FOSTER WHEELER ENVIRONMENTAL CORPORATION

April 13, 1999
FWBEL-1442-99-O-483

Distribution

SUBJECT: APC - Transmittal of the Technical Memo Entitled: Decision Framework for Managing Navigation in Sawmill Cove

Dear Recipient:

I have enclosed a copy of the subject technical memo for your review. The document identifies and describes options available for managing navigation in Sawmill Cove that are compatible with the natural recovery/monitoring alternative selected for implementation in Sawmill Cove.

Sincerely,
Foster Wheeler Environmental Corporation

Dan McCarthy

Daniel A. McCarthy
Project Manager

Enclosure

Distribution:
Sitka Document Repository (2)
T. Cole, CBS
B. Dennison, CBS
K. Wiener, PGE
R. Pool, APC
S. Minter, SRI
D. Rudis, USFWS
B. McNitt, SCS
B. Richards, E&E
J. Clark, RME
E. Ballard, BA
R. Kauffman, ATSDR
M. Buggins, CBS
B. Janes, ADEC (2)
R. Klein, ADEC (2)
H. Hillman, NOAA
M. Buchman, NOAA
J. Lorrigan, STA
L. Flynn, E&E
B. Adams, EPA
K. Williamson, TOSC

PLAZA CENTER BUILDING
10900 NE 8TH STREET, SUITE 1300, BELLEVUE, WA 98004
TEL: 425-688-3700 FAX: 425-688-3952

EXHIBIT 7

April 13, 1999

DECISION FRAMEWORK FOR MANAGING NAVIGATION IN SAWMILL COVE

1. Introduction and Purpose of Document

The State of Alaska and City and Borough of Sitka (Sitka) have consistently identified the goal to restore Sawmill Cove to productive economic use for the community in conjunction with remedial decisions. This interrelationship is reflected in the final Bay Operable Unit Feasibility Study Report (Foster Wheeler 1999) approved by DEC in February 1999. This approach is also consistent with the State of Alaska's and US EPA's brownfields initiatives.

Sawmill Cove is one of the relatively few locations in Southeast Alaska with natural deep water moorage adjacent to a sizeable flat upland area with existing infrastructure (roads, water, power, etc.). Although the immediate need for redevelopment has been identified by the state and by the local community, it is also recognized that decisions made today are likely to affect the potential use of the site for many decades, especially if the property is in public ownership.

It is therefore important for the short and long term protectiveness of the remedy and for the short and long term options for navigational use to complement each other to the extent possible.

The purpose of this document is to identify and describe options available for managing navigation in Sawmill Cove compatible with remedial options. . Two basic management options have been identified that would permit navigation (vessel usage) at the docks to continue and expand in the future while protecting the integrity of the remedy. These are:

- Management Option 1: Continue Use of the Existing Docks with Periodic Maintenance Dredging
- Management Option 2: Construct marine facilities and improve navigation, where applicable, to accommodate a wide range of vessels including larger vessels than those previously calling at the APC mill site.

These management options are described and developed in Section 4 of this Decision Framework.

This document develops the actions, including potential dredging or structural improvements, that may be required to: 1) continue active navigation based on the dimensions (length, width and draft) of vessels that called at the docks in the late 1980s and early 1990s; and 2) provide for a wide range of vessels that may call at the docks in the future. This document addresses topics such as the likely navigational corridor along western Sawmill Cove, navigation and moorage to avoid disturbance of the remedy, dredging or removal of surface non-native sediments, conceptual layout of potential future marine terminal facilities, and the permitting actions that would likely be required to implement several potential dredging and vessel docking scenarios.

The in-water construction and environmental issues associated with the range of options are also analyzed to ensure short and long term compatibility with the site remedy.

2. Area Covered in the Analysis

2.1 Description of Docks and Physical Setting

The natural contours and bathymetry of Sawmill Cove were substantially altered when the APC mill was constructed in 1956. As described in more detail in the RI/FS, the creek was re-routed to the east side of the head of the cove and the delta and its intertidal area were filled. This resulted in generally steep shorelines. Even the head of the cove, which has a more gentle slope, has relatively steep shorelines with a large central area between the 40' and 60' contour and then a very steep descent to over 150' in depth. Consequently, the current contours would allow for deep water moorage along most of Sawmill Cove's shoreline. Although Sawmill Cove's native sediments are composed of a sandy-silt substrate, the steep shorelines are underlain by substantial rocky material, some of which is exposed.

The Area of Concern (AOC) generally extends in a rough semicircle from Outfall 001 on the west bank of Sawmill Cove south of the APC pulp dock. The active navigational area has been north of Outfall 001, from the pulp dock to the utility dock in the head of Sawmill Cove. A substantial portion of this area is located within the current AOC and impaired waterbody boundaries. Given the location of the former mill upland area and the existing serviceable docks, vessel traffic is likely to traverse the deep areas of the bay, approach the docks, and moor on the west shoreline from the pulp dock north to the utility dock in roughly from the –30' to the –60'contour. For purposes of this analysis, this area can be expected to be the most active "navigation corridor."

It is technically possible to construct navigational facilities elsewhere in Sawmill Cove, such as the eastern shoreline or the shoreline south of the AOC to Bucko Point. In addition to the infrastructure costs and steep uplands in these areas, they are a considerable distance from the AOC and former mill site, so it is not necessary to analyze them in this paper for expected use or compatibility with the remedial options. Analysis of single point mooring in Sawmill Cove is included in this document to address the potential for larger water tankers or other very large vessels.

A dive survey was conducted on January 23-24, 1999 in the area from approximately the vicinity of Outfall 001 to the utility dock as shown on Figure 1. This dive survey was conducted by Marine Taxonomic Services LTD (MTS) employing four divers. The purpose of the survey was to: 1) obtain videotapes of the subtidal zone to identify the natural recovery processes that are underway in the area; and 2) to obtain information on the general bathymetry and non-native surface depositional materials from the shoreline to the approximate 60 foot contour line. The results of the diving survey are described in the MTS summary report (MTS 1999). The information from this recent diving survey has been used to in conjunctio with other studies to describe the existing facilities, the existing substrate, and in the analyses of navigational impacts and recommended institutional controls.

There are four main navigational facilities in Sawmill Cove, in addition to various dolphins and pilings: (1) the APC pulp dock; (2) the utility dock; (3) the rail unloading facility; and (4) the mooring buoy.

Pulp dock

The APC pulp dock is situated in front of the warehouse facility in Silver Bay. It is a reinforced concrete structure approximately 600 feet in length and 75 feet in width. The concrete deck is supported by 300 steel piles spaced on 10-foot centers that parallel the face of the dock and 14-foot centers perpendicular to the face of the dock. The inner two rows of piles parallel to the dock face are 10-inch I-beams; the outer three rows are steel pipe piles (circular shapes) approximately 14 inches in diameter. The concrete deck is at elevation +19.6 feet Mean Lower Low Water (MLLW). There is a steel beam with rubber bumper fender system attached to part of the face of the dock.

A plan view of the pulp dock area is shown in Figure 1. This dock and the features below it were engineered to permit the docking of relatively deep draft (approximately 30 to 35 foot) vessels. The pulp dock extends out over the shoreline (west to east) approximately 75 feet. The slope of the shoreline beneath the dock varies between approximately 1 (V) on 2 (H) to 1on 1. The water depth directly below the face of the dock varies from approximately 15 feet below MLLW at the extreme northern end of the dock and between 27 and 36 feet below MLLW along the rest of the dock. The –60' contour is approximately 170 feet bayward of the face of the dock at the southeast and northeast corners. The slope under the dock was engineered to armor the shoreline with riprap (large rock) and concrete armor covers.

Starting at about 15 feet from the face of the pulp dock near its center and continuing bayward in the southeast direction is a prominent rock feature overlain by gravel, cobbles and boulders. There are three bedrock exposures along the length of the rock feature with surface elevations of –35 feet MLLW and –38 feet MLLW. This rock feature projects at least 200 feet away from the face of the dock at a nearly level profile, similar to a rock ridge. (For a plan view of the feature, refer to Figure 1 and Figure 3-4 in the APC Bay OU Feasibility Study report.)

Utility dock

The utility dock (also shown on Figure 1) is located approximately 600 feet north of the pulp dock. It is a reinforced concrete structure approximately 200 feet in length and 85 feet in width. The concrete deck is supported by piles consisting of 14-inch diameter steel cans filled with concrete. The elevation of the deck of the utility dock is approximately +20 feet MLLW.

The elevation of the mudline along the face of the dock varies from about –13 feet MLLW at the southern end to about –23 feet MLLW at the northern end. The bottom slopes vary between 1 on 2 and 1 on 4 to the –40 foot contour. The upper end of Sawmill cove is approximately 300 feet north of the utility dock.

Railcar Unloading Facility

The Railcar Unloading Facility is located just south of the utility dock. It has a movable ramp that is approximately 40 feet wide and 70 feet long. It has two sets of rails for off- and on-loading railcars. When the mill operated, rail car barges came to Sitka twice each month with supplies, chemicals, fuels and equipment.

Mooring Buoy

The mooring buoy is anchored near the outward corner of APC's tidelands property boundary. The buoy is lighted and maintained by APC and is regulated by the US Coast Guard. Traditionally, the buoy has been used to tie off barges.

2.2 Characteristics of Exposed Sediments

This section describes the surface sediments from the shoreline to the indicated contours, extending from approximately 700 feet south of the pulp dock to the north end of the utility dock. As noted above, the navigation corridor and moorage within or proximate to the AOC would likely be in the area from the pulp dock to the utility dock and from the shoreline out to approximately the 60 foot contour.

The basis for surface sediment descriptions are observations made along 18 of 22 transects during the January 23-24 diving survey (MTS 1999). These descriptions do not provide the actual bayward limits of the deposits described. They indicate the contours to which the deposits were either measured or observed. Table 1 shows tabular cross-sections of the transects taken in the area from the pulp dock to the utility dock, along the likely navigation corridor. The cross-sections indicate the water depth and thickness of the non-native surface sediments and the depth to native sediments out to the approximate 60 foot contour (pulp dock) and 40-foot contour (utility dock). The characterization in this section also includes the data on the physical properties of the wood-based materials deposited in the northern portion of Sawmill Cove obtained from the Engineering Field Sampling (EFS) and Sediment Profile Imaging (SPI) Reports. Figure 2 provides a data compilation showing the approximate depths of non-native sediment in this area from all of the surveys, borings, and sampling performed in the RI/FS process.

Area south of pulp dock near Outfall 001

From the south end of the dive survey area at Transect 22 to the Outfall 001 location, there is a surface deposit of fine wood chips (up to ½") circumscribing a deposit of fine material which has wood chips and alder leaves mixed with it. The outer edge of the fine wood chips follows the approximate 50'contour and then spreads bayward to the approximate 80' contour. From just north of Outfall 001 to the south edge of the pulp dock there is a narrow band of medium (1" to 2") wood chips and log splinters extending out from the shoreline to the approximate 80' contour. The solids deposited by Outfall 001 (cross-section 1 downstream of the outfall in the EFS report) have a very low dry density (15pcf), high volatile solids (69 percent) content and a high moisture content (378 percent or about 3.8 parts water for each part solids).

Area adjacent to pulp dock

With the exception of the rock feature described above, the surface area in front of the pulp dock is comprised of a variety of sediments ranging from fine wood debris to fine sand. The fine surface sediment does not appear to extend under the dock as native sand and gravel was observed on the bed at that location. As measured by diver probes, the thickness of the depositional material varies from zero to more than 10 feet (in the one hundred feet section between the two southernmost transects T-14 and T-15). For nearly the full length of the dock (from transects T-9 to T-14), the thickness of the depositional material ranges relatively consistently between 2 and 5 feet at depths of less than approximately -50 feet. The boring logs from samples B-4A and B-4B on the 40' contour southeast of the pulp dock (near T-16) indicate that the covering layer of fine wood material on top of the other non-native sediments is less than two feet. This layer is likely to be even less along the pulp dock, since these sediments were dredged in 1989 (see Section 3.3).

Near the north end of the dock, there is another narrow band of medium wood chips from the shoreline bayward to the 60' contour. The information from the EFS and SPI reports and 1999 MTS survey suggest that the solids present near the pulp dock (but deeper than the berthing area) are likely to consist of a gradation of mostly processed wood solids at the south end of the dock (cross section 2) to mostly wood chips and bark at the north end of the dock.

At the south end of the pulp dock (cross-section 2 in the EFS report), the volatile solids content was 32 percent, and the moisture content was 173 percent. The solids in this area contained more natural silts, sands and wood chips than the solids deposited by Outfall 001.

Area north of pulp dock to utility dock

The sediments in the area north of the pulp dock are harder substrates largely characterized by rock, gravel, sand, and wood chips and appear to represent a distinctly different regime than the outfall sediments (FWENC 1999 b). From just north of the pulp dock to a point near the railroad car unloading facility, the bed out to the 40' contour is comprised of rock rubble which transitions into native gravel. According to APC employees, the rock rubble was placed in the area between the pulp dock and rail spur during construction to stabilize the shoreline. North of a gravel area, there is a deposit of bigger (1"-2") wood chips along the shoreline in front of the railcar unloading facility extending northward to the south end of the utility dock and bayward to the 40' contour. Sampling east of the 50' contour near the rail car unloading facility measured the apparent thickness of non-native sediments at two feet. Immediately in front of the utility dock (transects T-1 through T-3), there is a deposit of fine wood chips (up to ½") from 4 feet to more than 10 feet in thickness (boring B-8A off the north end of the utility dock indicated wood chip thickness of 22 feet). Although not measured, the wood chip deposits likely extend north to the head of Sawmill Cove. As has been found at other chip unloading facilities, the layer of wood chips appears to be in close proximity to the unloading dock. It is thinner and more sporadic south of the utility dock along transects T-4 through T-6, where results of four of the seven diver probes ranged from 0' to 1'. The locations and thiekness of non-native surface materials are shown on Figure 2.

Biological conditions

A variety of epibenthic species are associated with this area. The rocky substrate area north of the pulp dock has several epifaunal (nudibranchs, anemones, tunicates, sea cucumbers, crabs) and fish species. Overall, 51 epifaunal taxa and 12 species of fish were observed (MTS 1999).

The video survey of the nearshore subtidal area (i.e., 0 – 60 ft) along most of the length of this shoreline including the former outfall area shows that a natural recovery process is underway. A biologically active epibenthos was present even in areas dominated by fine wood waste material. The epibenthic community in these areas is a mosaic that alternates between areas covered by a white microbial mat (probably the sulfur bacteria *Beggiatoa* sp.) and areas colonized by a variety of macroinvertebrate species. Sulfur bacteria such as *Beggiatoa* use oxygen from the water column to oxidize hydrogen sulfide from the sediments, converting it to elemental sulfur, then to sulfate, for energy production. The presence of large populations (microbial mats) of *Beggiatoa* implies three conditions:

- The presence of underlying anaerobic sediments
- Degradation of wood detritus to yield high concentrations of hydrogen sulfide in the sediments
- The presence of well-oxygenated seawater at the sediment-water interface.

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*), nudibranchs (*Coryphella fusca, Dirona albolineata*), and ascidians. Presumably, the *Beggiatoa* have moved the system towards recovery by removing hydrogen sulfide, and, thereby preparing the near-surface sediments for colonization by surface-dwelling invertebrates. This mosaic pattern of *Beggiatoa* and epifaunal invertebrates (particularly the nudibranchs *Coryphella* and *Dirona*) were observed to depths of over 60 ft.

