

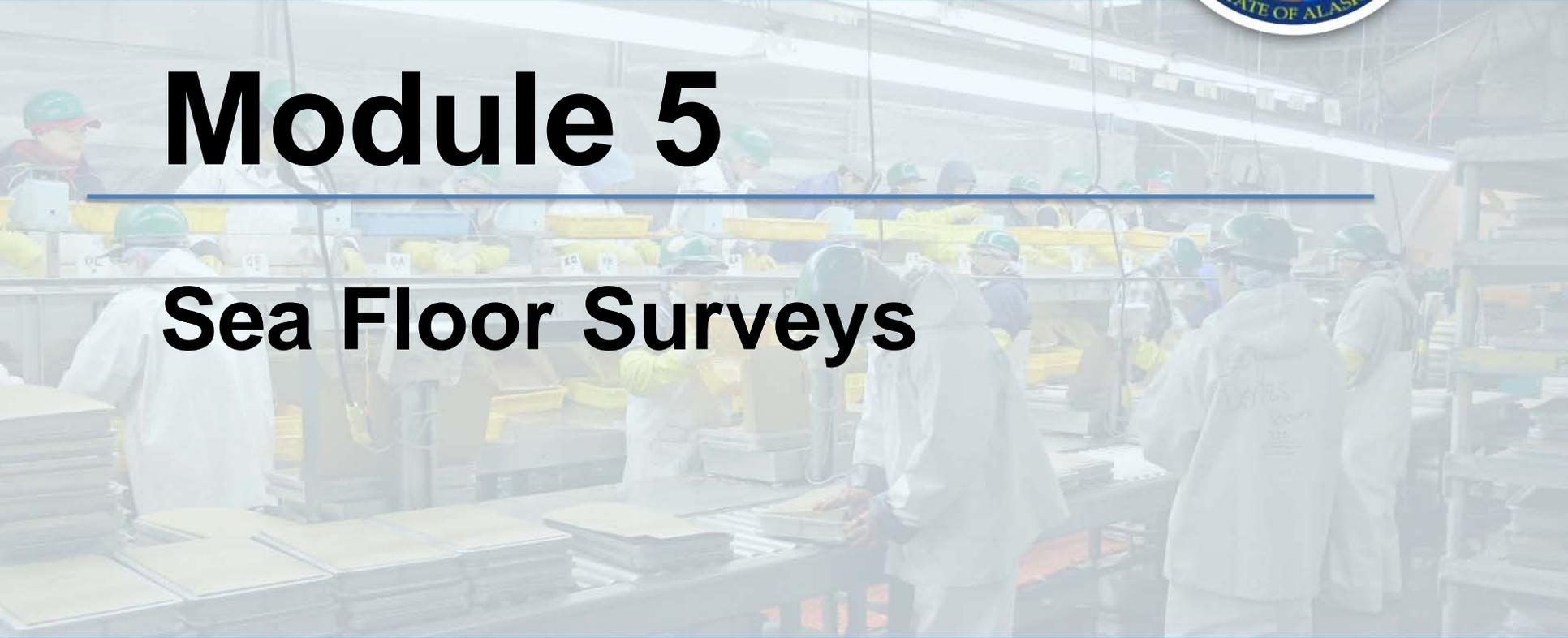


Alaska Department of Environmental Conservation
Division of Water



Module 5

Sea Floor Surveys



2012 SEAFOOD PROCESSING WASTE PERMITTING & COMPLIANCE WORKSHOP

Anchorage, Alaska • February 28-29, 2012

Module 5 – Sea Floor Surveys

MODULE 5



Steve Haggitt
Haggitt Consulting

Module 5 – OBJECTIVES

MODULE 5



- Be aware of the various sea floor survey methods that can be utilized to satisfy permit requirements
- Understand certain key factors necessary for an acceptable sea floor survey

Module 5 – What Will You Learn

MODULE 5



- What survey method is the appropriate method for your discharge location
- What are the key survey requirements
 - Qualifications
 - Repeatability
 - Accuracy
 - Safety

Seafloor Surveys

MODULE 5



- Approved Methods
- Guidance for Method Selection
 - Study Design
- Data Analysis and Collection
 - Reporting

Standardization

MODULE 5



Seafloor Survey Methods

- ADEC Standard Methods
 - Dive Survey Methods
 - Plan View Video Survey Methods
 - Grab Sampling



Dive Survey Methods

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- Provide a robust assessment of all required parameters contained in both IP and GP permits.
- Are the most commonly used survey method
- Is the practical choice for surveys under 2 acres and less than 120 feet in depth.
- Limitations for diving include;
 - High currents
 - Low visibility
 - Extreme depths



Video Survey Methods

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- Most often employed when the physical area to be surveyed is not practical with standard dive methods. It is important to note that alternate methods such as this, need to be pre-approved for the site.
- Provides data on most of the requirements contained in the permits. Approval for alternate methods for the site, also means the permit objectives are met and the data set as collected meets the permit requirements
- Used for situations where low light, poor visibility or high currents make diving not practical.
- Used for depths that exceed 120 feet MLLW.

Grab Sampling

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- Utilized in adverse conditions such as high current, zero visibility or extreme depth.
- Provides limited information on parameters contained in IP and GP permits.
- Capabilities Include:
 - Grab sampling can provide grind size.
 - Provides rough estimates of spatial extent.
 - May be used to compliment diving or video survey methods.

Selection Criteria: Diving

MODULE 5



- Diving Limitations Include
 - Depths under 120 feet MLLW
 - Currents under 2 knots
 - Visibility of at least 15 feet



Selection Criteria: Diving

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- Diving Advantages
 - Clear Digital Photography
 - Time, Date and Location Stamped Video
 - Up Close inspections and measurements



Selection Criteria: Diving

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- Diving Advantages
 - With Communication allows for two observers
 - Each survey may be recorded for review
 - Allows all of the permit data requirements to be met.
 - **Up Close inspections and measurements**

