

Underwater Bark Debris Survey
Two Moon Bay Log Storage Facility
Cordova, Alaska
March 1998

Submitted to: Citifor, Inc.
P.O. Box 1929
Port Angeles, WA 98362

Prepared by: Craig's Dive Center
P.O. Box 796
107 Main St.
Craig, AK 99921

*Hand delivered
/ rec'd on
3/31/98*

Subject: Two Moon Bay dive survey; EPA Permit AK-004560-8.

Introduction:

On March 25, 1998, an underwater bark debris survey was made at the Tatitlek Corporation Two Moon Bay Log Transfer Facility (LTF), at Port Fidalgo, near Cordova, Alaska. Periodic bark debris surveys are required as part of the bark deposition monitoring program stipulated by the National Pollution Discharge Elimination System (NPDES) permit. Protocols for operating a bark monitoring program are given in the *LTF Siting, Construction, Operation and Monitoring/Reporting Guidelines* (1985).

Methods:

Standard protocols for bark debris surveys include selection of a permanent reference point, ideally located in the center of the bundle entry structure or ramp and close to an essentially permanent structure or landmark so that the reference point can be relocated exactly in the future for continuation of the monitoring program. Depth of the reference point is positioned as close to 0 feet Mean Lower Low Water (MLLW) as possible using NOAA Tide Tables for tide correction calculations. Using the outer horizontal face of the entry structure as a reference plane (e.g., the center of a drive-down ramp or low-angle slide), magnetic compass headings for five transects at 30-degree intervals are selected, with the permanent reference point as the origin for each of the five transects. The center transect (parallel to the ramp/slide axis) is perpendicular to the face of the entry structure.

Each transect is sampled at 5-meter intervals starting from the origin at the permanent reference point. Sample points are established along a transect until either a water depth of 60 feet MLLW is reached or the measurable bark debris depth becomes insignificant. At each sample point, several data are recorded by the diver: water depth; debris depth; percent coverage of debris (determined by randomly dropping a 4-foot measuring ruler at the sample point and estimating amount of contact with debris); debris composition and character; substrate type; general algal and animal species and condition; abiotic factors such as direction and strength of current (if present); and the presence of any notable manmade debris. Transects are labeled with their magnetic compass heading for identification purposes.

Representative 35 mm photographs are taken of sample points to document substrate, bark debris, algal and animal life, and any other debris or objects that may be of concern. The camera is positioned vertically over the sample point and aligned with the ruler as the bottom of the photograph. Using a 20 mm wide-angle lens, the camera is positioned 3 feet above the bottom so that the field of view is approximately one square meter, or approximately the same as

the area used when estimating cover.

Areal extent of bark coverage was calculated with the outermost two transects as the boundaries of bark coverage. Calculation of the bark debris-covered surface area was made by taking the triangle formed by two adjacent transects and using the transect with the most sample points (longest distance) as the base leg of a right triangle area calculation. The total square footage of the debris field area was a summation of the areas of these four triangles. This figure was converted to acres as required by the guidelines.

To determine areal extent of substrate with 100 percent coverage of bark debris, the percentage of sample points with 100 percent coverage was calculated and multiplied by the total sample area to derive the areal extent in acres. The same procedure was used to determine areal extent for the area with debris depth of 10 cm or greater and 100 percent coverage.

Results:

<u>Site: Two Moon Bay</u>	
<u>Date Surveyed: 3/25/98</u>	<u>Total # of Sample Points: 61</u>
<u>Time of Sampling: 0920</u>	<u>Average Bark Depth: 19.4 cm</u>
<u>Sampler: C. Sempert</u>	<u>Calculated Survey Area: 1.25 acre</u>

<u>Area with Debris Cover</u>	<u>Area with 100% Cover</u>	<u>Area with Debris Depth >10 cm & 100% Cover</u>
1.25 acre	0.74 acre	0.66 acre

The Two Moon Bay LTF was not operational at the time of the survey, and all equipment associated with the operation of the facility had been removed. The east half of the bulkhead face (consisting of steel sheet piling, horizontal logs, and rock fill) has been damaged by a barge accident and subsequent storm activity, but has not significantly affected either the reference point location or bottom condition in the immediate vicinity.

