

Underwater Bark Debris Survey  
Permit Monitoring Services - Twelve Sites

Submitted to:

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June 18, 1997

# Table of Contents

	<u>Section #</u>
Introduction	1
Purpose	1
Methods	1
Discussion and Recommendation	1
Site 1: Traitors Cove 8 (Marguerite Bay)	2
Site 2: Carroll Inlet 20 (Shelter Cove)	3
Site 3: Ulloa Channel 4 (Port Refugio)	4
Site 4: Neets Bay 8 (Fire Cove)	5
Site 5: Skowl Arm 16 (Polk Inlet)	6
Site 6: Clarence Strait 24 (Coffman Cove)	7
Site 7: Davidson Inlet 8 (Port Alice)	8
Site 8: Carroll Inlet 7 (Shoal Cove)	9
Site 9: Carroll Inlet 23 (Upper Carroll)	10
Site 10: Tuxekan Pass 7 (Naukati)	11
Site 11: Tuxekan Pass 6 (Winter Harbor)	12
Site 12: Sumner Strait 21 (Cape Pole)	13

## **Introduction:**

This report is the required Log Transfer Facility (LTF) underwater bark accumulation monitoring of the twelve sites encompassed by the USDA Forest Service Permit Monitoring Services contract (order number 43 - 0116 - 7 - 0044).

## **Purpose:**

The survey is designed to fully comply with the permit monitoring requirements of a National Pollution Discharge Elimination System (NPDES) permit to operate a LTF. The technique described here has evolved over the last few years into a successful means of providing accurate, reproducible data to ascertain compliance.

## **Methods:**

The fundamental aspect of creating reproducible data is the selection of a permanent reference point location. Rather than use some type of marker that will likely be obscured or destroyed by natural or operational causes, we have found that using the exact center of the essentially permanent log transfer structure (A-frame, bulkhead, drive-down ramp, low angle slide, etc.) is best. This allows re-establishment of the reference point regardless of marker condition or presence.

From this exact center location, the reference point is positioned directly below at an elevation as close to zero feet Mean Low Low Water (MLLW) as possible. This depth may vary with input structure type and site topography. To correct the measured sample point depth to MLLW, the nearest subordinate station in the current NOAA Tide Table is selected and the averaged dive time is used to calculate the exact correction to apply.

Using the centerline axis of the entry structure as the reference from which five transects in 30 degree (magnetic compass headings) intervals are selected, with the middle transect in line with that centerline axis (for example the centerlines of a drive down ramp or low angle slide). Or, for a site with a bulkhead/A-frame structure, the middle transect is perpendicular to the face of the bulkhead. The permanent reference point is the origin for all transects.

Each transect is sampled at five meter intervals starting from the origin (permanent reference point). Sample points continue to be established along a transect until a water depth of 60 feet MLLW is reached or the measured bark debris depth becomes insignificant. At each sample point the diver measures and records: water depth of sample point in feet, wood debris depth to the nearest centimeter, the percent of bark cover to the nearest ten percent of the area within one meter of the sample point. In addition, qualitative assessment of bark debris

size and character, marine life present and their condition, substrate type, direction and strength of current and presence of any significant man made debris is conducted at the same time. Transects will be labeled by their magnetic compass heading for individual identification.

Water depth measurements are taken from a SeaQuest Solution Alpha dive computer with an accuracy of +/- 1%. An Ikelite compass is used for the transect compass headings, attached to the three foot measuring ruler. All data is collected and recorded *in situ* on waterproof paper.

35mm photographs are taken of representative sample points to document substrate, bark debris, algal and animal life and any debris or objects that may be of concern. Normal procedure is to photograph the middle and two outside transects. The camera is positioned vertically over the sample point and aligned with a one meter square PVC frame which is randomly dropped at the sample point. The photographs are organized in the report so that photo number one is top left in the holder and number three is the bottom left photograph. The photograph negatives will be archived by the permittee.

The field data was analyzed to meet the criteria of the contract. Areal extent was calculated with the outermost two transects as the boundaries of bark coverage and the end sample point of a transect. Debris surface area calculation was made by taking the triangle formed by two of the 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 these four triangle areas. This figure was converted to acres as required by the guidelines.

To determine areal extent of substrate with at least a trace of bark debris, the percentage of sample points with debris was calculated and multiplied by the total sample area acreage to give the areal extent in acres. The same procedure was used to determine areal extent for the area of 100% debris cover and for the area with 100% debris cover and debris depth 10 centimeters or greater.

