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G.1 Introduction

During the Preassessment Phase, the trustees are encouraged to collect and analyze all necessary information that may be reasonably connected to the incident; including baseline and historical data, case histories of previous incidents, incident-specific data, and data on reference and control conditions.

G.2 Baseline and Historical Data

Baseline data refers to on-site information of conditions prior to the incident that are compared to site-specific information of those same conditions subsequent to the incident. Data on baseline conditions provide quantitative information on natural variability of natural resources and other (i.e., human-induced) variability, therefore serving as a temporal comparison. Such data should be collected from locations and natural resources and services that may be affected by the incident. When baseline data is lacking, the trustees may need to rely on more qualitative historical data that may serve to identify preexisting trends.

The NRDA approach is dictated, in part, by the extent and quality of baseline data on potentially affected natural resources and services. In past NRDAs, baseline data were seldom of sufficient extent and quality to fully satisfy the needs of injury quantification. Very few monitoring programs include appropriate analytical targets useful to assess baseline petroleum hydrocarbon contamination levels and sources. The National Status and Trends Program of NOAA and various State Mussel Watch Programs are possible sources of baseline data and long-term trends on petroleum hydrocarbons in sediment and bivalve shellfish. Baseline data on biological and human-use natural resources should be carefully reviewed for the quality of data collection and analysis, the absence of intervening events that would affect the natural resources (e.g., unusual weather, salt-water intrusion, or other discharges), and whether the sampling methods used in the baseline data collection are comparable with the sampling design used in incident-specific studies. Oftentimes, baseline and historical data are valuable during preassessment activities to characterize the environmental setting of the incident site, identify the potential natural resources and services at risk, indicate variability in the natural resources and services, and understand community and ecosystem inter-relationships that may be affected by the incident.

G.3 Case Histories of Previous Incidents

- A special type of data collected during the Preassessment Phase includes case histories of previous incidents under comparable conditions to the incident of concern. An understanding of appropriate case histories will allow the trustees to focus their activities on the natural resources and services most likely at risk. Many oil-related incident effects are well documented by scientific studies of previous incidents or demonstrated from laboratory experiments. Trustees should collect and evaluate the oil literature, with the following objectives:

- Provide empirical data on the natural resources and services most likely at risk. Although each incident is a unique combination of conditions, a review of previous incidents of the same or comparable type, environmental setting, and physical processes can assist the trustees in identification of the natural resources and services most likely at risk. The trustees should compile a list of natural resources and services present, and, based on studies of previous incidents and the advice of experts, identify those natural resources and services that may be affected by the incident. For example, whales and dolphins often surface in the vicinity of slicks during oil discharges, but very few studies have reported any immediately discernible detrimental effects (Geraci, 1990). In the absence of obvious effects on dolphins during a discharge, the trustees should turn to the oil literature to determine if effects to dolphins were reported for other discharges under comparable conditions.

- Develop the conceptual model for pathways of exposure. There will only be limited chemical data available during the Preassessment Phase of an incident that the trustees can use to evaluate the potential extent of exposure. The trustees will have to rely on the literature for the behavior and fate of an oil to develop a conceptual model to determine how the oil is most likely transported in water, sediments, and tissues and the relative concentrations and composition of the oil as it is transported and weathered. This conceptual model drives the prediction of which natural resources may be exposed (i.e., directly or indirectly) or be threatened to be exposed.

- Identify successful methods for injury assessment. Standard methods for injury assessment can be used for incidents. However, trustees may need to enact special refinements to tailor the method to the specific conditions of the incident. The trustees will especially need to focus on terminology for oiling categories, guidelines for sampling in contaminated environments, and specific analytes for chemical analysis and interpretation.

- Provide the basis for determining restoration. An integral part of the preassessment process is estimating the scope and extent of injury so as to develop a basis for selecting and scaling feasible restoration alternatives. Until this estimation is complete, trustees will have to rely upon the literature and their best professional judgment to offer possible restoration alternatives. For example, recovery rates for oiled marshes can be derived from monitoring studies of previous incidents that were comparable in type and degree of oiling, vegetation type, physical setting, and substrate.

The literature on case histories of and research results on incidents is widely scattered and much of it is gray literature. Since 1969, the American Petroleum Institute, in conjunction with the USCG and USEPA, has sponsored a bi-annual Oil Spill Conference and proceedings. Though the conference covers policy, training, operations, and legal issues as well as scientific studies, the proceedings are an excellent source for identifying case histories, literature, and researchers on many different topics. Environment Canada sponsors an annual Arctic Marine Oil Spill Program conference that also publishes a proceedings, with emphasis on arctic oil discharge issues. The National Research Council (NRC, 1985) published a summary of oil inputs, fates, and effects in marine ecosystems as an update to a 1975 synthesis.