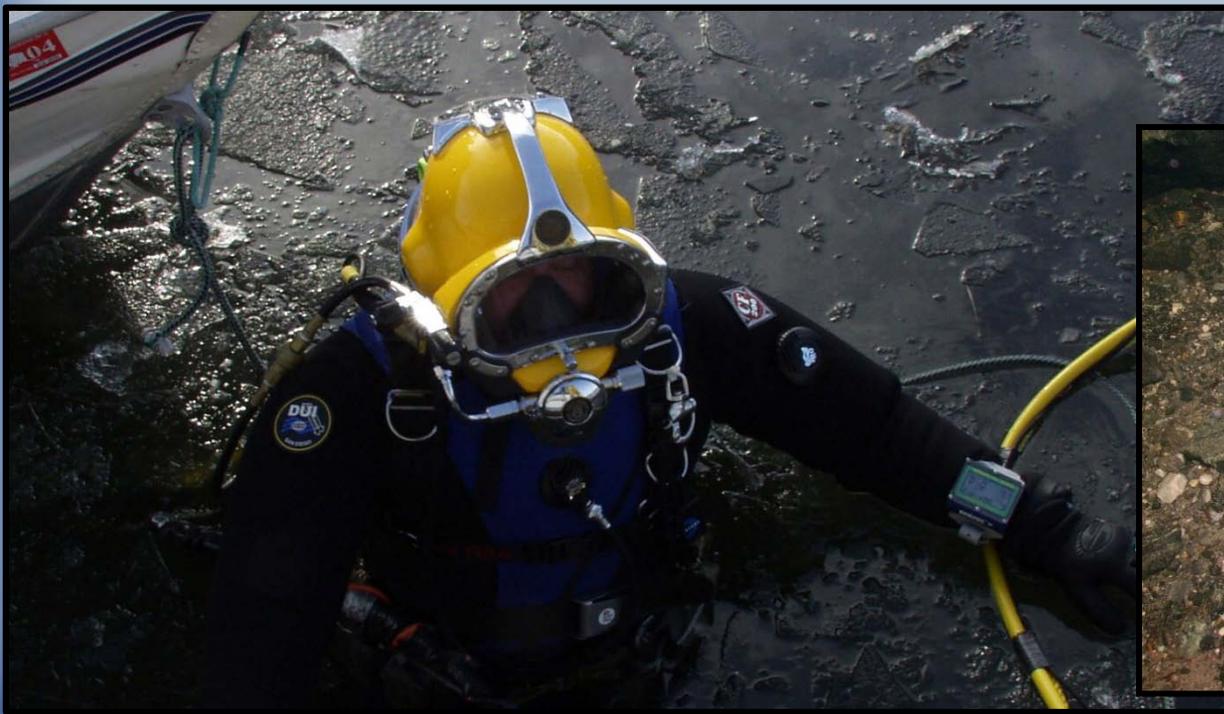


Selection Criteria: Diving

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- Diving Advantages
 - Allows for a global view of conditions
 - Allows for the survey to adapt quickly to new conditions

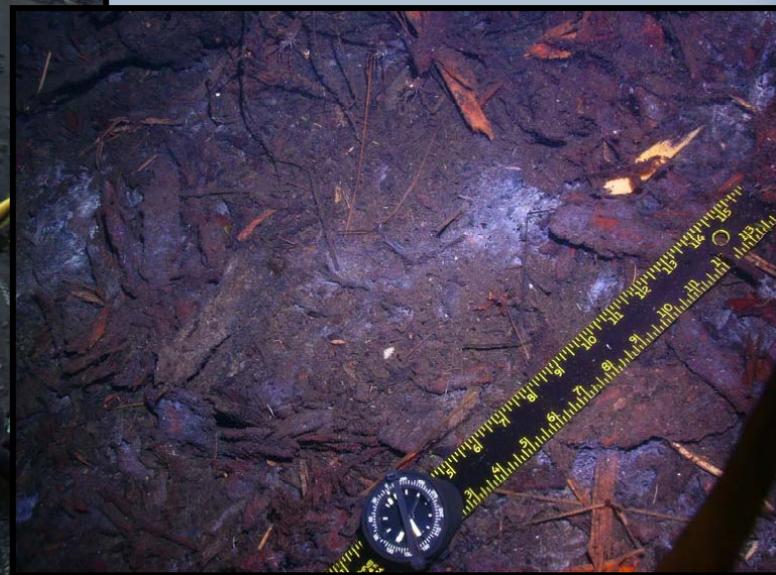


Selection Criteria: Diving

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- Diving Requirements
 - Knowledgeable in the requirements of the Permit
 - Dedicated performance in obtaining objectives
 - Experienced in navigation in Alaskan waters



Selection Criteria: Video

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- Video Limitations
 - Depths under 200 feet MLLW
 - Currents under 3 knots
 - Visibility of at least 3 inches



Selection Criteria: Video

MODULE 5



- Video Limitations
 - Depths under 200 feet MLLW
 - Currents under 3 knots
 - Visibility of at least 3 inches



Selection Criteria: Video

MODULE 5



- Video Limitations
 - Depths under 200 feet MLLW
 - Currents under 3 knots
 - Visibility of at least 3 inches



Selection Criteria: Video

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- Video Advantages
 - DGPS Position overlays
 - Unlimited Dive Time
 - Able to cover large areas

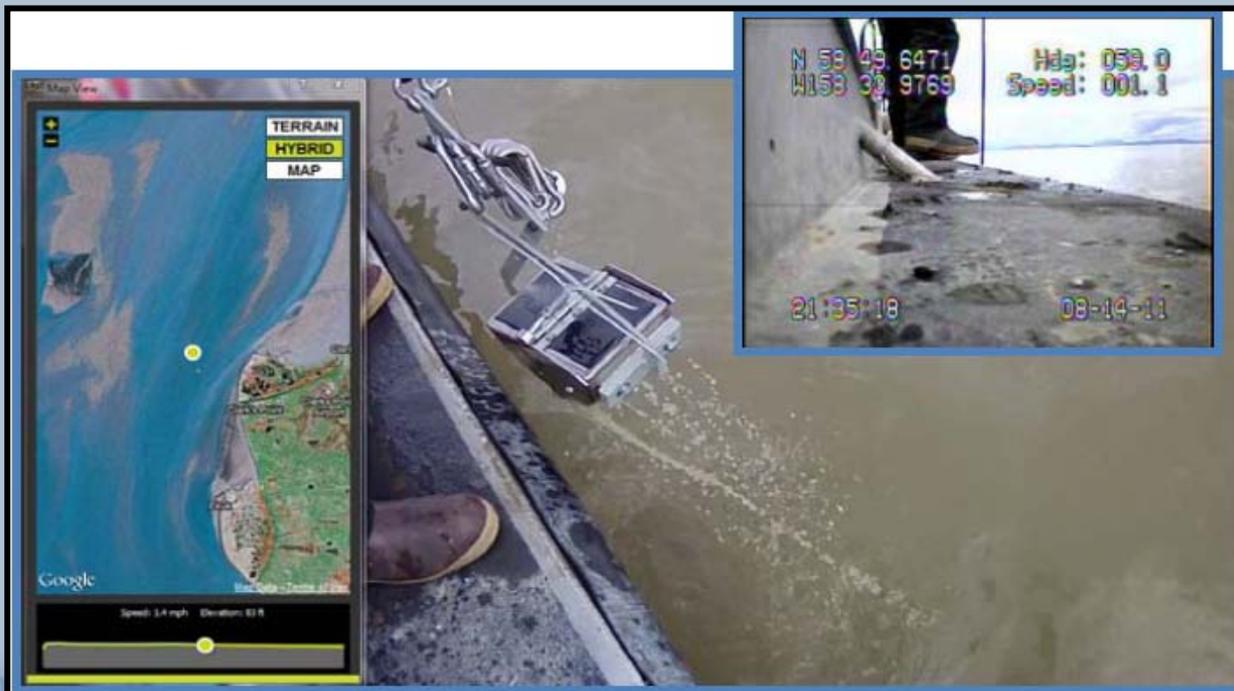


Selection Criteria: Grab

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- Grab Sampling Limitations
 - Depths under 200 feet MLLW
 - Currents under 3 knots
 - Cannot determine thickness of waste discharge