## **Discussion and Recommendations:**

Each of the twelve LTF survey sites is completely different in site characteristics such as topography, tidal currents, substrate, natural flora and fauna and the bundle input method. But given the uniqueness of each LTF, there are common concerns relevant to all of the sites.

The primary concern, from the perspective of the diver performing these monitoring surveys, is the lack of information made available. Many of the LTFs in this contract are old sites

with a long history of use. In this case, lack of baseline survey data means that the diver not have the knowledge to distinguish where the debris measurement should stop if the natural substrate surface cannot be felt or seen. This is especially true when silt deposition is a component of the site system, as it is with many of these LTFs. Then factor in, somehow, the amount of bark debris that has accumulated over the years and try to gauge the decomposition rate and mixing with the silt. All of these factors can contribute, at some sites, to a high degree of uncertainty in the bark depth measurements.

To improve the system, it would help the diver to have as much information as possible regarding pre-use site characteristics and the amount of wood transferred over the years. Unfortunately, at some sample points at certain LTFs, the depth measurements are very subjective. Although this subjectivity is based upon experience gained by evaluating many such sites over the years, the data accuracy could be improved by providing the recommended information.

When the site to be surveyed has not been used for many years (input structure dismantled/removed) or the LTF has not been constructed prior to the survey it would be most helpful to provide precise directions to the desired survey point. Possibly the simplest and most accurate would be to provide GPS coordinates of the desired reference point location. This would remove any doubts when trying to find the site location by following the very general site maps usually provided or not finding the input structure at the location upon arrival as shown on the site plan.



**Subject: Marguerite Bay dive survey.**

**Results:**

<u>Site:</u> Traitors Cove 8, NPDES No. AK-004559-4, (Marguerite Bay)	
<u>Date Surveyed:</u> 5/22/97	<u>Total # of Sample Points:</u> 42
<u>Time of Sampling:</u> 1813	<u>Average Bark Depth:</u> 11.9 cm
<u>Sampler:</u> C. Sempert	<u>Calculated Survey Area:</u> 0.47 acres

Area with Debris Cover	Area with 100 % Cover	Area with 100 % Cover & Debris Depth $\geq$ 10 cm
0.47 acres	0.12 acres	0.10 acres

The permanent reference point was positioned along the centerline axis of the rail slide just below the end horizontal cross member at a depth estimated to be close to zero feet MLLW. Actual corrected depth of the reference point was 7 feet MLLW. A total of 42 sample points were taken on the five transects and all sample points had at least a trace of debris present. Of these, 9 had a measured debris depth of 10 centimeters or greater and 100% cover. A total of 11 sample points had an estimated 100% coverage. Surface area covered by bark debris in the survey, using transects 130 and 250 as boundaries, computes to 0.47 acres.

**Observations:**

Weather conditions at survey time were partly cloudy skies with light westerly winds at 5-10 knots. The diving started at 1721 and took place during a low slack period. Low tide occurred at 1835 with a height of 1.9 feet (corrected to subordinate station # 1427, Traitors Cove, lower section, and based on the Ketchikan tide tables) and a tidal exchange of 12.3 feet. Fairly strong surface current was experienced during the survey from the direction of the creek which dissipated to negligible current at depth. Water temperature was measured at 48 degrees, underwater visibility was estimated at approximately 6-8 feet increasing to about 15 feet at depth.

The site was operational at survey time with the dives conducted after wood watering hours. Situated in a large, shallow bay in lower Traitors Cove, an alluvial plain of a good sized creek is the dominating feature all the way to the westernmost edges of the site. The alluvial shelf itself is nearly flat up to where it breaks sharply to a steep drop down to a nearly flat bay

bottom of silt and mud. The alluvial shelf tapers off, in horizontal distance from the shoreline, to become the normal substrate slope at the western edge of the survey area.

Method of bundle entry was a high angle slide from an A-frame with a moderate high tide necessary to float the bundles. The slide was constructed using three steel slide rails set on large, horizontal steel pipes. A new layer of fill rock was placed over the existing fill. The bottom area directly in front of the rails, where the log bundles enter the water, has formed a shallow crater in the sand and gravel substrate.

Bark debris present was a mixture of sizes, from fine debris characterized as sawdust to larger debris composed of bark chips and chunk and slabs were present throughout the sample area. Only occasionally were scattered branches and old, sunken logs observed. Some woody debris has flushed down from the creek system and is obviously different in character from the log bundle bark debris. How much of this detritus originates from the creek is very difficult to determine under these survey conditions.

