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Statement of Work

Remedial Investigation/Feasibility Study (RI/FS) & Identification of Potential Early Action Areas *for the* Portland Harbor Superfund Site

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Section 1: Introduction

This Statement of Work (SOW) provides an overview of work that will be carried out by Respondents as they implement a Remedial Investigation and Feasibility Study (RI/FS) for the Portland Harbor Superfund Site (Site). This RI/FS SOW is attached to the Administrative Order on Consent (AOC) for the Site, and is a supporting document for the AOC. Technical work described in the SOW is intended to provide more information to Respondents for purposes of implementing the AOC and is not intended to change the meaning of any AOC language. This SOW is also consistent with both the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) and the National Contingency Plan (NCP). The AOC and this SOW are hereafter referred to interchangeably as the "AOC". Any discrepancies between the AOC and SOW are unintended, and whenever necessary the AOC will control in any interpretive disputes.

The RI/FS is expected to be an iterative process. Virtually all RI/FS efforts at CERCLA sites around the country require two, three, or more iterations of sampling and analyses before EPA approves the final RI/FS. This SOW outlines a decision process that will be used to focus sampling programs to gather data that are needed for the decision process. At very large, complex CERCLA sites such as this Site, EPA understands there may be concern on the part of Respondents that such an iterative process could lead to substantial increases in the size, cost, and scope of the RI/FS. However, EPA has an obligation under CERCLA to protect human health and the environment wherever hazardous substances have been discharged or migrated in the environment. To balance these competing interests without arbitrarily defining Site boundaries, EPA has implemented an Initial Study Area (ISA) concept for sampling in the AOC. The ISA concept allows for the initial focus of the sampling effort to be the 5.7-mile stretch of the Willamette River from approximately the southern tip of Sauvie Island at River Mile (RM) 3.5 to the southern end of Swan Island at RM 9.2, and adjacent areas logically associated with an evaluation of the in-water portion of this stretch of the River. This ISA does not include upland sources of contamination being investigated or cleaned up pursuant to ORS 465 as implemented by DEQ. The ISA concept does not define Site boundaries in any manner; it is intended only to provide guidance to Respondents regarding EPA's expectations for sampling and analysis during the first RI/FS effort.

EPA will consider requests by Respondents to apply its prospective purchaser agreement and other policies to facilitate appropriate commercial transactions at Respondents' facilities.

The purpose of the RI/FS is to investigate the nature and extent of contamination for the in-water portion of the Site, to assess the potential risk to human health and the environment, to develop and evaluate potential remedial alternatives, and to recommend a preferred alternative. The RI and FS are interactive and will be conducted concurrently, to the extent practicable, in a manner that allows information and data collected during the RI to influence the development of remedial alternatives during the FS, which in turn affect additional information and data needs and the scope of any necessary treatability

studies and risk assessments. A critical objective of Respondents during the RI/FS will be to investigate the Site sufficiently to allow EPA to define Site boundaries in one or more Records of Decision (RODs).

The ISA concept provides a focus area for investigation by Respondents in the initial RI/FS effort consistent with the investigation area used in proposing the Site for the National Priorities List (NPL). Sampling and analyses of environmental media will be necessary outside this focus area although EPA anticipates such sampling and analyses during the initial RI/FS activities will be focused on characterizing the Site and defining the nature and extent of contamination, i.e., to differentiate between comparatively contaminated and comparatively uncontaminated areas. The Site boundaries cannot be defined before the RI/FS is completed. Following completion of the RI/FS work plan for the ISA, the requirements for subsequent RI/FS iterations will be dependent on data needs required to make decisions to protect human health and the environment. EPA will consider issuing orders to obtain participation of additional potentially responsible parties as the RI/FS proceeds. Following identification of data needs required to make decisions relating to protection of human health and the environment, Respondents will prepare RI/FS work plan addenda specifying tasks to be performed in subsequent RI/FS iterations.

Respondents will conduct the RI/FS and will produce draft RI and FS reports that are in accordance with the AOC. The RI/FS will be consistent with the Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (U.S. EPA, Office of Emergency and Remedial Response, October 1988), Data Quality Objectives (DQOs) planning process (EPA QA/G-4, August 2000), and other guidance that EPA uses in conducting an RI/FS (a list of the primary guidance is attached). EPA is aware that not all guidance used for RI/FS purposes may be applicable to a sediment site. EPA's Project Managers for the Site have authority under the NCP to determine when application of any guidance would be inappropriate. Respondents may raise such guidance issues they consider appropriate during implementation of the AOC. EPA's decisions regarding guidance applicability will be incorporated into document approval correspondence or in other written correspondence as appropriate.

The RI/FS Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA describes the report format and the required report content for the draft RI and FS reports. Respondents will furnish all necessary personnel, materials, and services needed for, or incidental to, performing the RI/FS, except as otherwise specified in the AOC.

During implementation of the AOC, Respondents will recommend candidate early action (actions prior to a ROD) criteria and evaluate how in-water portions of the Site meet those criteria in a memorandum for EPA review and approval. The AOC does not require Respondents to implement early actions. Early action implementation may be proposed by Respondents, individually or collectively, and may be undertaken or required of Respondents, individually or collectively, or of other responsible parties pursuant to orders outside the scope of this AOC. The evaluation of candidate early

action areas may be updated based on data collected during implementation of the AOC whenever Respondents deem appropriate or upon EPA request. EPA and Respondents will further discuss the timing of updates as the perceived need may arise.

At the completion of the RI/FS, EPA will be responsible for the selection of a Site remedy and will document this selection in one or more RODs. The remedial action alternatives selected by EPA will meet the cleanup standards specified in Section 121 of CERCLA; the selected remedial action will be protective of human health and the environment, will be in compliance with, or include a waiver of, applicable or relevant and appropriate requirements (ARARs) of all other state and federal laws, will be cost-effective, will utilize permanent solutions and alternative treatment technologies or resource recovery technologies, to the maximum extent practicable, and will address the statutory preference for treatment as a principal element, as appropriate under the NCP. The final RI/FS report, as approved by EPA, will, with the administrative record, form the basis for the selection of the Site's remedy and will provide the information necessary to support development of one or more RODs.

As specified in Section 104(a)(1) of CERCLA, EPA will provide oversight of Respondents' activities throughout implementation of the AOC. Respondents will support EPA's initiation and conduct of activities related to implementation of oversight activities, except for those actions performed by individual Respondents or others under separate orders.

Section 2: Project Strategy

The strategy for general management of the Site includes shared responsibilities between the Oregon State Department of Environmental Quality (DEQ) and EPA, pursuant to a Memorandum of Understanding (MOU) for the Site. Six Tribes and several Natural Resource Trustees (NRTs) are also signatories to this MOU. The MOU does not define Site boundaries or in any way limit EPA's or DEQ's statutory authority to protect human health and the environment from hazardous substance releases to the Site, or from hazardous substance releases from upland sources to the Site.

The terms "in-water" and "upland" have been used in the MOU and this AOC for administrative convenience in a sharing of workload between EPA and DEQ. They do not represent limitations or demarcations in EPA and/or DEQ authority. EPA and DEQ roles, as more fully described in the MOU, in no way establish limitations or boundaries that bind either agency or limit the effective scope of the AOC. Source control work or enforcement beyond source identification will be the subject of agreements or orders by EPA or DEQ outside the scope of the AOC.

As described in the MOU, EPA and DEQ will consult with Tribes and NRTs throughout implementation of the AOC, and will solicit their technical expertise on all aspects of the project. To facilitate timely review and comment of all work products by EPA, Respondents will make all draft and interim deliverables available for DEQ, Tribes' and NRTs' review and comment. EPA will compile all comments from DEQ, Tribes and NRTs and will identify the comments requiring a response by Respondents. Where the AOC refers to EPA, indicating activity by EPA employees, such activities may also be performed by representatives of DEQ. EPA and DEQ may alter their work sharing arrangements and will notify Respondents in advance of any such alterations affecting Respondents' duties under the AOC.