Selection Criteria: Grab



Advantages

1. Large areas may be assessed
2. Deployable in heavy currents
3. Sediment samples may be utilized for a variety of testing purposes
4. With proper sample density, may be used to define a rough estimate of the area of coverage.
5. Provides grind size

Guidance on Method Selection

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- **Diving Methods** are preferred unless the following conditions warrant an alternate method:
 - High Currents (over 2 knots)
 - Low visibility (under 15 horizontal feet)
 - Extreme Depth (over 120 feet MLLW)
 - Physical Risk to the surveyor (risk must be identified)



Guidance on Method Selection

MODULE 5



- **Video Survey Methods** are the first alternate choice to diving methods. The Video system must include telemetry information to determine location and the survey date/time.
 - High currents over 2 knots and up to 3 knots
 - Low visibility less than 15 feet (down to 3 inches)
 - Depths over 120 feet and up to 200 feet MLLW



Guidance on Method Selection

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- **Grab Sampling** is the final choice for debris field mapping. It should only be used when conditions are too extreme to utilize Dive or Video survey methods such as:
 - Depths over 120 feet MLLW
 - Currents up to 3 knots
 - Visibility at zero inches



Guidance on Method Selection



- The chart below considers practical field considerations for implementing the type of device, not just equipment depth capabilities.

CONDITION	DIVING SE, WT, PS, PC, L	VIDEO SE, PS, PC, L	GRAB SE, PS, L
Extreme depth	N/A OVER 120 fsw	200 MLLW MAX	200 MLLW MAX
High current	Less than 2 KNOTS	Over 3 + KNOTS	Less than 3 KNOTS
Low visibility	N/A UNDER 15 FEET	3 INCHES	0 INCHES
Large area	2 ACRES PER DAY	12 ACRES PER DAY	500 ACRES PER DAY

Operational limits and data collection capabilities of three methods of seafloor sampling. Spatial extent=SE, Waste thickness=WT, Particle Size=PS, Percent Cover=PC, Location=L, Feet of Seawater=fsw