The marine life community has not changed noticeably from the previous surveys. Many Horse neck clam siphons were observed, especially up on the flats to the east. Dungeness crabs were numerous on the substrate/debris moving about and also buried in both debris (see photograph # 20) and substrate. They were up directly under the slide rails and on the shallow flats as well as down on the steep slope and the flat bay bottom. Also up on the shallow flats a school of fingerling salmon briefly swam by and a few Pacific sand lances were observed erupting out of the sandy substrate and swimming off.

The steep slope from the shallow flats to the bay bottom tended to have the deepest accumulation of debris. And because of the steepness the debris is continually sloughing which does not allow any life to colonize this zone other than mobile species like the Dungeness crabs. But on the bay bottom life typical of a muddy habitat was present. Large, white *Metridium* anemones were numerous, attached to whatever solid substrate was available. Sea cucumbers in low numbers were present at the deeper sample points. And the ever-present sea stars were observed throughout the survey area, represented by a few species. Also on the bay bottom some small flatfish would swim off when disturbed by the diver.

No prominent manmade debris was observed. There are old two inch plastic pipe pieces running across the shelf in to the east of the input area and out on the bay bottom flats. There are also several scattered small concrete anchors that once were attached to the pipeline on the shelf area as well.

## **Conclusion:**

An old site with a large volume of wood transferred in the past, the distinction between

Transect	Reference Point Location
250	Along the centerline axis of the rail slide
220	just below the end cross member on the
190	gravel and rocks. Actual measured depth
160	was 9 feet, corrected to MLLW depth of
130	7 feet.

Table 1  
Transect Location

old bark debris and natural sediment was difficult for two main reasons. First, the estimation of bark depth was hampered by lack of clear distinction between old debris and the silt/mud type of sediment. The second bark debris identification problem is the apparently large volume of natural forest detritus washed down from the creek watershed. The transects most affected by this problem are 130, 160 and 190, which are directly in the path of the creek debris, but lighter debris such as leaves and needles were present on all transects and especially at the base of the steep slope.

The depth of bark accumulation over part of the survey area is significant enough to cause a shift from a benthic filter feeding community to that of detrital feeding organisms. Also, the debris in the vicinity of the slide appears to unstable and moving due to log bundle input in the shallow water, current outflow from the creek and debris sliding down the steep drop from the alluvial shelf.

