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Appendix O

Pre-Design Study

1. Introduction

A pre-design study will be conducted to confirm the preferred remedial alternative approach, to support the design and permitting of the preferred remedial alternative, and to confirm and refine the mitigation area for the Dawson Cove Inlet Channel, Open Water Area, and Heavily Vegetated Area. Alternative 4, which is the most preferred and recommended alternative, consists of targeted removal in the Inlet Channel, reactive capping in the Open Water Area, and targeted in-situ amendment placement in the Heavily Vegetated Area. The pre-design study activities will provide additional data to support the following:

- Refinement of the proposed mitigation area to determine the horizontal boundaries of capping and/or removal activities and to confirm the required excavation depth (where applicable).
- Mapping of access roads, staging areas, areas of removal, etc., to further guide mitigation and restoration planning.
- Wetland delineation, as required in the permit application to identify potentially jurisdictional wetlands.
- Locations of utility crossings, utility easements, and rights-of-way within the site boundary.
- Survey of elevations along ditches and stream channels for stormwater hydraulic calculation.

2. Refinement of the Proposed Mitigation Area in Dawson Cove

A pre-design field effort will be conducted to confirm the preferred remedial alternative approach and refine the mitigation area proposed in the Downstream Areas Data Assessment Report (DADAR). Activities will include, but not limited to, field probing, field observation logging, staking and establishing coordinates for sheen-bearing areas to be targeted for mitigation action. Specifically, activities will be completed in the areas shown in Figure O-1, and described below:

- Dawson Cove Inlet Channel: Main channel between I-40 and the Open Water Area of Dawson Cove.

- Dawson Cove Open Water Area: Open marsh and water area located between Dawson Cove Inlet Channel and the heavily vegetated area.

- Heavily Vegetated Area: Vegetated area between the Open Water Area to the west and Highway 89, including the natural channels between the vegetation.

These activities will include the following steps:

1. Upon arrival at the target location, document and photograph the existing sheen, if any, in accordance with the Sheen Field Description and Characterization Standard Operating Procedure (SOP) provided in Attachment O-1. Based on field observations, sheen samples may be collected at selected locations to confirm the sheen origin. Sheen sampling will be performed in accordance with the Surface Water Sheen Sampling SOP provided in Attachment O-1.

2. Remove the sheen using absorbent booms or pads.

3. Use a metal or wooden rod to probe the sediment in the following increments: 0.5 to 1.0 inch, top 0.5 foot, and then the top 1.0 foot. For each increment, follow the steps below:

    a. Probe to gently agitate the submerged sediments for sheen generation.

    b. Document and photograph sheen, if any.

    c. Characterize the sheen and record observations in field notes in accordance with the Sheen Characterization SOP.

    d. Remove the sheen using absorbent booms or pads and continue to the next increment.

4. After completing the probing activities at all target areas and confirming that the sediments are settled, shake-jar tests will be conducted using sediment samples, which will be collected at each target location as described below:

    a. Based on the sheen observations recorded during probing activities, estimate the depth of sheen-producing sediments. Collect a sediment core up to 2 feet below sediment surface using push cores with Zipliner Soil Sampling Sleeves, or equivalent, and ZipTool Opener, per the manufacturer's instructions, and decant the overlying water.

    b. Open the Zipliner using the ZipTool Opener per the manufacturer's instructions, and scrape a thin layer of surface sediment to collect 0 to 0.1 inch

(approximately 2 millimeters) of sediment sample. Further section the core, and collect samples from 0.1 to 6 inches, and subsequent 6-inch intervals.

c. Place each sample into a clean jar and add clean water to observe immediate sheen generation, if any. If sheen does not generate immediately, gently stir the water and sediment mix using a stick, and allow sheen to release from the sediment, if present. Document sheen characteristics and photograph the sheen development for each sample in accordance with the Sheen Characterization SOP.

d. Describe sediment samples according to the Unified Soil Classification System, and document any other observations (e.g., color, type of organic materials present, odor, sheen, staining).

