



## Natural Resources Survey for Cultivated Oyster Mariculture Sites

### Survey purpose

The purpose of the natural resources survey is to ensure no sensitive habitats or natural resources will be negatively impacted by Commercial Oyster Mariculture operations. Sensitive habitats include seagrasses, oysters, and other biogenic reefs (Rangia, serpulid, etc.), as well as intertidal habitats such as saltmarsh, mangroves, and tidal flats. Natural resources include areas that are essential for fish and wildlife species, such as bird rookeries, designated Threatened and Endangered (T&E) species critical habitats, and protected conservation areas.

To minimize impacts to sensitive habitats, the following buffers have been established:

- 200-feet for seagrass habitat
- 500-feet for oyster habitat
- 2,000-feet for bird rookeries
- Avoid serpulid reefs within proposed area

Applicants are strongly encouraged to coordinate with Texas Parks and Wildlife Department (TPWD) before completing their field natural resource survey and COM permit application. During this pre-application coordination, TPWD will evaluate your proposed site using the department's Spatial Planning Tool (SPT), which can help avoid investing effort into a site that may be denied during the permitting process.

The field survey (to be completed by applicant) will ONLY investigate the presence of seagrass and oyster habitats (see Field Survey Protocols below on how these are to be conducted). The remainder of the sensitive habitats and natural resources will be evaluated by TPWD staff using their SPT and/or site visits at their discretion.

### **Desktop Analysis with TPWD Spatial Planning Tool (Strongly Encouraged)**

Coordination with TPWD before commencing the field survey is strongly encouraged, the staff will use the SPT with all submitted applications, prior consultation will reduce the chances of applicants having to conduct more field surveys. TPWD staff will review the proposed location using SPT that has been developed to identify current and historic natural resource concerns along the Texas coast. The SPT also identifies additional concerns that may be identified by other agencies later in the permitting process where TPWD is not the coordinating agency (navigation concerns, conflicting use, etc.). Reviewing sites with TPWD and the SPT may prevent unnecessary expenditures on field surveys and subsequent permit applications by preemptively identifying excluded sites. Spatial data from previous habitat mapping efforts have been curated into the SPT to expediate site review, and the tool will be updated annually with new data.

The SPT includes information on:

- Sensitive subtidal habitats (seagrass, oyster, other hard reefs)
- Sensitive intertidal habitats (saltmarsh, mangrove, tidal flats)
- Bird rookeries
- T&E species critical habitats\*
- Restoration and mitigation sites\*
- Conservation areas\*
- Conflicting uses (such as spoil areas, sand sources, etc.) \*
- Oil and gas infrastructure\*
- Navigation concerns\*
- Environmental conditions, including bathymetry, water quality (dissolved oxygen and salinity), and Health Department area designations\*
- High-resolution imagery
  - Because mapping efforts in Texas have been limited, free and publicly available aerial imagery should be evaluated by a trained analyst to see if seagrass can be identified at the site. Imagery from multiple years should be used due to intra-annual variability in seagrass extent. Imagery should only be used if water clarity was sufficient to visually examine the bottom. TPWD will use Texas Orthoimagery Program imagery and National Agriculture Imagery Program (NAIP; found on the Texas Natural Resource Information System (TNRIS) website), and any additional imagery that may be available and be of sufficient quality (no turbidity, glare, etc.).

\* Indicates that TPWD is not the coordinating agency for these concerns but is providing the information as a courtesy. These concerns will be officially coordinated by other agencies during the permitting process.

If seagrass or oyster habitats are identified within the boundaries of the buffer around the site using any of the above data sources, then the site will be rejected for COM activities. If seagrass or oyster habitats are absent from the above analysis, then a field survey must be completed to confirm seagrass/oyster absence at the proposed site.

To schedule a site coordination meeting, please contact: [oyster.mariculture@tpwd.texas.gov](mailto:oyster.mariculture@tpwd.texas.gov)

## **Habitat definitions**

**Seagrass habitat** is defined as the presence of above-ground or below-ground (rhizome) biomass of any of the 5 species of seagrasses that occur in Texas, including Shoalgrass (*Halodule beaudettei*), Widgeongrass (*Rupia maritima*), Manatee grass (*Syringodium filiformes*), Turtle grass (*Thalassia testudinum*), and Star grass (*Halophila engelmannii*). In a grab sample survey, this would be any sample that has rooted seagrass material present. In a sidescan survey, this would be any feature that is visible in the imagery where in-situ grabs confirm the presence of rooted seagrass – in this case, the entire seagrass feature would be avoided using a 200' buffer. Using TPWD's Spatial Planning tool, this habitat definition also includes any seagrass habitats that have been identified in the past 20 years by accurate

mapping efforts. If seagrass is present at a single sampling location, that location should be avoided with a 200' buffer.