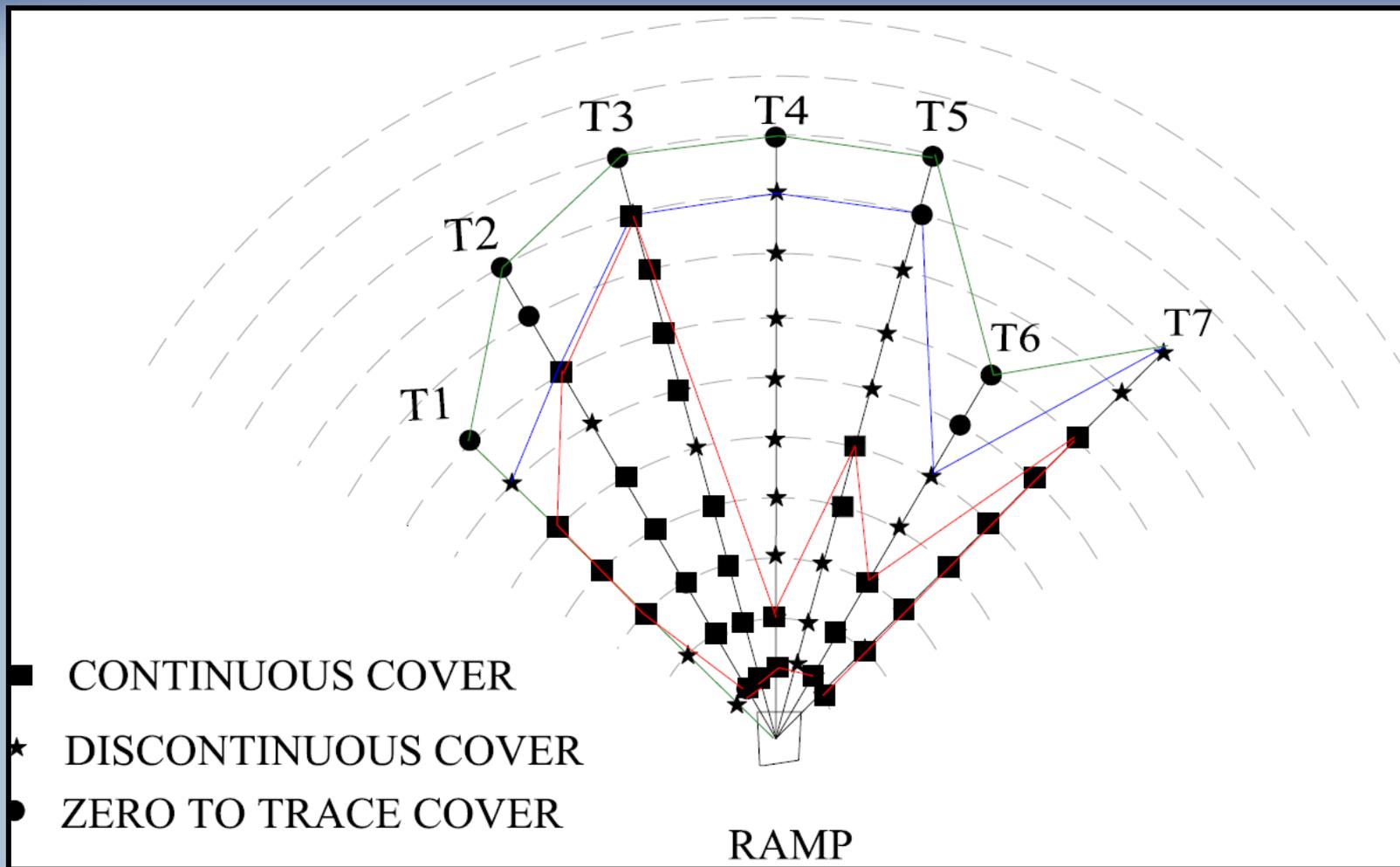
Study Design

MODULE 5



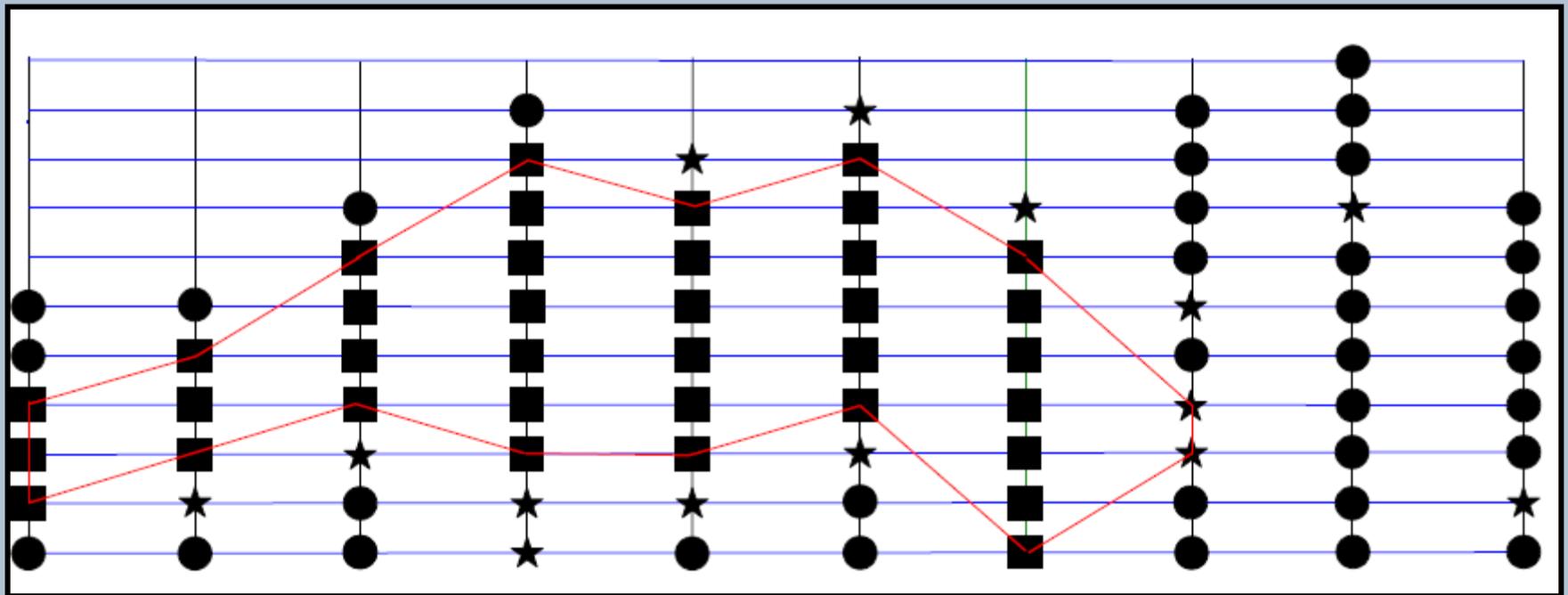
- Transects may be in a radial array or a parallel array:
 - Radial Transect must use a minimum of 5 transects and be spaced no greater than 30 degrees apart. It is also acceptable to use a 15 degree spacing interval if the input source is at a long distance from the distal edge of the waste area.
 - Parallel Transects must use a minimum of 5 transects and be spaced no greater than 75 feet apart to document continuous coverage.

Radial Design at a 15 Degree Interval Distance



Parallel Design at a 75 foot Interval Distance

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Number of Transects

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- Regardless of the type of pattern selected (radial or parallel), the number of transects required will depend on the physical area to be surveyed.
- The study design will propose either five radial or five parallel transects initially as a minimum.
- Transects will continue to be added if continuous debris extends more than 15 feet perpendicular to any transect.

Sample Points

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- Both parallel and radial transects are sampled at a frequency of every 15 feet. Sample points are a Quadrate that measures three feet by three feet square, and includes:
 - Water Depth
 - Thickness of Debris
 - Percent of Cover of Debris
 - Substrate Type
 - Operational Debris
 - Native Vegetation and Marine Life
 - Current speed and visibility are also recorded along with time of sampling.

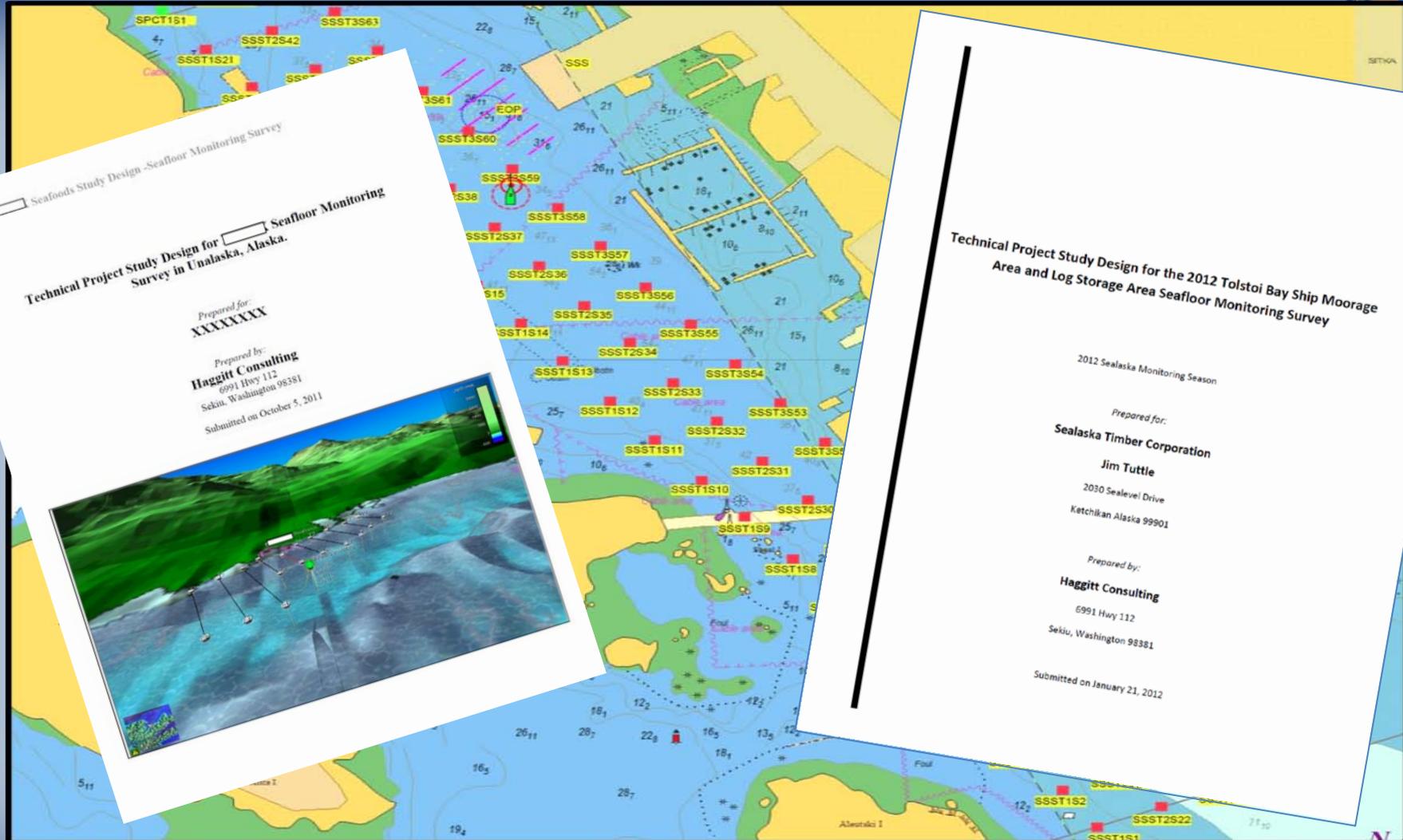
Sample Points

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Saltery Point LSA 2011

Study Design



Technical Project Study Design for Seafloor Monitoring Survey in Unalaska, Alaska.

