UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I

27204

In the matter of: PETERSON/PURITAN, INC. NPL SITE CCL Custom Manufacturing, Inc. (formerly Peterson/Puritan, Inc.) Martin Street Cumberland, Rhode Island, and Bestfoods (formerly CPC International, Inc.), Respondents Proceeding Under Section 122(d)(3) (relating to a settlement agreement for action under Section 104(b)) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Super- fund Amendments and Reauthorization Act of 1986 (SARA)	U.S. EPA Docket No. 1-87-1064 **Second Amendment to** **Administrative Order** **on Consent**

SECOND AMENDMENT TO
ADMINISTRATIVE ORDER ON CONSENT

Pursuant to Paragraph 52 of the Administrative Order on Consent between the United States Environmental Protection Agency, Region I ("EPA") and Peterson/Puritan, Inc. dated May 29, 1987 ("Consent Order"), the terms of the Consent Order are hereby amended as follows. Paragraphs 1, 2, 3, 6, 12, 26, 27, and 59 of the Consent Order are hereby deleted and replaced by Paragraphs 1, 2, 3, 6, 12, 26, 27, and 59 of this Second Amendment. Paragraphs 43 and 44 of the Consent Order which were amended in the First Amendment to the Administrative Order on Consent dated March 10, 1992 ("First Amendment") are replaced by Paragraphs 43 and 44 in this Second Amendment to the Administrative Order on Consent ("Second Amendment"). Paragraphs 12a and 41a of this Second Amendment shall be added to the Consent Order after Paragraphs 12 and 41, respectively, of the Consent Order. Finally, Appendix I of this Second Amendment replaces Appendix I of the Consent Order.

Jurisdiction

1. The Respondents, CCL Custom Manufacturing, Inc. (formerly Peterson/Puritan, Inc.) ("CCL"), Bestfoods (formerly CPC International, Inc.) and EPA, hereby modify the rights and obligations of the Respondents as originally created in: (1) the Administrative Order on Consent signed by EPA on April 29, 1987 and by Peterson Puritan, Inc. on May 21, 1987 ("Consent Order"), and (2) the First Amendment to the Administrative Order on Consent signed by EPA and CPC International, Inc. on March 10, 1992 ("First Amendment"). These modifications are set forth in this Second Amendment to the Administrative Order on Consent ("Second Amendment"). Under these modifications: (1) the performing Respondent CCL ("Respondent CCL") agrees to perform a Remedial Investigation and Feasibility Study ("RI/FS") at the Second Operable Unit of the Peterson/Puritan, Inc. Superfund Site (hereinafter called "OU-2"), and (2) the contributing Respondent Bestfoods ("Respondent Bestfoods") agrees to assume financial responsibility for those EPA costs associated with the RI/FS at OU-2 as further defined in Paragraphs 43 and 44 of this Consent Order, as amended. In the event that Respondent Bestfoods does not fulfill its legal responsibilities, EPA is not precluded from pursuing Respondent CCL for all costs accrued pursuant to Paragraphs 43 and 44 of this Consent Order, as amended. OU-2 is defined at Appendix I of the Consent Order, as amended. The activities constituting the RI/FS are described and defined in the Statement of Work ("SOW") as set forth in Appendix I of this Second Amendment. The Consent Order, as amended, is issued pursuant to the authority vested in the President of the United States by Section 122(d)(3) (relating to a settlement agreement for action under Section 104(b)) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 ("CERCLA"), as amended. This authority has been delegated to the Administrator of the EPA by Executive Order 12850, 52 Fed. Reg. 2926, further delegated to the Regional Administrator of EPA Region I by EPA delegation No. 14-14C, and further delegated to the Director, Office of Site Remediation and Restoration ("OSRR"), by EPA Region I Order No. 1200, dated June 30, 1995. CCL Custom Manufacturing, Inc., a Texas Corporation, duly authorized and existing under the laws of Texas, agrees to undertake all actions required by the terms and conditions of the Consent Order, as amended. Respondent Bestfoods recognizes that while it is not the performing respondent for conducting the RI/FS activities for OU2, its obligations under the Consent Order, as amended, remain. The Respondents consent to and will not contest EPA jurisdiction regarding the Consent Order, as amended.