In addition to peer-reviewed journals, case histories and effects related to oil spill incidents are published in a series of special topic books. Unfortunately, there is no current, comprehensive synthesis of the oil-effects literature. Further, many recent, quantitative studies are kept confidential until on-going NRDAs are settled.

G.4 Incident-Specific Data

Incident-specific data is usually needed for injury determination and quantification. Incident-specific data collection and analysis are likely to fall into the following three categories:

- Mapping of oil distribution;
- Collection of chemical samples; and
- Documentation of immediate effects.

Each of these categories is discussed in the following sections.

G.4.a Mapping Oil Distribution

One of the most important types of data that needs to be systematically collected during the early stages of an incident is detailed documentation of the areal extent of the oil contamination on the water surface, along the shoreline, in sediments, and on land. Time-series maps may be needed, depending on the duration of the incident. Standard terms for characterizing the amount of oil should be defined and used. Often it is difficult to enforce the use of standard terms among different teams and particularly over time as the amount of oil diminishes. Photodocumentation by all teams becomes very important as a means to verify and calibrate the actual use of field descriptors. If the data are collected properly, they can be used for stratifying habitats by the degree of oiling to compute a mass balance of the discharge, estimate exposure, and validate computer models. Distribution of oil slicks on the water should be mapped daily until the slicks dissipate. Maps of oil on the shoreline or land should be generated once most of the oil is stranded and then over time to predict recovery rates or document on-going exposure.

At most larger incidents, the response organization generates information on oil distribution on a daily basis, either as descriptions or maps. The trustees should rely on this source of information when it is available and not duplicate these efforts. However, the response organization may not always generate degree-of-oiling data to the scale needed for NRDA use. The trustees should therefore keep track of the status and scale of oil mapping efforts by the response agencies and be prepared to supplement mapping efforts or continue making observations as needed, once the response effort is terminated. If supplemental data collection is required, the trustees should collaborate with the Federal or State OSC or designee.

G.4.b Collection of Chemical Samples

Samples for chemical analysis during the early stages of an incident consist of two general types, fingerprinting of the oil and measurement of the concentration of selected contaminants. For fingerprinting, samples of the known source of the discharge must be obtained. There is always a great demand for samples of the source, so a large volume (i.e., one gallon or more) should be collected, where practicable. Characterizing the neat or unweathered oil is critical so as to track the changes in the oil over time as it weathers. It is very important to confirm the origin and handling of the source material so its validity can be evaluated. The OSC or RP can usually provide a source sample. The trustees, however, should be aware that a “source” sample can be collected from floating slicks, recovery vessels, storage tanks, etc., and may be contaminated or weathered. Temporary storage barges or tanks are not regularly cleaned prior to use, so they most likely are contaminated with other materials. As with all samples, chain-of-custody documentation for the source sample should be obtained.

With a valid source oil, environmental samples can be analyzed to determine whether they are contaminated with the same oil, a technique known as fingerprinting. Samples for fingerprinting are collected to answer the question "Is this the same oil as was discharged?" Oiled samples therefore do not have to be quantified or related to a measured amount. Samples do not have to be representative of the amount of oil present, only the type. Fingerprint samples may be collected from sheens from the water surface where there is concern about multiple sources of floating oil. Tarballs on beaches can be fingerprinted to differentiate the discharged oil from chronic background accumulation. Samples of oiled feathers from birds or mammals are collected to link the oiled animal to the discharge. Bivalve molluscs, both in-situ as well as caged, can be sampled to measure bioavailability of the oil, assuming that the discharged oil in tissue samples can be fingerprinted and differentiated from background or other sources over time.

Samples for quantitative measurement of a contaminant must be collected in a manner that is representative of the area being sampled. Because of extensive patchiness in the distribution of oil, collection of representative samples can become quite complicated. The trustees should identify sampling objectives and develop appropriate sampling approaches, including the number of replicate and composite samples. One approach is to collect a larger number of samples or replicates. A subset of those samples can then be selected for preliminary analysis to screen for the magnitude of variability or concentrations at the sites where maximum contamination is expected. Proper sample preservation methods and holding times should be used.