5. Use stake-out rods or flags to stake the sampling locations to establish the boundaries of the sheen-bearing materials. Record the coordinates using a handheld global positioning system unit, and photograph the staked location.

6. Based on the sheen observations and the recorded coordinates for staked locations, determine the extent of the mitigation areas.

3. Wetlands Delineation

Wetland delineation is required in the permit application to identify potentially jurisdictional wetlands, and will be performed as part of the pre-design study. Jurisdictional areas will be delineated by two teams of two ARCADIS scientists utilizing the methods outlined in the 1987 U.S. Army Corps of Engineers (USACE) Wetlands Delineation Manual (USACE 1987), as well, as the Regional Supplement to the Corps Wetland Delineation Manual (Version 2.0; USACE 2012) and Regulatory Guidance Letter 08-02 (USACE 2008). The project area will be traversed and studied for the presence of hyrdophytic plants, hydric soils and wetland hydrology. Wetlands or other jurisdictional areas will be delineated on-site and data points will be collected using Global Positioning System (GPS) equipment capable of sub-meter accuracy for use in ESRI's ArcMap software to determine cumulative impacts to jurisdictional waters.

In addition to assessing the boundaries of the jurisdictional areas, the wetlands and streams will be assessed using the Hydrogeomorphic (HGM) approach per the USACE and Arkansas standards (USACE 2013; Arkansas Multi-Agency Wetland Planning Team 2006). ARCADIS scientists have extensive experience documenting

wetlands and streams using these methodologies and will utilize these tools to determine the integrity of impacted waters.

4. References

Arkansas Multi-Agency Wetland Planning Team. 2006. Arkansas HGM Functional Assessment Guidebooks. Website. Last updated: April 14. Available online at: http://www.mawpt.org/wetlands/classification/project.asp

USACE. 1987. Corps of Engineers Wetlands Delineation Manual. Wetland Research Program, Technical Report Y-87-1. January. Available online at: http://www.wetlands.com/pdf/wdm0225e.pdf

USACE. 2008. Regulatory Guidance Letter, No. 08-02. June 26. Available online at: http://www.usace.army.mil/Portals/2/docs/civilworks/RGLS/rgl08-02.pdf

USACE. 2012. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region (Version 2.0). Engineer Research and Development Center, Environmental Laboratory, TR-12-9. April. Available online at: http://www.usace.army.mil/Portals/2/docs/civilworks/regulatory/reg_supp/EMP_Piedmont_v2b.pdf

USACE. 2013. Hydrogeomorphic (HGM) Approach to Assessing Wetland Functions: Guidelines for Developing Guidebooks (Version 2). Engineer Research and Development Center, Environmental Laboratory, TR-13-11. June. Available online at: http://el.erdc.usace.army.mil/elpubs/pdf/trel13-11.pdf