Work conducted pursuant to the AOC will include development of Site-specific remedial action objectives (RAOs). These RAOs may be a combination of applicable federal and state ARARs, published guidelines, and/or risk-based cleanup levels. Respondents will participate in developing these RAOs. EPA will closely coordinate the development of Site-specific RAOs with upland work performed by DEQ in order to prevent recontamination of the Site following implementation of the selected remedial actions.

Work conducted pursuant to the AOC will include completion of a comprehensive cultural resource analysis (Task 2b) as described below. The coverage area for this analysis during the first RI/FS iteration will include the in-water portion of the Site from the confluence of the Willamette and Columbia Rivers to Willamette Falls, including relevant upland areas adjacent to this stretch of the river as determined in consultation with the Tribes. The comprehensive cultural resource analysis itself, procedures for protecting and addressing cultural resources before, during, and after both the RI/FS and Remedial Action/Remedial Design (RD/RA) are complete, and performance of all cultural resource work, will be coordinated with the Tribes. All cultural resource Site

information will be protected as confidential information under procedures developed in consultation with the Tribes.

Section 312 of the Water Resources Development Act (WRDA) prioritizes contaminated sediments within the Willamette River for environmental remediation and restoration. As non-federal sponsor, the Port of Portland is negotiating a cost sharing agreement with the U.S Army Corps of Engineers (Corps) to perform a feasibility study of the Lower Willamette under WRDA. EPA will pursue an interagency agreement with the Corps, in consultation with the State, Tribes, and NRTs that integrates or coordinates any activity or funding under WRDA, which may become available for work at the Site. Following an EPA-Corps agreement, the parties will develop an appropriate process to integrate and coordinate with the RI/FS any activity or funding under WRDA which may become available for work at the Site, consistent with the EPA-Corps agreement. The parties agree that any WRDA activity or funding shall not affect the rights and responsibilities of any person under CERCLA and must be consistent with the National Contingency Plan. The unavailability of WRDA activities or funding shall not affect Respondents' obligation to perform the RI/FS.

The following tasks describe the work to be conducted by Respondents.

Section 3: Task 1 - Shared Server

Respondents will develop a shared server designed for secure access by designated representatives of Respondents, EPA, DEQ, Tribes, NRTs, the Agency for Toxic Substances and Disease Registry (ATSDR), the Oregon Health Division (OHD), and the United States and Oregon Departments of Justice (USDOJ and ODOJ), and designed to accomplish the following objectives:

1. secure viewing of validated information and data; project information, photographs, sketches, and other information intended to facilitate rapid analysis of ongoing fieldwork;

2. secure access to project schedules, memoranda, references, important correspondence, and other project-management materials to facilitate communication among all principal parties regarding schedule and project status; and,

3. secure tools for sending common documents out for review to multiple parties, sending and receiving comments and approvals from EPA electronically, and approving documents electronically.

All information placed on the shared server will be subject to EPA approval, and it must have a valid, exclusive mechanism for assuring that all information placed on the shared server is protected from general access. Specific cultural resource information and sensitive information regarding threatened or endangered species, such as the specific locations of eagle nests, shall not be placed on the shared server.

Section 4: Task 2 – Scoping (RI/FS Guid, Chap 2)

Respondents will document the specific project scope in an RI/FS work plan. Because the work required to perform the RI/FS is not fully known at this time, and will occur in an iterative approach as appropriate, it may be necessary to add addenda to the RI/FS work plan during implementation of the AOC to satisfy project objectives. The project scope must consider known or suspected upland sources of sediment contamination, including information and data generated from upland investigations, as they relate to the in-water portion of the Site, and will require coordination with DEQ. Respondents will meet with EPA, DEQ, Tribes, and NRTs at DEQ's and EPA's offices in Portland to discuss the organization and content of information in DEQ's files and to determine the most efficient manner for understanding and incorporating relevant DEQ and EPA information into the project scoping task. Respondents will summarize this DEQ coordination task in a memorandum that will be submitted to EPA for review and approval. Known or suspected upriver sources of contamination must also be considered. Furthermore, as there are species listed under the Endangered Species Act (ESA) located at the Site, EPA is required to coordinate with federal agencies responsible for implementing the ESA. Such work will likely require EPA consultation with federal ESA implementing agencies prior to implementation of significant federal actions conducted or proposed pursuant to the AOC. Therefore, EPA intends for the scoping phase of this project to include scoping for ESA compliance objectives, information and data collection, and other efforts.

Respondents will initiate the RI/FS effort by preparing an RI/FS work plan focused primarily on sampling in the ISA. Goals for the Site have been identified preliminarily based on available information. While there are many potential goals that may, and should, be considered while developing an RI/FS work plan, the protection of survival, growth, and reproduction of the following ecological and human receptors will be directly addressed by Respondents with respect to releases or threatened releases of any hazardous substances to the in-water portion of the Site:

1. benthic invertebrates;
2. fish and shellfish;
3. birds and mammals;
4. human health: protection of human health (cancer and non-cancer impacts) from ingestion of aquatic life and exposure to sediments and surface water and groundwater, as a result of dermal exposure and incidental ingestion through expected beach use, in-water recreation, occupational activities, and ceremonial and subsistence fishing; and,
5. species listed under the ESA.

In identifying Remedial Action Objectives, the following will be considered:

1. the collected information and data may be used by DEQ, Tribes, NRTs; and,
2. all actions to be evaluated should consider current and reasonably foreseeable future land and water uses.

EPA expects that the RI/FS work plan for the ISA, and any subsequent work plan addenda will incorporate problem formulations that articulate what technical decisions need to be made, and then define the information and data needs required to make those decisions. Respondents will use the data quality objectives (DQOs) planning process, and other relevant EPA guidance in conducting the RI/FS, to develop sampling designs for information and data collection activities that support problem formulation and decision-making. Other than in the initial RI/FS work plan for the ISA and adjacent areas, Respondents will propose in all subsequent work plan revisions whether additional information and data are needed and, if so, the design of each information and data collection effort. Respondents may also propose a decision framework that can be applied to the information generated during each data collection effort. This decision framework may aid EPA in determining whether additional data will be required.

Respondents will develop an RI/FS work plan and risk assessment approach that carefully and efficiently addresses these goals in the selection of appropriate remedial actions. During scoping for the RI/FS work plan and for the risk assessment approach, Respondents will meet with EPA regularly to discuss all appropriate project planning decisions and special concerns associated with the Site.

4.1 Scoping Tasks

This Site is an active urban harbor with ongoing cleanup, restoration, infrastructure redevelopment, and maintenance dredging projects being performed under multiple federal and state programs. The presence of listed species under the ESA adds complexity to the RI/FS process. Therefore, the scoping task for the RI/FS has been organized into the following subtasks:

Subtask 2a: Data Compilation/Site Background
Subtask 2b: Cultural Resources Analysis
Subtask 2c: Work Plans Submitted via the Stipulated Agreement
Subtask 2d: Data Review & RI Planning
- Preliminary Conceptual Site Model
- Preliminary Analytical Concentration Goals

Subtask 2e: Preliminary FS Planning Tasks
- RAO Technical Memorandum
- Facility Siting Technical Memorandum
- Capping Material Evaluation

Subtask 2f: CERCLA/WRDA Integration and Coordination
Subtask 2g: Identification of Potential Early Actions Areas
Subtask 2h: RI/FS Work Plan for the ISA

4.2 Subtask 2a: Data Compilation/Site Background (RI/FS Guid, Chap 2.2)

Respondents will gather, evaluate, and present the existing Site information and data, and will conduct a Site visit with EPA to assist in planning the scope of the RI/FS. As no Site boundaries currently exist, Respondents will initially focus this effort on the in-water portion of the Site from the confluence of the Willamette and Columbia Rivers to Willamette Falls, and adjacent upland areas logically associated with an evaluation of contamination of the in-water portion of this stretch of the River. This coverage area will be adjusted in subsequent RI/FS activities as necessary to define the Site. The objectives of this subtask are as follows:

1. identify and compile applicable historical information and data that are of acceptable quality for use during the RI/FS process;
2. identify current and historical studies regarding the characteristics of environmental media and the condition of receptor populations;
3. identify useable information and data from current and historical studies for use in developing a conceptual site model (CSM);
4. collect and analyze existing information and data and document the need for additional information and data to the extent practicable. Before planning RI/FS activities, existing Site information and data described above will be thoroughly compiled and reviewed by Respondents, and used to develop a preliminary CSM. Specifically, this will include presently available information and data relating to

the varieties and quantities/concentrations of hazardous substances in sediment at the Site, and past disposal practices and/or releases (including spills and point discharges) that may have impacted the in-water portion of the Site. This will also include results from any previous sediment sampling events that may have been conducted. Information regarding upland sources of contamination will be considered when collecting and analyzing background information. Respondents may consider Table 2-1 of the RI/FS Guidance, the Portland Harbor Sediment Management Plan, and the Draft Portland Harbor Remedial Investigation/Feasibility Study Work Plan (March 31, 2000), to ensure that a comprehensive list of potential information and data sources is prepared and utilized in an effort to gather existing information and data. The following types of information and data as they relate to contamination in the river will be considered, compiled, and evaluated for subsequent use:

a. sediment chemistry (both bulk and pore water);
b. ground water discharges/quality;
c. surface water quality;
d. sediment toxicity bioassays;
e. benthic community analyses;
f. salmon, steelhead, lamprey, and sturgeon life history data;
g. abundance and distribution of the resident fish community;
h. sensitive and special habitat areas (including mitigation and restoration projects);
i. fish and invertebrate home range data/projections;
j. demographic data including socio-economic and ethnicity information;
k. site use information (e.g., public access, commercial, recreational, fish and shellfish consumption, ceremonial and subsistence fishing activities, etc.);
l. potential sources of contamination to the in-water portion of the Site, including a summary of sources in surface water, groundwater, storm water, CSO discharges to the river, and other upland sources;
m. bathymetric surveys, and any available hydrodynamic and sediment transport data;
n. tissue chemistry, for the purpose of assessing direct impacts to aquatic species, as well as to address trophic transfer (bioaccumulation and biomagnification) of contaminants;
o. fish histopathology and biomarker data;
p. data on federally listed threatened and endangered species and state-listed species;
q. summary of pertinent quality assurance/quality control information from each study if available in the study reports and/or a statement that such information is not available or is only available to a limited extent and why, to the extent this is ascertainable; and,

5. compile and summarize all valid permits previously issued by the Corps, or to be issued during implementation of the AOC, as well as all pending permit applications, under which any permit holder may be able to dredge sediment within the Willamette River anywhere between the confluence of the Willamette and

Columbia Rivers to Willamette Falls, including the date of issuance or application submission, the status, if any, of each permit or application, the identity of each permit holder or applicant, all stated volumes or ranges of volumes of material subject to the permit or application, and the potential time frames of potential dredging to the extent ascertainable.

Respondents will develop DQOs for evaluating the collected information. The DQOs will be focused on determining which collected information is appropriate for incorporation into a Site database. After EPA review of the collected information and approval of the DQOs, Respondents will incorporate acceptable data and information into a single relational database.

Respondents will submit a proposal for design of the relational database for EPA's approval. At a minimum, the database will support geographic information system (GIS) presentation of information and data, and Respondents will present existing information and data in this format. Respondents will evaluate the use of SEDQUAL, a database with GIS interface developed by the Washington Department of Ecology, relative to the development of a new Site-specific database.

Existing information and data will be utilized to help determine data gaps in Site characterization (including determination of background), identify chemicals of potential concern, develop a preliminary CSM, preliminarily identify risks to human health and the environment, better define potential ARARs, and develop a range of preliminarily identified remedial alternatives. Respondents will also provide electronic and database files directly to EPA to allow independent review and analysis of information and data.

4.2.1 Conduct Site Visit

Respondents will conduct a site visit by boat with EPA during the project scoping to assist in developing a conceptual understanding of sources, and areas of contamination as well as potential exposure pathways and receptors at the Site. During the site visit Respondents will observe the Site's physiography, hydrology, geology, and demographics, as well as natural resource, ecological, and cultural characteristics. The site visit will be coordinated with the Tribes to assure that appropriate cultural resource staff can attend to assess cultural characteristics. This information will be documented in a trip report primarily consisting of a narrated video that will be utilized to better scope the project. Cultural resources information will be excluded from videotapes or reports unless otherwise approved by the Tribes.

4.3 Subtask 2b: Cultural Resources Analysis

Respondents will evaluate cultural resources and cultural uses using a typical approach provided for under Section 106 of the National Historic Preservation Act (16 USC Section 470). Respondents will coordinate cultural resource work with appropriate Tribes to ensure that a full and comprehensive cultural resource analysis is done when characterizing Site use. The cultural resources and cultural use analysis will be initiated in 2001 and will be considered in future work.

4.4 Subtask 2c: Work Plans Submitted via the Stipulation and Agreement

Respondents will conduct investigations and submit reports as identified in the Stipulation and Agreement. The work plans for these investigations are being reviewed, and after approval by EPA, will be implemented as approved under the terms of this AOC.

4.5 Subtask 2d: Data Review & RI Planning

Respondents will review the information compiled in Tasks 2a-2c and identify, to the extent practicable, data needed to complete the RI/FS. This analysis will be based on application of relevant EPA guidance, and the results of any AOC tasks completed prior to the data gaps analysis effort. The analysis will identify additional information and data that will be required to complete the baseline human health and ecological risk assessments, and to identify and screen remedial action alternatives. The analysis will include the preparation of a preliminary CSM and development of preliminary analytical concentration goals to support the analysis.

4.5.1 Preliminary Conceptual Site Model (CSM)

The preliminary CSM will portray the relationship among sources, chemicals, transport mechanisms (including sediment transport, surface runoff and groundwater discharges to the Site), receptors, and other parameters that are determined to be relevant during implementation of the AOC.

The preliminary CSM for the ecological risk assessment (ERA) will include a variety of species that could be impacted by Site-related in-water contamination based on information generated during the historical review and will show the relationships among species and potential exposure pathways. The CSM for the human health risk assessment (HHRA) will include potential exposure pathways.

Consistent with the ISA concept, Respondents may initially focus this effort on the ISA and adjacent areas logically associated with an evaluation of the in-water portion of this

stretch of the River. This coverage area will be adjusted as necessary in subsequent RI/FS activities to encompass the entire Site, though Respondents will not be required to update the CSM unless EPA determines there is sufficient change to warrant an update.

4.5.2 Preliminary Analytical Concentration Goals

Preliminary analytical concentration goals will be developed as part of the planning process to assist in selecting appropriate analytical methods and setting analytical DQOs for ecological and human health exposure pathways identified in the CSM. Development of these analytical goals will include, but not be limited to, evaluation of:

1. chemical specific ARARs;
2. sediment concentrations for protection of benthic invertebrates;
3. published tissue concentrations for protection of human health through consumption of fish;
4. published tissue concentrations for protection of fish and wildlife;
5. method detection limits for standardized analytical methods.

4.6 Subtask 2e: Preliminary FS Planning Tasks

As part of the planning process for the FS, Respondents will prepare the RAO technical memorandum, the disposal facility siting technical memorandum, a capping source evaluation, and an assessment of the data needed to evaluate natural attenuation options.

4.6.1 RAO Technical Memorandum

Respondents will submit a draft technical memorandum to EPA that identifies preliminary RAOs. The RAOs identified by Respondents will include a range of broadly defined potential RAOs and associated technologies and be consistent with CERCLA, the NCP, and with EPA interpretive guidance. The range of potential alternatives will encompass, where appropriate, alternatives in which treatment significantly reduces the toxicity, mobility, or volume of the waste; alternatives that involve containment with little or no treatment; alternatives that include removal of waste, and a no-action alternative. Respondents will include dredging, capping, monitored natural attenuation, and other alternatives (as well as combinations of each where called for) in the range of alternatives, and will include this analysis in the RAO technical memorandum. This technical memorandum will summarize previously identified RI/FS data gaps associated with each potential remedial action, including data gaps associated with siting a dredged-material disposal facility or obtaining capping material.