2. In entering into the Consent Order, as amended, the mutual objectives of EPA and the Respondent CCL are: to determine fully the nature and extent of the threat to the public health or welfare or the environment caused by the release or threatened release of hazardous substances, pollutants or contaminants at or from OU-2; and to provide to EPA information for its use in evaluating alternatives for the appropriate extent of remedial action to prevent or mitigate the migration or the release or threatened release of hazardous substances, pollutants, or contaminants at or from OU-2. The activities conducted pursuant to the Consent Order, as amended, are subject to approval by EPA and shall be consistent with: CERCLA, as amended; the National Contingency Plan ("NCP") 40 C.F.R. Part 300; and, including but not limited to, Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal

Landfill Sites, Presumptive Remedy for CERCLA Municipal Landfill Sites, Risk Assessment Guidance for Superfund (RAGS, Vol 1, A-D), other OSWER Directives as identified in Appendix I of this Amendment or otherwise applicable, EPA Region I-New England Compendium of Quality Assurance Project Plan Requirements and Guidance, EPA Region I Low Stress (low flow) Purging and Sampling Procedure for the Collection of Ground Water Samples from Monitoring Wells, and other Regional Technical Directives as identified in Appendix I of the Consent Order, as amended, or otherwise applicable. If any inconsistencies exist between any of the above laws, regulations, or guidance documents, CERCLA, as amended, shall govern which takes precedence. Further, if any of the above laws regulations or guidance documents are amended prior to the signing of a Record of Decision for a final remedial action at OU-2, EPA may amend the SOW to reflect such amendments, or develop a new SOW and Respondent CCL shall conduct all activities required by the new or amended SOW.

3. The Peterson/Puritan Site is located along the Blackstone River between the Towns of Cumberland and Lincoln in Rhode Island. The Site is about two miles long and extends approximately 2000 feet to the east and to the west of the main river channel of the Blackstone River. The above is a description of the approximate extent of the Site which, in fact, may be larger due to the migration of contamination. OU-2 is a portion of the Site that is located along the Blackstone River. This River forms the boundary between the Towns of Cumberland and Lincoln, Rhode Island. OU-2 is comprised of a former landfill, a former transfer station, a portion of the Blackstone River, flood plain and wetlands, borrow areas, the former Lennox Street municipal well and Quinnville municipal wellfield, and other areas that are further described in Appendix I.

6. Based upon information supplied to EPA by the Respondents and others, hazardous substances have been detected and may be migrating in groundwater from OU-2. These hazardous substances include, but are not limited to, volatile organic contaminants such as trichloroethylene, freon 11, 1,2-dichloroethene, 1,1,1-trichloroethane, benzene, and metals such as chromium, nickel and lead in groundwater. Hazardous substances detected in soils and sediments include, but are not limited to, benzo(a)pyrene, chrysene, indeno(1,2,3+cd)pyrene, bis(2hexyl)phthalate, arochlors, and asbestos insulation/transite.

12. Respondent CCL, formerly Peterson Puritan, Inc., neither admits nor denies such status, but agrees to perform the obligations in this Consent Order, as amended, as a "generator" within the meaning of Section 107(a)(3) of CERCLA, 42 U.S.C. § 9607(a)(3). No recitation contained within this Paragraph 12 shall be deemed an admission on the part of Respondent CCL in connection with any future actions, other than actions seeking enforcement under this Consent Order, as amended.

12a. For the purposes of this Consent Order, as amended, Respondent Bestfoods neither admits nor denies such status, but agrees to assume financial responsibility for Paragraphs 43 and 44 of this Consent Order, as amended, pursuant to its status as a signatory to the First Amendment to the Administrative Order on Consent. No recitation contained within Paragraph 12a.shall be deemed an admission on the part of Respondent Bestfoods in

connection with any future enforcement actions, other than actions seeking enforcement under this Consent Order, as amended.

26. Documents, including reports, approvals, disapprovals, and other correspondence, to be submitted pursuant to the Consent Order, as amended, shall be sent to the following addresses or to such other designated persons in writing:

(1) Documents, to be submitted to EPA should be sent as hard copy in triplicate, with two such copies being bound, one copy being unbound and identified as a photo-copy ready original, and one delivered via electronic media to:

David J. Newton
Regional Project Manager
US Environmental Protection Agency
New England
1 Congress Street
Suite 1100 (HBO)
Boston, MA 02114-2023
email: newton.dave@epa.gov

(2) Documents, to be submitted to RIDEM-OWM should be sent as hard copy in triplicate, with two such copies being bound, with one copy being unbound and identified as a photo-copy ready original, and one delivered via electronic media to:

Louis R. Maccarone
Project Manager
RI Department of Environmental Management
Office of Waste Management
235 Promenade Street
Providence, RI 02908
email: lmaccaro@dem.state.ri.us

(3) Documents to be submitted to the Respondent CCL should be sent to:

CCL Custom Manufacturing, Inc.
c/o Harry Tourville
6133 North River Road
Suite 800
Rosemount, IL 60018
htourville@cclcustom.com

With copy to:

Jonathan A. Murphy, Esq.
Lester Schwab Katz & Dwyer
120 Broadway

New York, NY 10271
email: jmurphy@lskdnylaw.com

(4) Documents to be submitted to the Respondent Bestfoods should be sent to:

David Rogers
Director of Environmental Regulatory Affairs
Unilever/United States
700 Sylvan Ave.
Englewood, NJ 07632
email: David.Rogers@unilever.com

With copy to:

Dennis H. Esposito, Esq.
Adler Pollock & Sheehan P.C.
2300 Financial Plaza
Providence, RI 02903-2443
email: desposito@apslaw.com

27. EPA may determine that tasks, including remedial investigatory work and/or engineering evaluation, are necessary as part of the RI/FS at OU-2 in addition to EPA-approved tasks and deliverables, including reports which have been completed pursuant to the Consent Order, as amended. Respondent CCL shall implement the additional tasks which EPA determines are necessary as part of a RI/FS and which are in addition to the tasks detailed in the RI/FS Work Plan or amendments thereto. The additional work shall be consistent with CERCLA, as amended, the NCP, written OSWER Directives and EPA Guidance Documents as applicable, and completed in accordance with the standards specifications, and schedule determined or approved by EPA.

41a. In addition to paying the stipulated penalties assessed pursuant to Paragraph 41, in the event of a violation of the terms of this Consent Order, as amended, Respondent CCL agrees to provide an amount calculated pursuant to the chart set forth below to perform an EPA approved project which will improve, protect, or reduce risks to public health, and/or the environment in the Rhode Island segment of the Blackstone River Valley National Heritage Corridor as set forth below. The project will be carried out by the Respondent CCL or under contract with a nonprofit organization or state entity that is selected by Respondent CCL and approved by EPA.

Period of Failure to Perform:	
1st-5th day	$ 500.00 per day per violation
6th-10th day	$1000.00 per day per violation
Each day thereafter	$2000.00 per day per violation

Following receipt of a written demand by EPA for stipulated penalties assessed pursuant to Paragraph 41, Respondent CCL shall submit within thirty (30) days one or more

detailed good faith project proposals to EPA for approval. A good faith proposal shall consist of a project or projects designed to restore or protect natural environments or improve the overall condition of the Rhode Island segment of the Blackstone River Valley National Heritage Corridor ecosystem. Such project(s) may include: restoration of wetlands; purchase and management of a watershed area; protection of endangered species or habitat; or other environmentally protective measures above and beyond what is already required under this Consent Order, as amended, or any other legal obligation. EPA shall review the proposal(s) and inform Respondent CCL, in writing, of its approval, conditional approval (subject to modification by Respondent CCL of the proposal in accordance with EPA's comments), or disapproval of each proposal. If EPA disapproves any of the project proposals or conditionally approves a project proposal subject to modification, Respondent CCL shall have not more than thirty (30) days from its receipt of EPA's written disapproval or conditional approval, either to modify the proposed project and resubmit it for EPA approval, or to propose one or more additional projects. Within thirty (30) days following EPA approval of the project, Respondent CCL shall begin performance of the approved project. If Respondent CCL fails to carry out the terms of this Paragraph within the specified period of time, the amount to be spent on the project shall increase by three hundred dollars ($300) per day starting on the day after performance is due and shall continue to accrue until the terms of this Paragraph are fully satisfied. If EPA and Respondent CCL are unable to agree upon a project, Respondent CCL shall submit the disputed project to the EPA Region 1 Director of Office of Site Remediation and Restoration for dispute resolution in accordance with Paragraph 40 of this Consent Order, as amended.

43. At the end of each fiscal year, EPA shall submit to Respondent Bestfoods an accounting of all response and oversight costs relating to the RI/FS for OU-2 incurred by the U.S. Government and interest thereon with respect to the Consent Order, as amended. Respondent CCL shall receive a copy of all response and oversight costs. Respondent Bestfoods shall, within 30 calendar days of receipt of that accounting, remit a check for the amount of those costs and interest made payable to the Hazardous Substance Response Trust Fund. Checks should specifically reference the identity of the Site and be addressed to:

U.S. Environmental Protection Agency
EPA New England
Superfund Accounting
P.O. Box 360197 M
Pittsburgh, PA 15251

A copy of the transmittal letter should be sent to the Project Coordinator.

