafloor in the AOC has been recently observed to be underway, as documented by the January 1999 video survey.

- Institutional controls have been established in this ROD to control disturbances to the seafloor in the AOC.

- Natural recovery avoids potentially significant short-term environmental impacts related to widespread disturbance and re-suspension of pulp residue caused by large-scale dredging or capping, as documented in the *Bay Operable Unit Feasibility Study Report* (Foster Wheeler, February 1999) and *Dredging and Disturbance of Buried Wood Waste in the Marine Environment* (Foster Wheeler, February 1999).

- Natural recovery avoids potential wastewater and de-watered sediment disposal problems accompanying large-scale dredging, as documented in the *Bay Operable Unit Feasibility Study Report* (Foster Wheeler, February 1999).

- Natural recovery preserves the recovery within the AOC that has occurred since the cessation of mill related discharges, as documented in *Benthic Community Succession: Sediment Profile Imaging and Supporting Information* (Foster Wheeler, February 1999) and the January 1999 underwater video survey.

- Natural recovery avoids exposing (via dredging) deeper, potentially more contaminated material in the thickest pulp residue deposits, as documented in *Fate and Effects of Wood Waste in the Marine Environment* (Foster Wheeler, June 1998), *Dredging and Disturbance of Buried Wood Waste in the Marine Environment* (Foster Wheeler, February 1999), and the *Bay Operable Unit Feasibility Study Report* (Foster Wheeler, February 1999).

- Natural recovery is predicted to achieve the RAO in a 40-year period of time that DEC believes is commensurate with the limited degree of ecological risks and impacts presented by the affected benthic community within the AOC, as documented in Appendix A of the *Bay Operable Unit Feasibility Study Report* (Foster Wheeler, February 1999).

- Natural recovery is predicted to achieve the RAO over the entire AOC within the same time frame as the other alternatives, as documented in the *Bay Operable Unit Feasibility Study Report* (Foster Wheeler, February 1999).

- Natural recovery has been documented to provide the greatest value of all the alternatives on a cost/benefit basis, as documented in the *Bay Operable Unit Feasibility Study Report* (Foster Wheeler, February 1999).

- Natural recovery represents a remedy that is supported by various interest groups in the community, including the Sitka Tribe of Alaska, as documented in comments received during the Proposed Plan public review period.

As documented by reports and technical memoranda produced during the course of the Remedial Investigation (referenced above), DEC has determined that selection of any of the other alternatives is not justified or prudent at this time for the following reasons:

- Human health risks are judged to be acceptably low.

- Ecological risks to fish, birds, and mammals associated with the presence of low concentrations of hazardous substances are judged to be acceptably low.

- Ecological risks and impacts are spatially limited to approximately 3.5% of Silver Bay.

- Implementation of any of the technologies described in the other alternatives may disturb other valued ecosystem components (recovering benthos and epibenthos, short-term water quality).

- The recovery process within portions of the AOC has begun.

In addition to the documented facts above, DEC has considered the following factors:

- Discharges into the AOC have been absent since the mill closed in 1993, resulting in no new source material or contaminants being added to the existing wood waste residues.

- No significant existing sources of pollution elsewhere are exacerbating the risks to ecological receptors in Silver Bay.

- No significant new impacts are expected within the AOC that would prevent achieving the RAO.

- Future permits will control new discharges of contaminants into the AOC so that any such discharges would not set back the natural recovery process or cause further degradation to water quality.

- Institutional control measures will ensure that natural recovery proceeds with minimal disturbances.

AS 46.09.020 provides the DEC Commissioner broad authority regarding the cleanup of hazardous substances released to the environment. Under 46.09.020 (a), DEC has determined that:

1) Active cleanup may cause more environmental damage than if the hazardous substances are left in place.

2) Cleanup of the majority of the Sawmill Cove AOC, which lies in water deeper than 100 feet, may be technically feasible but impractical considering cost, availability of specialized equipment, and the questionable efficacy of the results.

The Hazardous Substance and Pollution Control Regulations (18 AAC 75) direct DEC to consider human health, safety, and welfare when conducting a site cleanup. In comparison to the acceptably low human health risks and limited ecological risks and impacts the APC site poses, DEC concludes that expedient economic reuse of the facility is a factor that must be given due consideration in terms of the overall welfare of the community.

Long-term monitoring provides DEC with the ability to both define the existing state of recovery within the AOC, and measure the nature and rate of this recovery. Monitoring may document an absence of recovery, an insufficient rate of recovery, or regression. If so, the agency will re-evaluate the need for active intervention by considering factors such as:

- natural recovery objectives, ecological impacts, and ecological risks;
- community and other stakeholder concerns;
- available remedial technologies;
- short-term and long-term costs and benefits.

Based on the outcome of the evaluation, DEC may implement appropriate active intervention.

5.7.2.2 Adaptive Management Approach to Monitor Benthic Community Recovery

The January 1999 underwater video survey has demonstrated that natural recovery has begun in portions of the AOC. Since most discharges from the APC facility have been eliminated, recovery of benthic macroinvertebrate communities is expected to proceed more rapidly and should follow the classical patterns of colonization and recovery documented for organically enriched areas and degraded material disposal areas. Evidence of natural recovery will include initial colonization by “pioneering” species, subsequent modification of physical/chemical characteristics of the substrate and overlying waters, and final colonization by deeper dwelling “equilibrium” species (*Benthic Community Succession: Sediment Profile Imaging and Supporting Information* [Foster Wheeler, February 1999]).

Monitoring the recovery of the benthic community is a key component of the natural recovery action. The approach, summarized below, will be incorporated as an integral, enforceable component of this ROD upon its approval by DEC.

DEC anticipates that baseline conditions will be documented in 1999, assuming detailed workplans are finalized in time to conduct the fieldwork (approximately October). To establish baseline conditions, the first monitoring event will include sediment chemistry, photometric surveys above and in the sediments, and benthic community analysis that will include measurement of faunal abundance and diversity. The baseline monitoring will be conducted throughout the AOC to tailor subsequent monitoring events to site-specific conditions. The baseline information will provide a critical link between past observations, trends in chemical and biological succession of site sediments, and future site management decisions.

Foster Wheeler Environmental is currently completing detailed monitoring workplans. The workplans will provide specific criteria DEC will use to determine whether recovery is occurring as projected, identify sampling locations, and present standard operating procedures and quality control measures.

5.7.2.3 Risk-Based Review of the Selected Remedy
DEC will periodically evaluate the protectiveness of the remedy to human health and ecological receptors. This review will be coordinated with the long-term monitoring events.

A bioaccumulation survey will be implemented as part of this evaluation. The purpose of the bioaccumulation survey sampling is to evaluate dioxin and furan body burdens in specific species over time, and to compare them to the results obtained during the remedial investigation conducted for the APC site. DEC expects the concentrations of dioxins and furans to remain relatively constant or decline over time. If the survey verifies this expectation, additional sampling will not be required. If the concentration of dioxins and furans increases over time, further analysis will be conducted. Existing site uses and potential pathways to humans, fish and wildlife will be evaluated to determine if any contingency actions will be needed. The survey will be included in the adaptive management approach, and will be incorporated as an integral, enforceable component of this ROD upon its approval by DEC.

5.7.2.4 Measures To Control Exposure to Contaminants
The APC Mill Site includes uplands near Silver Bay, and various tidelands in Silver Bay, Sawmill Cove and Herring Cove. To control future exposure to residual contamination from the mill, the APC properties have been deeded with several restrictions on their use. Such restrictions may be in place for a significant time. They will apply to any future lessees or purchasers.

A deed restriction is a narrative limitation that is printed on the deed for the property and then recorded. This is one type of “institutional control” on the property under 18 AAC 75.375. A deed notice informs the public of limitations imposed in other documents.

Two institutional controls will be recorded: (1) the property is for industrial use only; residential use (or use as a school, or hospital) is banned; and (2) establishment of a No Disturbance Zone near outfall 001. Navigational dredging or other in-water construction outside the No Disturbance Zone will not be precluded.

5.7.2.4.1 Controls Regarding Residential Use
The "industrial use only" restriction was created in 1997 as part of the “Hood Bay Land Exchange” between APC and USFS. This restriction was recorded in the Sitka Recording District. It is a form of deed restriction called a "Restrictive Covenant." See Book 126, Pages 709-716 at the Recorder’s Office (part of the Alaska Department of Natural Resources). The elements of that restriction are:

- No use for human habitation, schooling of children, hospital care, child-care, or any purpose necessitating round-the-clock residency by humans. The State of Alaska has authority to remove this restriction should a demonstration be made that contaminant levels are below the residential cleanup standards.