The memorandum will include a preliminary identification of potential state and federal ARARs (chemical-specific, location specific, and action specific), including state ARARs

identified by DEQ in accordance with the NCP, to assist in the refinement of RAOs. Respondents will also identify other advisories, criteria, guidance, and other "to be considered" initiatives, including, but not limited to the Oregon Plan and Wy-Kan-Ush-Mi Wa-Kish Wit. Respondents will update ARAR identification in the technical memorandum during implementation of the AOC as Site boundaries, conditions, contaminants of concern, and RAOs become better defined.

If remedial actions involving treatment are identified by Respondents in the draft technical memorandum, or are identified by EPA prior to final approval of the RAO technical memorandum, treatability studies may be required. Where treatability studies are needed, initial treatability testing activities (such as research and study design) should occur concurrently with implementation of the RI/FS work plan for the ISA and subsequent iterations.

4.6.2 Facility Siting Technical Memorandum

Respondents will submit a technical memorandum for EPA review and approval that describes the process needed to identify and obtain disposal site options for contaminated sediment.

4.6.3 Capping Evaluation

Respondents will submit a technical memorandum for EPA approval that identifies potential sources of sediment capping materials and outlines testing requirements needed to evaluate the acceptability of the material.

4.6.4 Natural Attenuation Data Gaps

Respondents will identify the data needed to evaluate natural attenuation options, and include collection of this data in a RI planning task so that it is available when needed.

4.7 Subtask 2f: CERCLA/WRDA Integration & Coordination Plan

Following completion of an EPA-Corps agreement, an initial task in the WRDA integration and coordination process will be identification of potential WRDA projects, including the Section 312 project identified in the Corps reconnaissance study dated December 26, 2000. These projects may include siting of possible dredged sediment disposal facilities, contaminated sediment removal, and/or other activities. Respondents will prepare a WRDA integration and coordination plan for EPA review and approval that describes the specific projects that may be considered for WRDA projects, common tasks which may be required for both the Site RI/FS and WRDA projects, and how such common tasks could be performed.

4.8 Subtask 2g: Identification & Evaluation of Potential Early Action Areas

Respondents will submit a draft technical memorandum to EPA identifying potential criteria for identification of candidate early action areas. Early actions for purposes of the AOC are activities other than RI/FS activities performed before a ROD. Respondents will then use these criteria to identify areas that may be candidate early action areas. Respondents' initial identification of potential early action areas will be based on existing information and data at the time the technical memorandum is prepared. However, Respondents may elect or EPA may require Respondents to update the technical memorandum and/or make further early action candidate evaluations with information and data obtained during implementation of the AOC.

EPA intends that early action areas identified by Respondents in the technical memorandum will focus primarily on sediment early actions, though early actions involving other environmental media or involving upland source control may be considered if there are perceived impacts to sediment from these areas. Engineering Evaluation/Cost Analysis of any removal actions and implementation of any early action will be conducted outside the scope of this AOC.

Early actions at the Site will be the subject of separate government action including those related to source control and/or conducted under DEQ authority. EPA may pursue early actions in areas unrelated to those identified by Respondents if imminent and substantial endangerment conditions are encountered during project implementation, or if EPA otherwise determines there is cause within EPA's authority to pursue early actions.

4.9 Subtask 2h: RI/FS Work Plan for the ISA (RI/FS Guid, Chap 2.3.1)

Respondents will submit a draft RI/FS work plan for the ISA and adjacent areas to EPA, which incorporates information and data obtained during implementation of subtasks 2a through 2g. The work plan will be developed in conjunction with a sampling & analysis plan, which will consist of a field sampling plan, a quality assurance project plan, and a Site health and safety plan, although each plan may be delivered under separate cover. The work plan will include a comprehensive description of the work to be performed, including a brief overview of the methodologies to be utilized, as well as a corresponding schedule for completion. In addition, the work plan must include the rationale for performing the required activities.

The draft RI/FS work plan will include a table that shows the relationship between the preliminary RAOs, identified data gaps, and sampling locations proposed by Respondents in the work plan. The work plan will include a presentation of DQOs associated with each proposed information and data collection effort, an ISA background summary of known portions of the ISA, and maps/GIS tools depicting the ISA's physiography, hydrology, geology, demographics, ecological, cultural, and natural resource features. The work plan will include a synopsis of the ISA's cultural and development history, and a description of previous environmental work and chemical spills/responses by local, state, or federal authorities, or by private parties.

The draft RI/FS work plan will include a summary (including graphical and geographic information system depictions as appropriate) of the existing information and data in terms of physical and chemical characteristics of the contaminants identified, and their distribution among environmental media in the ISA. The work plan will incorporate the information and data from Task 2.

Most importantly, Respondents will incorporate into the work plan a detailed description of all tasks to be performed, information and resources needed to perform each task, information to be produced during and at the conclusion of each task, a description of the work products that will be submitted to EPA, and the decision-making processes that will be followed by Respondents to interpret results and make recommendations for future efforts under the RI/FS. Specific decision points will be identified in the work plan.

The work plan will include a project management plan, including a data management plan (e.g., requirements for project management systems and software, minimum data requirements, data format and backup data management). The work plan will include a schedule for monthly reports to EPA as well as meetings and presentations to EPA at the conclusion of each major phase that has been identified as a critical decision point during

implementation of the AOC. If Respondents determine that a phased approach to information and data generation is appropriate, the work plan will include the basis for that determination, and how each subsequent phase of the work will flow from previous phases. Respondents will refer to Appendix B of the RI/FS Guidance for a comprehensive description of the contents of the required work plan. The work plan will also include a description of the general approach to conducting the baseline risk assessments and the feasibility study. Because of the absence of Site boundaries and the iterative nature of the RI/FS, additional information and data requirements and analyses may be identified throughout the process. Whenever this occurs, Respondents will submit a technical memorandum documenting the need for additional information and data. In any event, Respondents are responsible for fulfilling additional information and data and analysis needs identified by EPA consistent with the general scope and objectives of the AOC.

4.9.1 Sampling & Analysis Plan (RI/FS Guid, Chap 2.3.2)

Respondents will prepare a sampling & analysis plan (SAP) to ensure that sample collection and analytical activities are conducted in accordance with technically acceptable protocols. The SAP provides a mechanism for planning field activities and consists of a field sampling plan (FSP) and a quality assurance project plan (QAPP). These documents may be combined.

The FSP will define in detail the sampling and data-gathering methods that will be used on the project. It will include sampling quality assurance objectives, sample location and frequency, sampling equipment and procedures, and sample handling and laboratory analysis. The QAPP will describe the project objectives and organization, functional activities, and quality assurance and quality control (QA/QC) protocols that will be used. The laboratory QA/QC will, at a minimum, reflect use of analytic methods to identify contamination consistent with the levels for RAOs identified in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR 300.420 (c)(4) and 300.430(b)(8). In addition, the QAPP will address sampling procedures, sample custody, analytical procedures, and data reduction, validation, reporting, and personnel qualifications.

Respondents will demonstrate in the SAP that each laboratory it may use is qualified to conduct the proposed work. This includes use of methods and analytical protocols for the chemicals of concern in the media of interest within detection and quantification limits consistent with both QA/QC procedures and DQOs approved in the QAPP. The laboratory must have and follow an approved QA program. If a laboratory not in the contract laboratory program (CLP) or a lab that has not been previously approved by EPA is selected, methods and QA/QC procedures with demonstrated performance that are consistent with CLP methods that would otherwise be used at this Site for the purposes proposed and QA/QC procedures approved by EPA will be used. If the laboratory is not in the CLP program, a laboratory QA program must be submitted for EPA review and approval. EPA may require that Respondents submit detailed

information to demonstrate that the laboratory is qualified to conduct the work, including information on personnel qualifications, equipment, and material specifications. Respondents will provide assurances that EPA has access to laboratory personnel, equipment, and records for sample collection, transportation, and analysis.