A large portion of the wood deposition zone has been colonized by a variety of infauna and epifauna that are indicative of natural recovery processes. Stage 1 (early colonizing) infaunal assemblages were observed in SPI images throughout much of the wood deposition zone, including areas that show wood depths of approximately 10 feet. A variety of epifaunal organisms, as well as bacterial mats were identified in nearshore areas where original SPI results were not interpretable.

3. Past Vessel Usage at Dock

3.1 Vessel Description and Movement

Up to the mid-1970s, ships frequenting the APC pulp dock were pulp and lumber carriers that were specially designed for APC. These ocean-going vessels were about 490 feet in length and 11,000 dead weight tons (DWT) in size. They arrived at the APC mill empty and departed partially or fully loaded. They were maneuvered into the berthing area and up to the dock with two tug boats. In the mid-1970s, the *Baronoff* class vessel was introduced. This vessel came in empty and departed fully loaded again using two tug boats to assist. Starting in the early-1990s, pulp ships came in both light (first call) and nearly loaded (last call). Some of these vessels were equipped with bow thrusters and some were not. In the later years, the number of ships calling at the APC pulp dock was approximately two per month. These ships were general bulk carriers and were 500-650 feet in length, 80-90 feet in width and 32,000-44,000 DWT in size. Normal loaded draft was about 10 meters (32.8 feet), although some had a loaded draft of 11 meters (36 feet) (Cronk, 1999). These vessels represent approximately the deeper draft vessels capable of using the current pulp dock.

Ships without bow thrusters entering the berthing area, requiring assistance of two tugboats, were first nosed into the pulp dock at the bow and then pushed into the dock at the stern. Upon departure, the ships were pulled away from the dock by the tugboats until they were in deeper water. Then, using ship's propulsion in reverse, the ship moved south to a point where the cove was wide enough to enable turning of the ship. At this point, the tugs pushed on both the bow and stern and the ship was rotated 180 degrees to head outbound (south) and departed using vessel propulsion.

Ships with bow thrusters calling at the pulp dock angled into the berthing area with the nose of the ship toward the dock . At this point, while in deeper water prior to reaching the dock , the bow thruster was used to move the nose of the ship to the north end of the dock. Following this maneuver, ship propulsion was put in reverse and the variable pitch rudder was also reversed. The tug would then assist and push the stern of the ship into the dock. For departure, the tug, pulling at the stern, and the bow thruster would be used in concert to pull the ship away from the dock into deeper water. Then, using ship's propulsion in reverse, the ship moved south to a point where the cove was wide enough to enable turning of the ship. The ship would then be rotated 180 degrees using the bow thruster and the tug pushing at the stern.

The utility dock has been used for unloading oil and wood chips during the operational life of the mill. Chip barges, with lengths of 160 to 200 feet and drafts between 10 and 15 feet, would call at the utility dock frequently (approximately every other day). The barges would be unloaded with a clamshell which resulted in chip spillage adjacent to the dock. Oil barges with approximately the same dimensions would call at the dock about twice a month. Prior to 1974, oil tankers of 610-foot length and approximately 20-foot draft would call at the utility dock.

Barges bound for the utility dock would be maneuvered into the dock using the tug boat that had brought them to the site. Out in Silver Bay, the tug boat would be tied to the starboard side of the barge with about 1/3 of the tug's length positioned aft of the barge and 2/3 of its length positioned along side the barge. The tug would then maneuver the barge alongside the dock and push it to the dock using port rudder and tug power. Maneuvers for departure would be the opposite of those used for docking.

3.2 In-Water Construction and Vessel Prop Wash and Scour Considerations

The continued use of the existing docks and the in-water construction and use of new docking facilities have the potential to resuspend some of the surface sediments located near the facilities. The extent of the resuspension expected when past practices are resumed or when new practices are initiated can be estimated. The methods traditionally used to perform these estimates are summarized in this section. The anticipated environmental (toxicity, TSS, DO) consequences associated with the resuspension of sediments near the existing and potential future docks are described in Sections 4.1.2 and 4.2.4.

3.2.1 Resuspension Considerations Due to In-Water Construction

Two types of pile installation may be required for any additional docks or dolphins. The first is the more traditional driven piling wherein the piling is spotted by a crane with leads. It is then positioned over the proposed location and driven to design depths or specified blow count using an impact (air or diesel) hammer. This type of installation sequence would probably not noticeably disturb loose sediments except immediately surrounding the point where the pile is spudded in. As long as the piling remains in this location there would be minimal sediment resuspension during driving.

The second type of piling installation which may be required is to socket and anchor the piling in bedrock. For this type of piling a drilled hole slightly larger than the outside diameter of the piling is advanced through the rock to a specified depth. Before the drilling can take place, any relatively thin layers of overlying sediment may need to be removed by clam shell, airlift or water jet. This would disturb the sediments. If there is more than 2-4 feet of overburden, a casing might be used with the material inside cleaned out by jetting or augering. For a 14- to 16-inch diameter piling, a 3" pilot hole might first be advanced, followed by a larger bit. Divers might be required to jet material, clean a casing, or spot the drill. Once the hole is drilled, the piling are slipped into the socket. A second hole is then drilled through the piling for an anchor tendon, Since the piling is in place, no additional disturbance to the sediments would occur during drilling the second hole. The tension rod and interior of the piling are then typically grouted. Depending on the procedures used and sediment overburden, drilling and socketing would probably disturb the sediments in the area of the hole more than simple pile driving. However, with care the disturbance should not extend more than 2 to 4 feet from the pile. As revealed by the Dive Survey, there was gravel and cobbles on the surface of the rock feature in front of the pulp dock (see Figure 2). Consequently, there would not be sediment resuspension from construction activity in this area.

3.2.2 Evaluation of Potential Vessel Scour

The resuspension of sediments due to vessel scour depends on the physical properties of the sediments, and the type and configuration of the vessel. The sediments present near the pulp and utility docks have been influenced by the effects of maintenance dredging and prop wash from ships that routinely used the docks (refer to Sections 4.1.2 and 4.2.4.1). Based on observations during past docking of vessels and barges (Cronk 1999), these sediments are not likely to resuspend significantly if past vessel usage is resumed or if larger vessels call here or near the utility dock under Alternatives 3 and 4. The only resuspension observed was for a brief period of time at a location south of the pulp dock as the stern of the vessels swung into the dock.

As described above, the sediments in a small area south of the pulp dock could experience some resuspension as occurred in the past. (As evidenced by the videotape survey, fine wood waste material was only observed in the vicinity of the pulp dock in water depths approximately > 40 feet.) Although biological toxicity tests have not been conducted on sediments collected from under or adjacent to the pulp dock, the sediments that are present in these areas (as described above) are not likely to exhibit toxicity to benthic organisms since the sediments are primarily wood chips and bark that do not degrade readily. The largely inorganic materials, wood chips, and bark are not likely to exhibit wood degradation-derived toxic effects (caused by the generation of ammonia, sulfide, and related compounds) found at sediment sampling stations south of Outfall 001. These effects are caused by the chemical decomposition of the processed wood material that is present in the sediments south of Outfall 001.

Physical observations of the bottom materials in the utility dock and rail car areas (diver surveys and borings) indicate that there is a deposit of large (2-4 inch) wood chips in front of the railcar unloading facility extending northward to the utility dock and bayward to the 40-foot contour. In front of the utility dock, there is a deposit of wood chips from 4 to >10 feet thick. Although not measured, the chip deposits likely extend north to the head of Sawmill Cove. The bottom materials near the utility dock consist primarily of silts, sand, bark, and wood chips. The sediments near the utility dock like those near the pulp dock have been influenced by the effects of prop wash from ships that routinely used the dock. As evidenced by the diver survey, fine wood waste material was only observed infrequently in the vicinity of the utility dock. The sediments and bottom materials that are present in the vicinity of the utility dock (as described above) are not likely to exhibit toxicity to benthic organisms. The largely inorganic materials, wood chips, and bark are not likely to exhibit wood degradation-derived toxic effects (caused by the generation of ammonia, sulfide, and related compounds) found at sediment sampling stations near Outfall 001.

3.3 Past Dredging Practices

The berthing area at the pulp dock was initially dredged in the mid-1950s and maintained to approximate elevation -35 feet MLLW for a distance of 100 feet bayward of the face of the dock. Maintenance dredging was performed about every 10 years. In 1985, a Corps of Engineers permit was issued to remove approximately 8,000 cubic yards (cy) from in front of the dock. The permit also provided for maintenance dredging for a 10 year period (COE Permit 071-OYD-M-670042 dated September 19, 1985). The last dredging was in 1986, when approximately 8,000 cy were dredged and disposed of at the Herring Cove Landfill site at a cost of approximately $ 94,000.

3.4 Permitting Considerations

If dredging and/or construction of marine facilities under either Management Option 1 or Management Option 2 were implemented, several permitting activities would likely have to be undertaken.

The first step in the State of Alaska permit process is to complete the Coastal Project Questionnaire (CPQ). The completed CPQ is then submitted to the Office of Management and Budget Division of Governmental Coordination (DGC) where the project will receive a "project consistency" review based on the Alaska Coastal Management Program (ACMP). A key element of this review is to determine which agencies have authority over the dredging activity and need to be involved. Based on our analysis and a previous APC dredging permit, the following agencies would be contacted and permits/certifications applied for:

- Corps of Engineers Section 10/404 permit. This permit is issued pursuant to Section 10 of the River and Harbors Act of 1899 and Section 404 of the Clean Water Act. For dredging or structural work, Section 10 applies. For placement of rock protection Sections 10 and 404 apply. This analysis is based on disposal of dredged material at an upland site. For in-water disposal of dredged material a Section 404 permit would be required. The Section 404 permit requires an analysis of alternatives and impacts in accordance with Section 404(b) of the CWA. If beneficial reuse or open water disposal were to be considered, the Corps would require core borings and chemical analysis to establish the acceptability of the sediments for open water disposal, or other analyses to protect water quality and determine any BMPs required during dredging. Although beneficial reuse for habitat enhancement would be encouraged for suitable sediments, aquatic disposal (e.g, confined aquatic disposal or a nearshore confined disposal facility) would appear unlikely at this time given the nature of the sediments, shallow water depths and lack of suitable sites (see discussion in Section 3.6 of the Bay OU FS). It should be emphasized, however, as it was in the FS, that screening and evaluation of technologies and remedial alternatives for purposes of sediment remediation of the AOC should not be applied to limited navigational dredging in the corridor identified in this paper. DEC explicitly concluded in the proposed plan that navigational dredging is not precluded by the remedy.
- Alaska Department of Environmental Conservation (ADEC) Clean Water Act Section 401 Water Quality Certification. ADEC will be the key state authority for a dredging project. Primary emphasis of the 401 Water Quality Certification relates to water quality (TSS, DO, Turbidity) at the boundary of a mixing zone. ADEC also issues permits for upland disposal of dredged material.
- Alaska Division of Governmental Coordination (ADGC). This agency will issue a Certification of Consistency with the Alaska Coastal Management Program. ADGC also streamlines permitting by coordinating both state and federal regulatory programs.
- Alaska Department of Fish and Game. The Department of Fish and Game will comment on the Corps permit application, but that agency does not issue permits. The ADFG is an integral part of in-water construction activities conducted in Alaska. They will recommend permit conditions restricting dredging or filling during periods of fishery spawning or migration.

4. Analysis of Navigation Management Options

Two management options are discussed in this section. Management Option 1 is based on the continued use of the existing pulp and utility docks with vessels of similar size and draft as previous vessels that called on these docks. Management Option 2 considers the potential future construction of marine facilities and navigation improvements to accommodate a wide range of vessels, including larger vessels than those previously calling at the APC mill site. The ADEC has stated that "Navigational dredging or dock construction under permit will not be precluded in the Proposed Plan." The options discussed below should be acceptable to ADEC.

4.1 Management Option 1: Continued Use of the Existing Docks

This option assumes that the future use will include uses similar to past uses by medium sized breakbulk freighters or tankers, and new uses for large yachts, or small cruise ships that do not draw more water than previous ships using the docks. Depending on the vessel and its configuration, tug boats may be required to assist the ships maneuvering in and out of the docks. Whether new facilities would be needed at or on the dock would depend upon the use developed for dock.

In the past, periodic maintenance dredging occurred approximately every 10 years, partially as a result of the operation of the outfall. Although periodic maintenance dredging is expected in the future, the frequency will depend on the rate of sedimentation. The recent diving survey indicated an uneven bottom below the dock. Although maintenance dredging does not appear to be needed at this time, if it were to occur to achieve an elevation –35 foot depth across the face of the dock, it is currently estimated that approximately 1,300 cy of non-native sediment would be dredged.

4.1.1 Description of Anticipated Future Uses of Existing Docks

The future uses that are assumed for the docks under this option include continued use by medium sized breakbulk freighters or tankers and use of the docks by large yachts and small cruise ships. Large and small barges could call at both docks, and barges could call at the railcar unloading facility. Medium sized breakbulk freighters or tankers that would call on the pulp dock would use and maneuver in manners similar to those described in Section 3.1. Large yachts and small cruise ships would also likely maneuver into and away from the dock with bow thrusters or with tugboat assistance as described in Section 3.1.

4.1.2 Impacts Associated with Continued and Anticipated New Uses

Impacts associated with continued and anticipated new uses are described in Section 3.2.2. In that section it was concluded that sediments near the pulp and utility docks are not likely to resuspend significantly if past vessel usage is resumed or if larger vessels call at these docks in the future under Alterntives 3 and 4.

The column settling tests conducted during the Engineering Field Study (Foster Wheeler 1998) were based on composited samples from areas located south of the pulp dock and a second area located from the south end of the pulp dock to the north (Areas 1 and 2, respectively). These composited samples did not include stations in the shallow areas in the vicinity of the pulp dock.

Based on the physical observations of the sediments types likely to be dredged, it is anticipated that the resuspension and settling times would be much less than those predicted by the column settling tests performed on the material from the wood deposition zone. More rapid settling times would be expected since the smaller sediment would have been washed away from past practices because of the nature of the material. The smaller size fractions are the slowest settling fraction in most sediments.

Continued use of the railcar unloading facility and utility dock should not cause resuspension of sediments because the surface materials near these facilities are generally comprised rock rubble and large wood chips.

4.1.3 Maintenance Dredging

Maintenance dredging, as needed, near the pulp dock would consist of removing the non-native sediments that are located above the approximately –35-foot contour. These sediments are located from the face of the dock to a point about 30 feet bayward of the dock. The volume of material currently anticipated to be dredged in front of the pulp dock is approximately 1,300 cubic yards (cy). There is a slope area rising sharply above elevation –35 feet MLLW at the north end of the dock that, in the past, was not dredged. This slope appears to be an engineered feature that was built when the mill site was created.

4.1.4 Dredging and Disposal Operations

A floating mechanical clamshell dredge equipped with a 1½ cy bucket (the same dredge used in previous dredging) would likely be used to remove the sediments. The non-native sediments would then be loaded directly into 10-ton end-dump trucks positioned on the dock and transported to an approved landfill. After dumping and initial drainage, the material would be spread in thin lifts and graded with a small dozer.