Representative water samples are very difficult to collect, especially where surface oil slicks are present. Contamination is likely. Surface slicks are also likely to track differently than contaminated plumes of water. Further, evaporation and dilution rapidly decreases concentrations in the water column to very low levels, except where such processes are restricted (i.e., in rivers and streams, isolated water bodies, or very cold climates). In most coastal and marine settings water, samples for quantitative analysis of oil concentrations are not a high priority. In riverine and shallow waterbody settings, with light products such as No. 2 fuel oil and jet fuel and where public water supplies are at risk, water-column sampling is more appropriate.

Other types of collection and measurement that may be appropriate during incident studies include temperature, salinity, and dissolved oxygen, so that the basic water-quality conditions of the site are documented. Detailed descriptions of the sampling location should be recorded, including visual description of the degree of oil contamination of the site, physical setting, elevation or depth, description of the sample (e.g., grain size, nature of contamination, water turbidity, etc.), and type of sample (i.e., grab, composite).

For all data collection and analysis efforts, development of and compliance with QA plans are essential. Any deviation from the approved and published plan should be documented, and the potential effect on the validity of the sample determined. Without careful pre-incident planning, collection of samples during an incident may result in important data being lost.

G.4.c Documentation of Immediate Effects

Early on-scene surveys of the affected area will be needed to determine short-term effects to natural resources and services that occur soon after the incident. Such effects include, but are not limited to, fish kills, dead and oiled birds and mammals, closures of recreational parks, and reduced human use of the oiled areas. Sampling and census of these effects must be conducted during the time of occurrence. Taking census of populations that are actually present in the affected or threatened areas can provide field data or verification for computer models. Natural resources or services that have significant spatial or temporal variations in their distribution or life stage (e.g., migratory waterfowl and spawning streams for anadromous fish) need on-scene documentation relative to their presence and activity at the time of the discharge. Photodocumentation of oiled and affected natural resources and services should be an integral component of all early data collection activities.

G.5 Data on Reference and Control Conditions

During the Preassessment Phase it may be necessary to establish reference and/or control conditions. Reference and control data refers to off-site information of unaffected conditions that are compared to the similar or same, respectively, on-site conditions affected by the incident. Establishing such conditions soon after the initial oiling will allow the trustees to document the extent of exposure as well as collect data on the presence and condition of natural resources and services at the time of exposure.

Data on reference and control conditions are needed to provide spatial comparisons. Most study objectives will involve detecting differences or making comparisons and thus require a reference or control from which to measure change. Reference and control conditions should be selected based on the close resemblance and proximity to the affected conditions, but remain free from the potential effects resulting from the incident. Reference or control conditions, however, may not always be available because of the nature or size of the incident relative to the natural resources and services affected, or the special status of specific natural resources and services (i.e., unique habitats, sensitive species).

G.6 Quality Assurance (QA)

Quality Assurance (QA) is essential for the collection and analysis of data in a manner that is scientifically acceptable and legally defensible. Since data collected during the Preassessment Phase may form the basis for spatial and temporal comparisons, these data must be collected in a manner that ensures their highest quality and validity. Because of the unplanned nature of incidents, QA development through pre-incident planning efforts is most efficacious.

One way to ensure that data collected during the Preassessment Phase meets these requirements is to follow the USEPA guidelines for preparing QA project plans (USEPA, 1980). There is a pocket guide on Preparing Perfect Project Plans (USEPA, 1989) that outlines and summarizes the process. Additional guidance on QA project plans can be found in Gaskin, (1988), Simes (1991), and USEPA (1984; 1985; 1989; 1992). While the USEPA requirements are not always applicable to an NRDA, they provide a useful reference for issues that should be addressed. During the Preassessment Phase in particular, the QA plan may be developed in phases as the need for data collection and analysis evolve. At a minimum, QA procedures should assure that:

- The sampling, processing, and analysis techniques are applied consistently and correctly;
- The number of lost, damaged, or uncollected samples is minimized;
- The integrity of the data record is maintained;
- Data collected are accurate, precise, representative, complete, and comparable with similar data collected elsewhere; and
- The study results are reproducible, within the constraints of the incident.

Duplicate counts, calibrations, laboratory replicates, verification by independent experts, and other types of data that allow an evaluation of data quality should be included in field notes and data tables so that an independent evaluation of the data quality may be performed. Therefore, trustees should take appropriate steps to ensure that such data are recorded appropriately. From a legal perspective, valid QA procedures must be followed for the data to be admissible as evidence. Appendix H contains example QA protocols for data collection and analysis during Preassessment Phase activities developed by NOAA.

G.7 References

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