Figure

Attachments

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Figure

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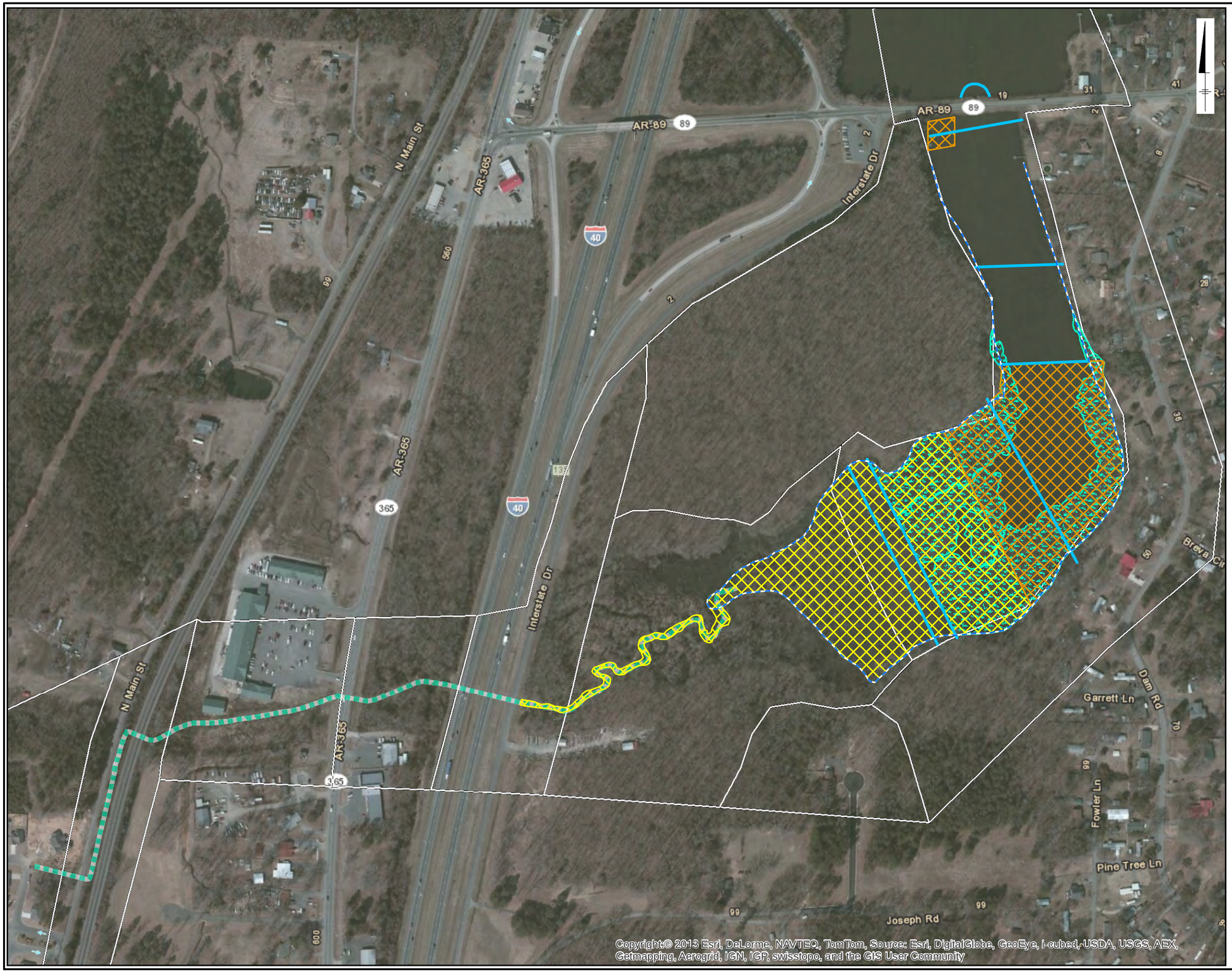

Legend

- Pre-Design Study Activities to Refine Proposed Mitigation Area
- Field Probing to Confirm Delineation of Mitigation Area
- Areas with Heavy Vegetation
- Drainage Path
- Water's Edge
- Containment Boom
- Operations Areas

NOTE:
1. Details regarding proposed pre-design activities are described in Appendix O.

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Feet

MAYFLOWER PIPELINE INCIDENT RESPONSE
EXXONMOBIL ENVIRONMENTAL SERVICES COMPANY
DOWNSTREAM AREAS DATA ASSESSMENT REPORT

PRE-DESIGN STUDY AREAS

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FIGURE
O-1

Attachment O-1

Relevant Standard Operating Procedures

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Sheen Field Description and Characterization

Rev. #: 2

Rev Date: January 12, 2014

I. Scope and Application

This ARCADIS standard operating procedure (SOP) describes proper procedures to describe and characterize in-situ sheens on surface water and saturated surface soils in the field.