Consistent with the assumptions in the Feasibility Study report, it is assumed that the runoff effluent will not require treatment and can be discharged directly into the receiving water. This assumption is reasonable given the information that is available for the characteristics of the seawater in Sawmill Cove and the pore water contained in the sediments. The pore water characteristics for sediment composite samples obtained from areas near Outfall 001, were summarized in Table 3-5 of the Bay OU FS report. Detectable but low levels of metals and dioxin/furans were observed. The concentrations of potential COCs in the seawater in Sawmill Cove were summarized in Section 5.2 of the Bay OU RI report. These concentrations were judged to be below levels of concern. During dredging the volume of seawater removed will greatly exceed the volume of porewater removed. As a result, it is likely that the concentration of COCs in the water fraction of the sediments dredged will approximate the concentration found in seawater. If treatment of the effluent was needed, the treatment approaches discussed in Section 2.5 and 3.6 of the Bay OU FS report could be implemented.

This approach also assumes that the dewatered sediment will be acceptable for disposal as a single layer at a local landfill. This assumption requires that the dewatered sediments pass a

TCLP test. This seems likely given the nature of the sediments that would be dredged along the face of the pulp dock. As discussed above, the sediments appear to consist primarily of wood chips and bark, rather than the processed wood fibers present south of Outfall 001. The wood chips and bark are not likely to release metals at concentrations exceeding TCLP criteria.

The chemical properties of the sediments collected in Sawmill Cove are summarized in Section 5.3 of the Bay OU RI report. The chemical concentrations found in the sediments do not appear to be high enough to cause a TCLP exceedance when the sediments are leached. Samples of the actual sediments to be dredged along the dock face would be tested to verify this assumption.

4.1.5 Institutional Controls for Management Option 1

4.1.5.1 Navigation Dredging

Navigational dredging on the west side of Sawmill Cove in and adjacent to the AOC will occur in a navigational corridor that runs from the south end of the former pulp dock to the north end of the utility dock. Navigational dredging in this corridor is consistent with the proposed remedy, subject to the normal permitting requirements. Maintenance dredging for navigation is anticipated to occur in approximately 10-year intervals, but could be varied depending on sedimentation rates.

4.1.5.2 In-water Construction

In-water construction in the AOC will not be prohibited in the navigation corridor with appropriate precautions incorporated through the permit process. In-water construction in the AOC, including pilings, dolphins, docks, moorage and navigation aids, will employ best professional judgment to specify best management practices (BMPs) to minimize disturbance or resuspension of sediments. An example of an appropriate BMP for drilling, socketing and anchoring piling to bedrock is to remove the overlying sediment (if in a thin layer) or to employ and then clean out a casing used in conjunction with the drill bit (if a thin layer exists). Special techniques would not be required for conventional pile driving, since any resuspension will be brief and very localized as described in this memorandum..

4.5.1.3 Vessel Management

- Vessels approaching or departing the former pulp dock must remain east of the –40 ft MLLW contour near Outfall 001 in the AOC. CBS will place a navigation marker or similar navigation aid in this area, as determined in consultation with the US Coast Guard (might be located on an existing dolphin).
- Sitka will include a provision in leases to tenants with navigational uses that tenants' vessels are not allowed to anchor in the both the final AOC. The ROD will define these areas in support of managing both the overall site recovery and the area of residue currently driving the 303(d) listing (a figure showing the site boundary in the bay will be attached as an exhibit to this Management Plan after the ROD is completed).

- ADEC will request NOAA or other agencies as appropriate to show the AOC as a "no anchor" zone on navigational charts of Silver Bay and Sawmill Cove. ADEC will request this designation be removed at such time as sufficient natural recovery has been achieved per the ROD.
- The existing mooring buoy in the south end of Sawmill Cove may be used or reconstructed for future use by larger vessels. Vessels may traverse the AOC and AOICR and may be moored in there on single point moorage, as long as they comply with the above restrictions.

4.1.6 Cost of Management Option 1

The cost to implement Management Option 1 is estimated to be $80,000 (+/- 30%). This estimate is based on the following assumptions. See the attached estimate for complete details.

- There is a contractor in Sitka (W & S Construction Co.) with a 1 ½ cy clamshell dredge that has performed previous dredging at the pulp dock. This dredge would be used for the work.
- The dredge will load 10 cy end-dump trucks with the dredged material. Before the dredging is undertaken, the condition of the piles supporting the dock will be reviewed with respect to the loads imposed by the hauling vehicles used to transport the dredged sediments.
- The volume to be removed is approximately 1,300 cubic yards. This quantity includes a contingency of 20% for equipment tolerances and sloughing of slopes.
- The material will be transported to a local landfill for disposal. It will be spread in thin lifts and graded by a dozer after dumping and drainage of excess water. Dumping will be controlled so that sediment does not run off. If necessary, a temporary containment dike consisting of concrete "Jersey" barrier or similar method will be utilized.
- Dredged sediments are assumed to pass a TLCP test to be clean.
- An ADEC disposal permit will be issued.
- Duration of dredging will be four days working one shift.
- Water quality monitoring and permitting costs are not included in the cost estimate.

4.2 Management Option 2: Use by Larger Vessels

This option assumes that future uses will include use by vessels with drafts deeper than approximately 30 or 33-feet, as well as the uses discussed in Management Option 1.

Management Option 2 recognizes that: (1) ocean-going Pacific Rim trade is currently using uses vessels in the 40-foot draft range (35-45 foot drafts); and (2) the trend has been toward the use of larger vessels, including in ports where very deep draft vessels (referred to as "Post Panamax") are unlikely to call. Management Option 2 recognizes that an important gap currently exists in the range of navigational uses that can be supported by existing facilities in Sawmill Cove. Existing facilities will not support use by vessels in the 50-100,000 DWT range with –35 to-50 foot drafts up to approximately 700 feet in length, as discussed in Section 4.2.1. Likewise, very large vessels (e.g., 1,000 feet in length or over 100,000 DWT), such as large water tankers, may not be able to be accommodated at a dock, but could use single point moorage facilities.

Management Option 2 is based on the following reasonable assumptions in light of economic and environmental conditions and the remedial action documents:

- Rapid technological changes in the maritime industry over the past 10-20 years make it difficult to predict the precise vessels and berthing facilities that will be needed in the future to accommodate site users. If the City and Borough of Sitka becomes the property owner, the property will likely be in public ownership for a long period of time. It is essential for a wide range of options to be preserved for future navigational uses.

- The SE Alaska cargo market suggests that freight movement will continue to be dominated by barge and moderate draft vessels for the foreseeable future. Future navigational options should provide for the use of existing docks and the ability to moor a wide range of barge traffic. Ideally, the facilities would support moorage of multiple barges simultaneously and long barges (e.g., 400+ feet in length). The site needs to be able to support vessels in the 50-100,000 DWT range (i.e., larger than can be accommodated by the pulp dock).

- Given the deep water characteristics of Sawmill Cove and the potential for multiple operations on the upland area, it is important to have the option for substantial vessels to call at two docks. This would also strengthen areawide economic development by enabling other commercial/industrial development in the community to be served by dockside deep water moorage in Sawmill Cove.

- Feasible navigational options need to be identified that are not constrained by the current depth limitations at the pulp dock and do not involve major disruption of natural recovery processes in the AOC.

- The construction methods, institutional controls, and permitting considerations discussed under Management Option 1 would likewise apply to Management Option 2 for any dredging or in-water construction work within the AOC.

This option reviews six ship docking alternatives to accommodate larger vessels calling at the Sitka former mill site, specifically a representative –45 foot draft vessel and larger vessels, as discussed below. These alternatives address use of both the pulp dock and the utility dock in the docking arrangements, as well as a single point mooring configuration. The docking alternative which preserves the wide range of options and has the least affect on the AOC (No. 4) would involve some dredging to achieve navigable depths; the others do not.

4.2.1 Description of Anticipated Future Use

The existing pulp dock facility has an alongside design depth of approximately -35 feet. As discussed in Section 3, the size and type of vessel which traditionally called at the dock were 25,000 to 30,000 DWT general cargo/break-bulk, small container (mixed cargo) vessels, up to

600 feet in length, typically drawing 35 feet or less fully loaded. Somewhat larger ships called on the pulp dock in the 1990s (bulk carriers up to 44,000 DWT). Future site redevelopment may require that larger freight vessels or vessels of a different type such as container, tank, or cruise ships be accommodated.

Given the site location, size of the upland area, capital investment and regional infrastructure typically associated with large-scale containerized cargo operations, it appears unlikely that Sawmill Cove would be redeveloped to support Post Panamax vessel traffic (i.e., dockside moorage for 1000-foot long freight vessels). These options are not ruled out, however they would involve supplemental analysis beyond the alternatives examined below.

Given the need to preserve flexibility for future users, the alternatives analyzed under Management Option 2 include a wide range of navigational uses, from barge traffic to single point moorage for very large vessels such as water tankers. The analysis focuses on developing alternatives to address the gap between 50,000 and 100,000 DWT vessels, typically drawing between 35 and 50 feet when fully loaded. A vessel of these dimensions could serve a wide range of maritime uses. Therefore, a "representative" vessel with a 45-foot draft is used in this decision framework to evaluate feasible navigation and moorage alternatives for this range of vessel traffic that would be compatible with remedial and waterbody recovery efforts in Sawmill Cove.

The representative design vessel has dimensions of approximately 720 feet in length, up to 124 feet in width and 44 to 45 feet draft when fully loaded. This multi-purpose vessel is assumed to be 70,000 dead weight tons (DWT) in size, although the vessel dimensions and the draft when fully loaded will be the key factors. Tugs can assist vessels with a wide range of loads; as noted in Section 3.2.2, tug prop wash will not be an issue given the deep water. The required navigation depth for a 45-foot draft vessel is about 50 feet, which provides sufficient depth for berthing when fully loaded during low tides and adequate under keel clearance. In screening the alternatives, preference was given to alternatives that would provide closer to ten feet of clearance when fully loaded. This provides a greater margin of safety both for navigation and for limiting the potential for sediment resuspension in the AOC.

Further information regarding the tanker vessels proposed suggests that a larger vessel in the 150,000 DWT range could be employed. Representative vessel dimensions are 930 feet in length, 160 feet beam, drawing 55.5 feet. The decision framework identifies the general locational requirements for single point moorage of such a vessel in Sawmill Cove.

For the purpose of this analysis, the representative 45-foot draft vessel will be assumed for alongside berthing alternatives. For the larger vessel, a single point mooring system (SPM) located offshore, is considered.

4.2.2 Screening of Future Berthing Alternatives

In addition to maintenance and use of the existing facilities, the range of various berthing alternatives identified as potentially feasible in light of the assumptions, objectives and criteria explained in Sections 4.2 and 4.2.1 are summarized below.

Alternative 1 - Deepen the existing deep water (pulp) dock (hereinafter pulp dock) facility to –50 feet MLLW alongside the dock face.
Alternative 2 - Widen all or portions of the existing pulp dock, deepen as necessary to elevation –50 feet MLLW.
Alternative 3 - Construct and connect new mooring offshore of the existing pulp dock in water in water depth of –50 feet or greater.
Alternative 4 - Construct new mooring offshore and south of the utility dock, deepen to -50 feet. Relocate rail dock.
Alternative 5 - Construct a new mooring in the natural "bight" between the utility dock and pulp dock with natural depths of -50 feet.
Alternative 6 - Install a single point mooring buoy in the bay served by an underwater pipeline.

Other alternatives are potentially available, such as the extension of the pulp dock southward into the area offshore of outfall 001 or development of new dock facilities south of the AOC on Sawmill Cove west or along Sawmill Cove east. These alternatives are not necessarily precluded, but would need supplemental analysis. Because those alternatives appear to be speculative at this time, this report does not address their feasibility or compatibility with the remedy.

<u>Alternative 1</u>

Alternative 1 would require deepening the face of the dock, including (for purposes of navigation) the removal of the rock outcrop described in Section 2 to elevation –50 feet MLLW. It may also be necessary to construct at least one mooring dolphin structure to handle lines from the stern of the ship overhanging the dock end. Concerns associated with this alternative relate to the structural integrity of the existing dock if the depths at its face were increased from -35 to -50 feet, as well as extensive in-water construction and the cost of reconstructing a large, currently-serviceable dock.

There would be little advantage over Alternative 2 because the entire rock outcrop would need to be removed to achieve the desired depths. Therefore Alternative 1 would achieve the same navigational benefits as Alternative 2, but with far more cost and in-water construction work within the AOC.

<u>Alternative 2</u>

Alternative 2 overcomes the problems principally associated with stability and piling described in Alternative 1 by extending the dock face offshore approximately 60 feet. This alternative essentially enlarges the dock, so that a ship can be moored in deeper water, beyond the rock outcropping. The face could be either continuous or a shorter section, consisting of a loading platform and two outlying breasting dolphins. Mooring lines can be taken to the existing dock, with possibly one or two additional mooring dolphins constructed for the aft mooring lines.

This alternative requires underwater blasting to remove the rock outcrop which would involve extensive in-water construction work and associated mitigation measures in the AOC and be very costly. The cost to remove approximately 6,000 cy of rock alone is roughly estimated to be about $2 million (+/- 30%). This cost does not include the associated navigational dredging to –50' and the dock construction. The Corps permit process would likely require a careful examination of other feasible alternatives to avoid and minimize aquatic impacts.

Given these environmental and economic considerations, the navigation decision framework assumes that this alternative would not be pursued in the foreseeable future unless the other alternatives, which appear to be preferable, could not be implemented. These considerations might diminish as natural recovery and sediment consolidation processes continue over time.

By way of background, a variation on this alternative that has been and can continue to be used under Management Option 1 employs a "camel" (e.g., a few logs rafted together and tied to the pier or a barge tier to the pier) to allow a vessel to moor between the two rock pinnacles shown on Figure 2. This mooring device provides a few more feet of clearance during loading or unloading operations. Because of the extent of the rock outcrop, however, it does not address the moorage need for deeper draft vessels under Management Option 2.

Alternative 3 (Figure 3)

Alternative 3 envisions a berth suitable for tanker vessels offshore of the existing pier in water depths of -50 feet or greater. A loading platform would be constructed off-shore of the face of the existing pulp dock at approximately –50' to –60,' which would allow the vessel to moor in deep water. The in-water construction methods are described under Management Option 1 in Section 3.2. No navigational dredging or blasting of rock appears to be required.

Alternative 3 takes advantage of the bathymetric contours to move the bow of the ship in closer to the existing dock where forward mooring lines can be taken to the existing dock. An access bridge or trestle is needed to reach the loading platform, as well as two outlying breasting dolphins. Two or even three mooring dolphins and catwalks, or a buoy system will probably be necessary for aft mooring lines under this alternative. A variation that could be implemented, depending on user needs, loading technologies and cost-effectiveness would be to construct triangular dock, so that the most of the vessel is moored alongside a dockface.

Although Alternative 3 does not interfere with the use of the rail barge facility or utility dock, it would substantially limit the use of the existing pulp dock. Because of the access bridge or trestle to the loading platform, only the southern half of the existing pulp dock would be available for moorage. This alternative would limit use of the existing pulp dock to barges and vessels of similar length.

This alternative could be modified by rotating the bow of the ship offshore to create a parallel alignment to the face of the existing pulp dock (i.e., the loading dock and the vessel would be parallel to the face of the pulp dock, rather than the roughly a 45-degree angle to the existing dock shown on Figure 3). This variation orients the new dock parallel to and offshore of the existing pier in water depths of -50 or greater, and also does not involve dredging/blasting of rock. This has the appearance of a more "linear" orientation which may lend itself to future expansion, however, this orientation requires additional mooring dolphins at the bow which may preclude the use of the existing rail barge facility.