- The restrictions shall exist until 2097 or until DEC determines that human health risks to potential future residents are acceptable.

- The restrictions bind subsequent owners or operators of the lands, including lessees.

- The State may enforce these restrictions. Modifications may occur only by agreement of the Alaska Attorney General's Office and the property owner.

5.7.2.4.2 Additional Bay OU Controls

To ensure that natural recovery ecological management milestones occur within the stated time frames, and that contaminants of concern present at levels that may pose a potential risk remain unavailable to human and ecological receptors, the control measures described below shall apply to the Bay OU AOC. Appendix E of this ROD provides definitions and a diagram depicting the different areas described.

- A "No Disturbance Zone" (NDZ) has been established within the AOC and a notice of that fact will be recorded in the Sitka Recording District. The purpose of the NDZ is to ensure that no activity occurs that may compromise the ability of the area to achieve the recovery management goals within the stated time frame. The NDZ encompasses approximately 5-6 acres of pulp residue extending to the southwest immediately offshore of outfall 001. Limitations on activities in the NDZ include the following:

a. Log booms, pipelines, buoys, dolphins, pilings, and other structures in place in the NDZ at the time of this ROD may be maintained, repaired, or removed. These activities shall employ best management practices BMPs to ensure minimal re-suspension of pulp residue and disturbance of biota that may be colonizing the area.

b. A navigational boundary marker or other navigational aid(s) will be placed in the NDZ over the –50 foot contour at a point southward of the seaward corner of the south end of the existing dock, as determined in consultation with DEC and the US Coast Guard. To prevent disturbances from vessel propulsion, approaching or departing ships shall not pass over the NDZ shoreward of the line between the seaward corner of the dock and the navigational boundary marker.

c. Existing stormwater discharges are allowed from outfall 001 because they are not known to disturb bottom sediments. Other discharges may be allowed if they meet the requirements of the permitting agencies.

- A buffer zone has been established between the south boundary of the navigational corridor and the north boundary of the NDZ. The purpose of the buffer zone is to ensure that disturbances from navigational dredging and berthage do not affect the NDZ. Minimal disturbance construction, as described in number 2 above, is allowed within the buffer zone.

- Navigational dredging in the AOC is limited to the navigational corridor. New construction (such as single point mooring buoys, navigation aids, dolphins, pilings, and other structures) and ancillary dredging associated with construction may occur within the entire AOC, excluding the NDZ.

- BMPs for dredging or other in-water construction in the entire AOC will be employed to ensure that re-suspension of COCs is minimized. Specific BMPs shall be identified during the Corps of Engineers permit process, the Alaska Coastal Management Program consistency review, and in the DEC (401) water quality certification.

- Vessel anchoring is prohibited within the AOC, excluding securing to mooring buoys, piers, dolphins or fixed structures.

The control measures described above establish a hierarchy of activity that may occur within the AOC. Maximum disturbance is allowed within the navigation corridor: COCs in that area are not affiliated with the fine pulp residue prone to re-suspension. The material in the NDZ is more prone to re-suspension, more toxic to benthic invertebrates, and constitutes the poorest substrate for re-colonization by sediment dwelling organisms. Although the intent of the NDZ is clear, DEC recognizes as a practical matter that some intrusion will occur with limited "maintenance only" construction and incidental re-suspension from vessel props. In the remainder of the AOC, construction of new, permanent structures is allowed because potential impacts are minimal and short-term. Vessels are prohibited from anchoring in the AOC, however, because dragging anchors may impact the recovery process on a frequent basis and over a longer period of time.

5.7.2.5 Land Use Considerations

The potential effects on the remedy of a wide range of upland and navigational uses were considered. Existing and future navigational uses were examined in detail in a supplemental study by Foster Wheeler, *Decision Framework for Managing Navigation in Sawmill Cove*, which identified acceptable navigational options and uses compatible with the remedy. As noted earlier in this ROD, the City and Borough of Sitka will implement the remedial action under the *Management Plan for the Sawmill Cove Property*. The plan identifies specific short and long-term site controls and management measures to avoid adverse effects on the natural recovery process and to assure protectiveness of the remedy as the site is redeveloped under the City's land use codes.

6.0 REGULATORY FRAMEWORK

The APC Commitment Agreement (CA) sets the framework for the potential regulations that should be considered in the decision. The CA states that action levels and cleanup standards will:

- permanently reduce the volume, toxicity, and/or mobility of constituents of concern;
- not be inconsistent with the National Contingency Plan (NCP) 40 CFR 300;
- be consistent with all human health and ecological risk assessments;
- conform to 18 AAC 78.310(b) or with such similar rule as the Contaminated Sites Section may develop for general application;
- be consistent with applicable, relevant, and appropriate requirements of state law; and
- satisfy the requirements of 18 AAC 75.327.

Regulations and policy guidance that have directly or indirectly come to bear on the remedial action decisions are discussed below.

6.1 Applicable Regulations

The following paragraphs describe how various regulatory requirements are applicable or relevant to the site decision.

6.1.1 Oil and Other Hazardous Substances Pollution Control Regulations, Cleanup Standards (18 AAC 75)

The primary state regulation governing the disposition of contaminated sites in Alaska is 18 AAC 75 Article 3, *Discharge, Reporting, Cleanup, and Disposal of Oil and Other Hazardous Substances*. These regulations were promulgated in January 1999. These regulations focus on soil and groundwater contamination but provide pertinent guidance for contaminated marine sites. The regulations provide four methods of determining site cleanup standards. Human health and ecological risk assessments (Method Four) have been completed for the Mill and Bay OUs. The Mill OU may be closed under this regulation because no human health or ecological risks were documented.

Petroleum-contaminated soils were addressed through an expedited removal action. The removal action was implemented in accordance with *Guidance for Storage, Remediation, and Disposal of Non-UST Petroleum Contaminated Soils* (DEC 1991). Petroleum-contaminated soils were excavated from the Heavy Duty Shop, Paint Shop, Wood Room, and sediments from the sumps and drains at the DMS and placed in on-site treatment system. The cleanup levels were initially established according to 18 AAC 78 and the *Guidance for Non-UST Contaminated Soil Cleanup Levels* (DEC 1991). In January 1999 the cleanup levels presented in this guidance document were adopted into 18 AAC 75, Article 3. A subsequent request from APC for site-specific alternative cleanup levels for the material in the on-site treatment cells has been received. This request will be considered as part of the completion of the ongoing expedited remedial action.

For the Bay OU, 18 AAC 75.345 (d) states that toxic substances in sediment may not cause, nor reasonably be expected to cause, a toxic or other deleterious effect on aquatic life, except as authorized under 18 AAC 70. DEC has demonstrated that ***Natural Recovery with Long-Term Monitoring and Institutional Controls*** will fulfill the intent of this clause over time.

6.1.2 Alaska Water Quality Standards (18 AAC 70)

18 AAC 70 sets the water quality standards for Alaska for both fresh and marine waterbodies. The Alaska Water Quality Standards were reviewed in evaluating the possible impacts of the various remedial alternatives. The Water Quality Standards would be directly applicable to implementation of remedial alternatives that created in-water disturbance, and are indirectly applicable to natural recovery with monitoring in that they are one standard against which recovery can be measured.

Water Quality Standards consist of designated uses and quality criteria. The designated uses for the Bay OU are “growth and propagation of fish, shellfish, other aquatic life, and wildlife” (aquatic life) and “harvesting for consumption of raw mollusks or other raw aquatic life” (food consumption). The water quality criteria in the Bay OU are “toxics and other deleterious organic and inorganic substances” (toxics) as well as “floating solids, debris, sludge, deposits, foam, scum or other residues” (residues).

The risk assessments have shown that the designated water quality use for food consumption has never been impaired. A seafood bioaccumulation survey will be implemented as an action of this ROD to insure this designated use continues to be unimpaired. With respect to aquatic life, deleterious substances remain at concentrations in the AOC that may cause toxicity to benthic invertebrates. Thus, Sawmill Cove has not yet attained the level of quality sought by the toxics and residues criteria.

The natural recovery process is expected to improve the substrate to a condition that will fully support aquatic life in 40 years. Although both residues and toxic and deleterious substances may physically remain in Sawmill Cove after 40 years, if the ecological RAO has been met, the water quality criteria will also have been met.

The criterion for toxic substances does not apply to toxins that were "authorized by this chapter." In Sawmill Cove, burial and alteration of the benthic habitat was known and allowed by both EPA and DEC since 1957. In that year the territorial Alaska Water Pollution Control Board (AWPCB) conferred upon APC (then known as Alaska Lumber and Pulp) a permit to discharge pulp residues. In determining whether to grant the Permit, AWPCB was well aware that the discharge would settle if released in Sawmill Cove at the permitted rates. AWPCB was also well aware of alternatives available to alleviate the foreseeable buildup of toxic residues. (*Report on Silver Bay Water Pollution Control Studies Near Sitka, Alaska* [Eldridge and Sylvester, 1956]). With this knowledge the Permit was granted, authorizing the discharge and deposit.