4.9.2 Site Health & Safety Plan (RI/FS Guid, Chap 2.3.3)

A health & safety plan will be prepared in conformance with Respondents' health and safety programs, and in compliance with OSHA regulations and protocols. The health and safety plan will include the eleven- (11) elements described in the RI/FS Guidance, such as a health and safety risk analysis, a description of monitoring and personal protective equipment, medical monitoring, and Site control. It should be noted that EPA does not "approve" Respondents' health and safety plan, but rather EPA reviews it to ensure that all necessary elements are included, and that the plan provides for the protection of human health and the environment.

Section 5: Task 3 - Community Relations

The development and implementation of community relations activities are the responsibility of EPA, with support from DEQ. Respondents may be requested to assist with activities such as providing information, participating in public meetings, and establishing a community information repository at or near the Site. The extent of Respondents involvement in EPA-related community relations activities is left to the discretion of EPA.

Section 6 Task 4 - Dredging Coordination

Respondents will notify and consult with EPA prior to Respondents undertaking any dredging activities at the Site during implementation of the AOC. *(See Subtask 2a, 5.)* The notification shall include information regarding the nature and scope of the dredging activity, proposed schedule, potential environmental impacts, and coordination with the RI/FS. The notifications in this paragraph shall be updated annually or as necessary to account for Respondents new dredging activity.

Section 7: Task 5 - Site Characterization (RI/FS Guid, Chap 3)

As part of the RI, Respondents will perform the activities described in this task, including the preparation of a site characterization/RI data compilation summary and an RI Report. The overall objective of site characterization is to describe/identify areas of the in-water portion of the Site that may pose a threat to human health or the environment. This is accomplished by first determining/describing the Site's physiography, geology, and hydrology. Surface and subsurface pathways of contaminant migration to the River will be evaluated, including a sediment evaluation to better understand contaminant fate and transport analyses. Respondents will identify sources of contamination to the in-water portion of the Site, including those sources identified based on information obtained through DEQ summaries, and define the nature, extent, and volume of sediment that poses unacceptable risk (using the human health and ecological risk assessment processes) relative to those sources.

During this phase of the RI/FS, the work plan, SAP, and health & safety plan are implemented. Field information and data are collected and analyzed to provide the information required to meet the goals of the RI. Respondents will notify EPA at least one week in advance of initiating fieldwork. In view of the possible unknown Site conditions, activities often are iterative, and to satisfy the objectives of the RI/FS it may be necessary for Respondents to supplement the work specified in the initial RI/FS work plan. In addition to the deliverables below, Respondents will provide a monthly progress report and participate in meetings at major decision points, as described in the work plan, during the RI/FS process.

7.1 Field Investigation (RI/FS Guid, Chap 3.2)

Field investigation includes gathering of information and data to fill data gaps, and to define Site physical and biological characteristics, sources of contamination, the nature and extent of contamination at the Site, and both human and ecological risks associated with the Site. Respondents will perform these activities in accordance with the work plan and SAP and as described in the AOC.

7.2 Implement & Document Field Support Activities (RI/FS Guid, Chap 3.2.1)

Respondents will initiate field support activities following approval of the work plan and SAP. Field support activities may include obtaining access to the Site, scheduling and procuring equipment, obtaining field laboratory space, laboratory services, and/or contractors. Respondents will notify EPA at least one week prior to initiating field support activities so that EPA may adequately schedule oversight tasks, if appropriate. Respondents will also notify EPA, in writing, upon completion of field support activities.

7.3 Investigate & Define Site Physical & Biological Characteristics (RI/FS Guid, Chap 3.2.2)

Respondents will collect information and data on the physical and biological characteristics of the Site relevant to the presence and migration of hazardous substances, the evaluation of risks to human health and the environment and the development and evaluation of remedial action alternatives. Data gathering will be focused on those characteristics that impact the decision-making process, including the physiography, geology, and hydrology, and specific physical characteristics identified in the work plan. This information will be ascertained/gathered through various means that may include a combination of physical measurements, observations, and sampling efforts, and will be utilized to help identify potential transport pathways and the human and ecological receptors mentioned in the project objectives. In defining the Site's physical characteristics Respondents will also obtain sufficient data for the interpretation of contaminant fate and transport, and to support development and screening of remedial action alternatives, including information to assess treatment technologies.

7.3.1 Develop Preliminary Remediation Goals (PRGs)

To support RI/FS activities, Respondents will develop PRGs. Respondents will meet with EPA technical representatives prior to initiating this task. The objective of these meetings will be to discuss application of EPA guidance. Development of PRGs for applicable contaminants will include the following:

1. nationally-developed and/or regionally developed numerical sediment guidelines for the protection of benthic invertebrates;

2. protection of human health from consumption of aquatic organisms. This will be done by calculating acceptable chemical specific fish tissue concentrations then utilizing biota-sediment accumulation factors (BSAFs), or another appropriate method for analyzing paired observations of contaminant concentrations, to derive associated sediment goals. Development of acceptable fish tissue calculations will consider the patterns and consumption rates of subsistence fishers and/or other potentially highly exposed individuals;

3. protection of human health assuming direct contact with environmental media as a result of beach use, fishing, occupational exposure, transient use, recreational activities, and other activities in which such contact may occur;

4. groundwater that enters the River or daylights in beach seeps where humans can become exposed to it as surface water for protection of human health from consumption of aquatic organisms and from direct contact activities;

5. acceptable screening fish tissue contaminant concentrations for an appropriate piscivorus wildlife receptor utilizing literature-based trophic transfer factors, then utilize a BSAF, or another appropriate method for analyzing paired observations of contaminant concentrations, to derive an associated sediment goal;

6. pertinent studies of residue-effects relationships in fish to determine acceptable fish tissue contaminant concentrations for protecting the health of resident and migratory fish (for contaminants that bioconcentrate or bioaccumulate), then use a BSAF or another appropriate method for analyzing paired observations of contaminant concentrations to derive an associated sediment goal; and,

7. pertinent studies and appropriate approaches to determine acceptable exposures for the health of resident and migratory fish (for contaminants that are readily metabolized).

7.4 Identify Sources of Contamination (RI/FS Guid, Chap 3.2.3)

Respondents will identify source areas that are contributing to contamination to the in-water portion of the Site. Although DEQ is primarily responsible for the control of upland contaminant sources to the Site, as part of the RI/FS, Respondents shall evaluate the distributions of sediment contaminants and, if appropriate (e.g., if the sediment data suggests the presence of an ongoing source), make recommendations to EPA and DEQ if the need for further investigation or control of sources is identified.

EPA and DEQ will utilize this information in making source control adequacy determinations. Because upland sites represent many of the known contaminant sources, coordination with upland investigations and DEQ source control efforts will be required.

7.5 Define Human & Ecological Use of Site

Respondents will gather the information and data necessary to define use of the Site so that a Site-specific exposure assessment can be performed. In addition to existing literature, information and data gathering, defining the use of the Site may require observation, surveys (including field surveys of fish and wildlife populations and habitats within Portland Harbor, and surveys of human fishing practices) and personal interviews. The Portland Harbor RI/FS work plan will be considered as a starting point for collection of this information. Site use will be determined on a year-round basis. In addition, future use of the Site shall be investigated. Specifically, Respondents shall identify planned or projected shoreline developments, navigational dredging projects, and any other reasonably foreseeable future uses that may affect sediment quality or human or ecological exposure to hazardous substances at or from the in-water portion of the Site.

7.6 Describe the Nature & Extent of Contamination (RI/FS Guid, Chap 3.2.4)

Respondents will gather the information necessary to describe the nature and extent of contamination as a final step during the field investigation. Respondents will then implement sampling that will generate information and data on contaminant distributions and biological effects. Any study program identified in the work plan or SAP shall utilize analytical techniques sufficient to detect and quantify the concentration of contaminants and the migration of contaminants through the various media (specifically groundwater and sediment) at the Site. In addition, Respondents will collect the information and data necessary to assess contaminant fate and transport. Subsequent sampling events may be required. This process is continued until sufficient information and data are known to characterize the area and depth of contamination to complete the RI and to evaluate remedial alternatives. Respondents will use the information on the nature and extent, and fate and transport of contamination in conjunction with the baseline risk assessments to determine the level of risk presented by the Site. Respondents will also use this information to help determine the appropriate potential remedial action alternatives to be evaluated.