Advantages and disadvantages between the layout shown and this modification are related to access to the rail barge facility which would be limited in the latter condition when a ship is at the berth, and issues associated with type and installation challenges for the support piling depending on rock elevations and sediment characteristics. Assuming confirmation by design-level geotechnical work, a possible advantage of Alternative 3 as shown is that the loading platform pilings could be drilled into the bedrock (the 1999 underwater survey indicates that the rock outcrop is exposed and is not covered with sediment).

All variations of Alternative 3 have the advantage of locating a pier in deep water to avoid the impacts of dock construction along shorelines and intertidal areas and of dredging in the AOC. However, all variations of Alternative 3 would preclude any concurrent use of the existing pulp dock for all but smaller vessels and barges between the end of the existing dock and the proposed approach section as shown.

Based on our experience with similar facilities, a rough order of magnitude cost estimate for Alternative 3 is approximately $2-3 million (+/- 30%). The geologic conditions for installation of support piling would be a determinative factor in this cost.

Alternative 3 represents a feasible method of providing moorage for a larger representative vessel within the navigation corridor on the site. By avoiding or minimizing environmental impacts within the AOC, it represents an alternative that would be consistent with the site remedy. It would appear to have the least environmental impact and least cost compared with other alternatives for the use of the pulp dock by larger vessels.

Alternative 4 (Figure 4)

Alternative 4 envisions an approach similar to Alternative 3, located south of the utility dock and north of the pulp dock. A loading platform would be situated with its face on roughly the 50' contour. The platform would be parallel to, and approximately 200-400 feet south of, the utility dock (the face of the utility dock might be extended somewhat for the two docks to align). It would be connected to the upland by an access bridge or trestle. In terms of future flexibility, the platform could also take the form of a "T" dock if a larger area for cargo transfer were desired.

The 50' contour extends in toward the head of Sawmill Cove in a large knob shape approximately 200' by 400,' bounded on the east by the existing log boom. The depth of this embayment ranges from 50 to 60 feet. Approximately 4,000 cy of sediment would be removed between approximately the 40' and 50' contours to construct the 200-foot wide berthing area, which includes adequate additional width to maneuver the vessel into the berth by assist tugs. The berthing area dredge slopes would be constructed to 1 (V) on 2 (H) and would be armored with rock riprap to protect against the tidal and wave energy and vessel prop wash. The facility will need to be located offshore of the utility dock to preclude undermining of the support piling as described in Alternative 1. The actual location of this alternative in the natural embayment formed by the 50' contour could be adjusted in final design to optimize navigational, pilotage, environmental, and cost considerations.

The armored slope at the head of the berthing area (at the north end of the 50' contour) is outside of the AOC. No pulp residue or contaminants of concern were identified in the RI/FS documents and companion technical reports in the area where ship moored at this pier would employ bow thrusters. The stern of a ship moored at this facility would be located in the AOC where the depths are 100' and greater, which would likewise not have the potential to resuspend sediments.

This alternative precludes the use of the existing rail barge facility. To accommodate this conflict, the rail barge is envisioned to be relocated off the end of the existing pulp dock pier, using the pier as its alignment system in lieu of dolphins. This alternative has the advantage that the existing deep water facility can be used concurrently for either rail or another smaller vessel.

If aligned with the utility dock, the dock that would be constructed under Alternative 4 could also serve as moorage for long (400+ foot) barges, as well as deep draft vessels. Pilots generally prefer wide waterways to handle large ships. Because Alternative 4 balances a location as far south in the head of the cove as possible (to be in open water), and as far northeast of the pulp dock as possible (to allow tugs to assist vessels at the pulp dock), there is a potential for some navigational conflict if multiple vessels were to call on all of the facilities simultaneously. Further review of the need for a southernmost third mooring dolphin should be examined during design. This is the only alternative where more than one substantial vessel could feasibly be moored at Sawmill Cove docks at the same time.

It would appear that Alternative 4 preserves the ability to use the existing pulp and utility docks and a rail unloading facility, provides the ability to perform dredging and in-water construction in consolidated substrates with a minimum of non-native sediment on the periphery or outside of the AOC, and offers the the greatest degree of flexibility and future navigational use options among the alternatives. Alternative 4 represents a feasible method of providing moorage for a larger representative vessel within the navigation corridor on the site. By avoiding or minimizing environmental impacts within the AOC, it represents an alternative that would be consistent with the site remedy. It would appear to have the least environmental impact and a cost similar to Alternative 3.

Based on our experience with similar facilities, a rough order of magnitude cost estimate for Alternative 4 structural improvements is approximately $2-3 million (+/- 30%). The geologic conditions for installation of support piling would be a determinative factor in this cost. Cost of dredging and installation of riprap slope protection is estimated to be approximately $446,000 (+/- 30%). The dredging cost estimate is based on the assumption that no rock will be encountered in the excavation. It is also based on a clamshell dredge performing the work. In the design phase, we would review whether hydraulic dredging might also be feasible. A detailed cost estimated for this portion of the work is attached. .

Alternative 5

Alternative 5 is envisioned to be placed between the utility dock and the pulp dock in water depths of -50 feet or greater. This alternative basically rotates and relocates Alternative 3 northward, with the loading platform extending from the shoreline where the rail unloading facility is currently located. Mooring lines are envisioned to extend to shore or the existing dock facilities, thus removing the need for outlying mooring dolphins. Some form of trestle or bridge from shore will be needed to access the loading platform and for handling lines.

The layouts shown are for a tank vessel berth. Should a deep water (-50) general cargo/multi purpose dock be required the layouts could be modified to provide a wider approach and the loading platform extended to create a continuous dock face.

This alternative was examined in order to evaluate all of the potentially feasible or reasonable alternatives for siting the necessary facilities in the navigation corridor and not adversely affecting recovery of Sawmill Cove. Upon analysis, this alternative does not meet the basic navigational purpose and need because of direct navigational conflicts with all three existing docks. It would preclude use of the rail unloading facility (which could continue as-is under Alternative 3 or as a slightly relocated facility in Alternative 4). It would preclude simultaneous use of the pulp dock, and it would preclude or obstruct simultaneous use of the utility dock. Unlike Alternative 4, the facilities cannot be aligned to provide the additional flexibility of being used in conjunction with either the pulp dock or the utility dock. Alternative 5 does not have environmental advantages compared with Alternatives 3 and 4, and it could require deepening at the north end of the pulp dock to dredge sufficient navigational depth for the stern of the vessel.

Alternative 6 (Figure 5)

Alternative 6 envisions a single point mooring (SPM) buoy offshore. A SPM buoy is typically designed to allow minimum lateral displacement due to winds on the ship. A SPM system is typically used for vessels that do not require dockside transfer of passengers or cargo.

To accommodate the swing of the vessel, and lateral displacement that the buoy and ship would undergo in wind conditions, what is sometimes referred to as the "watch circle", the buoy should be located *at least* 115% of the length of the largest vessel from shoal water (the nearest -60 foot depth contour). For the purpose of this preliminary design, we would suggest placing the buoy 1,500 feet from the -60 contour. Should the larger 150,000 DWT vessel be utilized, it is recommended that this distance be increased to *at least* 2,000 feet. These design considerations also serve to ensure that the ship is located in deep water, which limits the potential for sediment resuspension. Consequently, there is no adverse impact to the watch circle being within the AOC or any impaired waterbody boundary. The location of the existing mooring buoy would be appropriate; however, it would need to be constructed to serve large vessels.

Detailed anchor system and catenary design will be required to establish the actual location of a SPM buoy. As noted under the institutional controls for Management Option 1, ship anchors or placement of SPM buoys would not be allowed within the AOC. Based on our experience with similar facilities, a rough order of magnitude cost estimate for Alternative 6 is approximately $2-4 million (+/- 30%).

4.2.3 Areas that Would be Dredged

The only sediment dredging in Management Option 2 is associated with Alternative 4. Approximately 3,200 cy of wood chips and silt and sand sediment would be dredged to a depth of elevation –50 feet MLLW at the head of the berth to accommodate the design vessel and its assist tug. Beyond the small area to be dredged, approximately half of the berthing area lies between the 50' and 60' contour, while the remainder is between 60' and 140' deep. Alternatives involving removal of the rock outcrop adjacent to the pulp dock are not being further evaluated at this time.

4.2.4 Dredging and Disposal Operations

Dredging would be accomplished with the floating clamshell dredge described in section 4.1.4 using a standard bucket. Dredging with an environmental (enclosed) bucket was indicated in the Bay OU FS report, however, that bucket was envisioned to be used in light, flocculent material. The dive survey revealed that non-native surface material in front of and near the utility dock mostly consists of large wood chips so a regular clamshell bucket is appropriate. Also, because the dredge materials appear to be predominately wood chips and native sand and silt, the 1 on 2 dredge cut slopes would have to be evaluated to determine if any they would provide the stability to support the riprap slope protection. This analysis would be made in the design stage if improvements were implemented.

To the extent the dredged sediments are not suitable for beneficial reuse (see Section 4.2.4.3), the dredged material would be loaded on flat-deck haul barges and transported to the pulp dock where it would be offloaded into 10-cy end dump trucks for transport to a local landfill for disposal. If water quality requirements could not be met at the dredging mixing zone compliance boundary, a silt curtain may be required at the dredge site (it is included in the cost estimate, but current data on the substrate indicates it may not be needed).

Although the dive survey and core borings revealed that the material to be dredged is predominately wood chips, dense, subsurface granular material may also be encountered in the dredge cut to elevation –50 feet MLLW. If this was the case, the 1 ½ cy bucket previously used may not be heavy enough to penetrate and dig these materials so a larger (heavy duty) bucket suitable for digging in more dense materials would be required to complete the work.

4.2.4.1 Resuspension Due to In-water Construction, Dredging and Berthing Activities

Dredging operations associated with Alternative 4 would be conducted south of the utility dock, located in the northern portions of Sawmill Cove. All, or nearly all, (upward of 90%) of the material to be dredged is outside of the AOC. As discussed in Section 2.2, the sediments in this area are harder substrates largely characterized by rock, gravel, sand, and wood chips and appear to represent a distinctly different regime than the outfall sediments. Immediately in front of the utility dock (transects T-1 through T-3), there is a deposit of fine wood chips (up to ½") from 4 feet to more than 10 feet in thickness. The layer of wood chips appears to be in close proximity to the unloading dock. It is thinner and more sporadic south of the utility dock along transects T-4 through T-6, where results of four of the seven diver probes for non-native sediment ranged from 0' to 1.'

As evidenced by the diver survey, fine wood waste material was only observed infrequently in the vicinity of the utility dock. No pulp residue or contaminants of concern were identified in the RI/FS documents and companion technical reports as far north as the area where the bow of a ship would be moored at the new pier. The stern of a ship moored at this pier would be located in the AOC where the depths are 100' and greater, which would likewise not have the potential to resuspend sediments. The sediments and bottom materials that are present in the vicinity of the utility dock (as described above) are not likely to exhibit toxicity to benthic organisms. The past activities associated with the utility dock likely resulted in reworking and resuspending any fine material that may have been present. Consequently, the largely inorganic materials, wood chips, and bark are not likely to exhibit wood degradation-derived toxic effects.

4.2.4.2 Water Discharge/Sediment Disposal Permitting Issues

The potential dredge area is on the northern periphery of the AOC, outside of the main influence of the processed wood material and south of the raw wood deposition area in the head of the cove.. Consistent with the assumptions in the Feasibility Study Report (Foster Wheeler 1999), it is assumed that the runoff effluent will not require treatment and can be discharged directly into a receiving water. This assumption is reasonable given the information that is available sediments and bottom materials present in the potential dredge area. However unlikely, if treatment of the effluent was needed, the treatment approach discussed in the Feasibility Study report could be implemented.

4.2.4.3 Beneficial Reuse of Dredged Native Sediments

It would be desirable to benefically reuse suitable sediment encountered during the dredging for the berth area in Alternative 4. While wood chips or similar non-native sediments would be disposed of at a local landfill, there is a potential beneficial reuse of the native silts and sands. It is envisioned that these materials could be separated out during the dredging operation and placed on a flat-deck barge. They could than be transported to a shoreline area in Silver Bay amenable to enhancing or building intertidal habitat. This reuse option would be beneficial in that it would promote intertidal benthic habitat.

As shown on Figure 2, the area to be dredged does not indicate much non-native material. The wood chips appear to be located in the immediate vicinity of the utility dock and in-shore of the 40' contour. Most of the dredging would occur south and east of these areas for reasons noted in the screening analysis for Alternative 4 in Section 4.2.2. Because the dredging would generally occur in a relatively limited area between the 40' and 50' contours, the dredging quantities are expected to be quite small. Consequently, depending on the final dredge prism, there may not be enough native material excavated to implement this approach.

4.2.5 Institutional Controls

Institutional controls for anchoring, navigational approaches, dredging and in-water work near the pulp dock in the AOC would be the same as those identified for Management Option 1 in Section 4.1.5.

New single point mooring buoys should follow the following design guidelines, unless design-level analysis indicates different locational standards are appropriate and will not set back natural recovery in Sawmill Cove: (1) the new buoy should not be anchored in the AOC; (2) it should be located at least 115% of the length of the largest vessel from shoal water (the nearest -60 foot depth contour), or an estimated location of 1,500 feet from the -60 contour; (3) if 150,000 DWT vessels will be utilized, it is recommended that this distance be increased to at least 2,000 feet.

4.2.6 Cost of Management Option 2

The costs for the alternatives are summarized in Table 2.

5. Summary and Conclusion

In addition to the use of the existing facilities, three of the above alternatives were determined to be feasible and preferred based on the evaluation presented. These site layouts are shown on the attached figures, and cost estimates are provided in the appendix.

Continued navigation and use of the existing moorage facilities (pulp and utility docks, rail unloading facility, mooring buoy) at the APC site are not expected to create significant environmental effects. The sediments near these docks have been influenced by the effects of maintenance dredging which last occurred about five years before the mill ceased operation. These sediments are not likely to resuspend contaminants at levels of concern if vessel usage of the dock is resumed. Implementation of the recommended institutional controls will ensure consistency between these uses and the remedy over the long term.

A range of potential future navigation site use alternatives from the berthing of barges to the berthing of very deep draft vessels was evaluated. The construction of future facilities similar to those discussed and shown on the attached figures should likewise be considered consistent with the remedy and would not cause significant environmental effects on the environment or on the recovery of the Sawmill Cove.

The following navigation decision framework is recommended to integrate the future site use with remedial and other actions to promote the recovery of Sawmill Cove. This framework can be incorporated into a site management plan or other appropriate document.

1. A nearshore "navigation corridor" on Sawmill Cove west be recognized from the south end of the pulp dock to the utility dock, from the shoreline to the approximate 60' contour. Use of existing navigational facilities, expanded facilities, and navigational dredging are considered to be appropriate within this corridor and compatible with the remedy, subject to the institutional controls identified in this framework. (This corridor is not intended to restrict vessels from otherwise traversing the waters of Sawmill Cove.)

2. For purposes of the navigation decision framework, the following candidate alternatives, which were evaluated in this report, are renumbered as the following final alternatives and are illustrated on the attached figures.