**Oyster habitat** is defined as the presence of live oysters OR the presence of consolidated oyster shell substrates OR shells greater than 25 mm. In a grab sample survey, this would be any sample that is dominated by shell substrates, or contains shell fragments greater than 25 mm. In a sidescan survey, this would be any feature that is visible in the imagery where in-situ grabs confirm the presence of shell material – in this case, the entire oyster feature would be avoided using a 500' buffer. Using TPWD's Spatial Planning tool, this habitat definition also includes any oyster habitats that have been identified in the past by accurate mapping efforts. Live oysters do not need to be present in order to define the area as "oyster habitat" due to seasonal variation in oyster production and mortality. If oyster habitat is present at a single sampling location, that location should be avoided with a 500' buffer.

**Other biogenic habitats** include all remaining hard reefs that are formed by living organisms, such as *Rangia* clams or serpulid worms. If serpulid reef presence is suspected at the site, please consult with TPWD and the SPT before completing in-situ sampling – serpulid reefs are fragile and can be negatively impacted by in-situ sampling. Sensitive intertidal habitats include all vegetated intertidal habitats (vegetation, including *Spartina* marsh, mangroves, or other saltmarsh plants present between the high tide and low tide lines) as well as vegetated and non-vegetated tidal flats. *These habitats will not be surveyed as part of the field survey but will be assessed using the optional Desktop Analysis by TPWD.* Potential impact to these habitats is dependent on the operations plan (e.g., if the site will be accessed through sensitive habitats).

**Rookeries** are defined as any site that supports breeding activity from any of the bird species listed in the Colonial Waterbird Species List (below). Rookeries must be avoided with a 2000' buffer. Sites that have been inactive for more than 20 years, are degraded (e.g., fully submerged) so that they can no longer support bird activity and are not priorities for restoration may be reviewed on a case-by-case basis to determine if the 2000' buffer is applicable. *These habitats will not be surveyed as part of the field survey but will be assessed using the optional Desktop Analysis by TPWD.*

NOTE: There is no threshold of density required to classify an area as a "**sensitive habitat**". The department will evaluate each application separately based on the most current data available through the Spatial Planning Tool, the Natural Resource Survey and input from local department staff. TPWD reserves the right to use our discretion when habitats are not clearly discernable based on the results of the natural resource survey.

## **Colonial Waterbird Species List**

- Pelecaniformes
  - American White Pelican, *Pelecanus erythrorhynchos*
  - Brown Pelican, *Pelecanus occidentalis*
  - Neotropic Cormorant, *Phalacrocorax brasilianus*
- Wading Birds
  - Great Blue Heron, *Ardea Herodias*
  - Great Egret, *Ardea alba*
  - Snowy Egret, *Egretta thula*
  - Reddish Egret, *Egretta rufescens*
  - Tricolored Heron, *Egretta tricolor*
  - Little Blue Heron, *Egretta caerulea*
  - White Ibis, *Eudocimus albus*
  - White-faced Ibis, *Plegadis chihi*
  - Glossy Ibis, *Plegadis falcinellus*
  - Roseate Spoonbill, *Ajaia ajaja*
- Gulls, Terns, Skimmers
  - Laughing Gull, *Larus atricilla*
  - Caspian Tern, *Sterna caspia*
  - Royal Tern, *Sterna maxima*
  - Forster's Tern, *Sterna forsteri*
  - Least Tern, *Sterna antillarum*
  - Gull-billed Tern, *Sterna nilotica*
  - Sooty Tern, *Sterna fuscata*
  - Sandwich Tern, *Sterna sandwicensis*
  - Black Skimmer, *Rynchops niger*
  - Black-crowned Night-Heron, *Nycticorax nycticorax*
  - Yellow-crowned Night-Heron, *Nyctanassa violacea*
- Shorebirds
  - American Oystercatcher, *Haematopus palliatus*
- Inland/Other
  - Anhinga, *Anhinga anhinga*
  - Green Heron, *Butorides virescens*
  - Cattle Egret, *Bubulcus ibis*
  - Double-crested Cormorant, *Phalacrocorax auratus*
  - Black-necked Stilt, *Himantopus mexicanus*