EPA conducted a study of the water and aquatic life in Silver Bay in 1971 that was similar to, but on a smaller scale than, the Eldridge and Sylvester study. The results of that study were published in the report entitled *Effects of Pulp Mill Wastes on Receiving Waters at Silver Bay, Alaska.* Observations included a finding that "discarded solids, wood chips, and pulp fibers had formed sludge deposits blanketing 0.2 square miles which prevented the establishment of bottom-associated organisms and essentially eliminated all benthic animals in the area."

In May 1971 EPA issued a new permit to APC. The permit required primary treatment of pulp processing wastewaters. EPA issued a revised permit in 1973 requiring "best practical treatment" by 1977. While these discharge limits did reduce the quantity of settling residues, they did not, and were not intended to, eliminate them. A 1975 EPA report on studies implemented in association with the 1971 permit stated: "there remained… a significant paucity in the variety of bottom associated organisms in these reaches and no major change in the chemical characteristics of the sludge deposits, features indicative that the improvement process is nowhere near complete."

DEC provided a "Working Paper" on the water quality of Silver Bay-Sawmill Cove in 1980. This report noted that the deposition of residuals was being gradually reduced, but not eliminated. The report also recognized that effects to bottom dwelling life remained unaddressed.

The history of federal and state wastewater discharge permits for the APC mill show that burial and alteration of the benthic habitat was known and allowed by both EPA and DEC. However, the natural recovery process is expected to improve the substrate to a condition that will fully support aquatic life.

6.2 Other Regulations

State and federal regulations that indirectly bear on the site decision include Section 303(d) and (e) of the

Clean Water Act (33 U.S.C. § 1313 (d) and (e)), and 18 AAC 60 Solid Waste Regulations.

6.2.1 Clean Water Act, Section 303(d)

For each of the 14 freshwater and marine uses designated in the Alaska Water Quality Standards (18 AAC 70), criteria are specified for a variety of parameters or pollutants. The criteria are both numeric and descriptive. The pollutant parameters are fecal coliform bacteria, dissolved gas, pH, turbidity, temperature, dissolved inorganic substances, sediment, toxic substances, color, petroleum hydrocarbons, radioactivity, total residual chlorine, and residues (floating solids, foam, debris, deposits).

Section 303(d) of the Clean Water Act requires identification of surface waterbodies that are water quality-limited because of pollution. These waterbodies are ranked based on the severity of the pollution and other factors, and may require additional controls to meet water quality standards. The 1998 Section 303(d) list of impaired waters lists Silver Bay for toxic and other deleterious substance, residues, and dissolved oxygen (DO). At this time DEC and EPA are considering amending the listing to exclude DO, which no longer appears to be a problem because the mill process wastewater discharge has ceased.

A waterbody recovery plan typically describes the process and steps to be taken to restore a water quality-limited waterbody to a condition that meets the water quality standards for the pollutant parameters indicated. A waterbody recovery plan may include various restoration activities and a Total Maximum Daily Load (TMDL). The TMDL establishes the allowable loading for a waterbody, and thereby provides a basis for water quality-based controls. The recovery plan may also recommend other control measures. Although low dissolved oxygen levels in Sawmill Cove no longer appear to be a significant problem, the continued presence of residues and deleterious substances could require relocating the main outfall (001) for future discharges. This would prevent input of these pollutant parameters to Sawmill Cove.

6.2.2 Solid Waste (18 AAC 60)

The industrial waste disposal site (Industrial Mill Waste Landfill) across Sawmill Creek from the mill facility was closed by APC under DEC's 1987 18 AAC 60 regulations. On January 12, 1999 DEC informed APC that corrective action would be necessary at the landfill. The following problems were listed:

- Water often seeps out near the toe of the landfill. DEC believes these seeps are primarily caused by infiltration water from the hillside above the landfill.

- Waste is eroding along the steep slopes adjacent to Sawmill Creek. Some waste materials can be seen in the water, and a portion of the landfill toe appears to have been undercut by wave action.

- There are cracks and other signs that the waste may be settling or sliding in the areas where the slopes of the landfill are steep.

- Exposed waste including potentially dangerous items such as scrap metal and broken glass can be found on the landfill surface.

APC has submitted a preliminary corrective action plan that has been approved by DEC. DEC has also negotiated with City and Borough of Sitka and reached some basic agreements about the post closure monitoring requirements. APC will proceed with corrective action activities in the summer of 1999. When the work is completed to the satisfaction of the DEC's Solid Waste Program, the City and Borough of Sitka will assume the responsibility for long-term monitoring and any necessary future corrective action.

7.0 SUMMARY OF COMMUNITY INVOLVEMENT

In support of public participation throughout the project, DEC prepared a *Public Participation Plan* for the APC site. The Public Participation Plan outlines the various ways DEC communicated and interacted with community members and other stakeholders, lists site contacts and SIRT members, and presents community concerns identified early in the process. The plan was released for public comment in early 1996.

Other community involvement strategies included:

- primary project documents and supporting materials placed in the Sitka project document library located at the Stratton Library at Sheldon Jackson College;
- an open Administrative Record established at the DEC office in Juneau;
- regularly published and distributed fact sheets and newsletters;
- a Citizens Advisory Committee active in the planning stages of the project;
- public availability sessions at appropriate project milestones;
- open SIRT technical meetings; and
- a toll free telephone number to the project manager in Juneau.

The public participated in the selection of the remedies for Mill and Bay OUs during a public comment period from February 10 to March 15, 1999. The *APC Proposed Plan for Remedial Action, Mill and Bay Operable Units* presented combinations of options considered by DEC. The Proposed Plan was released was sent to 157 known interested parties, including elected officials and concerned citizens.

8.0 RESPONSIVENESS SUMMARY

This section responds to the substantive comments received during the public comment period following the issuance of the Proposed Plan. Similar comments have been paraphrased and presented together.

8.1 Human Health

Do not trust the results of the risk assessments. Common sense not to eat subsistence resources from Silver Bay.

Response: The human health risk assessment was rigorously planned, and evaluated over a two-year period. DEC is confident the results present a conservative estimate of risks contamination may pose to workers, subsistence gatherers, and other Sitka residents. The approach used to assess potential health effects is not inconsistent with accepted EPA procedures.

The industrial deed restriction on the mill site contradicted with the fact that nothing was done to address *the "hog fuel" used in Sitka residents' yards.*

Response: Prior to the mill's closure in 1993, approximately 200 residences and businesses in Sitka received wood materials, sometimes with hog fuel, from APC. These wood materials were used to make pulp or fuel for APC boilers. The materials included wood chips, bark, and "hog fuel." Hog fuel included natural wood wastes and a small percentage of sediment taken from the mill wastewater treatment plants.

In response to the comment, Foster Wheeler Environmental conducted a human health risk screening using available chemical data associated with hog fuel from the mill site. The screening used two types of data: soil data from the Hog Fuel Area of the mill site and wood chip leachate data. No formal investigations were conducted on the specific wood materials transferred from the APC Sitka mill site to residences or businesses.

The best available data (Hog Fuel Area soil and hog fuel leachate) were used to assess any potential for significant risks to human health. All chemicals evaluated, with the exception of arsenic, detected in either soil or leachate were present at levels below the DEC regulatory residential soil clean-up levels. Arsenic was detected in soil from the hog fuel area at a concentration approximately 10% higher than the DEC cleanup level, a value that is within the level of precision of the analytical method used to identify the concentration of arsenic. Arsenic was not a component of mill processes and, thus, would not be expected to be elevated in wood materials due to mill activities. ATSDR (1993) reports that natural arsenic levels in soil range from 1 to 40 mg/kg in the United States. The hog fuel area soil arsenic level is consistent with other arsenic levels found in the Sitka area, and probably represents a background concentration level. (*Hog Fuel Evaluation*, [Foster Wheeler, April 1999]).

It is not appropriate to use the Food and Drug Administration concentration for dioxin in fish.

Response: DEC did not use the FDA Advisory Guidance for dioxin levels in fish to arrive at a final remedy decision. In the Proposed Plan, DEC mentioned the FDA level as a basis of comparison, but has not used this number in risk management decisions.