Management Option 1	Preferred Alternative 1 (Fig.1)
Management Option 2, Alternative 3	Preferred Alternative 2 (Fig.2)
Management Option 2, Alternative 4	Preferred Alternative 3 (Fig. 3)
Management Option 2, Alternative 6	Preferred Alternative 4 (Fig.4)

3. Preferred Alternatives 1-4, with their associated institutional controls, are considered to be consistent with remedy. They should be permitted through the normal permit process.

4. Other alternatives and berthing options are not rejected but, if proposed, would need supplemental analysis for consistency with the remedy. The supplemental analysis could take the form of an addendum to this navigation framework.

5. Resuspension of contaminated sediments is not an identified concern with regard to dredging, construction, and use of new facilities south of utility dock (preferred Alternative 3). Benefical reuse of dredged sediments is encouraged if practicable.

6. The existing moorage facilities can be used as they are without special management controls.

7. Navigational dredging at the pulp dock or the expansion of existing facilities located in the AOC will need to obtain permits and follow the institutional controls recommended for these activities.

Section 6. References

Blaauw, H.G. and KAA, E.J. van de. 1978. Erosion of bottom and sloping banks caused by the screw-race if maneuvering ships. Int. Harbour Congress. Antwerp. 1978.

Cronk 1999. Personal comunucation with L. Cronk. Southeast Alaska Steevadoors. Juneau, AK. February 1, 1999.

Coastal Engineering Research Center. 1992. *Automated Coastal Engineering System – User's Guide*. Department of the Army, Corps of Engineers Waterways Experiment Station, Vicksburg MS. Version 1.07. September 1992.

Foster Wheeler Environmental. 1997. Bay Operable Sediment Profile Survey Results Sawmill Cove. Prepared for Alaska Pulp Corporation. Sitka, AK. August 20, 1997.

Foster Wheeler Environmental. 1998a. Bay Operable Data Evalution for Engineering Field Sampling. Prepared for Alaska Pulp Corporation. Sitka, AK. May 1998.

Foster Wheeler Environmental. 1998b. Final Bay Operable Unit RI Report. Prepared for Alaska Pulp Corporation. Sitka, AK. July 1998.

Foster Wheeler Environmental. 1999. Bay Operable Unit Feasibility Study Report. Prepared for Alaska Pulp Corporation. Sitka, AK. February 10, 1999.

Marine Taxonomic Services, Ltd. 1999. Notes on the APC Dive Operation for Foster-Wheeler Environmental. January 22-25, 1999. Marine Taxonomic Services, Ltd. Corvallis, OR. February. 1999.

Verhey, H.J. 1983. The stability of bottom and banks subjected to velocities in the propellor jet behind ships. Int. Harbour Congress. Antwerp, 1983.

Weggel, J. Richard, and Robert M Sorenson. 1986. "Ship Wave Prediction for Port and Channel Design". In Ports '86, American Society of Civil Engineers. 1986. Pp. 797-814.

List of Tables

Table 1 – APC Pulp Dock and Utility Dock Cross-Sections

Table 2 – Conceptual Level Cost of Future Use Alternatives

List of Figures

Figure 1 – Existing Conditions and Vessel Docking Alternative 1

Figure 2 – Non-Native Sediment Thicknesses and Descriptions

Figure 3 – Vessel Docking Alternative 2

Figure 4 – Vessel Docking Alternative 3

APC PULP DOCK AND UTILITY DOCK CROSS-SECTIONS

TABLE I

Transect	Time		Tide	Water Depth (MLLW)	Non-Native Sediment Thickness	Top of Native Sediment (MLLW)	Length Along Line	Sediment Description
T-9	1/23	1105	0.4	-15	0	-15	0'	Gravel
T-9		1106	0.4	-20	½'	-20	24'	5"-6" long slivers w/ 1/2" chips
T-9		1107	0.4	-30	5'	-35'	50'	½" chips
T-9		1109	0.4	-40	2'	-42	88'	½" chips
T-9	1/24	928	2.8	-47	2'	-49	116'	½" chips with fine floc
T-9		930	2.8	-57	5'	-62	150'	½" chips in fine floc
T-10	1/23	1120	0.5	-36	2'	-38	0'	Mostly shell w ½" fine chips
T-10		1122	0.5	-40	9'	-49	24'	½" chips in fine floc
T-10	1/24	928	2.8	-47	4'	-51	57'	Fine floc
T-10		930	2.8	-57	7'	-64	100'	Fine floc
T-11	1/23	1129	0.6	-30	0'	-30	0'	Gravel mix w/ 2" max chips
T-11		1131	0.6	-39	5'	-44	36'	Fine floc
T-11	1/24	948	2.3	-48	7'	-55	78'	Fine floc
T-11		950	2.3	-58	7'	-65	125'	Fine floc
T-12	1/23	1136	0.6	-29	4'	-33	0'	½" chips
T-12		1142	0.6	-39	4'	-43	162'	Fine flock
T-12	Cross section is flat beyond 162'					-43	> 162'	
T-13	1/23	1447	5.0	-27	5'	-32	0'	½" chips
T-13		1448	5.0	-35	9'	-44	30'	½" chips
T-13		1454	5.1	-45	2'	-47	182'	Fine floc
T-13		1459	5.3	-50	2'	-52	250' end of tape	Fine floc
T-14	1/23	1502	5.3	-29	8'	-37	0'	Fine floc
T-14		1504	5.5	-35	>10'	>-45	23'	½" chips
T-14		1506	5.6	-44	2'	-46	62'	Fine floc
T-14		1508	5.6	-54	3'	-57	105'	Fine floc
T-15	1/24	1021	0.6	-27	>10'	>-37	0'	1"- 2" chips
T-15		1022	0.6	-29	>10'	>-39	15'	1"- 2" chips
T-15		1024	0.5	-40	5'	-45	39'	½" chips in fine floc
T-15		1026	0.5	-50	7'	-57	70'	1"- 2" chips in fine floc
T-15		1028	0.5	-60	9'	-69	172'	Fine floc
T-16		1042	0.4	-10	10'	-20	35'	1" – 2" chips w/ fine floc
T-16		1044	0.4	-20	5'	-25	67'	1" – 2" chips w/ fine floc
T-16		1046	0.4	-30	>10'	>-40	88'	½" chips in fine floc
T-16		1048	0.4	-40	9'	-49	109'	½" chips in fine floc
T-16		1050	0.4	-50	10'	-60	137'	½" chips in fine floc
T-16		1052	0.4	-55	10'	-65	250'	½" chips in fine floc

Table 1 (Cont.) APC PULP DOCK AND UTILITY DOCK CROSS-SECTIONS

Transect	Time		Tide	Water Depth (MLLW)	Non-Native Sediment Thickness	Top of Native Sediment (MLLW)	Length Along Line	Sediment Description
Utility Dock								
T-1	1/23			-23	>10'	>-33	0'	½" chips
T-2		0952	1.1	-23	>10'	>-33	0'	½" chips
T-2		0954	1.0	-29	5'	-34	21'	½" chips
T-2		0956	0.9	-39	5'	-44	59'	½" chips
T-3		1010	0.7	-13	4'	-17	0'	1" – 2" chips
T-3		1012	0.7	-19	>10'	>-29	14'	½" chips
T-3		1014	0.6	-29	>10'	>-39	31'	½" chips
T-3		1016	0.6	-39	>10'	>-49	54'	½" chips
South of Utility Dock								
T-4	1/24	1332	1.0	-29	5'	-34	5'	½" – 2" chips
T-4		1334	1.0	-39	1'	-40	41'	Fine floc
T-5		1343	1.1	-29	0'	-29	23'	Native Gravel
T-5		1345	1.2	-39	5'	-44	49'	Fine floc w/1"-2" chips
T-6		1351	1.3	-19	1'	-20	33'	1" – 2" chips
T-6		1353	1.3	-29	7'	-36	69'	Floc w/ 1" – 2" chips
T-6		1355	1.4	-39	½"	-39	91'	Gravel

Table 2 – Conceptual Cost of Future Use Alternatives

Alternative		Estimated Cost
Preferred 1	Continued Navigational Use as in Past (Maintenance Dredging Only)	$80 thousand
Preferred 2	New Mooring Offshore of Existing Dock in Water -50 feet or Greater (Construction of Facilities)	$2-3 million [1]
Preferred 3	New Mooring Offshore of Utility Dock. Deepen to –50 feet. Relocate Rail Dock) (Berth Dredging and Construction of Facilities)	$2.4–3.4 million [1]
Preferred 4	New Single Point Mooring in Deep Water, Served by Under water Pipeline (Construction of Facilities)	$2–4 million

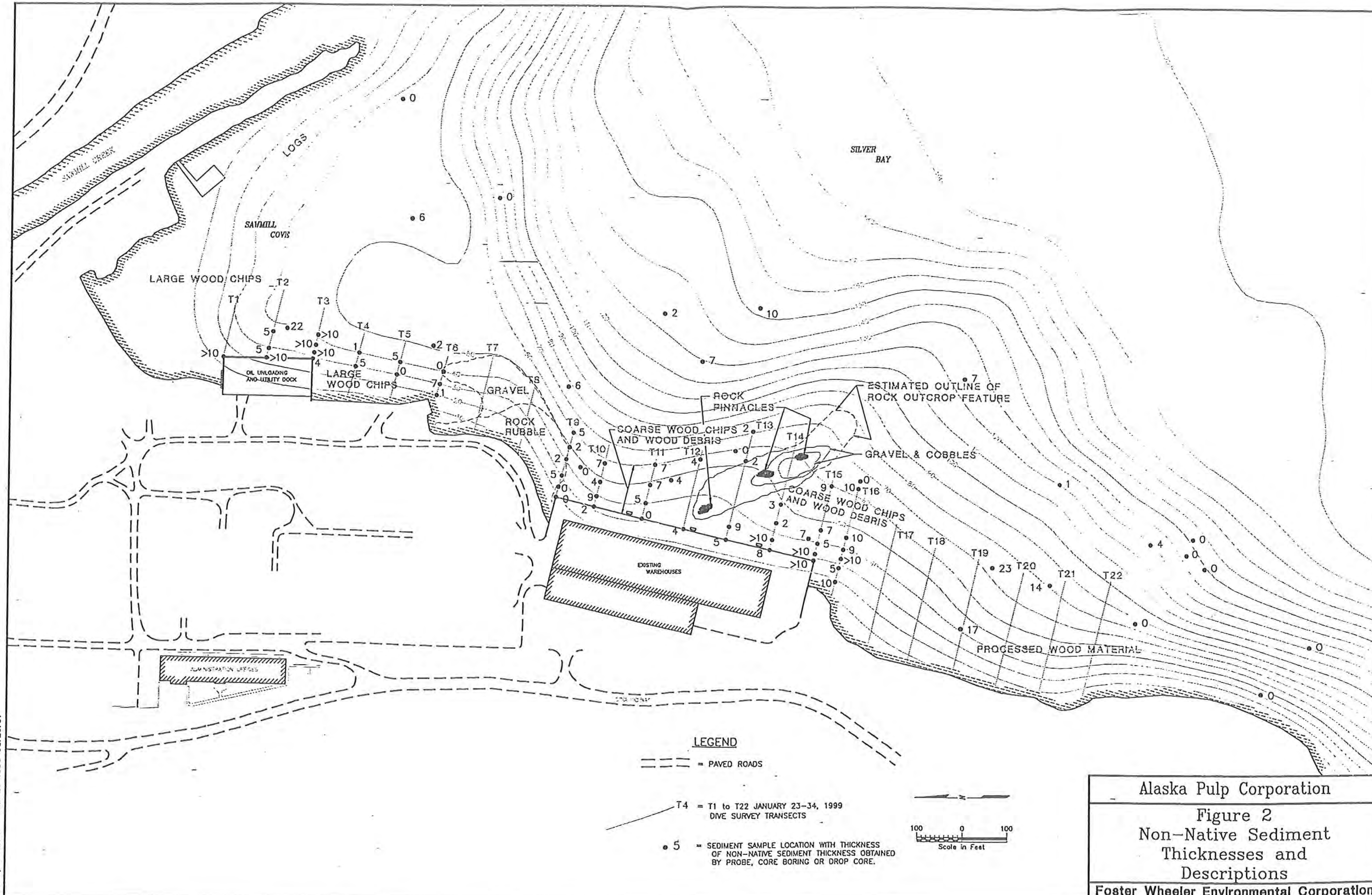
1. While the estimate for preferred Alternative 3 is shown to be $400,000 higher than the estimate for preferred Alternative 2 due to the dredging and rock armoring under preferred Alternative 3, the cost of both alternatives might be the same (within the degree of accuracy projected) due to the necessity to construct some of the docking facilities in preferred Alternative 2 on rock.