## Field Survey Protocols

Applicants have the option of completing either a sidescan sonar survey (with in-situ sediment grab ground-truthing) or a higher density in-situ sediment grab survey – the decision for which type of field survey should be based on logistic considerations (project size, equipment availability, etc.) and time of the survey. Sidescan SONAR surveys (with ground-truthing) will only be accepted if conducted during the seagrass growing season (May 1 – November 30). Natural resources surveys should be completed within 1 year prior to submitting the permit application. Sites that were surveyed greater than 1 year prior to the application will need to be re-surveyed.

It is suggested that applicants visually inspect the site by boat (if water clarity allows) to ensure no seagrass or oyster habitats are present before commencing the field survey, and to adjust the footprint of their proposed site accordingly. Visual boat surveys alone will not be accepted as

- 1) some habitat features will not be visible from that boat regardless of water clarity (seagrass rhizome presence) and
- 2) sufficient water clarity for accurate habitat identification cannot be guaranteed. If seagrass is visible from the boat, it is strongly recommended that the applicant reconsider the location of the site and resulting survey.

NOTE: If seagrass or oysters are identified in a sample during the survey, all COM activities will be rejected within the appropriate buffer distance of the sample or detected sonar feature (200' for seagrass, 500' for oysters).

### **1) Sidescan SONAR Survey (with Ground-Truthing)**

Sidescan SONAR surveys can be cost-effective when surveying large areas (>5 acres). They provide full- coverage images of the survey area and thus can have better spatial resolution than in-situ surveys alone. A sidescan survey can be used to identify seagrass above-ground biomass and oyster habitat features but cannot be used to verify presence of below-ground seagrass biomass (rhizomes). For this reason, additional in-situ sampling at a reduced density is required to validate the results of SONAR surveys and confirm absence of seagrass rhizomes.

**Limitations:** Sidescan sonar surveys may be limited by water depths and are not suggested in less than 3' of water. Sonar surveys for seagrass are also limited by season and are only appropriate for identifying seagrass during the growing season (May 1 – November 30). Outside of this season, the in- situ method (below) is required to confirm absence of seagrass.

Surveys can be completed using recreational units (e.g., Hummingbird, Garmin, Lowrance, etc.) as long as the equipment and product meets the specifications outlined below.

### Survey and Equipment Specifications:

- SONAR Frequency: 200-1200 kHz
- SONAR Range: Maximum of 10x water depth
- SONAR Coverage Overlap: 15%
- SONAR data should be collected concurrently with integrated GPS data
- Survey boats should be operated at < 4 mph.
- SONAR surveys must be ground-truthed using the methods outlined in the next section
- SONAR surveys should not be conducted if wave height is >2.0 ft or during rainfall as these conditions will negatively impact the quality of the SONAR data.
- SONAR surveys should encompass the entirety of the proposed COM site and the maximum required 500 ft buffer (i.e., oyster habitat buffer) surrounding the site. Note, that it may be beneficial to survey a larger area so that the location of the proposed COM site can be altered to avoid conflicts if they are found in the proposed project area.