Field personnel will record the location of the sheen with reference to the site and site structures or features, and coordinates, if possible. Field personnel will use standardized terms conveyed within this SOP to characterize and describe the following attributes of sheen on surface water or saturated surface soil:

- Location of sheen with respect to monitoring area
- Estimated orientation and dimensions of sheen area
- Color and appearance
- Sheen structure and distribution
- Potential sheen sources, if readily apparent
- Frequency of sheen “blossoms”, if present
- Environmental conditions such as temperature, cloud cover, wind, and wind direction and other relevant information

This SOP is applicable to sheens on surface water and saturated surface soil, and should be followed for sheens regardless of their origin, unless there is a regulatory-required, alternative SOP.

II. Terminology and Definitions

According to the United States Environmental Protection Agency (USEPA), “Sheen means an iridescent appearance on the surface of water” (USEPA 2013). Iridescent objects appear to change color depending on the angle of view. Although anthropogenic materials like oil and tar can produce sheens, natural microbial processes and metals in clean water bodies can also produce sheens (Minnesota Pollution Control Agency [MPCA] 2008)

Terminology from NOAA (2007)

The National Oceanographic and Atmospheric Administration (NOAA) published a document to assist responders in describing and characterizing oil spills on open water (NOAA 2007). Therefore, NOAA’s definitions - presented below - focus predominantly on sheens caused by oil. As noted above, not all sheens are caused by oil.

Sheen: A very thin layer of oil floating on the water surface and is the most common form of oil seen in the later stages of a spill or release.

Streamers: Narrow bands or lines of oil (sheens, dark or emulsified) with relatively clean water on each side. Streamers may be caused by wind and/or currents, but should not be confused with multiple parallel bands of oil associated with “windrows,” or with “convergence zones or lines” commonly associated with temperature and/or salinity discontinuities.

Convergence Zone: A long narrow band of oil (and possibly other materials) often caused by the convergence of two masses of water with different temperatures and/or salinities. Unlike “windrows” and “streamers,” commonly associated with wind, convergence zones are normally associated with the interface between differing water masses, or with the effects of tidal and depth changes that cause currents to converge due to density differences or due to large bathymetric changes. Such zones may be several kilometers in length, and consist of dark or emulsified oil and heavy debris surrounded by sheens.

Windrows: Multiple bands or streaks of oil (sheens, dark, or mousse) that line up nearly parallel with the wind. Such streaks (typically including seaweed, foam, and other organic material) are caused by a series of counter rotating vortices in the surface layers that produce alternating convergent and divergent zones. “Windrows” begin to form with wind speeds of approximately six knots or more.

Patches: Oil configurations or “structures” that reflect a broad range of shapes and dimensions. Numerous “tarballs” could combine to form a “patch”; oil of various colors and consistency could form a patch or single layer 10s of cm to 10s (or even 100s) of meters in diameter; and a large patch of dark or rainbow oil could have patches of emulsion within it. Patches of oily debris, barely able to float with sediment/plants in them, might be called “tarmats,” circular patches at sea might be called “pancakes”; really big patches might simply be called “continuous” slicks. But, they are all “patches.”

Tarballs: Discrete, and usually pliable, globules of weathered oil, ranging from mostly oil to highly emulsified with varying amount of debris and/or sediment. Tarballs may vary in size from millimeters to 20- 30 centimeters across. Depending on exactly how “weathered,” or hardened, the outer layer of the tarballs is, sheen may or may not be present.

No Structure: Random eddies or swirls of oil of any thickness. This distribution of oil is normally the result of little to no wind and/or current.

Black oil: A black or very dark brown-colored layer of oil.

Dispersion: The breaking up of an oil slick into small droplets that are mixed into the water column as a result of sea surface turbulence. For response purposes, dispersed oil is defined as oil droplets that are too small to refloat back to the surface. The physical properties of the oil and the sea state are the main factors that determine how much oil is dispersed.