44. Respondent Bestfoods shall reimburse the U.S. Government for all direct and indirect costs related to the RI/FS at OU-2 under the Consent Order, as amended, including, without limitation:

A. All costs incurred by EPA under or in connection with the preparation and implementation of an oversight contract or arrangement by which EPA will secure assistance in overseeing and reviewing the RI/FS conducted by Respondent CCL under the Consent Order, as amended;

B. All costs incurred by EPA in preparation of an RI/FS Oversight Work Plan for OU-2;

C. All costs incurred by EPA in implementing tasks under said Work Plan; and such penalties incurred by EPA with respect to contracts entered into by EPA or its contractors solely to the extent such penalties are incurred as a result of Respondents' conduct in failing to meet their obligations pursuant to this Consent Order, as amended;

D. All costs incurred by EPA in the development and implementation of a Community Relations Plan related to RI/FS activities at OU-2;

E. The cost of EPA and/or its contractor performing any of Respondents' obligations under the Consent Order, as amended;

F. All administrative costs, including attorneys fees, incurred by EPA in negotiating, and monitoring compliance with, the Consent Order, as amended, and the accompanying amendments;

G. All costs incurred by ATSDR in conducting a Health Assessment for OU-2 as it relates to RI/FS;

H. All costs incurred by the federal Trustees in conducting Natural Resource Damage Assessments for OU-2 to the extent it relates to the RI/FS;

I. All costs incurred by EPA under a cooperative agreement, or an inter-agency agreement related to RI/FS activities at OU-2; and

J. All costs incurred by EPA related to community relations activities to the extent it relates to OU-2.

59. The provisions of the Consent Order, as amended, shall be deemed satisfied upon the issuance of the Record of Decision for OU-2 by EPA. For the purposes of the Consent Order, as amended, the issuance of the Record of Decision for OU-2 by EPA shall be a determination that the Respondents have demonstrated, to the satisfaction of EPA, that all the terms of the Consent Order, as amended, including the additional tasks, have been completed. Upon the issuance of the Record of Decision for OU-2 by EPA all obligations and duties of the Respondents arising under the Consent Order, as amended, shall terminate. This shall not, however, terminate Respondents obligation to pay for past costs, response and oversight costs, and any stipulated penalties under demand by EPA including the environmental improvement project required pursuant to Paragraph 41a of the Consent Order, as amended.

IT IS SO AGREED AND ORDERED:

By _____ July 13, 2001
for Patricia L. Meaney, Director Date
Office of Site Remediation and Restoration
U.S. Environmental Protection Agency

By *CCL's signature is on next page
Respondent, Title Date

CCL Custom Manufacturing, Inc., formerly Peterson/Puritan, Inc.

By Melvin N. Kurtz June 21, 2001
Respondent, Title Date

Bestfoods, formerly CPC International, Inc.

By H A Sauer, VP Engineering Services June 25, 2001
Respondent, Title Date

CCL Custom Manufacturing, Inc., formerly Peterson/Puritan, Inc.

By_____ _____
Respondent, Title Date

Bestfoods, formerly CPC International, Inc.

STATEMENT OF WORK FOR REMEDIAL INVESTIGATION AND FEASIBILITY STUDY FOR THE PETERSON/PURITAN, INC. SITE, OPERABLE UNIT 2: J. M. MILLS LANDFILL

US Environmental Protection Agency Region 1 - New England

November 2000

Final

Note: This document is to be included as Appendix I to the Second Amendment of the Administrative Order on Consent, signed and dated July 13, 2001.

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STATEMENT OF WORK FOR REMEDIAL INVESTIGATION AND FEASIBILITY STUDY FOR THE PETERSON/PURITAN, INC. SITE, OPERABLE UNIT 2: J. M. MILLS LANDFILL

SECTION 1: OBJECTIVES, REPORTING REQUIREMENTS, AND SCHEDULE

I. OBJECTIVES and DESCRIPTION

The primary objective of the Remedial Investigation and Feasibility Study (RI/FS) shall be to assess the Peterson/Puritan, Inc. Superfund Site conditions and to evaluate alternatives to the extent necessary to select a remedy for the Site; as defined in the Administrative Order by Consent (Consent Order), CERCLA Docket No.1-87-1064, May 29,1987, and as further amended and agreed upon on March 10, 1992 under the First Amendment to the Administrative Order on Consent and Memorandum of Understanding, and as further amended on July 13, 2001 under the Second Amendment to the Administrative Order on Consent.