The permanent reference point was located at the center of the bulkhead structure and positioned at a depth of 16 feet, corrected to a depth of 5 feet MLLW. A total of 61 sample points were taken on the five transects; all sample points had at least a trace of bark debris. Of these, 32 (53%) had a measured debris depth of 10 cm or greater and 100 percent cover. Thirty-six (59%) of the sample points had debris coverage of 100 percent. Using transects 100 and 220 as boundaries, the surface area covered by bark debris in the survey totaled 1.25 acres. The area

covered by the survey is also 1.25 acres.

Observations:

Weather conditions at the time of the survey consisted of mostly cloudy skies, with easterly winds at 10-20 knots, air temperature in the upper thirties, and scattered rain and snow showers. Diving started at 0920 and took place during a high tide cycle. High tide occurred at 1057 with a height of 12.0 feet (corrected to subordinate station #1909, Snug Corner Cove, Port Fidalgo, based on Cordova tide tables) and a tidal exchange of 9.6 feet. A very light current paralleled the shoreline in a roughly west to east direction. Water temperature was measured at 42° F. Underwater visibility was estimated at approximately 8 feet: the water was turbid as a result of a plankton bloom and glacial silt particulate material.

Underwater topography of the area was observed from the minus tide level down to the maximum depths of the survey. The bottom is composed primarily of a fine, fairly solid glacial silt substrate with areas of softer composition. Some gravel and shell in mixtures of varying concentrations is visible in the silt covering at some of the sample points; this material was best observed where sunflower stars or sea otters had dug into the bottom, exposing the substrate content. The grade of the slope is shallow and fairly uniform along this stretch of shoreline. The eastern transects were somewhat shallower with less of a slope.

Significantly less bark debris was present during this survey than was measured in the dive survey conducted almost exactly two years ago. In the current survey, over half of the sample points had 100 percent bark debris cover, and all had at least light deposit of bark debris. Most of the debris was in the form of bark dust and chips, with few larger chunks, slabs, or branches. One sunken log was observed near the end of transect 220. In patchy accumulations throughout the survey area, detrital eel grass blades and deciduous leaves were conspicuous on the surface of the debris. The deepest areas of bark accumulation demonstrated the "jiggle" movement when the measuring ruler was inserted, indicating the presence of deep debris with a gelatinous consistency.

Without more familiarity and better knowledge of the site dynamics, it is difficult to ascertain the reasons for the decrease in measured bark debris. One contributing factor might be that the almost clay-like surface of the glacial silt substrate does not seem to allow debris to settle into the substrate, thereby giving it time to be removed by the tide or storm action. Another factor might be the length of time since the last transfer of logs at the facility, which may have allowed action by currents or other mechanisms that decay, disperse or allow the bark debris to compact or settle. My confidence in the debris measurements of this survey is high, mainly because the firm, natural silt bottom creates an easily distinguished interface between it

and bark-influenced substrate.

The marine life community is one commonly associated with a soft, silty substrate surface covering a compacted clay mixed with gravel and shell. In general, within the sampled area, the marine life in the zone of 100 percent cover appears to have been impacted by the smothering action of the debris layer. However, the individuals observed on or around this zone, though low in numbers and species diversity, appeared to be healthy and showed no signs of being adversely affected. More than one crab species and at least three species of sea stars were observed on even the areas of deepest bark accumulation. Where solid points of attachment were available (such as a dogstake rope), sessile organisms such as *Metridium* anemones, sponges, or kelp were attached.

A single clam siphon was observed near the end of transect 130. This apparent scarcity of clams could be a function of the time of year, because the clams were just coming out of the winter hibernation/reduced feeding state. Other factors may include sea otter predation or the lack of many sample points beyond the 10 cm or greater bark zone. Also observed occasionally where the bark layer was thinning out were small flatfish of unknown species. Small moon snails, along with many of their egg cases, were also numerous on the fringe of the bark zone.

Throughout the entire survey area in low but regular numbers, even in the deeper bark accumulations, an unknown benthic burrow-dwelling organism appears to be an exception to the normal rule that benthic animals are smothered by debris greater than 10 cm in depth. I believe it to be one of the burrowing crustaceans but have not had the opportunity to dig one up for identification. The small volcano-like mounds of excavated sediments are worthy of notice because of the extension of the burrow through significant depths of debris. This might be due in part to the lack of new bark deposition, as well as the existing bark compacting and becoming more like a typical substrate the organism is used to.