Emulsification: The formation of a water-in-oil mixture. The tendency for emulsification to occur varies with different oils and is much more likely to occur under high energy conditions (winds and waves). This mixture is frequently referred to as “mousse”.

Recoverable Oil: Oil that is in a thick enough layer on the water to be recovered by conventional techniques and equipment.

Slick: Oil spilled on the water that absorbs energy and dampens out the surface waves making the oil appear smoother or “slicker” than the surrounding water. “Slicks” refer to oil layers that are thicker than Rainbow and Silver “sheens”. Natural slicks, from plants or animals, also may occur on the water surface and may be mistaken for oil slicks.

Weathering: A combination of physical and environmental processes such as evaporation, dissolution, dispersion, photo-oxidation, and emulsification that act on oil and change its physical properties and composition.

Additional Terminology

Brittle: Sheen that cracks, breaks apart, or disaggregates upon disturbance. Brittle sheens are often of natural biogenic origin (MPCA 2008).

Non-brittle: Sheen that rapidly coalesces upon disturbance. Non-brittle sheens are often related to anthropogenic sources, including petrogenic sources (e.g., petroleum hydrocarbons).

III. Personnel Qualifications

Sheen characterization will be completed only by persons who have been trained in ARCADIS sheen characterization procedures. Field personnel will complete training on the ARCADIS sheen characterization SOP in the office and/or in the field under the guidance of a person experienced in sheen characterization.

IV. Equipment List

The following equipment should be taken to the field to facilitate sheen characterization:

- Field book, field form, or electronic data collection device to record observations
- Digital camera with polarizing filters
- Site map including sheen monitoring areas and IDs
- Field book to take supplemental notes
- Stop watch or watch
- Floating scale for use when photographing sheens
- Wooden or steel rod
- Absorbent booms or pads
- Global positioning system device – optional, but recommended
- This SOP for sheen characterization
- NOAA's *Open Water Oil Identification Job Aid for aerial observation* (NOAA 2007)
- Personal protective equipment as required by the HASP

V. Health and Safety Considerations

Personnel performing sheen characterization may be required to work near rivers, lakes, or other surface water features. Personnel may also be required to operate small watercraft or to observe sheens from bridges or roads. Water, watercraft, and traffic related hazards are discussed in the site-specific HASPs and are not discussed in this SOP.

Generally, personnel performing sheen characterization will not be in contact with impacted surface water or soils. However, secondary tasks such as sheen sampling may be required. Surface water and saturated surface soil may contain hazardous substances. Routes for exposure may contain dermal contact, inhalation, and ingestion. Avoid contact with bare hands due to possibility of contacting face, ears, or other body parts with hands. Wear appropriate personal protections equipment during sheen monitoring and sheen sampling activities.

Surface water sheen sampling procedures and hazards are not discussed in this SOP. Please refer to the ARCADIS Surface Water Sheen Sampling SOP and the project specific HASP for guidance if sheen sampling will take place during sheen characterization activities.

VI. Procedure

The procedure for sheen characterization is divided into the following tasks.

In this section the tasks are first outlined, and then each one is explained in detail.

1. Identify the **location, orientation, and dimensions** of the sheen.
2. Observe and record sheen **color and appearance** using standard terminology and codes.
3. Observe and record **sheen structure and distribution** using standard codes.
4. Record **sheen "blossom" frequency**, if applicable over a 5-minute period.
5. Identify potential **sheen source(s)** if apparent.
6. Record **environmental conditions** and other observations.
7. Record the **action taken**.

Each task is important for sheen characterization and should be completed when possible. However, field personnel should use their stop work authority if they feel that any task cannot be completed safely given the current site conditions. The correct order to perform the tasks will vary for each situation. Refer to the ARCADIS Surface Water Sheen Sampling SOP and the project specific HASP for guidance if sheen sampling will take place during sheen characterization activities.