7.7 Data Analyses (RI/FS Guid, Chap 3.4)

7.7.1 Evaluate Site Characteristics (RI/FS Guid, Chap 3.4.1)

Respondents will analyze and evaluate the information and data to describe: (1) Site physical and biological characteristics; (2) contaminant source characteristics in areas impacted by contaminant sources; (3) nature and extent of contamination of the in-water portion of the Site; and (4) contaminant fate and transport. Site physical characteristics, source assessments, and extent of contamination analyses are utilized in the analysis of contaminant fate and transport. The evaluation of contaminant fate and transport will include the extent of horizontal and vertical spread of contamination as well as information from the literature on contaminant mobility and persistence of contaminants. If modeling is considered appropriate by the Respondents, such models shall be identified to EPA in a technical memorandum prior to their use. Except as otherwise provided in the AOC, all data and programming, including any proprietary programs, shall be made available to EPA together with a sensitivity analysis. Respondents shall discuss and then collect if necessary, any information and data needed to fill data gaps identified by EPA. Also, this evaluation shall include information relevant to Site characteristics that is

necessary for evaluation of the need for remedial action in the baseline risk assessment and for the development and evaluation of remedial alternatives.

7.7.2 Assess Human & Ecological Risk

The baseline human health and ecological risk assessments will be conducted following the collection of chemical and biological information and data as determined by EPA.

EPA will review with DEQ, NRTs, and Tribes, Respondents' qualifications to perform the risk assessments. EPA will determine Respondents qualifications to perform the risk assessments in accordance with OSWER Directive No. 9835.15c. Upon EPA approval, Respondents shall perform baseline risk assessments for human health and ecological impacts using guidance designated by EPA. This guidance may include but not be limited to: Risk Assessment Guidance for Superfund: Volume 1 - Human Health Evaluation Manual (Parts A and D); Interim Guidance: Developing Risk Based Clean-up Levels at Resource Conservation and Recovery Act Sites in Region 10, (January, 1998); Ecological Risk Assessment for Superfund: Process for Designing and Conducting Ecological Risk Assessments, Interim Final, June 1997; and Guidelines for Ecological Risk Assessment, EPA/630/R95/002-F, 1998. Many of these guidance documents and others may be found at:

www.epa.gov/superfund/programs/risk/humhlth.htm
www.epa.gov/r10earth/offices/oea/risk/r0riskec.htm

Respondents will meet with EPA, DEQ, Tribes, and NRTs to scope the risk assessments. Following the scoping meeting, Respondents will prepare a risk assessment scoping memorandum for EPA review and approval. The risk assessment scoping memorandum shall describe the scope of the human health and ecological risk assessments as agreed upon with EPA during the scoping meeting, describe the key elements of the human health and ecological risk assessments (e.g., exposure pathway and receptor identification) and provide a list of interim deliverables and a schedule for their submittal. It is anticipated that the conceptual site models, exposure assessments, and problem formulation that were completed during RI/FS scoping will be revised to reflect new information and data. Draft baseline human health and ecological risk assessment reports will be submitted to EPA for review and approval. The final risk assessment reports shall be included with the RI report.

Following early action implementation, other dredging projects, or cleanup activities at the Site, Respondent may at any time submit one or more technical memoranda assessing the impacts of such activities, if any.

7.7.3 Data Management Procedures (RI/FS Guid, Chap 3.5)

Respondents will consistently document the quality and validity of field and laboratory data compiled and generated during the RI.

7.7.3.1 Document Field Activities (RI/FS Guid, Chap 3.5.1)

Information gathered during site characterization will be consistently documented and adequately recorded by Respondents in well-maintained field logs and laboratory reports. The method(s) of documentation must be specified in the work plan and/or the SAP. Field logs must be utilized to document observations, measurements, and significant events that have occurred during field activities. Laboratory reports must document sample custody, analytical responsibility, analytical results, adherence to prescribed protocols, nonconformity events, corrective measures, and/or data deficiencies.

7.7.3.2 Maintain Sample Management & Tracking (RI/FS Guid, Chap 3.5.2; 3.5.3)

Respondents will maintain field reports, sample shipment records, analytical results, and QA/QC reports to ensure that only validated analytical data are reported and utilized in the characterization of the nature and extent of sediment contamination and the development and evaluation of remedial alternatives. Analytical results developed under the work plan will not be included in any site characterization reports unless accompanied by or cross-referenced to a corresponding QA/QC report. In addition, Respondents will establish a data security system to safeguard chain-of-custody forms and other project records to prevent loss, damage, or alteration of project documentation.

7.8 Site Characterization Deliverables (RI/FS Guid, Chap 3.7)

Respondents will prepare the following site characterization deliverables:

7.8.1 Preliminary Site Characterization RI/Data Compilation Summary (RI/FS Guid, Chap 3.7.2)

After completing field sampling and analyses, Respondents will submit a concise site characterization RI data compilation summary. This summary will review the investigative activities that have taken place, and describe and display Site information

and data documenting the location and characteristics of surface and subsurface features and contamination at the Site, including sample locations, chemical concentration distributions and the results of any biological testing. This evaluation will include, to the extent practicable, chemical distributions relative to known sources, the location and varying concentrations of contaminants in areas influenced by sources, and the extent of contaminant migration through the in-water portion of the Site. The RI data compilation summary will provide EPA with a preliminary reference for evaluating the risk assessments, the development and screening of remedial alternatives, and the further identification of ARARs.

7.8.2 Remedial Investigation (RI) Report (RI/FS Guid, Chap 3.7.3)

Respondents will prepare and submit a draft RI Report to EPA for review and approval. This report shall summarize results of field activities to characterize the Site, sources of contamination, nature and extent of contamination, and the fate and transport of contaminants. Respondents will refer to the RI/FS Guidance for an outline of the report format and contents. Following comment by EPA, Respondents will prepare a final RI Report that satisfactorily addresses EPA's comments.

7.8.3 Human Health & Ecological Risk Assessment Report

Once all interim deliverables have been completed, Respondents shall submit the baseline risk assessment reports. EPA guidance shall be consulted in preparing the reports.

Section 8 Task 6 - Treatability Studies (RI/FS Guid, Chap5)

To the extent necessary, to complete the screening of remediation alternatives as described in Task 7, treatability testing will be performed by Respondents to assist in the detailed analysis of alternatives. If treatability studies are needed as part of an early action, but not needed for the site as a whole, then the treatability studies will be performed as part of the early action process by the implementing Respondent or other party rather than as part of the FS. In addition, if applicable, testing results and operating conditions will be used in the detailed design of the selected remedial technology to the extent necessary. If treatability studies are needed to complete screening of the remedial alternatives, the following activities will be performed by Respondents.

8.1 Determination of Candidate Technologies & the Need for Testing
(RI/FS Guid, Chap 5.2; 5.4)

Respondents will identify, in a technical memorandum based on the preliminary screening during Task 7, and subject to EPA review and approval, candidate technologies for a treatability studies program. The listing of candidate technologies will cover the range of technologies required for alternatives analysis. The specific information and data requirements for the testing program will be determined and refined during the development and screening of remedial alternatives (Task-7).

8.1.1 Conduct Literature Survey & Determine Need for Treatability Testing
(RI/FS Guid, Chap 5.2)

Respondents will conduct a literature survey that focuses on existing sediment treatment methods to gather information on performance, relative costs, applicability, removal efficiencies, operation and maintenance (O&M) requirements, and implementability of candidate technologies. Based on this review and project DQOs, Respondents will recommend to EPA during Task 7 whether treatment is a feasible and cost-effective alternative for sediments. If EPA and Respondents agree that treatment is a feasible and cost-effective alternative based on existing Site characteristics, and if practical candidate technologies have not been sufficiently demonstrated, or cannot be adequately evaluated for this Site on the basis of available information, treatability testing will be conducted. Where it is determined by EPA that treatability testing is required, and unless Respondents can demonstrate to EPA's satisfaction that they are not needed, Respondents will submit a statement of work to EPA outlining the steps and information and data necessary to evaluate and initiate the treatability testing program.