### **Ground truthing with Sediment Grab Samples**

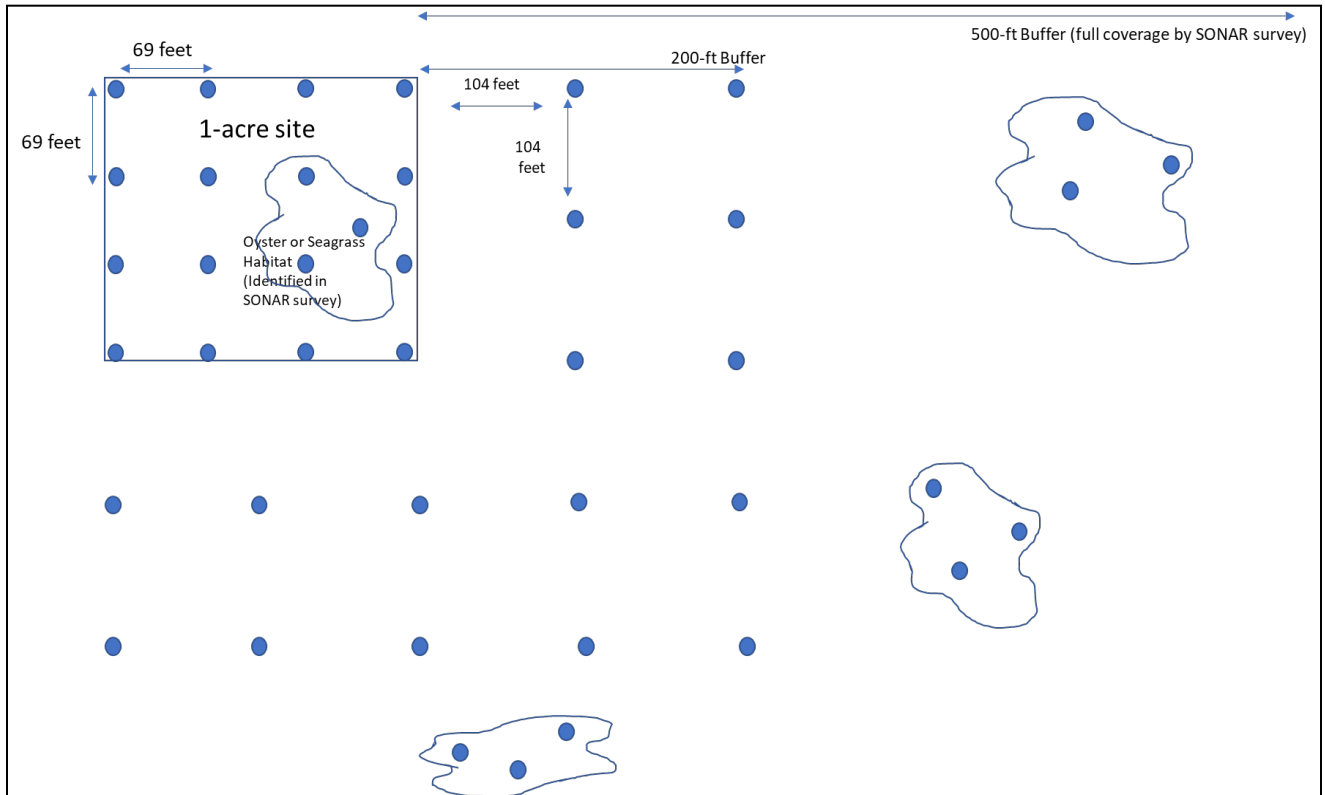
Sidescan sonar surveys must be verified using in-situ sediment grab ground-truthing observations. Samples can be collected with any grab sampler that penetrates to a depth of 3-5 inches, including Ponar, post-hole digger, or other grab samplers. If the sample is on a consolidated oyster reef, penetration to 3-5" is not required. Sample diameter should be 4 – 6" at a minimum. Sampler should retain enough sediment to be able to detect presence of seagrass rhizomes.

For each grab sample a photo must be taken, GPS coordinates given, and bottom classification recorded. Classifications should include, at a minimum: oyster habitat, above ground seagrass, below ground seagrass (rhizomes), or unconsolidated sediments (see Habitat definitions).

In-situ ground-truthing coverage pattern must adhere to the following specifications:

- In the proposed permit area:
  - o Approximately sixteen (16) samples should be collected per acre.
  - o Samples should be collected every 69' along transects that are spaced 69' apart (Figure 1).
  - o If any features in the sidescan imagery are not sufficiently sampled using the methodology above (i.e., 69' x 69' sampling pattern), additional samples should be taken.
- In the 200-ft buffer surrounding the permit area:
  - o Approximately nine (9) samples should be collected per acre of the buffer area.
  - o Samples should be collected every 104' along transects that are

- spaced 104' apart (Figure 1).
- In the 500-ft buffer surrounding the permit area:
    - o Only features that are identified in the SONAR survey need to be sampled with 3 samples per acre per feature.
    - o If any ground-truthing samples in a feature detect the presence of habitat, the entire feature will be classified as that habitat and the appropriate buffers will be enforced from the delineated edge of the feature.