8.2 Ecological

<u>Natural Recovery</u>

Habitat enhancement and or remediation such as capping or dredging should be implemented to speed recovery. Long-term benefits outweigh short-term water quality impacts. The benthic recovery is anemic at best. Lack of hard substrate in softer material precludes recolonization. Capping in conjunction with focused dredging would improve the substrate. There are currently few organisms to smother with capping material. Recovery after capping should proceed quickly. Without hard substrate to attach to, it is difficult to imagine how the sea anemones and nudribranchs common in other parts of Silver Bay will successfully re-establish in the AOC. The dive survey showed only bacterial mat species. No anemones or other macroinvertebrates were noted in the nearshore subtidal area.

Response: DEC has determined that any habitat enhancement efforts will be addressed under waterbody recovery rather than regulations promulgated to address the release of hazardous substances. DEC has further determined that no waterbody recovery activities requiring active intervention will be conducted in the Sawmill Cove AOC because construction activities will disturb the ongoing recovery process and re-suspend contaminants in the water column.

Capping or dredging may speed recovery to some degree in parts of the AOC; however, DEC does not believe such efforts are either prudent or justified at this time considering the localized nature of the benthic community risks (see Section 5). DEC disagrees that recovery is precluded by the absence of hard substrate, or "anemic" considering the mill has been closed for less than six years.

During the January 1999 dive survey, 51 epibenthic taxa and 12 species of fish were observed within the dive areas. The video survey of the nearshore subtidal area shows a biologically active epibenthos in the wood deposition zone. The epibenthic community is a mosaic that alternates between areas covered by the sulfur bacteria *Beggiatoa* and areas colonized by a variety of macroinvertebrate species. The presence of epifaunal invertebrates in *Beggiatoa*-free areas also implies the presence of dissolved oxygen at the sediment-water interface. The predominant macroinvertebrates consist of sea anemones (*Metridium senile*) and nudibranchs (*Coryphella fusca, Dirona albolineata*) and ascidians.

Observations of the bottom substrate during the dive survey indicated that in the area of the main pulp dock there were a variety of sediment types ranging from wood debris to rocky native sediments and fine sand and mud. Rocky rubble, gravel and large wood chips characterized surface sediments in the area between the pulp dock and utility dock. South of the pulp dock bottom material was dominated by fine wood waste material, although rocky substrates were present near shore. In front of the pulp dock there is an outcrop of native rocky material that follows the depth contours to the southeast. A variety of epibenthic species were associated with this area. The rocky substrate area had several epifaunal species (nudibranchs, anemones, tunicates, sea cucumbers, and crabs).

The area in which capping was determined to be feasible (depth and bottom slope restrictions) was in the area north of Outfall 001. This area totals approximately 3.6 acres and represents approximately four percent of the entire AOC. In contrast to concerns that "there are few organisms to smother," the sediment profile imaging and recent diver surveys have documented the presence of a variety of organisms in the areas potentially feasible for capping. Capping was determined to be infeasible in the softer material near outfall 001 that had the fewest organisms.

As indicated in the Feasibility Study, rapid benthic colonization has been initiated at a number of wood-detritus sites soon after abatement of the discharge. This also appears to be the case for much of Sawmill Cove, where Stage 1 (pioneering) and Stage 2 (transitional) infaunal communities are present in most of the AOC, and epibenthic biota were observed at depths above 60-ft. Hence, it is questionable whether short-term colonization (5-45 days as stated in the comment) would equal or surpass existing benthic succession, which has been ongoing for about 6 years since cessation of mill operations. Therefore, DEC is reluctant to sacrifice the successional progress made to date because it is uncertain whether capping (where it is feasible) would yield a substantial improvement at an accelerated rate of recovery.

Through the generation of a slime layer, the bacteria may prevent the exchange of oxygen between the "sediment" (pulp residue should not be considered natural sediment) and the water column, preventing the growth microbes that are essential to a healthy benthic community.

Response: Sulfur bacteria must compete with the autocatalytic oxidation of H_2S in oxygenated water. The slime may serve as a barrier between the anoxic H2S producing sediment, and oxygen-containing water.

Bacterial mats support the model of a recovering, naturally degrading system because their presence indicates:

- the existence of massive numbers of sulfur-reducing bacteria that are actively degrading wood-detritus in the surface sediments and generating H_2S as a degradation by-product of their activity;

- the existence of adequate supplies of dissolved oxygen at the sediment-water interface to support *Beggiatoa,* which is an aerobic bacteria; and

- the *Beggiatoa*-facilitated conversion of H_2S, which is toxic to aerobic invertebrates, to sulfate, which is substantially less toxic to aerobic invertebrates.

Sulfur bacteria such as *Beggiatoa* use oxygen from the water column to oxidize H_2S from the sediments, converting it to elemental sulfur, then to sulfate, for energy production. These conditions suggest that the *Beggiatoa* is acting like a terminal decomposer, moving the system towards an oxidized state where colonization by surface-dwelling invertebrates can occur.

The issue of oxygen exchange with surficial sediments should not be a concern in this instance for several reasons. First, the notion of a "barrier" was intended to express a competitive mechanism in a figurative sense, but does not imply that the exchange of oxygen or other dissolved constituents is completely occluded. If such a physical barrier existed, there would be no mechanism for diffusion of sulfate into the surface sediments, which is the primary source of oxygen for the sulfur-reducing bacteria that create H_2S during wood degradation. Also, video observations of the seafloor show that the epibenthos is very heterogeneous in most areas, and is comprised of a mosaic that alternates between areas covered by a white microbial mat (probably *Beggiatoa*) and areas colonized by a variety of macroinvertebrate species.

Wood waste is not intended to be representative of natural sediments; the use of the word is strictly a generic term. However, non-native sediments do appear to be providing the function of normal sediments in some areas of the AOC.

Low sedimentation rates in Sawmill Cove will result in a longer than reasonable (10 years) time frame for recovery. Disagree with the management goal time frame for recovery. Not sure how recovery estimates were generated. Not sure the performance measure can be attained. Need basis for management goal values. Ecological recovery management goals are not specific. Performance measures relative to succession goals need to be identified. Numerical monitoring endpoints should be identified. An adequate monitoring program is essential.

Response: DEC agrees that sedimentation rates are low in Sawmill Cove and will not assist natural recovery significantly. However, what constitutes a "reasonable" period of time for recovery is a judgement call based on the specifics of the site. In the case of the Sawmill Cove benthic community, the goal and milestones were established after a review of benthic recovery rates at other pulp mills and the recovery processes underway in Sawmill Cove. DEC's selection of a 40-year time frame was based on other studies of the recovery process in the vicinity of pulp mills located in Sweden and Canada. These are described in the document entitled *Fate and Effects of Wood Waste in the Marine Environment*, and in the *Bay Operable Unit Feasibility Study.* Although the process of colonization begins soon after abatement of mill discharges, these studies show that recovery can require 10 or more years in some locations. Consequently, the milestones were adopted in recognition of a process that can take place on the scale of decades, rather than years. DEC's adaptive management strategy for monitoring progress towards natural recovery addresses these concerns. The site will be monitored several times in the first half of the program. Adaptive management and contingency plans will address the issues of alternative approaches to site management where the absence of natural recovery is clearly a problem and warrants intervention. If the recovery rates actually observed in the AOC are significantly slower than the goal and the milestones that have been established, DEC will evaluate other existing or new alternatives for implementation.

Disagree with the statement in the Proposed Plan that states change in the abundance or diversity does not present an ecological risk. There are in fact risks to the bottom dwelling organisms.

Response: DEC agrees. Chemicals associated with wood waste decomposition pose a risk to benthic infauna as evidenced by the documented impacts. It is expected that risks and impacts will decrease over time.

Extent of infaunal recovery is unknown from the results of the recent dive survey: A benthic community analysis is needed.

Response: DEC acknowledges that the results of the dive survey cannot be used to determine the current extent or successional state of infaunal recovery. For these reasons, a benthic community analysis is a required component of the monitoring program.

Re-suspension of sediments in the dock area could impact the benthic community.

Response: DEC acknowledges that re-suspension of sediments immediately south of the dock could have on-going adverse impacts to natural recovery of the benthic infauna. An institutional control identifying this area as a No Disturbance Zone will therefore be recorded for the facility, and limits on activity have been imposed through the *Management Plan for the Sawmill Cove Property*. The management plan will be the "user's manual" for owners and operators of the site.

The issue of re-suspension due to prop wash is discussed in the technical memorandum entitled *Decision Framework for Managing Navigation in Sawmill Cove*. In areas where navigation has occurred in the past, sediments have been routinely and frequently suspended and re-deposited by prop wash. In the vicinity of the pulp dock, frequent re-suspension has effectively winnowed out the smaller particles of processed wood detritus, leaving behind primarily larger particles such as log splinters and chips. These larger materials are un-processed wood which decay at a very slow rate. Frequent re-suspension in the vicinity of the dock by prop wash has presumably re-oxygenated the surficial sediments and accelerated aerobic processes of degradation of any remaining processed wood detritus.