If it is determined that treatability studies are appropriate, Respondents shall begin the process of obtaining a site at which this work could be conducted. The treatability testing site will be dependent on the specifics of the process, and those specifics will be presented in a technical memorandum for EPA review.

8.1.2 Evaluation of Treatability Studies (RI/FS Guid, Chap 5.4)

Once a decision has been made to perform treatability studies, Respondents and EPA will decide on the type of treatability testing to use (e.g., bench versus pilot). Because of the time required to design, fabricate, and install pilot scale equipment as well as perform testing for various operating conditions, the decision to perform pilot testing shall be made as early in the process as possible to minimize potential delays of the FS. A brief scope of work will be prepared by Respondents that lists the candidate technologies, identifies the scale that they will be tested on (pilot vs. bench), and lists available facilities/sites at which the testing can occur. This scope of work will be reviewed by EPA prior to preparation of the work plan for the treatability studies. To assure that a treatability testing program is completed on time, and with accurate results, Respondents will either submit a separate treatability testing work plan or an amendment to the Site work plan for EPA review and approval.

8.2 Treatability Testing & Deliverables (RI/FS Guid, Chap 5.5; 5.6; 5.8)

The deliverables that are required, in addition to the memorandum identifying candidate technologies, where treatability testing will be conducted, include a work plan, a sampling and analysis plan, and a final treatability evaluation report. EPA may also require a treatability study health and safety plan, where appropriate.

8.2.1 Treatability Testing Work Plan (RI/FS Guid, Chap 5.5)

Respondents will prepare a treatability testing work plan or amendment to the Site work plan for EPA review and approval describing the Site background, remedial technology(ies) to be tested, test objectives, experimental procedures, treatability conditions to be tested, measurements of performance, analytical methods, data management and analysis, health and safety, and residual waste management. The DQOs for treatability testing shall be documented as well. If pilot scale treatability testing is to be performed, the pilot scale work plan will describe pilot plant installation and start-up, pilot plant operation and maintenance procedures, operating conditions to be tested, a sampling plan to determine pilot plant performance, and a detailed health and safety plan. If testing is to be performed off-site, permitting requirements will be addressed.

8.2.2 Treatability Study SAP (RI/FS Guid, Chap 5.5)

If the QAPP or FSP are not adequate for defining activities to be performed during the treatability tests, a separate treatability study SAP or amendment to the Site SAP will be prepared by Respondents for EPA review and approval. Subtask 2h (Section 4.9 1) of this SOW provides additional information on the requirements of the SAP.

8.2.3 Treatability Study Health & Safety Plan (RI/FS Guid, Chap 5.5)

If the original health and safety plan is not adequate for defining the activities to be performed during the treatment tests, a separate or amended health and safety plan will be developed by Respondents. Task 2h (Section 4.9.2) of this SOW provides additional information on the requirements of the health and safety plan. EPA does not "approve" the treatability study health and safety plan.

8.2.4 Treatability Study Evaluation Report (RI/FS Guid, Chap 5.6)

Following completion of treatability testing, Respondents will analyze and interpret the testing results in a technical report to EPA. Depending on the sequence of activities, this report may be a part of the RI/FS report or a separate deliverable. The report will evaluate each technology's effectiveness, implementability, cost, and actual results as compared with predicted results. The report will also evaluate full-scale application of the technology, including a sensitivity analysis identifying the key parameters affecting full-scale operation.

Section 9: Task 7- Development & Screening of Remedial Alternatives (RI/FS Guid, Chap 4)

The development and screening of remedial alternatives are performed to develop an appropriate range of alternatives that will be evaluated. This range of alternatives shall include, but is not limited to, no action, natural attenuation/enhanced natural recovery and/or attenuation, in-place confinement (capping), dredging and disposal in confined aquatic disposal sites (CADs), near shore and/or upland confined disposal facilities, dredging and disposal in existing landfills, dredging and sediment reuse, treatment, as appropriate, to reduce the toxicity, mobility, or volume of hazardous substances, and options combining aspects of these and/or other alternatives. The following activities will be performed by Respondents as a function of the development and screening of remedial alternatives.

9.1 Development & Screening of Remedial Alternatives (RI/FS Guid, Chap 4.2)

Respondents will begin to develop and evaluate a range of appropriate alternatives (i.e., remedial alternatives as well as disposal alternatives) that ensure protection of human health and the environment following completion of the baseline risk assessment.

9.1.1 Refine & Document RAOs (RI/FS Guid, Chap 4.2.1)

Based on the baseline risk assessment, and the results of the RI, Respondents will review and, if necessary, modify the Site-specific RAOs. Revised RAOs will include updated PRGs that were initially calculated by the Respondents during the RI. The revised PRGs will be documented in a technical memorandum that will be reviewed and approved by EPA. These modified PRGs will specify the contaminants and media of interest, exposure pathways and receptors, and an acceptable contaminant level or range of levels (at particular locations for each exposure route).

9.1.2 Develop General Response Actions (RI/FS Guid, Chap 4.2.2)

Respondents will develop general response actions for each media of interest defining containment, treatment, excavation, pumping, natural attenuation, or other actions, singly or in combination, as appropriate to satisfy the RAOs.

9.1.3 Identify Areas & Volumes of Sediment (RI/FS Guid, Chap 4.2.3)

Respondents will identify areas and volumes of contaminated sediments to which general response actions, other than early actions, may apply, taking into account requirements for protectiveness as identified in the RAOs. The chemical and physical characterization of the Site will also be taken into account.

9.1.4 Identify, Screen, & Document Remedial Technologies (RI/FS Guid, Chap 4.2.4; 4.2.5)

Respondents will identify and evaluate technologies applicable to each general response action to eliminate those that cannot be implemented and/or are not feasible at the Site. General response actions will be refined to specify remedial technology types. Technology process options for each of the technology types will be identified either concurrent with the identification of technology types, or following the screening of the considered technology types. Process options will be evaluated on the basis of short and long-term effectiveness, implementability, and cost factors to select and retain one or, if necessary, more representative processes for each technology type. If two technologies are of equal effectiveness and implementability, Respondents may propose that the more costly technology be eliminated from consideration. The technology types and process options will be summarized for inclusion in a technical memorandum. The reasons for eliminating alternatives must be specified.

9.1.5 Assemble & Document Alternatives (RI/FS Guid, Chap 4.2.6)

Respondents will assemble selected representative technologies into alternatives for the Site or, if appropriate, for each affected medium or operable unit. Together, all of the alternatives will represent a range of treatment and containment combinations that will address either the Site or each operable unit as a whole. A summary of the assembled alternatives and their related action-specific ARARs will be prepared by Respondents for inclusion in a technical memorandum. The reasons for eliminating alternatives during the preliminary screening process must be specified.

9.1.6 Refine Alternatives

Respondents will refine the remedial alternatives to identify the contaminated sediment volume addressed by each alternative. Sufficient information will be collected for an adequate comparison of alternatives. PRGs for each chemical in each medium will also be modified as necessary to incorporate any new risk assessment information presented in the baseline risk assessment report. Additionally, action-specific ARARs will be reviewed and possibly updated, as the remedial alternatives are refined.

9.1.7 Conduct & Document Screening Evaluation of Each Alternative (RI/FS Guid, Chap 4.3)

Respondents may perform a final screening process based on short- and long-term aspects of effectiveness, implementability, and relative cost. Generally, this screening process is only necessary when there are many feasible alternatives available for detailed analysis. If necessary, the screening of alternatives will be conducted to assure that only the alternatives with the most favorable composite evaluation of all factors are retained for further analysis. As appropriate, the screening will preserve the range of treatment and containment alternatives that was initially developed. The range of remaining alternatives will include options that use treatment technologies and permanent solutions to the maximum extent practicable. Respondents will prepare a technical memorandum summarizing the results and reasoning employed in screening, arraying alternatives that remain after screening, and identifying the action-specific ARARs for the alternatives that remain after screening.

9.2 Alternatives Development & Screening Deliverables (RI/FS Guid, Chap 4.5)

Respondents will prepare a technical memorandum summarizing the work performed in and the results of each task above, including an alternatives array summary. The memorandum will be modified by Respondents if required by EPA's comments to assure identification of a complete and appropriate range of viable alternatives to be considered in the detailed analysis. This deliverable will document the methods, rationale, and results of the alternatives screening process.