*Figure 1 Example sample spacing for ground-truthing SONAR surveys. Approximately sixteen (16) samples per acre should be collected within the proposed permit site area, with samples collected every 69' along transects that are spaced 69' apart. In a 200' buffer area around the proposed site, approximately nine (9) samples should be collected per acre of the buffer, with a sample every 104' along transects that are spaced 104' apart. Between the 200' buffer area and 500' buffer area, only features that are identified in the sidescan need to be verified with 3 in-situ samples per acre per feature.*

## Products/reporting

Applicant should provide the following in the report:

- Survey summary and metadata (word document), which should include
  - o Who collected the data
  - o What date/time the data were collected
  - o What the environmental conditions were at time of collection (wind speed, wave height, rainfall, etc.)
  - o What type of equipment was used to collect the data, and any appropriate specifications
    - Includes a description of the sonar unit and specifications listed above (frequency, range, transect spacing, etc.)
    - Includes a description of the grab sampler and grab size
  - o The horizontal datum used for all spatial data and GPS coordinates
  - o A summary of findings. This should include a narrative description of the general conditions at the site (including water depth), as well as a report of how many samples contained shell or seagrass materials, and the general location within the site where these materials were found.
- A processed and mosaicked SONAR image of the proposed site in GeoTIFF format
- A polygon file (.shp or .kml) of all delineated habitat features. Please provide a single shapefile or KML with all observations if possible.
- Grab sample observations should be provided as point shapefile (.shp) or Excel spreadsheet (Figure 2). For each sample, provide
  - o 1) the sampling coordinates
  - o 2) the water depth
  - o 3) the bottom characteristics
  - o 4) please indicate if shell material or seagrass material are present within the sample
- Photographs should be provided of each grab sample

	A	B	C	D	E	F	G	H	I
1	Natural Resource Survey Grab Sample Observations								
2	GPS Coordinate System: WGS1984								
3	<b>Sample ID</b>	<b>Date</b>	<b>Substrate</b>	<b>Latitude °N</b>	<b>Longitude °W</b>	<b>Depth (m)</b>	<b>Seagrass Present</b>	<b>Oyster Shell Present</b>	<b>Live Oysters Present</b>
4	WP-01	11/11/2022	Fine Sand, Silt	29.451159	-94.700922	3.2	no	no	no
5	WP-02	11/11/2022	Mud	29.13507	-95.15580	3.1	no	no	no
6	WP-03	11/11/2022	Mud, shell hash	28.675244	-96.265903	2.9	no	no	no
7									
8									
9									

Figure 2 Example spreadsheet of grab sample observations.



## **2) In-Situ Grab Sample Only Survey**

Higher density in-situ sediment grab sample surveys may be effective for smaller sites (< 5 acres) and are required if the survey is completed during December through April.

Samples can be collected with any grab sampler that penetrates to a depth of 3-5 inches, including Ponar, post-hole digger, or other grab samplers. If the sample is on a consolidated oyster reef, penetration to 3-5" is not required. Sample diameter should be 4 – 6" at a minimum. Sampler should retain enough sediment to be able to detect presence of seagrass rhizomes.

For each grab sample a photo must be taken, GPS coordinates given, and bottom classification recorded. Classifications should include, at a minimum: oyster habitat, above ground seagrass, below ground seagrass (rhizomes), or unconsolidated sediments (see Habitat definitions).

In-situ grab sample coverage pattern must adhere to the following specifications:

- In the proposed permit area:
  - Approximately forty-nine (49) samples should be collected per acre.
  - Samples should be collected roughly every 35' along transects that are spaced 35' apart (Figure 2) starting at the corner coordinate of the site. This allows for habitat detection at a threshold of 1/36<sup>th</sup> of an acre, which allows habitat (if detected) to be delineated for avoidance.
- In the 500-ft buffer surrounding the permit area:
  - Approximately sixteen (16) samples should be collected per acre of the buffer area, which allows for habitat detection threshold of ~1/10<sup>th</sup> acre.
  - Samples should be collected every 69' along transects that are spaced 69' apart (Figure 3).

### **Products/reporting**

Applicant should provide the following in the report:

- Survey summary and metadata (word document), which should include
  - Who collected the data
  - What date/time the data were collected
  - What the environmental conditions were at time of collection (wind speed, wave height, rainfall, etc.)
  - What type of grab sampler was used to collect the data, description, and grab size
  - The horizontal datum used for all GPS coordinate data
  - A summary of findings. This should include a narrative description of the general conditions at the site (including water depth), as well as a

report of how many samples contained shell or seagrass materials, and the general location within the site where these materials were found.