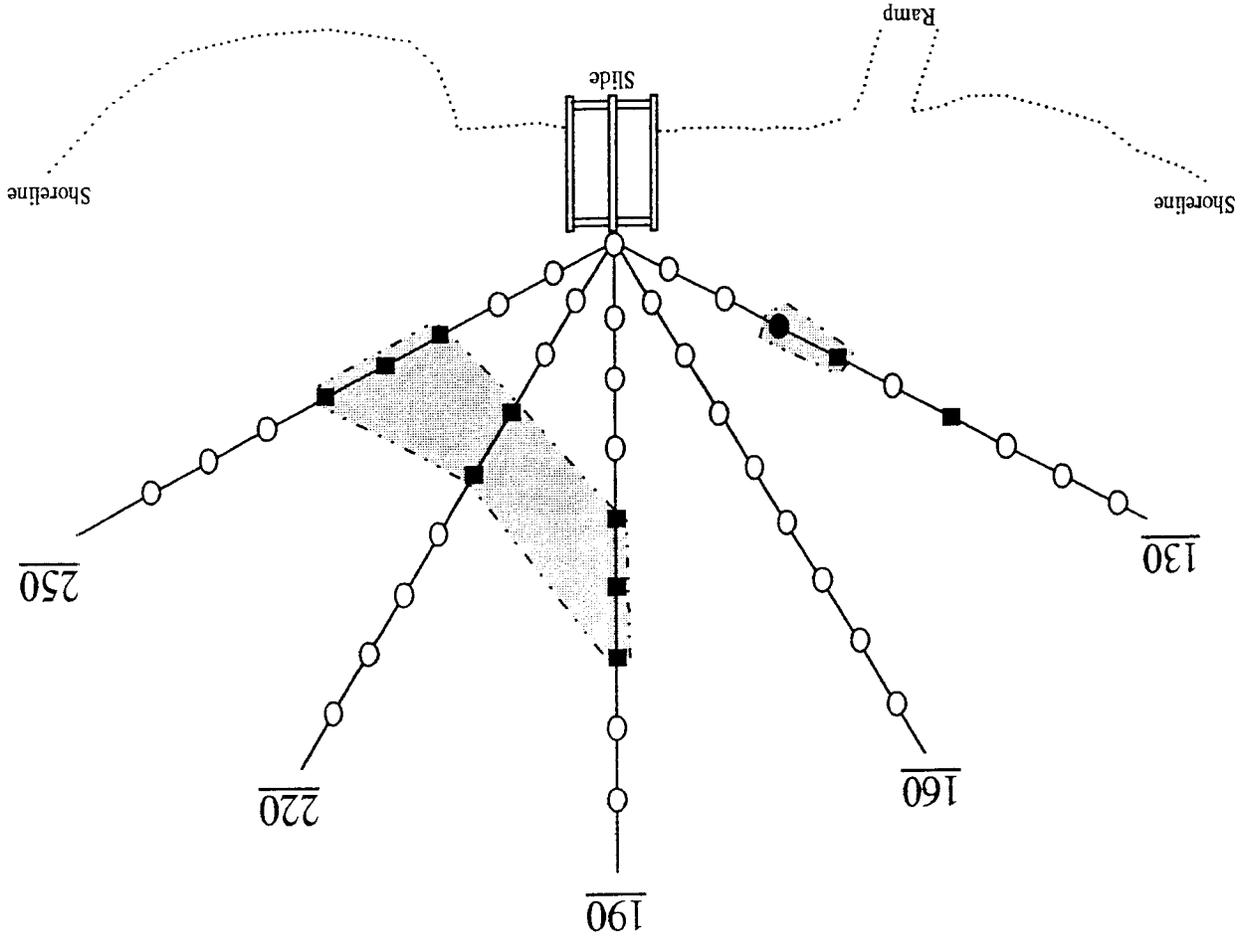
Transect/ Sample Pt.	Depth from MLTW	Debris Depth (cm)	Percent Coverage
Ref. Pt.	7	0	T
250/1	11	5	90
250/2	13	5	90
250/3	24	46	100
250/4	32	46	100
250/5	42	25	100
250/6	49	5	90
250/7	51	<3	50
250/8	53	<3	25
220/1	10	8	50
220/2	15	3	50
220/3	28	51	100
220/4	41	91	100
220/5	47	15	90
220/6	50	3	75
220/7	51	<3	25
220/8	63	<3	10
190/1	6	<3	10
190/2	6	<3	10
190/3	15	<3	25
190/4	29	43	100
190/5	39	46	100
190/6	44	15	100
190/7	47	<3	75
190/8	49	<3	75
160/1	5	0	T
160/2	5	<3	25
160/3	5	<3	50
160/4	5	<3	50
160/5	4	<3	50
160/6	4	<3	75
160/7	4	<3	75
160/8	5	<3	75

Table 2  
Transect Data

Transsect/ Sample Pt.	Depth from MLTW	Debris Depth (cm)	Percent Coverage
130/1	7	3	25
130/2	5	<3	25
130/3	5	8	100
130/4	5	10	100
130/5	5	3	90
130/6	5	10	100
130/7	5	<3	75
130/8	5	<3	90
130/9	4	<3	75

Table 2 (cont.)

# 5/22/97 Traitors Cv. Bark Debris Survey



60 F MLLW - NA

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

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

Photograph Key

Table 3

Photo #	Transect/ Sample Pt.	Description
1	Ref. Pt.	Fill gravel and rocks
2	250/1	Bark debris with a little substrate showing
3	250/2	Smaller debris sizes
4	250/3	100% cover of homogeneous debris sizes
5	250/4	Slightly larger debris sizes
6	250/5	End of old log
7	250/6	Increased silt/mud mixed with debris
8	250/7	2" pipe; small branch
9	250/8	Large <i>Metridium anemone</i>
10	190/1	Sand/gravel at edge of bundle drop zone
11	190/2	Still in the high energy area
12	190/3	Near edge of shelf drop-off
13	190/4	Variety of wood debris on slope
14	190/5	Debris at base of slope
15	190/6	Sea cucumber; silt on debris surface
16	190/7	Concrete anchor; much less debris
17	190/8	Sea cucumber; scattered wood pieces
18	130/1	Bark debris filling in small trough
19	130/2	High shell component to substrate
20	130/3	Female <i>Dungess</i> crab buried in debris
21	130/4	Natural detritus mixed in with bark debris
22	130/5	Sand visible through debris
23	130/6	Sea star on 100% debris cover
24	130/7	Thin, patchy debris area