Prepared for:
XXXXXXXX

Prepared by:
Haggitt Consulting
6991 Hwy 112
Sekiu, Washington 98381
Submitted on October 5, 2011

A 3D perspective rendering of a seafloor monitoring survey. It shows a grey vessel on the surface of a blue sea, with several buoys and sensors extending into the water. The seafloor below is depicted in shades of green and blue, with a grid of monitoring points overlaid.

Technical Project Study Design for the 2012 Tolstoi Bay Ship Moorage Area and Log Storage Area Seafloor Monitoring Survey

2012 Sealaska Monitoring Season

Prepared for:
Sealaska Timber Corporation
Jim Tuttle
2030 Sealevel Drive
Ketchikan Alaska 99901

Prepared by:
Haggitt Consulting
6991 Hwy 112
Sekiu, Washington 98381
Submitted on January 21, 2012

Guidance for Study Design

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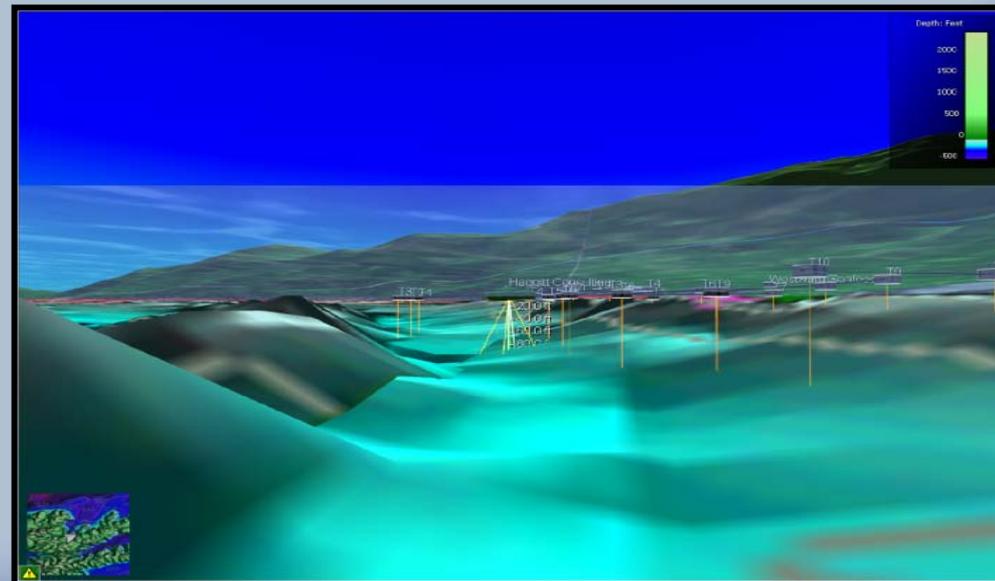
- A quality assurance project plan is required to be in place for seafloor surveys. That plan should incorporate a preliminary survey design, factors to consider in drafting such designs are:
 - Predicated currents at the discharge point
 - The bathymetry of the discharge location
 - The conditions and type of method that will be required to complete the survey work.

Guidance for Study Design

MODULE 5

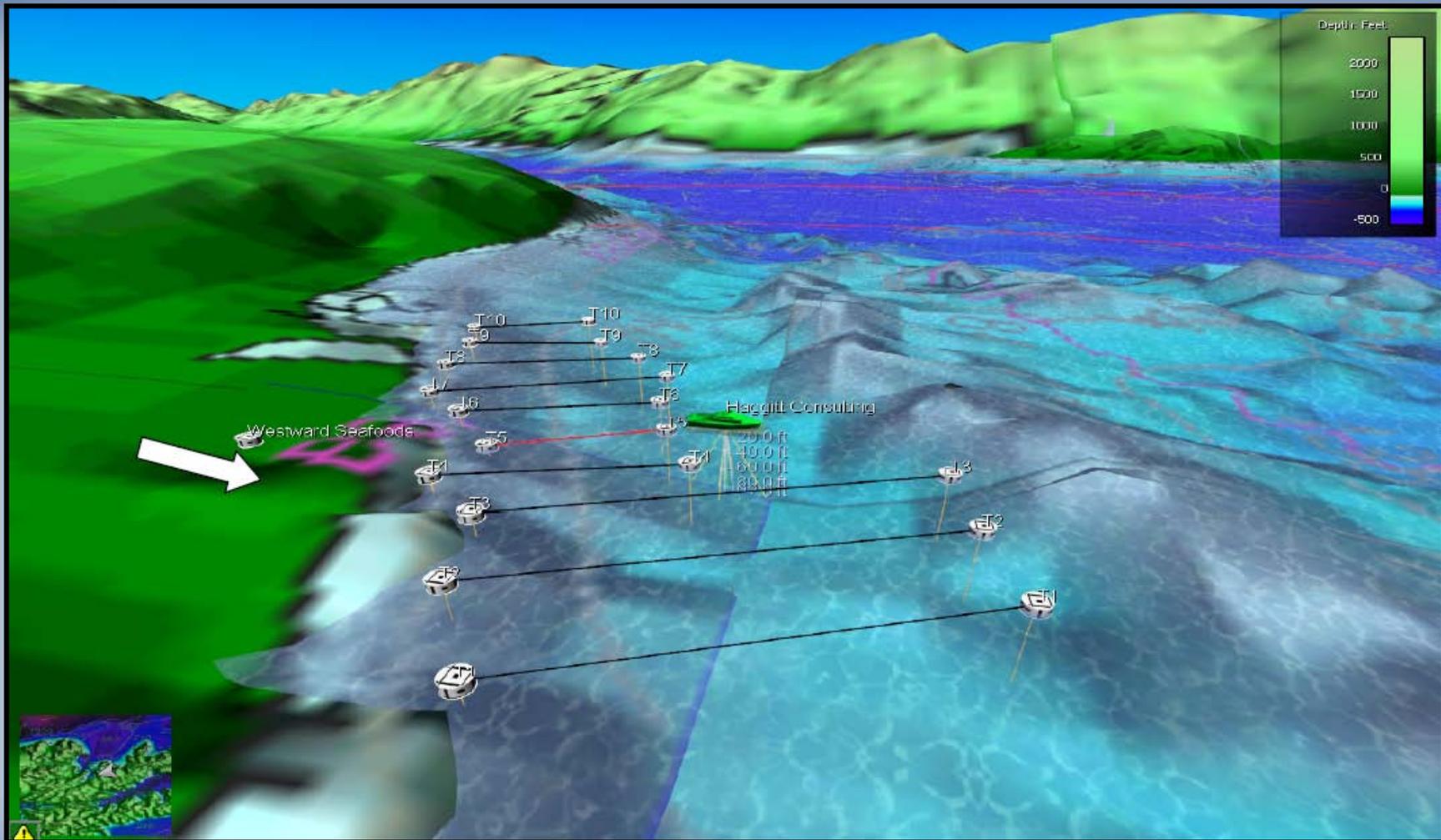


- A study design considers site conditions and determines the appropriate method that will be used.
- The type of transect array is selected by reviewing site conditions to determine what pattern will best delineate the debris coverage. Factors affecting the study design configuration are:
 - Current Speed
 - Bathymetric Conditions
 - Input Source Location
 - Physical Barriers
 - Input Type
(point source or nonpoint source)