Under the terms and agreements set forth under the Consent Order and amendments thereto, CCL Custom Manufacturing, Inc. is the Respondent of record. Thus the term "Respondent" (as used herein) shall mean CCL Custom Manufacturing, Inc., and its contractors, as those parties performing the Work for Operable Unit 2 (OU 2) of the Site. The term "Work" shall mean all activities the Respondent is required to perform to implement the OU 2 RI/FS described in the Consent Order, as amended, and subsequent amendments thereto, this Statement of Work (SOW), and any modifications thereto, including all activities set forth in any plans or schedules required to be submitted pursuant to the SOW. This Work shall be consistent with the National Contingency Plan (NCP) and relevant guidance. The Remedial Investigation (RI) and Feasibility Study (FS) shall be conducted simultaneously as integrated, phased studies leading to selection of a remedy. The integration and phasing of the RI and FS reflects the intent of the United States Environmental Protection Agency's policy for RI/FS studies at private, municipal and/or co-disposal landfill sites as reflected in Guidance for Conducting Remedial Investigation and Feasibility Studies Under CERCLA (EPA/540/G-89/004, OSWER Directive 9355.3-01 October 1988), Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites (EPA/540/P-91/001 OSWER Dir. 9355.3-11 February 1991), and the National Contingency Plan (NCP) (40 CFR Part 300). Previously collected data relevant to OU-2 will be considered historical and used to the extent possible to streamline the RI/FS process. The United States Environmental Protection Agency (EPA) may approve reasonable modifications to the SOW and will reject any requests for modifications that are not consistent with CERCLA, the NCP, the CERCLA guidance listed above, or other relevant CERCLA guidance documents.

The Second Operable Unit (OU-2) of the Peterson/Puritan, Inc. Superfund Site is located predominately in town of Cumberland in the north-central portion of the State of Rhode Island, and includes a small segment within the town of Lincoln. OU-2 is also known locally, and in part, as the J. M. Mills Landfill. The Study Area is surrounded by industrial, residential

and semi-rural properties. Bordering the Site to the north is the Hope Webbing Company property located at 88 Martin Street. To the south is the Stop and Shop Market (and strip mall) on Mendon Road (Route 122). To the east is the Mackland Sand and Gravel operations and wetlands also known locally as "New River". Finally, to the west is the Blackstone River and Canal. Access to the Study Area are from gravel and paved easements paralleling the Providence and Worcester Railroad tracks in the Town of Cumberland from Martin Street to the north and Route 122 (Mendon Road) to the south. The Study Area includes, but is not limited to, the land owned or operated by Joseph Marzalkowski and his agent(s) during the time of disposal. This description is further defined as the area encompassed by the fence line erected by the EPA under consequent removal actions (location of the primary landfill operation), the associated debris fields, staging areas, and disposal trenches along the bank of the Blackstone River, gravel/paved access roads in the immediate vicinity, the former Transfer Station property(s) and the Railroad easement south to, and including, the Pratt Dam, the associated river channel(s), a small unnamed island within the river, adjacent wetlands, and the former Lennox Street municipal well and Quinnville municipal wellfield.

EPA has reason to believe the Site was used for disposal of wastes, including wastes containing hazardous substances, from approximately 1954 to 1986. Within this period of time, the property was primarily used as a privately-owned, co-disposal landfill. Sewer sludge was also disposed at the facility as part of the daily operation. Various types of large, bulky solid materials (including, but not limited to, tanks, crushed drums, pre-formed concrete structures, railroad ties, demolition debris) are deposited along side of the landfill, along the north and south access roads and along the bank of the river. The now closed Lennox Street municipal well in Cumberland is located approximately one thousand (1000) feet South-east from the flank of the landfill. This well was closed by the Rhode Island Department of Health in 1979 due to the presence of volatile organic contaminants found in the supply water. The Quinnville Wellfield, immediately across the river in Lincoln, was also closed during this period of time.

Preliminary samples taken from the Site indicate the presence of volatile organic contaminants including, but not limited to, trichloroethylene, freon 11, 1,2-dichloroethene, 1,1,1-trichloroethane, benzene and metals such as chromium, nickel, and lead, in groundwater. Contaminants found in soils and sediments include benzo(a)pyrene, chrysene, indeno(1,2,3+cd)pyrene, bis(2-ethylhexyl)phthalate, aroclors, and asbestos insulation/transite.