In the half of Two Moon Bay where the LTF is located, schools of herring were actively spawning at survey time. This activity had attracted numerous sea lions, small groups of which transited the survey area during the dives.

No significant manmade debris was observed in the survey area other than a small amount of banding wire, some pennant lines, and a few dogstake lines. On the basis of my experience, the amount of this operational debris was low compared to the average LTF.

If there are any questions about the survey or this report, please call or fax us at (907)826-3481.

Thank you for allowing Craig's Dive Center to be of service.

Craig Sempert



Diver

Table 1
Transect Data

Transect/ Sample Pt.	Depth from MLLW	Debris Depth (cm)	Percent Coverage
Ref. Pt.	5	<3	10
100/1	11	5	50
100/2	20	33	100
100/3	24	23	100
100/4	25	10	100
100/5	25	5	90
100/6	26	5	75
100/7	26	5	90
100/8	27	5	75
100/9	26	3	75
130/1	11	41	100
130/2	23	46	100
130/3	25	25	100
130/4	26	20	100
130/5	28	15	100
130/6	30	10	100
130/7	31	5	100
130/8	32	5	90
130/9	34	5	100
130/10	35	5	100
130/11	36	5	100

Table 2 (cont.)

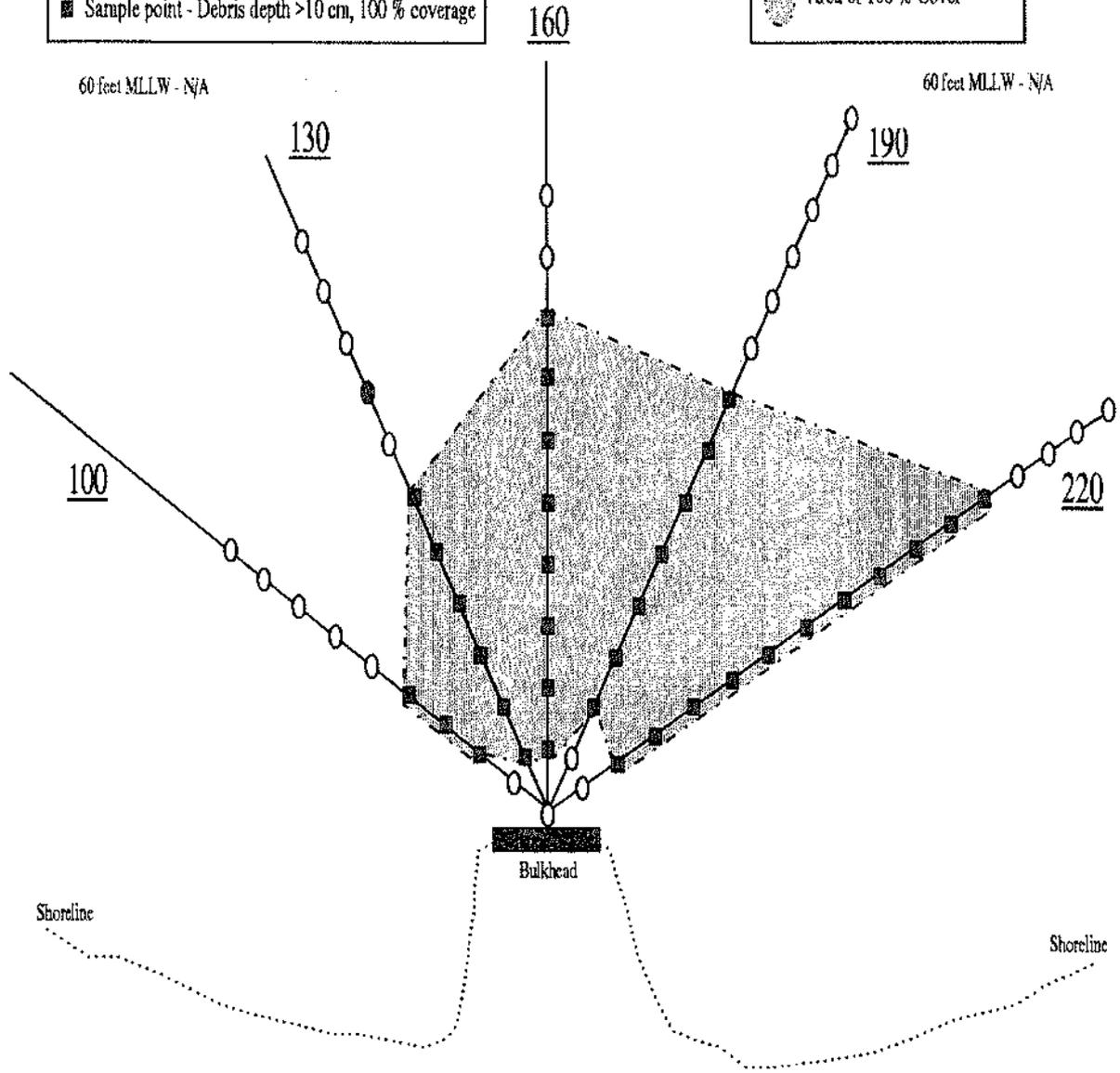
Transect/ Sample Pt.	Depth from MLLW	Debris Depth (cm)	Percent Coverage
160/1	13	53	100
160/2	25	89	100
160/3	29	33	100
160/4	31	23	100
160/5	33	15	100
160/6	36	5	90
160/7	38	3	90
160/8	39	3	90
160/9	41	<3	75
160/10	42	<3	75
190/1	11	<3	75
190/2	16	38	100
190/3	25	89	100
190/4	29	36	100
190/5	30	36	100
190/6	32	23	100
190/7	34	15	100
190/8	36	10	100
190/9	37	8	90
190/10	38	3	90
190/11	39	5	90
190/12	40	3	90
190/13	41	3	75
190/14	41	3	90
220/1	5	<3	10
220/2	8	<3	50
220/3	12	91	100
220/4	19	79	100
220/5	24	41	100
220/6	26	36	100
220/7	27	33	100
220/8	30	31	100
220/9	34	20	100
220/10	35	10	100