Guidance for Study Design

MODULE 5



Guidance for Study Design

MODULE 5



- In situations with low currents and a point source discharge, a Radial pattern will effectively map out the tear drop shaped plume.
- When current impacts the plume and drags the discharge pile into elliptical configuration, parallel transects are used to delineate the area of discharge.

Guidance for Study Design

MODULE 5



- In situations where the discharge point may be subject to movement, such as a ship based discharge point or in the case where a fixed discharge point has been relocated, a parallel pattern is typically used to define the area of



Guidance for Study Design

MODULE 5



- A preliminary study design; or a survey pattern that has been in use for years is always subject to field adjustments. Factors that require on-site field adjustment are:
 - Continuous cover extending more than 15 feet perpendicular to a transect.
 - Transects may be extended or shortened to define the edge of coverage.
 - Patterns may change their transect bearings to best quantify the shape of a developing waste pile.

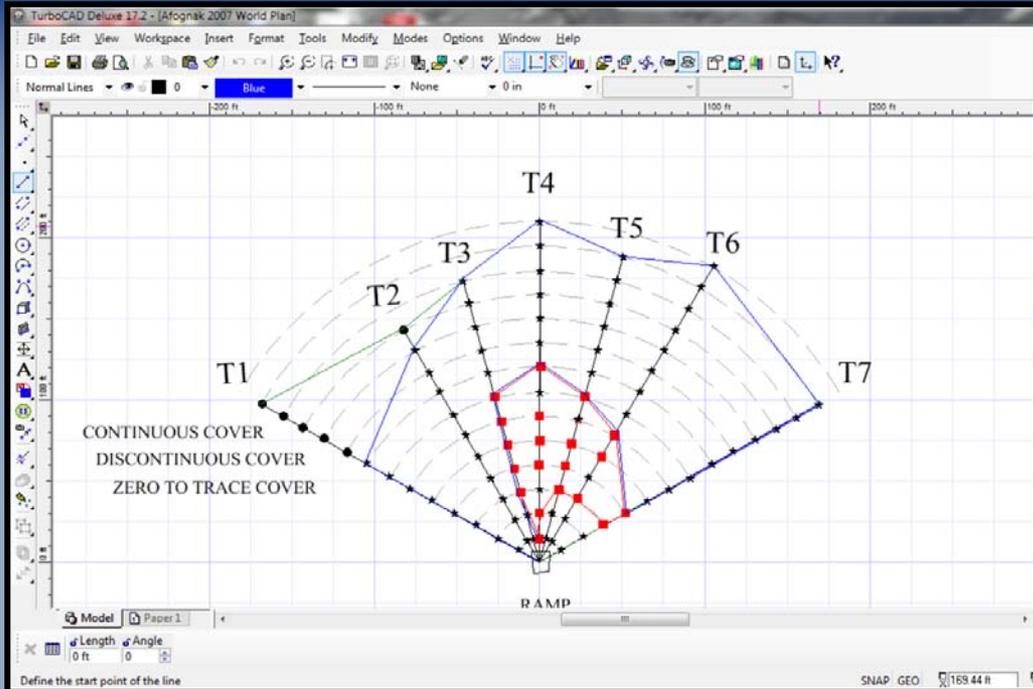
Analysis - Calculations

MODULE 5



- Area calculation methods that are approved by ADEC are contained in the permit. In addition to the methods described in the permit, alternate methods have also been approved by ADEC such as computer aided drafting (CAD) area calculations.
- It is important to remember that the calculations of the area of coverage are based on the accuracy of the measurements recorded in the survey.

Analysis - Calculations



EXAMPLE: Calculating the area of seafood cover

The following diagram shows "typical" radial transects set 30 degrees apart. Points of measurement are at 15-foot intervals along the transects. There is continuous seafood cover in the inner area, and discontinuous seafood cover in the outer area, but the two areas easily could be reversed.

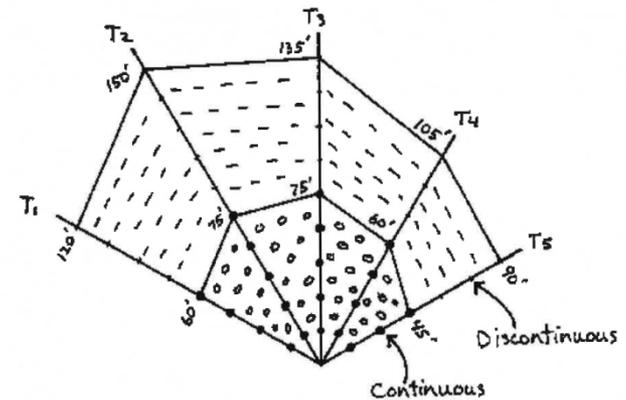


Figure 1

The continuous-cover area is calculated as the sum of the four continuous-cover triangles between transects.

The discontinuous-cover area is calculated as the sum of the four total-area triangles, minus the continuous-cover area.

Continuous cover is defined as an area of waste that is estimated to cover 100% of the ocean bottom, as measured within a three-foot square sample plot. Discontinuous cover is defined as an area of waste that is estimated to cover 10% or more, but less than 100%, in a 3-foot square sample plot. The survey must use a deposition which is 0.5 inch or thicker on the bottom (seafloor) as the minimum detection level.

Monitoring must provide a determination of the outer boundary of the area of the waste deposited on the bottom. All areas of continuous and discontinuous cover of deposited seafood processing waste must be measured and added together to calculate the total area of deposited seafood processing waste.

Calculation guidance can be found in the permit, or Computer Aided Drafting methods may be used, as both are deemed acceptable.

Guidance for Data Analysis

MODULE 5



- The calculations of area are of the “footprint” of the debris pile or area.
- The distance measurement over the top of a seafood waste pile is not the same as the measurement of the distance of the footprint.
- The distance measurement over the top of a pile, extends the line to include the height.
- This measurement must be corrected before the area calculation can be made.