EPA included the Peterson/Puritan, Inc. Site (which includes the J. M. Mills Landfill) on the Superfund National Priorities List on September 8, 1983. EPA has conducted two separate removal actions on the landfill (September 25, 1991 and September 12, 1997, respectfully) to prevent and maintain controls of unauthorized access to the property and to protect against exposures to identified harmful contaminants until further assessments can be made. EPA is in the planning stages of initiating a RI and FS to further assess the need for additional environmental response(s) at this portion of the Site. This document presents the scope and role of such activities.

A. Remedial Investigation

The objectives of the RI portions are to:

1. define the source(s), nature, extent, and distribution of contaminants released;

2. determine and quantify all potential exposure pathways that may pose a threat to human health or the environment;

3. provide sufficient information to assess the risks to human health and to the environment; and

4. provide sufficient technical and site characteristic information to form the basis from which to evaluate a range of remedial alternatives, conceptually design remedial actions, select a remedy, and issue a record of decision.

If EPA at any time during the OU 2 RI/FS process determines that any of these objectives are not fully met, additional work plans, studies or other appropriate activities necessary to comply with the NCP and CERCLA guidance shall be designed and performed until EPA decides that the NCP and CERCLA guidance have been satisfied and no further investigation is necessary to achieve the goals and intentions of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA).

The RI shall include, but is not limited to, data gathering (samples, monitoring, and testing), and developing methodology, procedures and assessments for characterizing the physical and chemical attributes of the Site.

The procedures used to address the objectives listed above may include, but are not limited to, evaluating all existing Site information including data generated by the Respondent, EPA, State of Rhode Island, and their respective contractors; identifying data gaps; performing field sampling and laboratory analyses; conducting bench scale and/or field pilot studies; and consulting all available applicable, or relevant and appropriate human health and environmental regulations and/or laws.

B. Feasibility Study

The objectives of the FS portions are to:

1. review the applicability of various remedial technologies, including innovative technologies, to determine whether they are appropriate remedies for the Site;

2. determine if each alternative developed by combining technologies is effective, by evaluating in the short and long term whether it is:

(a) effective,
(b) implementable, and
(c) cost effective, but cost shall only be used to evaluate alternatives of similar effectiveness;

3. evaluate each alternative or combination of alternatives through a detailed and comparative analysis based upon the nine (9) criteria listed in the Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (EPA 540/G-89/004 OSWER Dir. 9355.3-01 October 1988) and any criteria identified in the effective NCP (40 CFR Part 300) or CERCLA as amended; and

4. provide direction to the RI portions to ensure that sufficient data of the appropriate type is gathered to evaluate a range of remedial alternatives, conceptually design remedial actions, select a remedy, and issue a record of decision based on the factors mentioned in the objectives listed above.

The FS includes, but is not limited to, conceptualizations, engineering analyses, cost analyses, and time frames for the achievement of clean-up goals. The guidance document: Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites (EPA/540/P-91/001 OSWER Dir. 9355.3-11 February 1991) may be used to streamline the Feasibility Study for this Site.

II. REPORTING REQUIREMENTS

All data, methods, and interpretations must be:

A. scientifically and technically sound with all assumptions, biases, potential deficiencies, safety factors, and design criteria explicitly stated;

B. discussed with observations and interpretation clearly identifiable and distinguishable;

C. discussed with all supporting reference material clearly identified and included;

D. concisely illustrated and presented in separate graphs, charts, maps, plans and/or cross-sections where possible so that the text provides a discussion of such illustrations;

E. linked to each and every objective for which they were completed and to which they are applicable; and

F. sufficient to satisfy the objectives of the RI and FS listed above.

III. SCHEDULE: STEPS AND DELIVERABLES

A. RI/FS Steps

The Respondent shall perform the RI/FS as presented in this SOW, Table 1 herein, future approved Work Plans, and as generally described in the EPA guidance document Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites (EPA/540/P-91/001 OSWER Dir. 9355.3-11 February 1991). The process outline presented herein is based on this guidance and a current understanding of the Site. The integrated RI/FS process ensures an orderly selection of a remedy. Site data needed to perform the FS shall be identified as early as possible in the RI. However, the results of investigations during the RI/FS may require changes in the described process.