Alaska Pulp Corporation

Figure 1
Existing Conditions and Previous Vessel Docking Alternative 1

Foster Wheeler Environmental Corporation

PAPCFG06.dwg

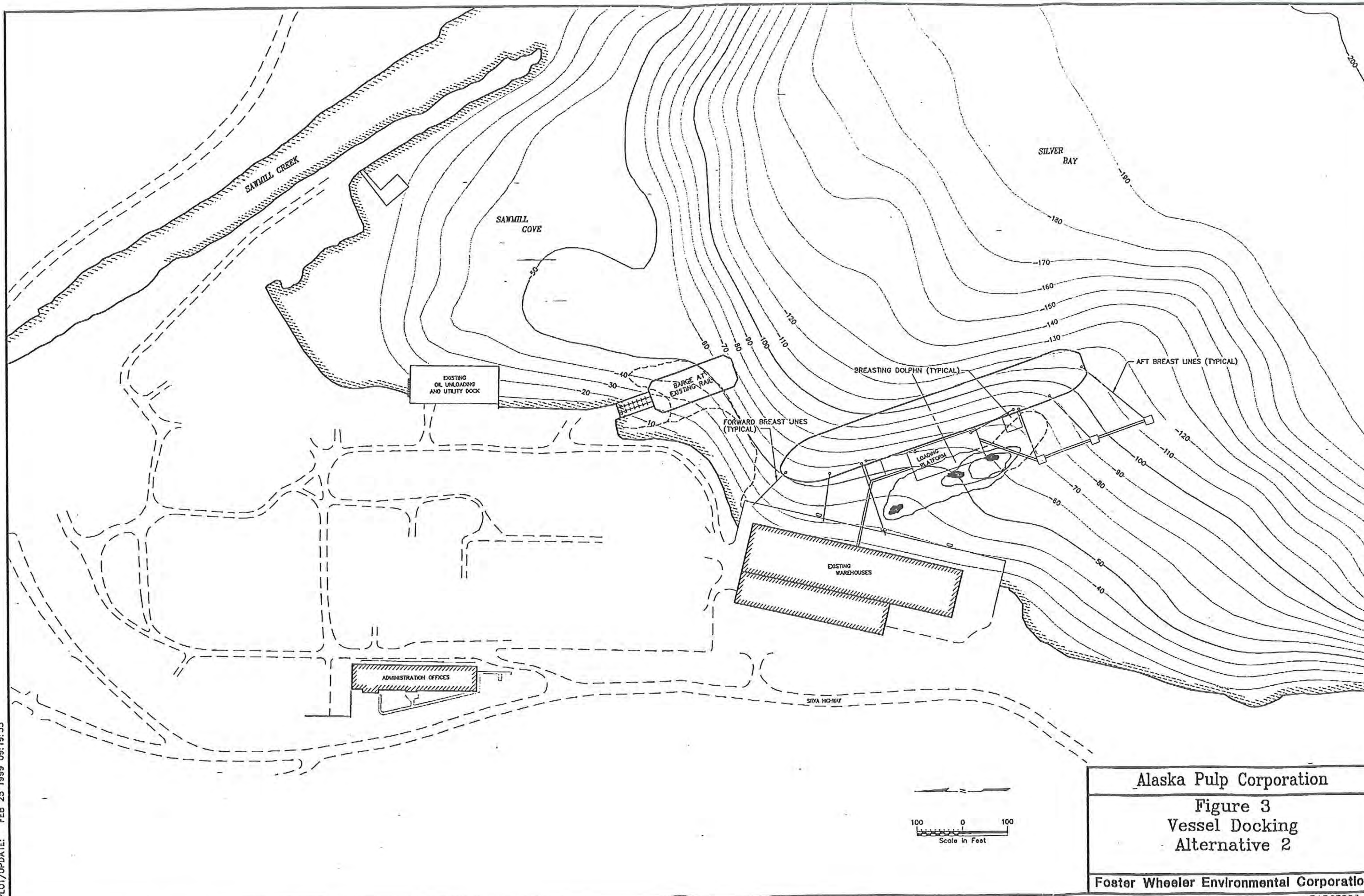


Alaska Pulp Corporation

Figure 2
Non–Native Sediment Thicknesses and Descriptions

Foster Wheeler Environmental Corporation

PAPCFG07.dwg



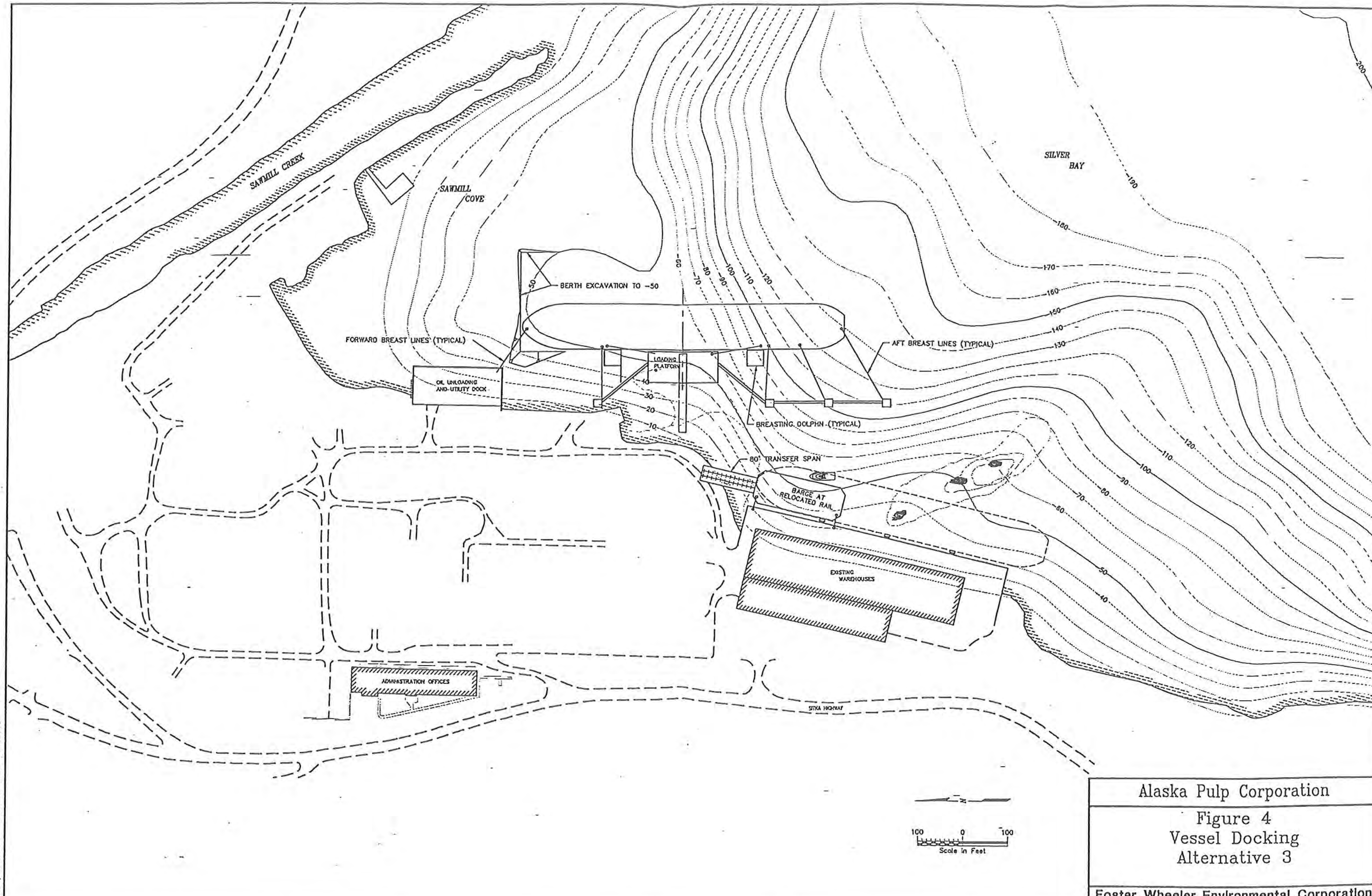
Alaska Pulp Corporation

Figure 3
Vessel Docking
Alternative 2

Foster Wheeler Environmental Corporation

I:\PROJECTS\1442000\DWG\PAPCFG03.DWG
PLOT/UPDATE: FEB 25 1999 09:19:55

PAPCFG03.dwg



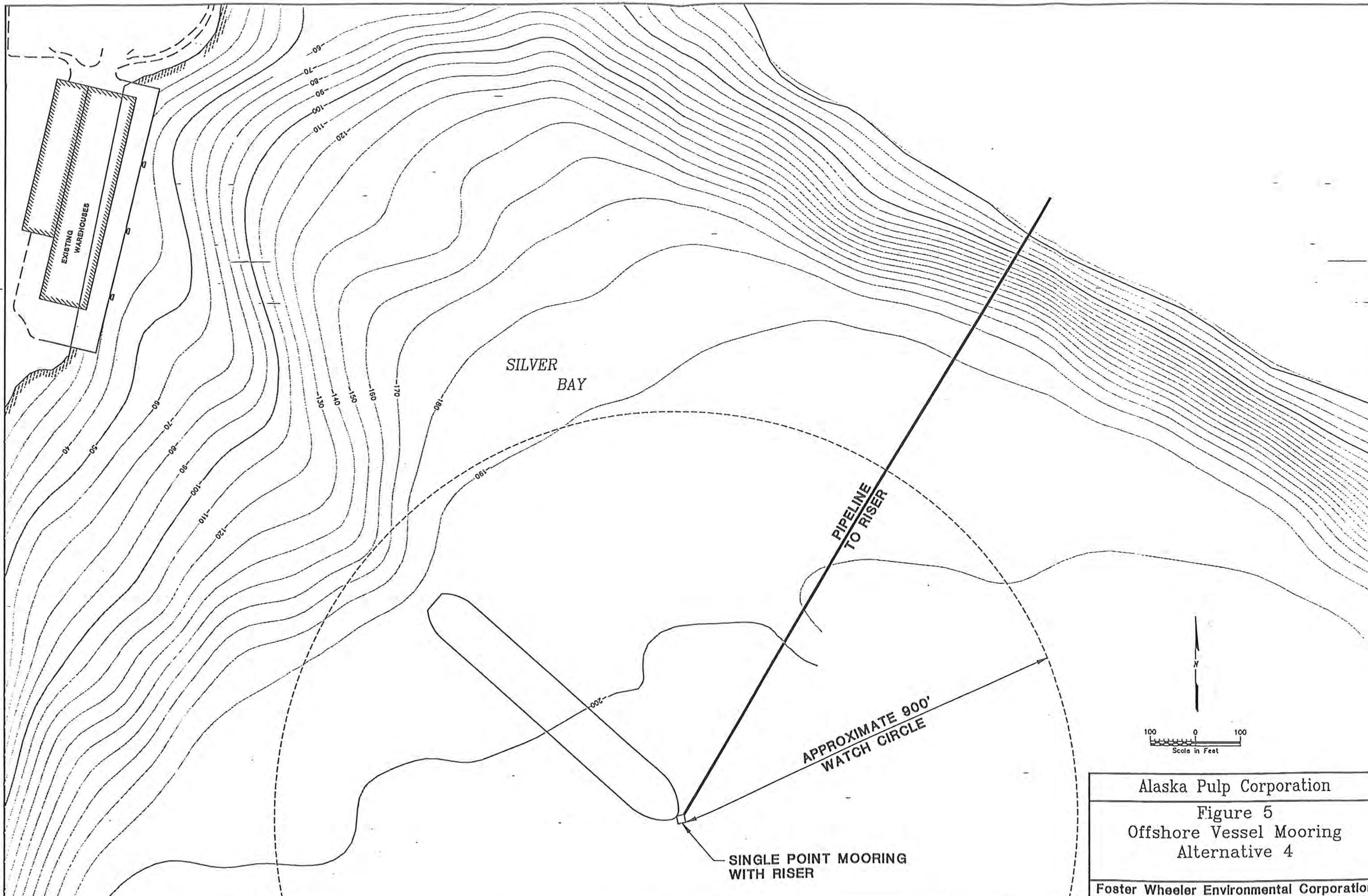
Alaska Pulp Corporation

Figure 4
Vessel Docking
Alternative 3

Foster Wheeler Environmental Corporation

PAPCFG04.dwg

I:\PROJECTS\1442000\DWG\PAPCFG04.DWG
PLOT/UPDATE: MAR 02 1999 14:45:10



Alaska Pulp Corporation

Figure 5
Offshore Vessel Mooring
Alternative 4

Foster Wheeler Environmental Corporation

PAPCFG05.dwg

I:\PROJECTS\1442000\DWG\PAPCFG05.DWG
PLOT/UPDATE: FEB 23 1999 10:41:35

APPENDIX A

DREDGING COST ESTIMATES FOR ALTERNATIVES 1 AND 3

ALASKA PULP CORPORATION
Conceptual Level Cost Estimate for 1,300cy
Local Landfill Disposal
Alternative 1
2/23/99

The volume of material associated with the area is broken down as follows:

Type of Volume	Volume (CY)
Approximate Volume (cubic yards)	1,300

MOBILIZATION/DEMOBILIZATION
Mobilization travel distance is based on ~5 miles one way travel.
Other typical equipment requiring mobilization includes:
surveying equipment.
Special equipment would include 1 dozer, and 3 dump trucks.

PRODUCTION RATES
A 1 1/2 floating clamshell crane the maintenance dredging.
An 8 hr workday is assumed.

In-situ production rate			50 cy/hr
Production rate			400 cy/day
	1,300 cy /	400 cy/day =	3.3 days
			Round to 4 days

DREDGING AND TRANSPORT
Dredging costs are based on assuming that dredge production and not the dewatering will be limiting factor.
Therefore, actual delays potentially caused by required dewatering or other end-use delays are not included.
Sediment will be directly placed into trucks as dredging occurs

DEWATERING
Sediment will be transported to a local landfill in end-dump trucks.
After sediment drains it will be spread out with a dozer.

ESTIMATED COSTS FOR MAINTENANCE DREDGING

Description	Quantity	Unit	Unit cost	Cost
PRE/POST CONSTRUCTION				
Pre and Post Construction Survey	1	Ea	$2,000.00	$2,000
Mobilization/Demobilization	1	LS	$5,000.00	$5,000
DREDGING (based on 1,300 cy of dredged material)				
Derrick w/ Clamshell Bucket <1>	4	day	$3,800.00	$15,200
Tug <1>	4	day	$5,000	$20,000
TRANSPORT TO A LOCAL LANDFILL				
3 Lined Dump Trucks	4	day	$3,000.00	$12,000
DISPOSAL, DEWATER, AND SPREADING				
Dozer (for spreading sediment)	4	day	$1,300.00	$5,200
Tipping Fee	1,950	tons	$8.00	$15,600
MONITORING				
QA Monitoring During Dredging	1	LS	$4,000.00	$4,000
APPROXIMATE DREDGING, TRANSPORT, AND DISPOSAL COST <2>				$79,000

<1> Equipment rates include crew
<2> Cost range anticipated to be -10% to +20% given the volumes identified.

BASIS FOR ESTIMATED COSTS
- Water quality monitoring is not included in this estimate.
- Estimated volumes are not based on defined dredge cut plans.
- Estimate does not include costs for permitting

ALASKA PULP CORPORATION
Conceptual Level Cost Estimate for 17,000 cy Removal
Dredging with Local Landfill Disposal and Armor Rock Placement
Alternative 3
2/12/99

The volume of material to be dredged is as follows:

Type of Volume	Dredge Volume (cy)
Approximate Volume (cubic yards)	17,000

MOBILIZATION/DEMOBILIZATION
Mobilization travel distance is based on ~940 miles one way travel.
One way travel for derrick is estimated at 7 days.
For dredging, typical equipment requiring mobilization includes:
derrick, clamshell, 1 tug, 2 barges, survey vessel, tender, and positioning equipment.
Special equipment would include two loaders and two dump trucks.

ARMOR ROCK PLACEMENT
Rock supplier will deliver the rock from within 150 mi. radius.
Quoted price is for material delivered to the jobsite.
Towing tug and flat-deck material barges are included in the price.

PRODUCTION RATES
Dredging production rates will depend on water depth, bucket size, ability to position, and efficiency factors.
An 8 cy bucket is anticipated to be used.
Barge capacity is anticipated to be 1000cy.
Daily operation is based on one shift of loading the barge for 10 hours and one shift for offloading

In-situ production rate			100 cy/hr
Production rate			1,000 cy/day
	17,000 cy @	1,000 cy/day =	17 days

Rock placement production rates will depend on water depth, topography, ability to position,
weather, delivery of material and other efficiency factors.
Production rate is estimated to be 150 cy/hr for armoring.
Daily operation is based on one 10 hour shift per day - no night operations.
Loading operations could concur with armor placement operations using two barges.

Duration of armoring operation = 2000 cy/100 cy/hr = 20 hrs.

DEWATERING
It is assumed that the effluent run off water can be discharged into storm drains or into the bay without treatment.
Stockpile area will be lined with berms made by a loader, if required.

DREDGING AND TRANSPORT
Dredging costs are based on assuming that dredge production will be limiting factor.
therefore, actual delays potentially caused by required dewatering or other end use delays are not included.
Barges will be lined to inhibit sediment flow back to the water.
Barge will be towed over to astockpile dewatering area and sediment will be offloaded using a mooring
barge or with a land based crane. After dewatering, a front end loader will load dump trucks which will transport the sediment
to Sitka Landfill for disposal.
Two dumptrucks are assumed to handle 15cy of sediment per load and have a cycle time of 20 minutes each and staggered
10 min apart (loading at a local landfill, traveling to Sitka Landfill, end dumping, and returning).