<u>Area of Concern</u>
Disagree with interpretation of data limiting the size of the AOC.

Response: DEC defined the AOC using a "multiple lines of evidence" approach. This included an evaluation of:

- sediment samples containing concentrations of contaminants in excess of comparative benchmark values;

- areas that showed significant toxicity as documented by laboratory bioassay; and
- sediment profile imaging information.

The AOC extends from the mouth of Sawmill Cove along the western shoreline towards Bucko Point and covers an area of approximately 100 acres. During the Feasibility Study, Foster Wheeler determined that although it was technically possible to implement remedial alternatives in water depths of 100 feet or more, it was cost prohibitive to actually implement the alternatives. As a result, the FS focused on the portion of the AOC that was less than 100 feet in depth. This portion of the AOC coincided with the area of greatest toxicity and with the highest concentrations of Contaminants of Concern.

The statement in the Proposed Plan that the information about sediment chemistry and toxicity further limited the AOC was not meant to imply that the AOC would decrease in size, but that an area within the AOC that is of greatest concern. The goals of the natural recovery alternative, however, apply to the entire area.

Use of historic infaunal biomass, diversity, and abundance data were not discussed in setting the AOC boundary.

Response: Historical information was used initially to assist in the planning and development of the RI study designs. Historical benthic community data pertinent to the preparation of the RI included the 1957 Eldridge and Sylvester study. This investigation was performed prior to the construction (filling of Sawmill Cove and redirection of the creek) and establishment of the mill. Two stations from this study were located within Sawmill Cove, but data were not were not useful for establishing the AOC boundary.

The AOC boundaries should be revised based on more recent information, such as the 1999 dive survey, the data overlays, and updated detailed substrate analysis in the navigation and benthic community succession memos. A follow-up technical memorandum on this proposal will be submitted.

Response: DEC used "multiple lines of evidence" to establish the AOC, including the Washington State Minimum Cleanup Levels (MCULs) for cadmium, 4-methylphenol, and benzoic acid; the results of the SPI; and the results of the specialized toxicity tests.

The adjustment to the AOC northern boundary, as proposed in the follow-up technical memorandum prepared on behalf of the commentor [*Technical Memo Regarding Adjustment of the Northern Boundary of the APC Area of Concern* (Foster Wheeler, April 1999)], would result in approximately a 2% reduction in the size of the AOC. The technical memorandum presented several pieces of evidence, which are summarized below.

- The chemical concentration of 4-methylphenol documented at Station SWSDD3 during the RI was 830 ug/kg, versus the Washington State comparative benchmark value of 670 ug/kg. This value could be considered an "outlier," and not related to the processed wood solids that were discharged from outfall 001.

- The bottom near the utility dock at the north end of Sawmill Cove is hard and consists of larger wood chips, in contrast to the soft bottom and processed wood waste closer to outfall 001.

- The January 1999 dive survey documented a biologically active epibenthos.

- The rock ledge in front of the main dock may have served as a barrier to the northward movement of processed wood solids.

DEC agrees that the bottom substrate off the utility dock is more conducive to benthic community recovery than the substrate near outfall 001, and that the 1999 dive survey provides visual evidence of an active epibenthos indicative of recovery. However, DEC has decided not to revise the AOC boundaries for the following reasons.

1. The presence of wood waste deposits from outfall 001 was only one of several factors used to delineate the AOC. DEC also used chemical benchmarks to define the northern boundary as described below.

    - The concentration of 4-methylphenol at Station SWSDC3 was elevated above the Washington State MCUL. DEC does not consider this an "outlier" even though the source of 4-methylphenol has not been documented to be from outfall 001. Making a positive connection to outfall 001 and the physical, biological and chemical findings was not a criterion used to screen out areas from the AOC. The Department was concerned about the impacts from all mill operations, including other outfalls, runoff from the facility, and air deposition. Although Foster Wheeler did not document site-specific toxicity from this chemical, to be conservative toxicity was inferred due to the uncertainties associated with the bioassay protocols.

    - Dioxin was elevated at Station SWSDC3 above the NOAA ecological benchmark. Dioxin was indirectly considered when establishing the AOC boundary. The stations with elevated 4-metholphenol encompassed all but two stations with dioxin elevated above this benchmark: one in the head of the cove and one along the Bucko Point shoreline. Dioxin was retained as a COC because of the unknowns regarding its effects to benthic infauna.

    - Cadmium at Station SWSDC3 was below the Washington State MCUL (5.8 mg/kg versus 6.71 mg/kg), but at a level that implies concentrations in the immediate area may be higher. The cadmium concentration at Station SWSDD25, the closest station to the south, was 8.26 mg/kg. As with dioxin, cadmium was used indirectly to establish the AOC boundary. Stations with elevated 4-methylphenol concentrations encompassed all stations where cadmium was above the benchmark, with the exception of one location along the Bucko Point shoreline.

2. The 1999 dive survey was useful but qualitative. Its primary purpose was to evaluate the substrate for navigational issues (dredging, re-suspension of pulp residue by vessels). It was not designed to provide the same level of rigorous information that will be required in the long-term monitoring program to determine whether the RAO has been met.

The majority of the area is within the Navigation Corridor. Navigational dredging, dock relocation and expansion, stormwater and relatively clean industrial wastewater discharges that meet water quality standards, and in-water construction are all planned and expected to occur with the area proposed for adjustment. As recognized in the *Management Plan for the Sawmill Cove Property*, DEC expects that the most intrusive and disruptive form of in-water activity (dredging) and other in-water facilities will occur in this area without negatively affeting the overall natrual recoery of the AOC. DEC will work with the City if concerns are raised by other permitting or reviewing agencies. DEC believes that the inclusion of this area in the AOC should not have a negative effect on future permitting.

Sediment Profile Imaging and Toxicity Tests
An independent evaluation of the SPI data from the Remedial Investigation was not conducted. SPI and toxicity tests were of limited value and questionable.

Response: DEC used the results of the toxicity tests and SPI conducted as part of the Remedial Investigation to help establish the extent of contamination in the Sawmill Cove AOC. DEC does not believe an independent evaluation of the data was necessary for that purpose. Though useful for establishing the AOC, DEC acknowledges the data are of limited value as a baseline for long-term monitoring. Consequently, a comprehensive baseline study will be initiated. The goals of the baseline study are fundamentally different than the goals of the Remedial Investigation

The toxicity tests were also used to evaluate short-term impacts that could result from construction activities associated with active remediation. The tests were valuable for that purpose. Sediment phase particulate (SPP) tests were conducted with Sea Urchin larva at 10, 50 and 100 percent SPP dilutions. Significant toxicity was evident at the 50 percent and the 100 percent SPP dilutions. These dilutions represent elevated levels of suspended solids that could occur as a result of human disturbance (e.g. dredge material disposal). Thus, this test indicates that under such conditions there would probably be some sort of short-term toxic effects to sensitive biota in the water column.

No toxicity was observed at the 10 percent SPP concentration, which is probably representative of natural processes of sediment disturbance and re-suspension. Because the 10 percent SPP dilution showed no effect, natural processes of sediment disturbance and re-suspension were judged to represent low potential risk to near bottom or pelagic receptors (refer to Section 5.4 of the Bay OU RI report).

The proposed plan states that ammonia did not appear to be a primary cause of toxicity. In fact, toxicity observed in almost half of the samples persisted even after ammonia and all other aqueous contaminants were eliminated from the samples.

Response: The Proposed Plan on page 6 states that ammonia did appear to be a primary cause of toxicity. Following the decision framework agreed to by DEC and the SIRT, only three toxicity stations (out of 18) exhibited any toxicity and only the acute amphipod test using *Rhepoxinius* was purged of ammonia.

Perceived Data Limitations
The data upon which ecological risk has been evaluated was originally proposed by Foster and Wheeler as a preliminary round only to identify the outer boundary of the fiber mat material; subsequent investigations were to refine initial indications of risk. Conclusions regarding ecological risk have been based on an investigative approach, which was exploratory (as opposed to more definitive) and experimental. The decision framework for evaluating ecological risk to benthic invertebrates was not adhered to despite approval by DEC and the SIRT. Specifically, bioassessment results, which identified the entire study area as toxic and thus would have subsequently enlarged the AOC, were ignored. Since sediment chemistry, which also identified the entire study area as an AOC, corroborated these results, they cannot be judged as spurious. The FS and proposed plan fail to consider the problems associated

with the limited nature of the preliminary data.