B. RI/FS Deliverables

Deliverables for each step of the RI/FS shall be identified in the RI/FS work Plan, as approved. The actual number of deliverables may vary depending on:

1. mutually agreeable changes to the schedule;
2. tasks within RI/FS steps, particularly the tasks planned for the scoping of the RI/FS (step 1) and the initial site characterization (step 2);
3. revisions based on EPA review;
4. requests for additional field studies, analyses, and documentation by EPA or the Respondent; and
5. the quality and completeness of Respondent's work.

EPA will consult with the Rhode Island Department of Environmental Management, Office of Waste Management (RIDEM-OWM) in its review of each major deliverable as described on Table 1; however, EPA retains the authority to approve or disapprove the deliverables. The number of paper copies of any documents submitted for review shall be three (3) to EPA, three to RIDEM, and a minimum of one (1) copy to each key technical support contact for which EPA identifies to receive copy of a specific deliverable. In addition, an electronic copy of each deliverable shall be submitted to EPA in a Corel 8 (or convertible) word processing format for EPA's future use.

C. RI/FS Schedule

Initiation of the OU-2 RI/FS schedule and submittal of the Work Plan(s) by the Respondent for the Work shall be triggered by written notice from EPA to the Respondent to proceed and continue with the Work as described herein, pursuant to the Administrative Order by Consent (Consent Order), CERCLA Docket No.1-87-1064, May 29,1987, and as further amended and agreed upon under the First Amendment to the Administrative Order on Consent and Memorandum of Understanding, March 10, 1992 to perform the RI/FS for the Site, and as further amended and agreed upon under the Second Amendment to the Administrative Order on Consent on July 13, 2001 and as may be otherwise modified and agreed upon by the Parties in writing. Initiation of additional studies or the other phases of this RI/FS shall be triggered by written notice from EPA (see Section 6 of this SOW). EPA may give notice to start a component of the study even if prior steps have not been completed.

The approved schedule for the Work shall be submitted with the Work Plan for the RI/FS. It shall also accompany each of the major predetermined deliverables and monthly progress reports. The approved schedule submitted with the Work Plan shall include the milestone deliverables identified in Table 1. The approved schedule shall also provide further detail so as to include field work components, Interim Deliverable submittals, and other critical path components determined to be necessary by either EPA or the Respondent to track the progress of the RI/FS. The schedule shall reflect Agency technical review of up to four (4) weeks from date of receipt of material, unless otherwise noted.

It is anticipated that from time to time during the RI/FS the Respondent may request, or EPA may require, that certain written information be provided for technical review, Agency oversight, or for the purpose of providing technical direction or modification to the Work. The Work Plan(s) shall anticipate, and plan for, the need for this information sharing and issue resolution throughout the performance of the RI/FS. On each of these occasions, a technical memorandum detailing the issue(s) shall be provided by the Respondent to EPA and RIDEM for review and comment. Unless otherwise agreed, the Respondent shall give verbal notice of not less than seventy-two hours of the impending submittal. Technical memoranda provided for this purpose are not considered to be formal submittals for the RI/FS but may be used as reference material and included as an appendix in support of the Study.

It is also anticipated that technical meetings will be required to present data and results, lend technical direction, and periodically report on the progress of the RI/FS. The Work Plan(s) shall anticipate, and plan for, the need for these periodic technical meetings during the course of the RI/FS. Unless otherwise agreed, the Respondent shall give written notice, including an agenda, no less than three (3) weeks prior to the accepted meeting date.

TABLE 1

Schedule of Milestone Tasks

	ACTIVITY	DELIVERABLE	DUE DATE
1.	Notice to Proceed	Response to EPA Notice	effective date of this AOC/SOW
2.	Phase 1 RI	Initiate Work Plans and Field Scoping	w/in thirty (30) days of effective date
3.	Initial Site Characterization	Initiate Field Work	w/in one hundred-twenty (120) days of effective date and with EPA notice to proceed
4.	Baseline Risk Assessments-Interim Deliverables (HH and ECO risk on parallel schedule)	Interim Deliverables 1, 2, 3,	w/in 240 days of effective date w/in 260 days of effective date w/in 280 days of effective date
5.	Initial Site Characterization Report	Compile and submit for EPA review a Data Base Summary Report and Initial Site Characterization Report	w/in 270 days of effective date
6.	Phase 1B Field Work	Compile/Submit Work Plan	TBD (based upon data requirements in support of Draft RI Report)
7.	Initial Screening of Alternatives Report, (w/ Phase 1B summary data report, and revised Baseline Risk Assessments as may be required to resolve Phase 1B results)	Compile/Submit Report(s)	w/in 390 days of effective date
8.	Draft Remedial Investigation	Compile/Submit Report	w/in 420 days of effective date
9.	Post Screening Field Work	Compile/Submit Work Plan	TBD (based upon data requirements in support of Draft FS Report)
10.	Draft Feasibility Study	Compile/Submit Report	w/in 480 days of effective date
11.	Final RI/FS Report	Compile/Submit Report	w/in 600 days of effective date (unless otherwise amended by EPA due to increased field scope relevant to Activity #6 and/or #9 above which delays final reporting)