Table 2 (cont.)

Transect/ Sample Pt.	Depth from MLLW	Debris Depth (cm)	Percent Coverage
220/11	36	13	100
220/12	37	13	100
220/13	39	3	75
220/14	40	3	75
220/15	41	<3	50
220/16	42	<3	25

- Sample point - No debris
- Sample point - Debris present
- Sample point - Debris with 100 % coverage
- Sample point - Debris depth >10 cm, 100 % coverage

Not to Scale
 Sample Point Interval = 5 m
 ● Area of 100 % Cover



3/25/98 Two Moon Bay Underwater Bark Debris Survey

Table 2
Photograph Key

Photo #	Transect/ Sample Pt.	Description
1	Ref. Pt.	Base of bulkhead sheet piles
2	220/1	Light debris on fill gravel
3	220/2	Some gravel on surface of debris
4	220/3	Crab (top) on surface of total debris cover
5	220/4	Detrital eel grass, larger bark chips
6	220/5	Two crustacean dens in debris
7	220/6	Algal film on bark chips
8	220/7	Algal film on bark chips
9	220/8	A few detrital leaves, new kelp growth
10	220/9	Banding wire, leaves, kelp on debris
11	220/10	Uniform bark chips
12	220/11	Uniform bark chips, more silt visible
13	220/12	End of small log
14	220/13	Thin debris layer mixed with silt
15	220/14	Shell becoming visible
16	220/15	More shell and gravel
17	220/16	Little bark debris
18	160/1	Fine debris on steep dropoff slope
19	160/2	Two small Moon snail egg cases
20	160/3	Algal growth on debris
21	160/4	Detrital eel grass, leaves on surface
22	160/5	Swifter wire, silt on debris surface
23	160/6	Now a layer of mixed bark and silt
24	160/7	Organisms attached to rope
25	160/8	Hermit crab, crustacean dens
26	160/9	Scattered bark and leaves, <i>Metridium sp.</i>
27	100/1	Fill gravel spill from broken bulkhead
28	100/2	Debris at base of steep dropoff
29	100/3	Silt den mounds, eel grass and leaves

Table 2 (cont.)

Photograph Key

Photo #	Transect/ Sample Pt.	Description
30	100/4	Thick detrital leaf cover
31	100/5	More silt in bark/silt mixture
32	100/6	Bark/silt mixture