Guidance for Data Analysis

MODULE 5



- The process of measuring the footprint of the pile requires that the data on pile thickness be taken at each sample point, and is considered.
- Once the thickness for each sample point is removed from the distance calculation, an accurate length of the transect across the seafloor is used to determine the footprint for that transect.

Guidance for Data Analysis

MODULE 5



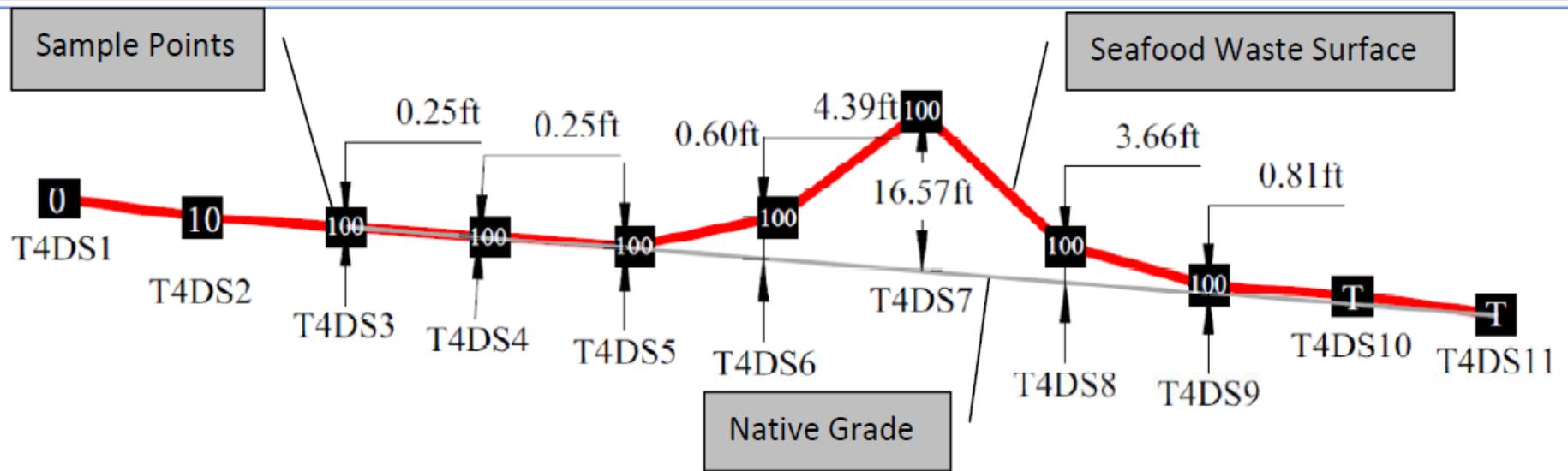
- The outer points of continuous/discontinuous cover at the minimum detection limit of one half inch may then be calculated to define the total area of seafloor covered by the waste pile.
- The following diagram illustrates how the bias of seafood waste pile thickness is removed from the distance calculation.

Guidance for Data Analysis

MODULE 5



- Sample points include information on the depth of the surface of the pile every 15 linear feet.
- The depth recorded at the beginning and end of the pile are used to determine the native grade under the pile.

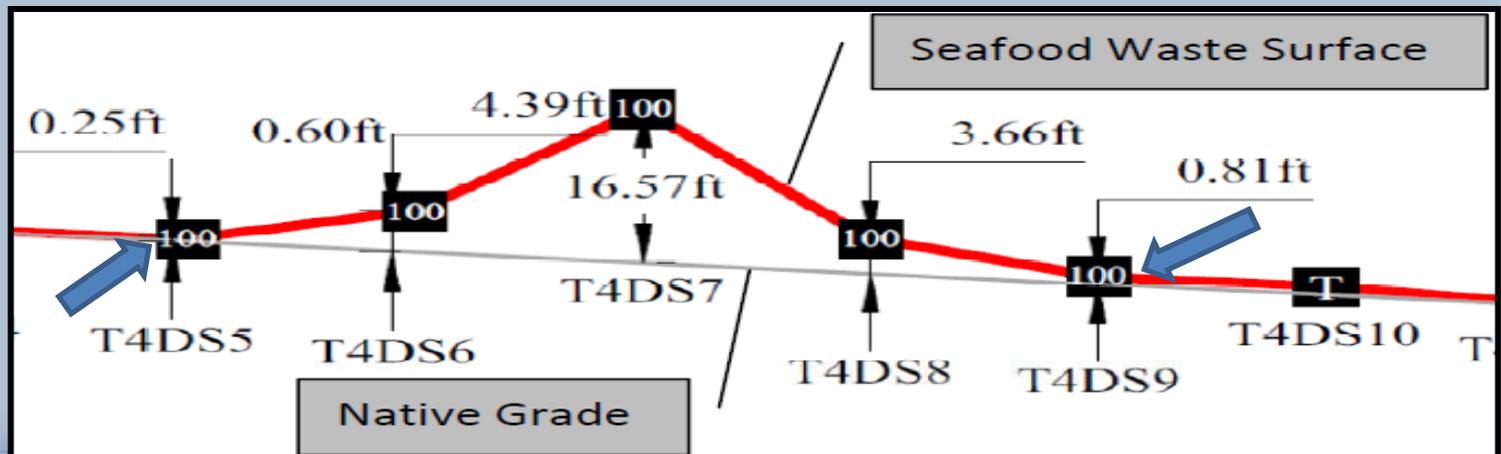


Guidance for Data Analysis

MODULE 5



- This method provides the pile thickness at any given point, and also provides the accurate footprint of the debris.
- In the example, transect 4 measured 74.39 ft across the top of the pile (T4DS5-T4DS9), the native grade for this transect (T4DS5-T4DS9) was only 61.69 ft.



Guidance for Data Collection

MODULE 5



- To ensure accuracy of measuring pile thickness by using the surface depth of the pile, *each* sample point is photographed and the time stamp is used to correct the depth to MLLW.
- The time is used by a computer program that adjusts the nearest tidal station to the coordinates of the debris pile.
- A standard rigid ruler is used to measure thickness of debris up 24 inches. After that, tactile measurements become subjective.

Guidance for Data Collection

MODULE 5



- **Bias and Errors:**
 - Common errors associated with diving methods include:
 - **Measurements of long distances:**
 - Measuring long distances underwater in limited visibility can be impacted by weaving and vertical changes of the seafloor as a result of bathymetry.
 - **Navigational errors:**
 - Magnetic influences may impact the divers direction and result in transect interval distance errors; a key component to the area calculations.

Guidance for Data Collection

MODULE 5



- To correct for both of these errors divers do not measure long distances underwater. The procedure for limiting the bias to a practical minimum is as follows.
 1. Divers only measure 15 foot distances (within the limits of visibility). Sample point to sample point only.
 2. Divers use the compass to align themselves on the transect and point to an object along the transect 15 feet ahead of them.

Guidance for Data Collection

MODULE 5



- This does not eliminate all errors, however the methods prevent errors from compounding over long distances.
- Accurate navigation underwater takes practice, accurate navigation is essential to accurate calculation of areas impacted by seafood waste discharges.
- Divers need to be properly trained, aware of bias and utilize proper procedures during the survey and after, when calculating the results.