1. Identify the location, orientation, and dimensions of the sheen

Identify the location of sheen and sketch it on a map relative to key site features, and/or compass directions. Record the location of the sheen relative to the site by using permanent, easily identifiable structures or site features as reference. Record the areal dimensions of the sheen onto the map and in field notes. If not already done, divide the site into distinct sheen monitoring areas with site references as station boundaries. Record and sketch the sheen position with respect to the site, shoreline, and the sheen monitoring areas.

Photograph the sheen using a digital camera with standard photographic polarizing filters. Take photographs by holding the filter between your eye and the sheen, and rotating through 90 degrees to optimize the polarization by maximizing or minimizing admission of polarized light. The rotation of polarizing filter will screen out glare from reflective water surface in order to allow the true colors of sheen to pass through the camera sensor. Take 1 or 2 photos when the polarization is parallel to the fluid surface and take 1 or 2 photos when the polarization is perpendicular to the fluid surface. Record the rotation, approximate photo direction (north, east, northeast, etc.), and photo number for each photo in the field book. Place a floating scale (floating object of known and documented size) near the sheen in photos for scaling purposes.

In presence of tar balls/oil spots, take a zoomed-in photo with a floating scale placed near tar ball/oil spot to record the approximate size. If tar balls/oil spots vary in size, take additional photos to document the size ranges of tar balls/oil spots. Additionally, take a photograph of the overall area of the sheen. Polarization effects on sheen appearance are included below:

- Biogenic sheens generally appear to be more blue or bluish purple.
- Petrogenic sheen (petroleum hydrocarbon-related) colors will intensify, deepen in hue or become brighter. For very thin sheens, polarization will brighten the sheen color and make the sheen more visible (see example below).
- Pyrogenic sheen (combustion-related) colors will appear to be slightly metallic under some circumstances such as low sun angles typical of late fall, winter, and early spring.

Non-Brittle Sheen Picture – Without a Polarizing Filter

Non-Brittle Sheen Picture – With a Polarizing Filter

2. Observe and record the sheen color and appearance.

Observe the sheen's color and record in the field form or field book. The following terminology will be used when describing sheen color. Note that these terms are listing in general order of increasing sheen thickness.

Color	Code	Description
Sheen (Silver/Gray)	**S**	Near **transparent** for thinnest layers to **silver/gray** for slightly thicker.
Rainbow	**R**	Rainbow colors are visible.
Metallic	**M**	The sheen reflects/mirrors the color of the sky with some element of oil color, often between light gray and dull brown.
Dark (or True) Color	**D**	The sheen is a continuous true oil color.

3. Structure and Distribution

Using standard terms, describe the structure and distribution of the sheen. Depending on the nature of the sheen, structures may include Streamers, Convergence Zones, Windrows, Patches, Tarballs/Oil Spots, or No Structure. See Section II for term definitions.

Gently agitate the sheen by moving a device (e.g., stick, steel/wooden rod, absorbent boom /pad or other object) horizontally through the sheen. While doing so, and after removing the object, observe if the sheen rapidly coalesces as a liquid (“non-brittle sheen”) or if the sheen cracks, breaks, and disaggregates (“brittle sheen”). Record the observation for brittle or non-brittle sheen in the field form or field book. See Section II for term definitions.

4. Sheen Blossom Frequency

A sheen “blossom” is the occurrence of a new sheen due to the migration of a droplet of a non-aqueous liquid to the water surface, often (but not always) due to gas bubbling (ebullition) from sediments.

If sheen “blossoms” are observed, count and record the number of “blossoms” that appear during a 5 minutes. The presence of gas bubbles that rise to the surface of the water (with or without causing sheen blossoms) and the rate of bubbles will be recorded (i.e., number per 60 seconds). Record the frequency observed.

5. Identify potential sheen sources, if readily apparent

Determine whether the sheen source is obvious and, if so, draw it on a map.