ESTIMATED COSTS FOR DREDGING				
Description	Quantity	Unit	Unit cost	Cost
PRE/POST CONSTRUCTION				
Pre and Post Construction Survey	1	Ea	$4,000	$4,000
Mobilization/Demobilization	1	LS	$400,000	$400,000
Construction of Stockpile Area	1	LS	$5,000	$5,000
DREDGING (based on 17,000 cy of dredged material in place)				
Clamshell Derrick with Bucket<1>	17	day	$10,000	$170,000
Mooring Barge	17	day	$1,500	$25,500
Site Tug <1>	17	day	$6,000	$102,000
2 Lined Flat Deck Barges (1000 cy cap.)	17	day	$3,000	$51,000
Tender <1>	17	day	$3,600	$61,200
Daily Condition Surveys/Positioning	17	day	$2,000	$34,000
Silt Curtain	1	LS	$26,000	$26,000
DEWATERING (includes off-load,construct berm at stockpile area, and stockpile)				
Loader <1>	20	day	$900	$18,000
2 Trucks <1>	20	day	$1,800	$36,000
TRANSPORT FROM STOCKPILE/DEWATERING AREA TO SITKA LANDFILL				
Loader (for loading barges) <1>	20	day	$900	$18,000
2 Trucks	20	day	$1,800	$36,000
DISPOSAL AT SITKA LANDFILL				
Loader (for spreading sediment) <1>	20	day	$900	$18,000
Tipping Fee	25,500	tons	$8	$204,000
MONITORING				
QA Monitoring after Dredging	1	LS	$20,000	$20,000
APPROXIMATE DREDGING, TRANSPORT, AND DISPOSAL COST <2>				$1,228,700

<1> Equipment rates include crew

<2> Cost range anticipated to be -10% to +20% given the volumes identified.

ESTIMATED COSTS FOR ARMOR ROCK				
Description	Quantity	Unit	Unit cost	Cost
PRE/POST CONSTRUCTION				
Pre and Post Construction Survey	1	Ea	$ 6,000	$ 6,000
Mobilization/Demobilization	1	LS	$ 50,000	$ 50,000
ARMOR PLACEMENT				
Class III Rock Delivered to Jobsite on Barge	2,000	CY	$ 35	$ 70,000
Clamshell Derrick	2	day	$ 10,000	$ 20,000
2 Flat Deck Barges	2	day	$ 3,000	$ 6,000
Site Tug	2	day	$ 6,000	$ 12,000
Workboat	2	day	$ 1,500	$ 3,000
Loader	2	day	$ 900	$ 1,800
Daily Condition Surveys/Positioning	2	day	$ 2,000	$ 4,000
Total Cost Armoring				$ 172,800

TOTAL CONSTRUCTION COSTS	**$1,401,500**

BASIS FOR ESTIMATED COSTS

- Water quality monitoring is not included in this estimate.
  No overflow from the haul barge will be allowed.
- Costs include dredging, dewatering, transport, and disposal of dredged material.
- No treatment of effluent from the dewatering process will be required
- Estimated volumes are not based on defined dredge cut plans.
  This volume has been linearly interpolated.
  Significant volume from slope sloughing at the boundaries of the dredging area is also part of the actual volume that is removed during excavation. An additional 20% is included to account for equipment tolerances and slope sloughing volume. However, there could be significantly greater volumes depending on the final dredge plan.
- Silt Curtain in 400 ft wide by 65 ft high.

ALASKA PULP CORPORATION

Conceptual Level Cost Estimate for 17,000 cy Removal

Dredging with Beneficial Reuse of Sediments, Sitka Landfill Disposal for Woodwaste, and Armor Rock Placement

2/11/99

The volume of material to be dredged is as follows:

Type of Volume	Dredge Volume (cy)
Approximate Volume (cubic yards)	17,000

MOBILIZATION/DEMOBILIZATION

Mobilization travel distance is based on ~940 miles one way travel.
One way travel for derrick is estimated at 7 days.
For dredging, typical equipment requiring mobilization includes:
derrick, regular clamshell, sealed clamshell, 1 tug, 2 barges, survey vessel, tender, and positioning equipment.
Special equipment would include two loaders and two dump trucks.

ARMOR ROCK PLACEMENT

Rock supplier will deliver the rock from within 150 mi. radius.
Quoted price is for material delivered to the jobsite.
Towing tug and flat-deck material barges are included in the price.

PRODUCTION RATES

Dredging production rates will depend on water depth, bucket size, ability to position, and efficiency factors.
A closed 8 cy bucket is anticipated to be used.
Barge capacity is anticipated to be 1000cy.
Daily operation is based on one shift of loading the barge for 10 hours and one shift for offloading the barge for 10 hours.

In-situ production rate			100 cy/hr
Production rate			1,000 cy/day
	17,000 cy /	1,000 cy/day =	17 days

Rock placement production rates will depend on water depth, topography, ability to position, weather, delivery of material and other efficiency factors.
Production rate is estimated to be 150 cy/hr for armoring.
Daily operation is based on one 10 hour shift per day - no night operations.
Loading operations could concur with armor placement operations using two barges.

Duration of armoring operation =2000 cy/100 cy/hr = 20 hrs.

DEWATERING

It is assumed that the water can be discharged into storm drains or into the bay without treatment.
Stockpile area will be lined with berms made by a loader.

DREDGING AND TRANSPORT

Dredging costs are based on assuming that dredge production will be limiting factor.
therefore, actual delays potentially caused by required dewatering or other end use delays are not included.
Barges will be lined to inhibit sediment flow back to the water.
Barge and clamshell derrick will be moved over to Herring Cove and sediment will be offloaded by a ramp by loaders which will load dump trucks on shore. Dump trucks will transport the sediment to Herring Cove Landfill to a bermed staging area to be dewatered.
Two dumptrucks are assumed to handle 15cy of sediment per load and have a cycle time of 20 minutes each and staggered 10 min apart (loading at Herring Cove, traveling to Sitka Landfill, end dumping, and returning).

ESTIMATED COSTS FOR DREDGING				
Description	Quantity	Unit	Unit cost	Cost
PRE/POST CONSTRUCTION				
Pre and Post Construction Survey	1	Ea	$4,000	$4,000
Mobilization/Demobilization	1	LS	$400,000	$400,000
Construction of Stockpile Area	1	LS	$5,000	$5,000
Silt Curtain	1	LS	$26,000	$26,000
DREDGING (based on 17,000 cy of dredged material in place)				
Clamshell Derrick w/ Closed and Regular Bucket <1>	17	day	$10,000	$170,000
Site Tug <1>	17	day	$6,000	$102,000
2 Lined Flat Deck Barges (1000 cy cap.)	17	day	$3,000	$51,000
Tender <1>	17	day	$3,600	$61,200
Daily Condition Surveys/Positioning	17	day	$2,000	$34,000
DISPOSAL AT BENEFICIAL USE SITE (14,000 cy)				
Loader	13	day	$900	$11,700
Site Tug <1>	13	day	$6,000	$78,000
2 Lined Flat Deck Barges (1000 cy cap.)	13	day	$3,000	$39,000
Daily Condition Surveys/Positioning	13	day	$2,000	$26,000
DEWATERING (includes off-load, truck to Herring Cove, and stockpile) (4,000 cy)				
Loader <1>	20	day	$900	$18,000
2 Lined Dump Trucks <1>	40	day	$900	$36,000
TRANSPORT FROM HERRING COVE LANDFILL TO SITKA LANDFILL (4000 cy)				
Loader (for loading barges) <1>	4	day	$900	$3,600
2 Lined Dump Trucks	4	day	$900	$3,600
DISPOSAL AT SITKA LANDFILL				
Loader (for spreading wood chips) <1>	4	day	$900	$3,600
Tipping Fee	6,000	tons	$15	$90,000
MONITORING				
QA Monitoring after Dredging	1	LS	$20,000	$20,000
APPROXIMATE DREDGING, TRANSPORT, AND DISPOSAL COST <2>				$1,182,700

<1> Equipment rates include crew
<2> Cost range anticipated to be -10% to +20% given the volumes identified.

ESTIMATED COSTS FOR ARMOR ROCK				
Description	Quantity	Unit	Unit cost	Cost
PRE/POST CONSTRUCTION				
Pre and Post Construction Survey	1	Ea	$ 6,000	$ 6,000
Mobilization/Demobilization	1	LS	$ 50,000	$ 50,000
ARMOR PLACEMENT				
Class III Rock Delivered to Jobsite on Barge	2,000	CY	$ 35	$ 70,000
Clamshell Derrick	2	day	$ 10,000	$ 20,000
2 Flat Deck Barges	2	day	$ 3,000	$ 6,000
Site Tug	2	day	$ 6,000	$ 12,000
Workboat	2	day	$ 1,500	$ 3,000
Loader	2	day	$ 900	$ 1,800
Daily Condition Surveys/Positioning	2	day	$ 2,000	$ 4,000
Total Cost Armoring				$ 172,800

TOTAL CONSTRUCTION COSTS	$1,355,500

BASIS FOR ESTIMATED COSTS

- Water quality monitoring is not included in this estimate.
- Due to high suspended solids concentrations and flocculent nature of material, it is anticipated that no overflow from the barge will be allowed.
- Costs include dredging, dewatering, transport, and disposal of dredged material.
- Loading for transport to Seattle will be accomplished using a loader obtained locally
- Offloading of dredged material in Seattle is anticipated to be accomplished using a clamshell
- No treatment of effluent from the dewatering process will be required.
- Estimated volumes are not based on defined dredge cut plans.
  Significant volume from slope sloughing at the boundaries of the dredging area is also part of the actual volume that is removed during excavation. An additional 20% is included to account for equipment tolerances and slope sloughing volume. However, there could be significantly greater volumes depending on the final dredge plan.
- Silt Curtain in 400 ft wide by 65 ft high.

ALASKA PULP CORPORATION
Conceptual Level Cost Estimate for 3,200 cy Removal
Dredging with Local Landfill Disposal and Armor Rock Placement with Local Equipment
Alternative 4

3/2/99

The volume of material to be dredged is as follows:

Type of Volume	Dredge Volume (cy)
Approximate Volume (cubic yards)	3,200

MOBILIZATION/DEMOBILIZATION
Mobilization travel distance is based on local contractor.
One way travel for derrick is estimated at 1 day.
For dredging, typical equipment requiring mobilization includes:
Crane with clamshell mounted on a derrick, 1 tug, 1 barge, survey vessel, tender, and positioning equipment.
Special equipment would include one dozer and one loader and three dump trucks.

ARMOR ROCK PLACEMENT
Rock supplier will deliver the rock from within 150 mi. radius.
Quoted price is for material delivered to the jobsite.
Towing tug and flat-deck material barges are included in the price.

PRODUCTION RATES
Dredging production rates will depend on water depth, bucket size, ability to position, and efficiency factors.
A 1-1/2 cy bucket is anticipated to be used.
Barge capacity is anticipated to be 1,000cy.
Daily operation is based on two-and-a-half 10 hour shifts of loading the barge and two-and-a-half 10 hour shifts for moving and offloading the barge with the clamshell derrick when the barge is full.

In-situ production rate			40 cy/hr
Production rate for 1-10 hour shift			400 cy/day
	3,200 cy @	400 cy/day =	8 days

Rock placement production rates will depend on water depth, topography, ability to position, weather, delivery of material and other efficiency factors.
Production rate is estimated to be 40 cy/hr for armoring.
Daily operation for rock placement is based on one 10 hour shift per day - no night operations.
Loading operations could concur with armor placement operations using two barges.

Duration of armoring operation = 1,000 cy/40 cy/hr = 25 hrs.

DEWATERING
It is assumed that the effluent run off water can be discharged into storm drains or into the bay without treatment at the landfill.

DREDGING AND TRANSPORT
Dredging costs are based on assuming that dredge production will be limiting factor.
therefore, actual delays potentially caused by required dewatering or other end use delays are not included.
Barge will be equipped with fences to preclude sediment flow back to the water.
Barge will be towed over to an offloading area and will be offloaded with the clamshell derrick into dump trucks.
Dump trucks will transport the sediment to a local landfill for disposal.
Three dumptrucks are assumed to handle 10 cy of sediment per load and have a cycle time of 45 minutes each and staggered 15 min apart (loading at a local landfill, traveling to a local landfill, end dumping, and returning).
Disposal rate will be 40 cy per hour.

ESTIMATED COSTS FOR DREDGING				
Description	Quantity	Unit	Unit cost	Cost
PRE/POST CONSTRUCTION				
Pre and Post Construction Survey	1	Ea	$4,000	$4,000
Mobilization/Demobilization	1	LS	$10,000	$10,000
DREDGING (based on 3,200 cy of dredged material in place)				
Clamshell Derrick with Bucket<1>	80	Hour	$380	$30,400
Site Tug <1>	80	Hour	$500	$40,000
1 Lined Flat Deck Barge (1,000 cy cap.)	80	Hour	$130	$10,400
Tender <1>	80	Hour	$360	$28,800
Daily Condition Surveys/Positioning	80	Hour	$250	$20,000
Silt Curtain	1	LS	$26,000	$26,000
TRANSPORT FROM BARGE TO TRUCKS (includes moving barge and derrick and offloading)				
Clamshell Derrick with Bucket<1>	80	Hour	$380	$30,400
Site Tug <1>	80	Hour	$500	$40,000
1 Lined Flat Deck Barge (1,000 cy cap.)	80	Hour	$130	$10,400
TRANSPORT FROM BARGE OFFLOADING AREA TO LOCAL LANDFILL				
Loader (for loading trucks) <1>	80	Hour	$130	$10,400
3 Trucks	80	Hour	$300	$24,000
DISPOSAL AT LOCAL LANDFILL				
Dozer (for spreading sediment) <1>	80	Hour	$110	$8,800
Tipping Fee	4,800	Ton	$8	$38,400
MONITORING				
QA Monitoring during Dredging	1	LS	$8,000	$8,000
APPROXIMATE DREDGING, TRANSPORT, AND DISPOSAL COST <2>				$340,000

<1> Equipment rates include crew
<2> Cost range anticipated to be -10% to +20% given the volumes identified.

ESTIMATED COSTS FOR ARMOR ROCK				
Description	Quantity	Unit	Unit cost	Cost
PRE/POST CONSTRUCTION				
Pre and Post Construction Survey	1	Ea	$6,000	$ 6,000
Mobilization/Demobilization	1	LS	$20,000	$ 20,000
ARMOR PLACEMENT				
Class III Rock Delivered to Jobsite on Barge	1,000	CY	$35	$ 35,000
Clamshell Derrick	25	Hour	$380	$ 9,500
2 Flat Deck Barges	25	Hour	$260	$ 6,500
Site Tug	25	Hour	$500	$ 12,500
Tender	25	Hour	$360	$ 9,000
Loader	25	Hour	$130	$ 3,250
Daily Condition Surveys/Positioning	2.5	Day	$2,000	$ 5,000
Total Cost Armoring				$ 106,750

TOTAL CONSTRUCTION COSTS	**$446,750**

BASIS FOR ESTIMATED COSTS

- Water quality monitoring is not included in this estimate.
  No overflow from the haul barge will be allowed.
- Costs include dredging, transport, and disposal of dredged material.
- No treatment of effluent from the dewatering process will be required at landfill.
- Estimated volumes are not based on defined dredge cut plans.
  This volume has been linearly interpolated.
  Significant volume from slope sloughing at the boundaries of the dredging area is also part of the actual volume that is removed during excavation. An additional 20% is included to account for equipment tolerances and slope sloughing volume. However, there could be significantly greater volumes depending on the final dredge plan.
- Silt Curtain in 400 ft wide by 65 ft high.

Exhibits

Marine Taxonomic Services LTD Dive Survey

REPORT ON SCUBA VIDEO SURVEY AT SAWMILL COVE,

SITKA, ALASKA PULP MILL SITE

January, 1999

Report Prepared for Foster Wheeler Environmental Corp.