Accountability

MODULE 5



- Seafloor surveys are conducted in a changing environment, the surveyor must use the best methods available to delineate the coverage at the site on the day of the inspection. When it becomes necessary to change transects patterns, number of transects or the method the survey uses, the surveyor must clearly describe the reasons for the changes in the report.
- Whenever possible significant changes should be approved by DEC and the client in advance.

Reporting – Permit Requirements

MODULE 5



- ADEC discharge permits require the operator submit certain data sets and documents in a timely fashion to remain in compliance with the regulations. With regards to seafloor monitoring the DEC Offshore General Permit lists the following, Individual Permits may include the same requirements as listed next, and may also require additional stipulations.

Reporting – Permit Requirements

MODULE 5



- Seafloor Survey Reports must contain the following to be considered responsive to the requirements:
 1. Seafood processors name
 2. APDES permit number
 3. Date, place and time of survey, including surveyors name and contact information
 4. Name and signature of surveyor

Reporting – Permit Requirements

MODULE 5



5. Method description must include:

- A. Method used to establish transects
 - B. Locate sample stations
 - C. Measuring seafood processing waste thickness
 - D. Estimating percent of cover at each station
 - E. Method used to calculate area of seafood waste coverage
6. Date of completion of the report, including the full name of those performing the analysis.
7. A table showing waste thickness and percent of cover along each transect

Reporting – Permit Requirements

MODULE 5



8. A narrative summary of the seafloor survey results.
9. A map with scale delineating the survey area, location of each transect, area of continuous and discontinuous cover.
10. Results for area of continuous and discontinuous cover are expressed in acres to one tenth, and in square meters.
11. A statement of compliance/noncompliance with the ZOD authorized in the permit.

Reporting – Permit Requirements

MODULE 5



12. Statement regarding the operating status of the discharge during the survey.
13. Abundances and types of marine life observed adjacent to the discharge pile, time/date stamped photos and a statement regarding changes observed from previous surveys.
14. Survey reports must meet qualitative standards as determined by ADEC, or in its discretion additional surveys or monitoring may be required.

Reporting – Permit Requirements

MODULE 5



In addition to the contents of the survey report, a Quality Assurance Project Plan is required from every operator. The QAPP has the following content and submission requirements:

1. A copy of the QAPP must be developed and submitted for each location.
2. The QAPP will contain enough information to reconstruct the seafloor survey from notes, field records, dive plans and still/video photography.

Reporting – Permit Requirements

MODULE 5



3. The QAPP will include a detailed description of the seafloor survey methods. Including establishing survey location controls in the water, measuring waste thickness, determining percent of cover, photographic procedures, and measuring water depth and tide stage.
4. Each seafloor survey report submitted to ADEC will include a copy of the QAPP and a statement that the QAPP has been implemented.

Reporting – Permit Requirements

MODULE 5



- The survey methods and study design will be circulated in the QAPP for approvals prior to field work.
- The QAPP will provide guidance for current surveys and will include updates for future considerations.
- A QAPP provides both quality control and cost control, ensuring that the sites historical compliance record and survey methods are preserved.

Report and QAPP Submissions

MODULE 5

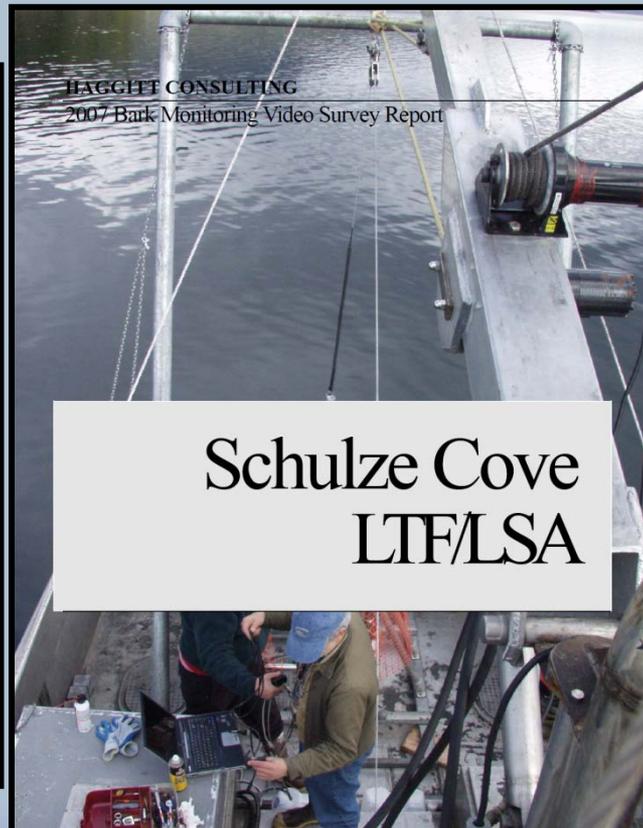


Regardless of the discharge, each site requires a dedicated QAPP Document to be submitted to ADEC

HAGGITT CONSULTING
2011 Bark Monitoring Survey Report

Saltery Point LSA

WATER WAY: SUKKWAN STRAIT 12 TIDELAND: ADL 106228



A1. Quality Assurance Project Plan

for

2007 Alaska Log Storage and Transfer Facilities Assessment

Prepared for:

Alaska Department of Environmental Conservation
Division of Water
410 Willoughby Avenue
Juneau, Alaska 99801

Prepared by:

Haggitt Consulting
6991 Hwy 112
Sekiu WA, 98381

And

Germano and Associates, Inc
12100 SE 46th Place
Bellevue, WA 98006

This quality assurance project plan (QAPP) has been prepared according to guidance provided in EPA Requirements for Quality Assurance Project Plans (EPA QA/R-5, EPA/240/B-01/003, U.S. Environmental Protection Agency, Office of Environmental Information, Washington, DC, March 2001) to ensure that environmental and related data collected, compiled, and/or generated for this project are complete, accurate, and of the type, quantity, and quality required for their intended use.

Approvals:

Joseph Germano, Ph.D.
Field Survey Co-Leader
Germano & Associates

Date

Steve Haggitt
Field Survey Co-Leader
Haggitt Consulting

Date

Howard Jones
Lead Taxonomist
Marine Taxonomic Services, Ltd.

Date

Mark Harris
Project Manager
Analytical Resources, Inc.

Date

Seafloor Monitoring Summary

MODULE 5



- A QAPP including a study design and detailed methods must be submitted to ADEC for each site.
- A copy of the QAPP must be submitted with each survey report.
- Surveys must use approved methods as contained in the permit; alternate methods may be used with prior approval from ADEC.
- Reporting must include all required data sets and information to be considered compliant.
- Both hard copies and electronic versions are required to be submitted to be considered responsive to the permit stipulations.



End of Module 5

MODULE 5