6. Record environmental conditions and other observations

Record the date, time, weather, water current, and wind conditions.

7. Record the action taken

After recording the sheen observations in the field form or field book, remove the sheen using absorbent booms or pads, to the extent practical if it is a petrogenic sheen. Record the removal action taken in the field form or field book.

VII. Data Recording and Management

Sheen observations will be maintained in a field notebook, log, or electronic data collection device. Sheen location sketches should be made on a location map. Sheen observations, locations, and associated photographs will be entered into the site database and electronic files for inclusion in summary reports. Upon project completion, field notebooks will be forwarded to the Project Manager for storage in the project files. Field personnel should keep copies for their files. Field personnel will forward copies to the Project Manager for quality assurance checks during project implementation at a frequency determined by the Project Manager.

VIII. Quality Assurance

Sheen characterization should be completed only by appropriately trained personnel. Field personnel will forward copies of any field notes, field logs, and maps to the Project Manager for quality assurance checks during project implementation at a frequency determined by the Project Manager.

IX. References

USEPA. 2013. Web site - http://www.epa.gov/oem/content/lawsregs/sheenovr.htm

Minnesota Pollution Control Agency (MPCA). 2008. Nonpetroleum Sheens on Water. Cleanup/Emergency Response, vol. 4, no. 07, April 2008. http://www.pca.state.mn.us/index.php/view-document.html?gid=2958

NOAA. 2007. NOAA Open Water Oil Identification Job Aid, updated 2007, http://response.restoration.noaa.gov/sites/default/files/OWJA_2012.pdf

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Surface Water Sheen Sampling

Rev. #: 0

Rev Date: January 15, 2004

I. Scope and Application

This Standard Operating Procedure (SOP) sets forth the field procedures for collection of surface water sheen samples (via boat and bridge).

II. Personnel Qualifications

A qualified scientist/biologist or technician must identify the approximate sample location(s) prior to sheen sample collection.

Those collecting sheen samples will require swift-water training if water flows exceed 3 feet per second. At least 1 day of previous supervised surface water or sediment sampling experience is needed for sheen sampling.

III. Equipment List

The following materials will be available, as required, during surface water sheen sampling via boat:

- health and safety equipment (as required by the site Health and Safety Plan [HASP]);
- nitrile gloves;
- cleaning equipment;
- boat and motor;
- appropriate water quality meter(s);
- field notebook;
- 200-foot measuring tape;
- indelible ink pens;
- appropriate transport containers and packing, labeling, and shipping materials (coolers) with ice;
- appropriate sheen sampler net test kit (i.e., General Oceanics soil spill sampling net kit); and

- appropriate sample containers and forms.
- The following materials will be available, as required, during surface water sheen sampling via bridge, dock, or bulkhead shore:
- health and safety equipment (as required by the HASP);
- nitrile gloves;
- cleaning equipment;
- telescoping pole;
- measuring tape and appropriate weights;
- appropriate water quality meter(s);
- field notebook;
- indelible ink pens;
- appropriate transport containers and packing, labeling, and shipping materials (coolers) with ice;
- appropriate sheen sampler net test kit (i.e., General Oceanics soil spill sampling net kit); and appropriate sample containers and forms.

IV. Cautions

Do not touch the sheen sample net with bare hands, as oils from the skin can be detected in the analysis and will interfere with the sheen analytical results.

V. Health and Safety Considerations

Use an extension rod, where appropriate, to avoid awkward body positioning or over-reaching. Review the HASP for appropriate health and safety equipment (including a life jacket).

VI. Procedure

Surface Water Sheen Sampling via Boat

Sheen samples will be collected from a boat using an oil spill net sampler. The sampling net consists of a highly porous TFE-fluorocarbon polymer net attached to a disposable ring. The sampling kit consists of the sampling net, nitrile gloves, a 4-ounce sampling jar with TFE-fluorocarbon lid and handle, and appropriate labeling and shipping materials. The procedures for collection of surface water sheen samples are provided below.