- Grab sample observations should be provided as point shapefile (.shp) or excel spreadsheet (Figure 2). For each sample, provide
  - o 1) the sampling coordinates,
  - o 2) the water depth
  - o 3) the bottom characteristics
  - o 4) please indicate if shell material or seagrass material are present within the sample
- Photographs should be provided of each grab sample

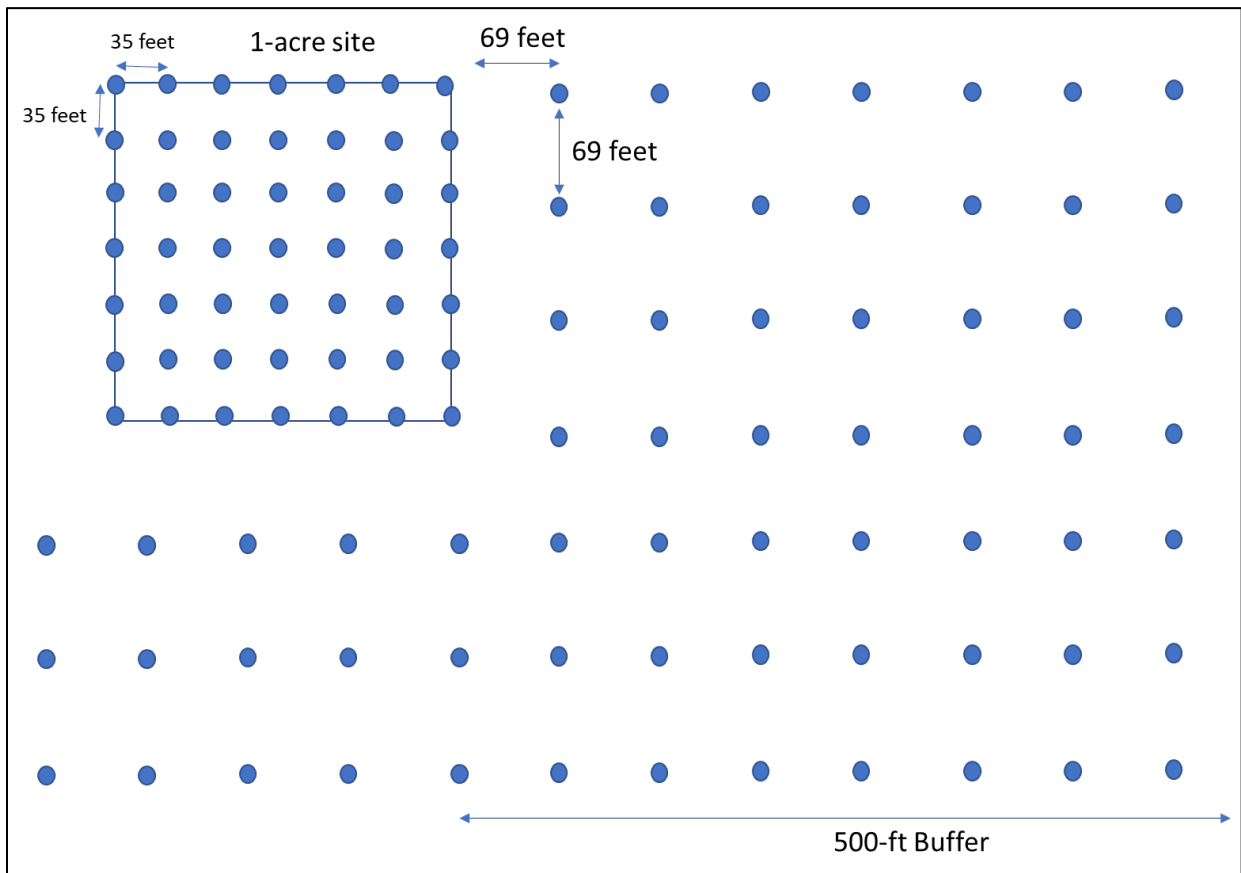


Figure 3 Sample spacing for in-situ surveys. Approximately forty-nine (49) samples per acre should be collected within the proposed permit site area, with samples collected every ~35' along transects that are spaced 35' apart. Approximately sixteen (16) samples per acre of the buffer area should be collected within the 500-ft buffer area, with samples collected every 69' along transects that are spaced 69' apart.