Section 10: Task 8 - Detailed Analysis of Remedial Alternatives (RI/FS Guid, Chap 6)

The detailed analysis will be conducted by Respondents to provide EPA with the information needed to allow for the selection of Site remedies. This analysis is the final task to be performed by Respondents during the FS.

10.1 Detailed Analysis of Alternatives (RI/FS Guid, Chap 6.2)

Respondents will conduct a detailed analysis of alternatives which will consist of an analysis of each option against the set of nine CERCLA evaluation criteria and a comparative analysis of all options using the same evaluation criteria.

10.1.1 Apply Nine Criteria & Document Analysis (RI/FS Guid, Chap 6.2.1 - 6.2.4)

Respondents will apply the nine CERCLA evaluation criteria to the assembled remedial alternatives to ensure that the selected remedial alternative(s) will be protective of human health and the environment; will be in compliance with, or include a waiver of, ARARs; will be cost-effective; will utilize permanent solutions and alternative treatment technologies, or resource recovery technologies, to the maximum extent practicable; and will address the statutory preference for treatment as a principal element. The evaluation criteria include: (1) overall protection of human health and the environment; (2) compliance with ARARs; (3) long-term effectiveness and permanence; (4) reduction in toxicity, mobility, or volume; (5) short-term effectiveness; (6) implementability; (7) costs; (8) state (or support agency) acceptance; and (9) community acceptance. (Note: criteria 8 and 9 are considered after the RI/FS report has been released to the general public.) For each alternative, Respondents shall provide: (1) a description of the alternative that outlines the sediment management strategy involved and identifies the key ARARs associated with each alternative; and (2) a discussion of the assessment of each alternative against each of the nine criteria. If Respondents do not have direct input on criteria 8 state (or support agency) acceptance or 9 community acceptance, these will be addressed by EPA.

10.1.2 Compare Alternatives Against Each Other & Document the Comparison of Alternatives (RI/FS Guid, Chap 6.2.5; 6.2.6)

Respondents will perform a comparative analysis between the remedial alternatives to evaluate the relative performance of each alternative in relation to each specific evaluation criterion. That is, each alternative will be compared against the others using the evaluation criteria as a basis of comparison. Identification and selection of the preferred alternative are reserved by EPA. Respondents will prepare and submit a

technical memorandum summarizing the results of the comparative analysis prior to preparation of the FS report.

10.2 Detailed Analysis of Deliverables (RI/FS Guid, Chap 6.5)

In addition to the technical memorandum summarizing the results of the comparative analysis, Respondents will submit a draft FS report to EPA for review and approval. Once EPA's comments have been addressed by Respondents to EPA's satisfaction, the final FS report may be bound with the final RI report.

10.2.1 Feasibility Study Report (RI/FS Guid, Chap 6.5)

Respondents will prepare a draft FS report for EPA review and comment. This report, as ultimately adopted or amended by EPA, provides a basis for remedy selection by EPA and documents the development and analysis of remedial alternatives. Respondents will refer to the RI/FS Guidance for an outline of the report format and the required report content. Respondents will prepare a final FS report, which satisfactorily addresses EPA's comments.

Section 11: EPA Guidance Documents

The following list, although not comprehensive, comprises many of the regulations and guidance documents that apply to the RI/FS process:

The (revised) National Oil and Hazardous Substance Pollution Contingency Plan (NCP).

"Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA", U.S. EPA, Office of Emergency and Remedial Response, October 1988, OSWER Directive No. 9355.3-01.

"Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA", U.S. EPA, Office of Emergency and Remedial Response, August 1993, OSWER Directive No. 9360.0-32.

"Interim Guidance on Potentially Responsible Party Participation in Remedial investigation and Feasibility Studies", U.S. EPA, Office of Waste Programs Enforcement, Appendix A to OSWER Directive No. 9355.3-01.

"Guidance on Oversight of Potentially Responsible Party Remedial Investigations and Feasibility Studies", U.S. EPA, Office of Waste Programs Enforcement, OSWER Directive No. 9835.3.

"A Compendium of Superfund Field Operations Methods", Two Volumes, U.S. EPA, Office of Emergency and Remedial Response, EPA/540/P-87/001a, August 1987, OSWER Directive No. 9355.0-14.

"EPA NEIC Policies and Procedures Manual", May 1978, revised November 1984, EPA-330/9-78-991-R.

"Data Quality Objectives for Remedial Response Activities", U.S. EPA, Office of Emergency and Remedial Response and Office of Waste Programs Enforcement, EPA/540/G-87/003, March 1987, OSWER Directive No. 9335.0-7B.

"Guidance for the Data Quality Objectives Process EPA QA/G-4", U.S. EPA, Office of Environmental Information, EPA/600/R-96/055, August 2000.

"EPA Requirements for Quality Assurance Project Plans", USEPA. EPA QA/R5, March 2001.

"EPA Requirements for Quality Management Plans", U.S. EPA, Office of Emergency and Remedial Response and Office of Waste Programs Enforcement, EPA QA/R-2, Interim Final, November 1999.

"EPA Requirements for Quality Assurance Plans", U.S. EPA, Office of Emergency and Remedial Response and Office of Waste Programs Enforcement, EPA QA/R-5, Interim Final, November 1999.

"EPA Guidance on Quality Assurance Project Plans", U.S. EPA, Office of Emergency and Remedial Response and Office of Waste Programs Enforcement, EPA/600/R-98/018, February 1998.

"Users Guide to the EPA Contract Laboratory Program: U.S. EPA, Sample Management Office, August 1982.

"Interim Guidance on Compliance with Applicable or Relevant and Appropriate Requirements", U.S. EPA, Office of Emergency and Remedial Response, July 9, 1987, OSWER Directive No. 9234.0-05.

"CERCLA Compliance with Other Laws Manual", Two Volumes, U.S. EPA, Office of Emergency and Remedial Response, August 1988 (draft), OSWER Directive No. 9234.1-01 and -02.

"Guidance on Remedial Actions for Contaminated Groundwater at Superfund Sites", U.S. EPA, Office of Emergency and Remedial Response, (draft), OSWER Directive No. 9283.1-2.

"Draft Guidance on Preparing Superfund Decision Documents", U.S. EPA, Office of Emergency and Remedial Response, March 1988, OSWER Directive No. 9355.3-02.

"Risk Assessment Guidance for Superfund--Volume I, Human Health Evaluation Manual (Part A)", December 1989, EPA/540/1-89/002.

"Risk Assessment Guidance for Superfund--Volume II Environmental Evaluation Manual", March 1989, EPA/540/1-89/001.

"Guidance for Data Useability in Risk Assessment", October 1990, EPA/540/G-90/008.

"Performance of Risk Assessments in Remedial Investigation/ Feasibility Studies (RI/FSs) Conducted by Potentially Responsible Parties (PRPs)", August 28, 1990, OSWER Directive No. 9835.15.

"Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions", April 22, 1991, OSWER Directive No. 9355.0-30.

"Health and Safety Requirements of Employees Employed in Field Activities", U.S. EPA, Office of Emergency and Remedial Response, July 12, 1981, EPA Order No. 1440.2.

OSHA Regulations in 29 CFR 1910.120 (Federal Register 45654, December 19, 1986).

"Interim guidance on Administrative Records for Selection of CERCLA Response Actions", U.S. EPA, Office of Waste Programs Enforcement, March 1, 1989, OSWER Directive No. 9833.3A.

"Community Relations in Superfund: A Handbook", U.S. EPA, Office of Emergency and Remedial Response, June 1988, OSWER Directive No. 9320.0-03B.

"Community Relations During Enforcement Activities and Development of the Administrative Record", U.S. EPA, Office of Waste Programs Enforcement, November 1988, OSWER Directive No. 9836.0-1A.

"Coordination between RCRA Corrective Action and Closure and CERCLA Site Activities", Office of Enforcement and Compliance Assurance, U.S. EPA, September 24, 1996.