1 Identify sampling location(s) in the field notebook, along with other appropriate information.

2 Don health and safety equipment (as required by the HASP). Extra gloves should be worn to avoid contact of finger or body oils with the net.

3 Pass the net through the oil sheen to collect the sample. Get as much of the net in contact with the surface sheen as possible. The net is used in a mop-like manner, not straining.

4 Remove the net from the disposable ring/handle. Break the ring and rotate the net off the ring.

5 Place the net in a 4-ounce glass sample jar with a Teflon-lined cap for storage and transportation.

6 At each station, in-situ field measurements may be collected for conductivity, temperature, and dissolved oxygen. Record results on the appropriate form and/or field notebook.

7 Secure all sample jar caps tightly.

8 Label all sample containers using indelible ink.

9 Place filled sample containers on ice in a cooler.

10 Follow procedures for preservation of samples and chain-of-custody, handling, packing, and shipping procedures for samples.

11 Identify the location of the sheen sample with a stake or a previously surveyed location and measure distance and direction of sheen sample location from surveyed point.

12 Record required information on the appropriate form and/or field notebook.

Surface Water Sheen Sampling via Bridge, Dock, or Bulkhead Shore

1 Surface water sheen samples will be collected from a bridge, dock, or bulkhead shore using an oil spill sampling kit.

2 Schedule sampling activities to occur during off-peak automobile and/or boat traffic hours (i.e., between 10:00 AM and 11:00 AM or between 2:00 PM and 3:00 PM), preferably during low wind conditions.

3 Don and/or ensure proper use of health and safety equipment/precautions (as required by the HASP). Extra gloves should be worn to avoid contact of finger or body oils with the net.

4 The sampling net can be attached to a 3- to 8-foot telescoping pole for sampling.

5 Conduct all sampling from the downstream side of the bridge or dock.

6 Observe the presence/absence of boating traffic on the river in the vicinity of sampling activities. Proceed with sampling if there are no obstructions (e.g., boats passing under the bridge).

7 Measure the total depth of the surface water sheen at the middle of the river by extending the surveyor's rod or weighted tape measure into the water until it reaches the river bottom.

8 Don two pairs of gloves before handling sheen sampling test kit containers or nets.

9 Pass the net through the oil sheen to collect the sample. Get as much of the net in contact with the surface sheen as possible. The net is used in a mop-like manner, not straining.

10 Remove the net from the disposable ring/handle. Break the ring and rotate the net off the ring.

11 Place the net in a 4-ounce glass sample jar with a Teflon-lined cap for storage and transportation.

12 In-situ field measurements of dissolved oxygen, conductivity, and temperature may be obtained. Results will be recorded on the appropriate form and/or field notebook.

13 Secure all sample jar caps tightly.

14 Label all sample containers using indelible ink.

15 Place filled sample containers on ice in a cooler.

16 Follow procedures outlined for preservation of samples and chain-of-custody, handling, packing, and shipping procedures.

17 Identify the location of the sheen sample with a stake or a previously surveyed location and measure distance and direction of sheen sample location from surveyed point.

18 Record required information on the appropriate form and/or field notebook.

VII. Waste Management

No waste management is anticipated for sheen collection.

VIII. Data Recording and Management

All sheen sample and location measurements will be maintained in a field notebook or log. Upon project completion, field notebooks will be forwarded to the Project Manager for storage in the project files. Samplers should keep copies for their files. Samplers will forward copies to the Project Manager for quality assurance checks during project implementation at a frequency determined by the Project Manager.

IX. Quality Assurance

Samplers will forward copies to the Project Manager for quality assurance checks during project implementation at a frequency determined by the Project Manager.

X. References

General Oceanics, Inc. 2004. Sheen Test Kit Instructions, http://www.general oceanics.com.