By Marine Taxonomic Services, Ltd.

March, 1999

TABLE OF CONTENTS

1:0 Introduction 3
2.0 Methods 3
3.0 Materials 3
4.0 Results 4
5.0 Summary of Observations 5
5.1 Types of Substrate 5
5.2 Epifauna 5
5.2.1 Pulp and Utility Dock Areas 5
5.2.2 Outfall Area 5
TABLE I (Pulp Dock and Utility Dock Cross-Sections) 7
FIGURE 1 (Existing Conditions and Previous Vessel Docking Alternative 1) 10
APPENDIX I (Scope of Work) 11
APPENDIX II (Dive Plan) 15
APPENDIX III (Species Observed) 20
APPENDIX IV (Dive Team 1 Field Notes) 23
APPENDIX V Dive Team 2 Field Notes) 266

1.0 Introduction

The area around Sawmill Cove, Sitka Bay, Sitka, Alaska was used as a pulp mill by Alaska Pulp Corporation until 1993. In September of that year, operations ceased and efforts to evaluate any long term environmental impacts were begun. As part of these ongoing studies Marine Taxonomic Services, Ltd. (MTS) was contracted to supply SCUBA divers with marine biological backgrounds to survey and video tape the area from near the outfall north to the area off the utility dock and out to a depth of 40-60' depending on bathymetry (See map Figure 1). (See also Scope of Work - Appendix I).

2.0 Methods

Twenty two (22) transects were laid out perpendicular to the dock front along the main pulp dock. Each transect was approximately 100 feet apart and lay on a compass course of 72° magnetic. Transects 1-8 (see map Fig.1) were to be surveyed to a depth of 40 feet and transects 9-22 to a depth of 60 feet. This aspect was due to the natural bathymetry of the area. Two separate tasks were to be accomplished by the two MTS dive teams. Team 1 (Howard Jones and Keith Merkel) used a hand held video camera (Super 8 format) and a Nikonos IV still camera (35mm format) to record the condition of the sediments along each transect. Team 2 (Allan Fukuyama and Tim Loher) used a calibrated rod to measure the overburden of non-native material (wood debris, cellulose, etc.) along each transect and recorded their findings via underwater writing equipment. Each transect was marked prominently along the shoreline using surveyors flagging. At each transect marker a 200 foot tape was attached to the beach and one member of dive Team 1 navigated a 72° magnetic course to the -60 foot contour while the other team member followed along video taping the sediments along the transect. Team 1 started at T-15 while Team 2 began the overburden measuring at T-2.

3.0 Materials

Each diver in the group was an experienced cold water divers with many advanced certifications. All team members were marine biologists with a combined 80+ years of experience dealing with many aspects of the marine environment and its ecology. All divers used dry suits and SCUBA systems. At least one member of each team utilized a dive computer to log the dives for safety purposes. Reliance on these computers and the Navy safe dive tables allowed a diver to maximize bottom time in a repetitive dive/multiple depth scenario while maintaining a safe no decompression dive situation. Both teams followed the dive plan as filed with the Foster Wheeler representative on site (see Appendix II). Each diver was equipped with a buoyancy compensator. No divers experienced any problems during the dives. Team 2 used a calibrated steel rod to measure the overburden.

4.0 Results

Team 1 began the underwater video work at T-15 (Fig. 1) on Saturday January 23, 1999 and proceeded north along each transect to T-9. Then, team 1 was transported via skiff to T-22 (far south transect) to complete their last dive of the day. Team 1 observed and recorded various sediment types along the completed transects. Sediments included sand, gravel, rock, wood debris (chips and fine pulp material) concrete debris, logs and other site debris. None of these sediment types posed a hazard to the divers and all have become habitats to a variety of marine organisms both plant and animal. (See Appendix III for a listing of observed organisms).

Team 1 returned to the site Sunday January 24, 1999 and the original dive plan was modified to include video taping of T-20, T-18, T-16 and video taping the general area around the observed rock outcrop near T-12 and the area between T-1 (utility dock) and T-9 (north end of the pulp dock). (See dive Team 1 field notes - Appendix IV).

Team 2 started their measuring work at T-2 on Saturday January 23, 1999 and continued south finishing up at T-16 on Sunday January 24, 1999. After all measurements were made, Team 2 took 4 core samples of the bottom sediments. These cores were extruded into a bucket for observation and then returned to the sea floor. No material or animals were removed from the site. A summary of the measurements taken by Team 2 is presented in Table 1.

Team 1 produced approximately 3 hours of underwater video footage from the transects and the general subtidal area. This was combined with 1 hour of surface video supplied by one of the APC reps and was edited into a 10 minute overview of what was observed by the divers during this field work effort. All video footage will be archived for future use. The repository for these videos will be located at ADEC in Juneau, Alaska (contact Bill Janes @ 907-465-5208) or at the public repository at Sheldon Jackson

College in Sitka, Alaska. At the end of each dive day the video tape was reviewed by all parties and a general debriefing session was held to help evaluate the success of Teams 1 and 2.

5.0 Summary of Observations

5.1 Types of Substrate

Physical observations of the bottom substrate in the dive area indicate that there are a variety of sediment types present. Near the main pulp dock, sediments observed included fine flocculent wood debris, fine sand, rocky native substrate and mud. The surface sediments in the area between the pulp dock and the utility dock to the north were characterized by rocky rubble, gravel and large wood chips. South of the pulp dock bottom material is dominated by fine flocculent wood waste material, although rocky substrates were present near the shoreline.

5.2 Epifauna

The video survey of Sawmill Cove shows that the natural recovery processes is underway, particularly in the near-shore areas. A biologically active epibenthos was present even in areas where the predominant sediment was fine wood waste material and a large portion of the wood waste area has been colonized by a variety of infauna and epifauna. Fifty one (51) invertebrate and twelve (12) fish species were tentatively (visually) identified at various locations within the survey area. These species included bacteria, algae, anthozoa, nemertea, polychaeta, crusteacea, brachiopod, mollusca, echinodermata, ascidiacea, and pisces.

5.2.1 Pulp and Utility Dock Areas

In front of the pulp dock there is an outcrop of rocky native material that's follows the depth contours running to the southeast. A variety of epibenthic species were associated with this area. The rocky substrate north of the pulp dock also had several epifaunal (nudibranchs, anemones, tunicates, sea cucumbers, crabs) and fish species.

5.2.2 Outfall Area

The video survey of the nearshore subtidal area shows a biologically active epibenthos in the wood deposition zone. This community is a moziac that alternates between areas covered by a white microbial mat (probably the sulfur bacteria *Beggiatoa* sp.) and areas colonized by a variety of invertebrate species.

Sulfur bacteria such as *Beggiatoa* use oxygen from the water column to oxidize hydrogen sulfide from the sediments. The hydrogen sulfide is converted to elemental sulfur and then to sulfate used for energy production. The predominant macroinvertebrates in this area consisted of anemones (*Mertridium sensile*), nudibranchs (*Coryphella fusca, Dirona albolineata*) and ascidians.

TABLE I

PULP DOCK AND UTILITY DOCK CROSS-SECTIONS

Transect	Time		Tide	Water Depth (MLLW)	Non-Native Sediment Thickness	Top of Native Sediment (MLLW)	Length Along Line	Sediment Description
T-9	1/23	1105	0.4	-15	0	-15	0'	Gravel
T-9		1106	0.4	-20	½'	-20	24'	5"-6" long slivers w/ 1/2" chips
T-9		1107	0.4	-30	5'	-35'	50'	½" chips
T-9		1109	0.4	-40	2'	-42	88'	½" chips
T-9	1/24	928	2.8	-47	2'	-49	116'	½" chips with fine floc
T-9		930	2.8	-57	5'	-62	150'	½" chips in fine floc
T-10	1/23	1120	0.5	-36	2'	-38	0'	Mostly shell w ½" fine chips
T-10		1122	0.5	-40	9'	-49	24'	½" chips in fine floc
T-10	1/24	928	2.8	-47	4'	-51	57'	Fine floc
T-10		930	2.8	-57	7'	-64	100'	Fine floc
T-11	1/23	1129	0.6	-30	0'	-30	0'	Gravel mix w/ 2" max chips
T-11		1131	0.6	-39	5'	-44	36'	Fine floc
T-11	1/24	948	2.3	-48	7'	-55	78'	Fine floc
T-11		950	2.3	-58	7'	-65	125'	Fine floc
T-12	1/23	1136	0.6	-29	4'	-33	0'	½" chips
T-12		1142	0.6	-39	4'	-43	162'	Fine flock
T-12	Cross section is flat beyond 162'					-43	> 162'	
T-13	1/23	1447	5.0	-27	5'	-32	0'	½" chips
T-13		1448	5.0	-35	9'	-44	30'	½" chips
T-13		1454	5.1	-45	2'	-47	182'	Fine floc
T-13		1459	5.3	-50	2'	-52	250' end of tape	Fine floc
T-14	1/23	1502	5.3	-29	8'	-37	0'	Fine floc
T-14		1504	5.5	-35	>10'	>-45	23'	½" chips
T-14		1506	5.6	-44	2'	-46	62'	Fine floc
T-14		1508	5.6	-54	3'	-57	105'	Fine floc
T-15	1/24	1021	0.6	-27	>10'	>-37	0'	1"- 2" chips
T-15		1022	0.6	-29	>10'	>-39	15'	1"- 2" chips
T-15		1024	0.5	-40	5'	-45	39'	½" chips in fine floc
T-15		1026	0.5	-50	7'	-57	70'	1" - 2" chips in fine floc
T-15		1028	0.5	-60	9'	-69	172'	Fine floc
T-16		1042	0.4	-10	10'	-20	35'	1" - 2" chips w/ fine floc
T-16		1044	0.4	-20	5'	-25	67'	1" – 2" chips w/ fine floc
T-16		1046	0.4	-30	>10'	>-40	88'	½" chips in fine floc
T-16		1048	0.4	-40	9'	-49	109'	½" chips in fine floc
T-16		1050	0.4	-50	10'	-60	137'	½" chips in fine floc
T-16		1052	0.4	-55	10'	-65	250'	½" chips in fine floc

Table 1 (Cont.) PULP DOCK AND UTILITY DOCK CROSS-SECTIONS

Transect	Time		Tide	Water Depth (MLLW)	Non-Native Sediment Thickness	Top of Native Sediment (MLLW)	Length Along Line	Sediment Description
Utility Dock								
T-1	1/23			-23	>10'	>-33	0'	½" chips
T-2		0952	1.1	-23	>10'	>-33	0'	½" chips
T-2		0954	1.0	-29	5'	-34	21'	½" chips
T-2		0956	0.9	-39	5'	-44	59'	½" chips
T-3		1010	0.7	-13	4'	-17	0'	1" – 2" chips
T-3		1012	0.7	-19	>10'	>-29	14'	½" chips
T-3		1014	0.6	-29	>10'	>-39	31'	½" chips
T-3		1016	0.6	-39	>10'	>-49	54'	½" chips
South of Utility Dock								
T-4	1/24	1332	1.0	-29	5'	-34	5'	½" – 2" chips
T-4		1334	1.0	-39	1'	-40	41'	Fine floc
T-5		1343	1.1	-29	0'	-29	23'	Native Gravel
T-5		1345	1.2	-39	5'	-44	49'	Fine floc w/1"-2" chips
T-6		1351	1.3	-19	1'	-20	33'	1" – 2" chips
T-6		1353	1.3	-29	7'	-36	69'	Floc w/ 1" – 2" chips
T-6		1355	1.4	-39	½"	-39	91'	Gravel

FIGURE 1

MAP

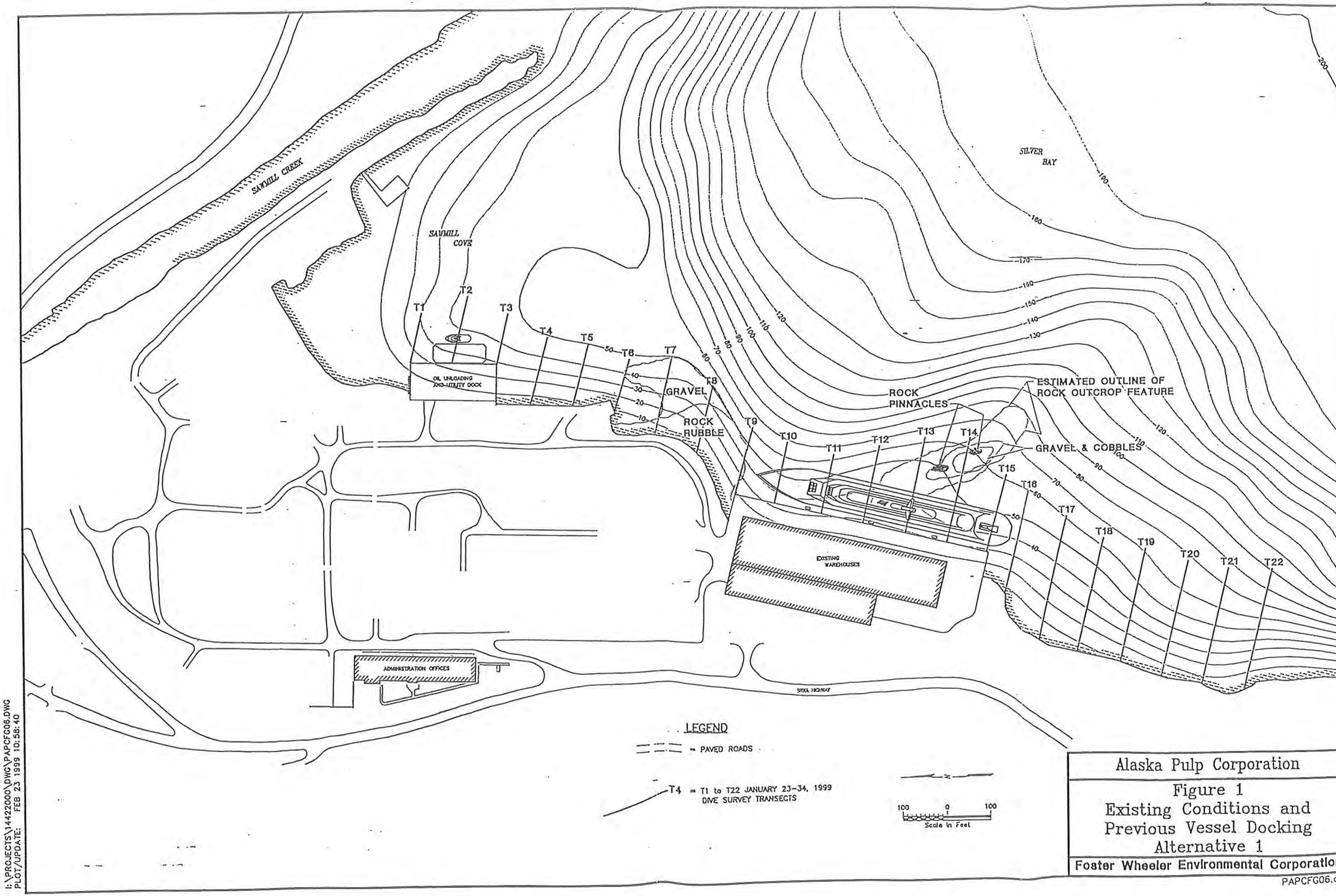


Figure 1
Existing Conditions and Previous Vessel Docking Alternative 1