Response: DEC addressed these comments during technical and administrative review of the RI/FS and the Bay OU ecological risk assessment. These comments were resolved in two ways:

- during formal comment review and resolution meetings of the SIRT; and
- through additional technical meetings and memoranda conducted in support of the investigation.

DEC determined the objectives of the remedial investigation and ecological risk assessment were accomplished. DEC recognizes that initial study designs and objectives changed as more detailed site information became available. With respect to the Bay OU, three rounds of investigation were performed: 1) the initial investigation of bathymetry, bioaccumulation, sediment chemistry, and sediment toxicity; 2) sediment profile imaging to determine the extent of wood-detritus material in the benthos, and to determine the status of benthic communities in Sawmill Cove; and 3) engineering feasibility analysis for possible remediation of sediments in Sawmill Cove. All of the elements in these phases were integrated into the Bay OU ecological risk assessment. Although a number of other kinds of studies were considered, they were not performed for a variety of reasons, which were openly discussed with the SIRT. Although additional studies had technical merits and limitations, DEC determined that the available information was sufficient to make judgements about the site and to proceed with site cleanup decisions.

Uncertainties in technical issues have been addressed at each stage of the site investigation. DEC believes there are many scientific and engineering designs that could lead to an appropriate conclusion. Although the various phases of the Bay OU investigation may not be ideal in some respects, DEC believes they were sufficient to make appropriate judgements about further site management. Although additional studies may add technical precision to the process, DEC believes they would not substantially alter the site-management decisions. Nevertheless, to assure that the decisions and site remedy selected were appropriate; DEC is adopting an adaptive management strategy for monitoring site recovery. An important aspect of the adaptive management strategy is periodic and critical review of monitoring data and re-assessment of the program's overall goals and objectives. In this way, DEC expects to control and respond to consequences associated with any uncertainties in past site-management decisions.

<u>Rhodes and Germano Study</u>
The Rhodes and Germano study may not be applicable to Sawmill Cove.

Response: The Rhoads and Germano study was intended to document the use of the sediment profile camera system for documenting and interpreting benthic community recovery processes. The benthic recovery model used by Rhoads and Germano was based on the recovery model of Pearson and Rosenberg; the same model being used to predict recovery within the AOC. The time frames cited in the Rhoads and Germano paper are not directly applicable to the AOC and the recovery rates within the AOC are not expected or assumed to occur at this pace.

<u>Ongoing Risks and Impacts</u>
Ongoing risks and impacts have not been acknowledged. The Proposed Plan states that impacts will continue to occur for another 40 years, and 25% of the area of the AOC may not recover at all.

Response: DEC does not take the position implied above that recovery will take 40 years, and that 25 percent of the area will not recover. The Proposed Plan recognizes and acknowledges potential ongoing impacts as stated on page 18, "Other Monitoring Requirements." These concerns will be addressed as part of the long-term monitoring program. The recovery milestones identified in Table 9 of the Proposed Plan are intended to show progress toward natural recovery. DEC recognizes that the AOC is not homogeneous in nature. Documentation that all areas of the AOC have achieved each milestone is unrealistic. DEC anticipates that most of the AOC will recover sooner that the 40 year milestone. However, documentation of natural recovery in other similar environments is limited, so the time frames take into account the uncertainties associated with these other studies.

8.3 Alternatives Analysis

The most costly dredging option should be implemented.

Response: DEC has determined that the most costly dredging option is not the most balanced option to address the Remedial Action Objective (see Section 5). The selection of the remedial alternative – ***Natural Recovery with Long-Term Monitoring and Institutional Controls*** – was based on an evaluation of all the remedial alternatives with respect to Superfund criteria and AS 46.09. One component of the criteria is cost effectiveness. In evaluating cost effectiveness, DEC considered overall costs of each alternative. The dredging alternative is clearly more expensive than natural recovery; however, the benefits with respect to the other criteria did not outweigh the benefits of natural recovery.

Capping materials do not have to be biologically inert. There may be places in Silver Bay where navigation dredging could obtain suitable material.

Response: DEC agrees that capping materials need not be biologically inert. DEC is not aware of any planned dredging activity in the Silver Bay area that would produce native or non-native sediments that could be beneficially reused as capping material.

Hydraulic dredging and alternative remedial measures did not receive full consideration. Much of the wood debris volume in the AOC could be removed by dredging. Geotextile capping and the placement of rubble mounds were mentioned as possibilities by Peratrovich, Nottingham and Drage.

Response: Dredging technologies were discussed in Section 3.4 of the Bay OU FS report. A wide array of hydraulic and mechanical dredging technologies was evaluated in the report. This evaluation process followed a screening protocol that was described in Section 3.1 of the FS (Figure 3-1). This protocol evaluated the implementability, reliability and effectiveness of each technology. Conventional hydraulic dredging with suction and cutterhead dredges (Tramrod, Eddy Pump, Toyo Pump) were evaluated. Most hydraulic dredges have not demonstrated successful performance at depths below 100 feet. The overall reliability, effectiveness and cost per cubic yard dredged of hydraulic and mechanical dredging technologies for the AOC were judged to be roughly equivalent (Section 3.4.2). Hydraulic dredging was screened from further consideration due to the increased cost associated with downstream solids-liquid-separation and ultimate disposal costs associated with hydraulic dredging. A mechanical dredge with an 'environmental bucket' was proposed for use in the AOC at depths above 100 feet.

The amount of sediment that will 'be left behind' depends on the physical properties of the sediment (low density, high water content), the slope on which the sediments reside (steep, hard rocky substrate), the depth below the surface where the sediments are located, and the type of dredge used to remove the sediments. Low-density sediments will tend to flow back into the depression made by the environmental bucket as it is returned to the surface. A steep, rocky substrate prohibits over digging to remove sediments. The angular structure of the rocky substrate prevents the bucket from collecting sediments that may be in interstitial spaces. All of these factors are present in the AOC at depths above 100 feet, and will cause sediment to remain after dredging.

Dredging at depths below 100 feet has not been successfully demonstrated at sites like the AOC in Sawmill Cove (refer to Section 3.4 of the FS). DEC focused Foster Wheeler's efforts on the nearshore areas of greatest toxicity and highest habitat value. Two dredging alternatives were evaluated. These alternatives would reduce the volume of contaminants and pulp residue in the nearshore area, but DEC believes they could result in significant short-term impacts.

Sediment disposal options were evaluated in Section 3.6 of the FS. Again, a wide range of options was evaluated. Geotextile containment was discussed in Section 3.6.1.2 of the FS. This technology was screened out based on implementability and effectiveness issues.

The only nearshore area in the AOC exhibiting an absence of benthos is not amenable to rubble mounds. Rubble mounds will not provide suitable substrate for species requiring soft-bottom substrate. Creation of rocky or firm bottom "islands" that can be colonized by benthic organisms is being conducted experimentally at another site in southeast Alaska (Ward Cove). The extent to which such islands can act as centers of dispersal and colonization for the rest of the area is not certain, but will be demonstrated at the Ward Cove site. For Sawmill Cove, there is also considerable engineering uncertainty concerning placement of rock or sand on a wood-detritus substratum that has low shear strength and resides on a steep and inherently unstable slope. For these reasons, this option was not considered a feasible alternative for Sawmill Cove (see Feasibility Study). DEC does not expect rocky bottom taxa from the existing ridge or added rubble mounds to exploit or re-colonize surrounding soft bottom substrate.

Inaccuracies pointed out by Peratrovich, Nottingham and Drage on Foster Wheeler's alternatives analysis appear to have been carried forward into Proposed Plan.

Response: Section 3 of the FS was completely rewritten as a result of the comments that were received on the public review draft of the document. The revised section included a well-defined protocol for evaluating the implementability, reliability and effectiveness of technologies. A detailed summary of how each technology addressed these criteria was provided.

The FS contains multiple references to the "hazardous" nature of the sediments, and the ProposedPlan acknowledges that elevated concentrations of dioxins and furans, metals, semi-volatiles and PAHs occur in the AOC. However, this facet of the problem does not seem be a factor in the selection of the preferred option.

Response: The concentrations of chemicals found in the sediments were evaluated and considered in the Proposed Plan. As discussed in the Plan, the risks to human and upper trophic level ecological receptors were judged to be acceptable. However, the risks and impacts to the benthic community from hazardous substances released by APC, as well as from hazardous substances produced as a result of wood waste decomposition, were judged to warrant further action. The mitigation of these risks and impacts was the foundation of the remedial action objective that guided the alternative selection.

The ROD should clearly distinguish between concerns regarding dredging of fine pulp residue versus dredging in limited areas for navigational purposes.

Response: The ROD addresses these concerns.

8.4 Monitoring

Recovery Indices

Benthic community analysis and numeric endpoints to determine success are needed.

Response: The monitoring plan defines the approach to benthic community analysis. This approach includes an assessment of total abundance, major taxa abundance, indicator species abundance, biomass, species richness, diversity and dominance indices (Swartz dominance index, infaunal trophic index, and the organism sediment index).

Wet Weight Biomass

Wet weight biomass should be used as a measurement of natural recovery.

Response: DEC believes that wet weight biomass, although useful, will be redundant with the benthic infaunal analysis that will be conducted.

Sediment Chemistry

Sediment chemistry should only be used as a tool in the long term monitoring program to help evaluate why recovery is not occurring.

Response: DEC has determined that sediment chemistry is an essential component of the monitoring plan. Sediment chemistry will complement the benthic community studies by assisting with the interpretation of the results. Both the benthic community studies and sediment chemistry are needed to provide a comprehensive picture of the status of natural recovery over time, to help determine why recovery is either occurring or not occurring, and to assist with the "adaptive management" that allows for changes to the program over time based on information obtained at each monitoring milestone and interim monitoring event.

Waterbody Recovery

It may be useful to include waterbody recovery monitoring in the long-term monitoring program to be as cost effective as possible.

Response: The development of the Waterbody Recovery Plan for Silver Bay is a component of Alaska's compliance program with Section 303(d) of the Clean Water Act. Silver Bay has been a 303(d) identified waterbody since 1994 due to concerns with "toxic and deleterious substances, residues, and dissolved oxygen." While DEC agrees with the comment in concept, development of the plan has just begun. To the extent practicable, DEC will not duplicate efforts between the long-term monitoring program and the Waterbody Recovery Plan.

Interim Recovery Goals
Earlier recovery goals should be used as mileposts for evaluating recovery, not as triggers for human intervention.

Response: Active intervention early in the designated 40-year recovery period may be necessary if human health or ecological risks appear to be increasing, or if an unforeseen catastrophic event occurs.

AOC Perimeter Sampling
Infaunal sampling along the perimeter of the AOC should occur to verify and adjust AOC boundaries.

Response: Benthic infaunal community analysis is a key component of the long-term monitoring program, and will be used to evaluate the milestones and areas requiring additional sampling. The monitoring program will be designed to document whether the 40-year recovery goal has been reached in portions of the AOC. Future monitoring events will be adjusted accordingly, although the AOC boundaries will not change unless the ROD is amended.

Recovery Hypotheses
A series of draft hypotheses for long term monitoring need to be developed and discussed with interest groups.
Response: The purpose of monitoring is to document whether the stated Remedial Action Objective has been achieved. Hypothesis testing would be difficult because of the lack of a reference area. In addition, hypothesis testing requires statistical analysis to prove or disprove. Since the success of natural recovery will be judged temporally and spatially, it would be difficult to quantify statistically.

8.5 Miscellaneous

AOC versus Bay OU Study Area
The ROD should clearly explain how the AOC differs from the Bay OU study area.

Response: The ROD addresses this concern.

Dive Survey
The dive survey and video were not rigorously peer reviewed.

Response: The primary purpose of the January 1999 dive survey was to evaluate site characteristics pertinent to future vessel navigation and the potential for additional marine docking infrastructure. The video survey documented the physical substrate in the nearshore area, both photographically and by physical measurement, of non-native sediment deposition. The survey also provided qualitative documentation of the presence of surface dwelling macroinvertebrates and demersal fish. DEC considered this work to be supporting evidence for the remedial decision. However, DEC saw no added value in a rigorous peer review because its intended purpose was to assist the City and Borough of Sitka in determining future navigation and infrastructure concerns.

Site Decision Influenced by Economics and Politics

The choice not to dredge was an economic and political decision. This should be acknowledged.

Response: Protection of human health and the environment is a threshold criterion. DEC acknowledges that economics were considered in the decision because the economic environment of a community is relevant to its welfare. Cost is a relevant factor under the Superfund decision criteria (see Section 5 and Table 5.3). DEC determined that Sitka's economic concerns must be given consideration in the decision since human health risks and risks to fish and wildlife were documented to be minimal. Risk management decisions are made in a public context, with all relevant factors considered.

Industrial Landfill

The long term monitoring program for the landfill should be established for a shorter period.

Response: DEC's Solid Waste Program has established the parameters for post closure monitoring under 18 AAC 60. The monitoring program calls for 30 years, including the seven years the landfill has been closed.

DEC has not acknowledged the full extent of the industrial waste landfill problem. A better assessment is needed.

Response: An evaluation of company records and a comprehensive sampling of the landfill are unlikely to reveal the full nature and extent of the landfill contents. The presumptive remedy for a landfill which may have uncharacterized waste is capping and long-term monitoring. The process of excavating the landfill would probably have more adverse environmental effects than leaving it in place due to the inherent safety issues with excavating a landfill and the problems with disposal. To prevent potential further leaching from the landfill, DEC is requiring APC to improve both the landfill cover and diversion of water from the hillside. The landfill will be intensely monitored for up to 23 more years. Problems, if they develop, should occur within that time frame. Contingency actions may be required if monitoring documents the occurrence of significant environmental problems.

Method Detection Limits

Method detection limits for metals in the water column are too high to tell if there were chemical concentrations above the standards.

Response: In order to respond to the comment, a cursory review of detection limits is required. The concept of detection limits is not as straightforward as it appears. Key issues include: 1) detection limits are operationally defined and empirically determined; 2) detection limits are dependent upon a number of factors (at least 15), not the least of which are the matrix and the analytical protocol; and 3) EPA has used in various publications at least seven different defined detection limit types (e.g. instrument detection limit, method detection limit, reporting limit, practical quantitation limit, etc.).

There is no absolute value or standard fixed detection limit that may be achieved and applied in all cases. For this reason, data quality objectives (DQOs) are as indicated in the study design; that is, a table of desired objectives, which may or may not be achieved given the specific conditions of a given sample and instrument. Unfortunately, a perception persists that a failure to satisfy a DQO parameter (such as detection limit) must mean something is wrong with the analysis. The DQOs must be thought of in terms of desirable goals, rather than final criteria that determine the usability of data. DQOs are objectives, not criteria.

The DQO tables in the APC Field Sampling Plan are taken directly from the EPA or PSEP documents for the corresponding methods. This was deliberately done to avoid any question as to the authority/source of the objectives, including detection limits. These tables provide detection limits based on inter laboratory studies and define either method detection limits (MDLs) or practical quantitation limits (PQLs), based on the analysis of distilled water. In summary, an MDL is a statistically determined value calculated from the variance of the results from performing the test a number of times under controlled conditions. It is in theory the best detection the method (not instrument) can achieve. The PQL, on the other hand, is similar to a laboratory reporting limit (RL) and represents the detection limit a laboratory can routinely achieve for a given type of matrix. It is typically a factor of five to ten times higher than the MDL. If a matrix specific MDL study had been conducted (e.g. in marine water), the site-specific characteristics of the local matrix may still have precluded achievement of the study MDLs. Such studies (i.e. research) are not normally conducted as part of a remedial investigation.

Resource Conservation and Recovery Act SW 846 protocols were selected for this project rather than the CERCLA/SARA Contract Laboratory Procedures. A major reason for this selection was the published detection limits. The SW 846 limits universally provide lower published levels of detection than the pre-specified CLP contract required reporting limits (CRRLs). In a remedial investigation, one would not typically specify special analytical services (SAS) or customized analytical methods. Thus, at a minimum, standard industry practice was followed for this RI. With the inclusion of SW 846 and PSEP protocols to achieve lower detection limits, the project exceeded the standard which would be typically applied at CERCLA/SARA sites.

A review of the results against the APC DQO tables indicates that the detection limit goals were satisfied in most cases. A few metal analytes did not meet the detection limit objectives. However, given the above background information, one should realize that this is to be expected. It does not reflect adversely on the data sets or laboratory. It simply is attributed to the effect of the site matrix and method variability on the detection limit. Four metals in the marine water exceeded the DQOs (arsenic 1 ug/l vs. 5 ug/l typical, nickel 15 ug/l vs. 20 ug/l typical, selenium 2 ug/l vs. 5-20 ug/l typical, zinc 2 ug/l vs. 3 ug/l typical). These differences are not considered significant, and are well within typical values achieved in remedial investigations. Most importantly, had the DQOs been achieved for every case, the ability to interpret the data would not have changed dramatically. The approved Quality Assurance Project Plan DQO for copper (3 ug/l), which was achieved, and for nickel (15 ug/l) are above their unusually low marine chronic criteria values of 2.9 ug/l and 8.3 ug/l, respectively. These criteria levels cannot routinely be achieved in saltwater without employing custom, modified analyses. Such analyses are not routinely applied to a screening remedial investigation.

The appropriate marine water quality criteria were originally provided in Table 1 of Attachment 1 (Representative Numerical Criteria and Guideline Tables for Water and Sediment) to the Bay OU data package distributed on 3/21/97. The source of these values is EPA's Water Quality Criteria (the "Gold Book"). A comparison of these values with the results of the APC water column samples yields the following:

- For mercury, nickel, and selenium, the laboratory's typical reporting detection limits (RLs, similar to PQLs) are higher than the corresponding marine chronic criteria (but below the marine acute criteria).

In the case of copper, there are no chronic criteria, but a relatively low acute criterion; the typical RL for copper was higher than this criteria value.

- For all the other metals with criteria, RL were below the criteria values and are therefore not an issue of concern.

In the case of mercury, the typical RL was 0.5 ug/l. The EPA chronic criterion is 0.025 ug/l. This chronic criteria is well beyond what can be achieved with the standard method available today (cold vapor atomic absorption (CVAA) instrumentation), even in distilled water. (Best case CVAA MDLs are typically 0.2 ug/l in distilled water.) For context, Goldberg (1963) cites a range of 0.15-0.27 ug/l, and Brewer (1975) cites 0.03 ug/l for natural concentration of mercury in seawater. These concentrations were determined in research facilities under research conditions, and required large volumes of water. The only possibility to perhaps achieve lower mercury detection limits in site samples would have employed the latest ultra-trace analytical procedures involving ultra-clean sampling techniques. These methods and techniques are at the research level, beyond the scope of the APC project.

For nickel and selenium, the typical RLs were 20 ug/l and 20-100 ug/l, respectively. The EPA chronic criteria are 8.3 ug/l for nickel and 71 ug/l for selenium. For context, Goldberg (1963) cites the natural concentration of nickel and selenium in seawater as 2.0 ug/l and 4.0-6.0 ug/l, respectively, while Brewer (1975) cites values of 1.7 ug/l for nickel and 0.2 ug/l for selenium. In these cases, the matrix (saltwater - specifically the sodium and the chloride) precludes lower detection limits using the ICP MS or the GFAA following the standard specified procedures. The signals from the sodium and chloride (as well as other major seawater components) interfere with the detection of the micro components (e.g. nickel and selenium). Lower detection limits may have been achieved using customized preparation procedures, such as ion exchange and chelation or reductive precipitation. These procedures attempt to separate the target analyte(s) from the salt matrix. However, they are not standard EPA protocols, not typically used in an RI, and were not required in the approved Field Sampling Plan (FSP). If custom preparation protocols were employed to achieve lower RLs, they would impact, to a varying degree, the RLs for all the target metal analytes. While enhanced RLs might result for some metals, there is also a significantly increased potential for an adverse effect on the recovery (accuracy) and reproducibility (precision) of the method.

The typical RL for copper in the APC marine samples was 10 ug/l. An estimated value (below RL but above MDL) of 3 ug/l was reported in one sample. The EPA acute criterion is 2.9 ug/l. The same issues concerning saltwater matrix for nickel and selenium apply to copper as well. For context, Goldberg (1963) cites a value of 0.5-3.5 ug/l, and Brewer cites a value of 0.5 ug/l for natural concentration of copper in seawater.

The RLs described above relate to the data as presented in the reports; they are not the laboratory’s absolute method detection limits (MDLs). Their typical MDLs for the water column samples are as follows: copper 3 ug/l; mercury 0.1 ug/l; nickel 20 ug/l; selenium 5-20 ug/l. Following convention, any results that in the opinion of the bench analyst meet criteria for a detection of the target analyte (i.e. compound is present) that fall between the RL and MDL are flagged as estimated ("J" flag). Quantification of the target analyte between the reporting limit and the MDL is always somewhat subjective, and relies upon the experience of the bench analyst. However, one can assume that for values given as “less than” at the RL, and no “J” flag value appears, they are also less than the MDL concentration.

In summary, the detection limits appear to be sufficient for all evaluations against EPA water quality criteria, with the exception of the chronic criteria for mercury, nickel and selenium, and the acute criteria for copper. In the case of mercury, the chronic value cannot realistically be achieved analytically, and may be below the concentrations reported for natural seawater. For nickel, selenium, and copper, customized research protocols would be required to reduce the reporting detection limits further, due to the saltwater matrix. Such protocols are not normally employed in a remedial investigation. In addition, there is no guarantee that such protocols would always achieve lower limits, and they may adversely impact the accuracy and precision of the data.

<u>Gas Releases from Sawmill Cove Pulp Residue Deposits</u>
Restrictions on future use of the area need to account for exposure of humans and wildlife to potential release of gases.

Response: The last known sighting of floating pulp residue occurred in 1991. The probable cause of the floating residue was the release of gases. The mill ceased operations in 1993 and no known significant releases of gases have occurred since. DEC believes that this is due to several factors. Small-scale off gassing continues to occur from natural decomposition. Due to the high volume of solids discharged while the mill was operating, DEC believes there may have been periodic slope failure due to the build-up and subsequent sloughing of discharged wood solids on the deep marine slopes adjacent to outfall 001. This sloughing would release large quantities of wood solids and other materials, including gases such as methane, hydrogen sulfide, and ammonia, into the water column. DEC also believes that some of the small-scale gas releases could be attributed to plugging and subsequent purging of bubble tubes within the sediments. Since the mill ceased operations, wood solids are no longer being discharged and sediments are decomposing and consolidating, thus reducing the potential for slope failure events.

This concern was addressed in detail in the document entitled *Fate and Effects of Wood Waste in the Marine Environment*. Section 6.3 of that document evaluated potential effects to human health via exposure to gases emanating from the seafloor. The results of that analysis indicate that chemicals generated by the decay of wood waste on the seafloor are not predicted to cause any meaningful exposure or affect humans at the sea surface. Control measures will be employed to ensure that disturbance of the wood waste in areas currently releasing gases is minimized.

<u>Contingency Actions</u>
Contingency actions for unexpected pollution events should be identified. Contingencies if natural recovery is not occurring as expected should be identified.

Response: Unexpected pollution events are typically addressed by DEC and other state and federal agencies. DEC sees no need to develop detailed contingency plans for hypothetical events unless required under existing regulations (i.e., oil spill contingency plans). The detailed workplans for monitoring recovery of the Sawmill Cove benthic community will specify the goals for each stage of natural recovery. Contingency action may be initiated if there is regression or stasis in the natural recovery process. However, DEC will weigh the need for contingency action against the same criteria used to evaluate the alternatives described in the Feasibility Study.

Institutional Controls
The Proposed Plan did not consider institutional controls that may be necessary.

Response: The Proposed Plan discussed the need for institutional controls but did not discuss details. They are presented in Section 5 of this ROD.

Habitat Restoration at Herring Cove
Support some form of restoration project for herring spawning habitat in Herring Cove.

Response: Habitat restoration is not addressed in this ROD because the remedial action decision specifically pertains to the prior release of hazardous substances by APC under the terms and conditions of the 1995 Commitment Agreement. Habitat restoration projects may be addressed under waterbody recovery planning efforts conducted under section 303(d) of the Clean Water Act.

9.0 REMEDY REVIEW AND SITE CLOSURE

Pursuant to 18 AAC 75.380 after reviewing the final cleanup report for the AOC, if DEC determines that:

> (1) the cleanup is complete in accordance with requirements of the ROD, it will issue a written determination that the cleanup is complete, subject to a future department determination that the cleanup is not protective of human health, safety, or welfare, or of the environment: or
>
> (2) the cleanup and applicable institutional controls are not protective of human health, safety, or welfare, or of the environment, the department will, as necessary to ensure protection of human health, safety, or welfare, or of the environment, require consistent with the terms of the *Prospective Purchaser Agreement* and the *Management Plan for the Sawmill Cove Property*, additional actions that may be necessary to protect human health, safety, or welfare, or of the environment.

10.0 APPEALS

A person aggrieved by this decision may request an adjudicatory hearing under 18 AAC 15.200 – 18 AAC 15.920, which provides a 30-day period for such requests.

11.0 LIST OF APPENDICES

Appendix A: Mill Operable Unit Data Summary
Appendix B: Bay Operable Unit Data Summary
Appendix C: Pertinent Figures from the Remedial Investigation/Feasibility Study
Appendix D: Monitoring Program
Appendix E: Management Plan for the Sawmill Cove Property
Appendix F: Technical Documents Used as a Basis for the Decision