SECTION 2: SCOPING OF THE RI/FS

I. OBJECTIVES

The scoping of the RI/FS shall ensure that the Respondent:

A. understand the objectives of the RI/FS;

B. develop procedures to meet the RI/FS objectives, including those for field activities;

C. initiate the identification of federal or state Applicable or Relevant and Appropriate Requirements (ARARs) which shall provide criteria for remedy selection at OU-2;

D. assemble and evaluate existing data, identify data gaps, and resolve inconsistencies;

E. develop a conceptual understanding of the study area based on the evaluation of existing data based upon the conclusions reached in D above, and other pertinent information relied upon;

F. identify likely response scenarios and potentially applicable technologies and operable units that may address Site problems;

G. undertake limited data collection efforts or studies where this information will assist in scoping the RI/FS or accelerate response actions, and begin to identify the need for treatability studies, as appropriate;

H. identify the type, quality and quantity of the data needed to assess potential remedial technologies, to evaluate technologies that may be combined to form remedial alternatives, and to support decisions regarding remedial response activities;

I. prepare site-specific health and safety plans that shall specify, at a minimum, employee training and protective equipment, medical surveillance requirements, standard operation procedures, and a contingency plan that conforms with 29 CFR §§ 1910.120(1)(1) and (1)(2);

J. develop sampling and analysis plans that shall provide a process for obtaining data of sufficient quality and quantity, allowing for the use of innovative, rapid data assessment protocols, field-derived data production, and/or contaminant screening tools, as may be appropriate, to satisfy data gathering and reporting needs; and

K. draft the negotiated schedule which shows the flow of studies and the submission of deliverables.

II. DELIVERABLES

A. Overview

In scoping the RI/FS, the Respondent shall deliver to EPA the following in writing:

1. Project Operations Plan;
2. Applicable or Relevant and Appropriate Requirements (ARARs);
3. Data Requirements of Potential Remedial Alternatives and Technologies; and
4. Expanded Schedule for the RI/FS.

Collectively, these documents are referred to as the RI/FS Work Plan. The initial RI/FS Work Plan shall describe necessary studies to be done to complete the RI/FS. The initial RI/FS Work Plan shall be revised as necessary, and revisions shall be submitted prior to each subsequent phase of work as described in Table 1.

To reduce the submittal of repetitive information contained in each subsequent Work Plan, the Respondent shall provide the appropriate cross-references at key places within each document.

The Respondent shall combine these plans to prepare the Project Operations Plan (POP). The POP is part of the Work Plan for the RI/FS. The POP is subject to EPA review, subsequent requests by EPA for revision, and rewriting by the Respondent before the commencement of RI field work at the Site. The four components of the POP are discussed in Attachment 1 of this document. Attachment 2 and Attachment 3 of this document provide the reader with a list of regulations and guidance commonly referenced and applied to the RI/FS process. These lists are not to be construed as comprehensive, but rather they are to be used as aids in identifying and applying appropriate regulations and other reference materials in supporting the RI/FS.

B. Applicable or Relevant and Appropriate Requirements

The Respondent shall identify all probable Federal Applicable or Relevant and Appropriate Requirements (ARARs), identify State ARARs and identify any local requirements. The Respondent shall use the NCP definition of ARARs. The Respondent shall also consider the ARAR sections of other Region I Feasibility Studies identified by EPA, especially those that have been prepared for sites in the State of Rhode Island and which are similar in nature.

In addition to ARARs, the Respondent shall also make preliminary determinations on the extent that other publicly available criteria, advisories, and guidances are pertinent to the hazardous substances, location of the Site, and remedial actions. ARARs and other criteria, advisories, and guidances shall be:

1. considered in terms of their chemical-specific, location-specific, and action-specific attributes;

2. evaluated for each medium (surface water, ground water, sediment, soil, air, biota, and facilities), particularly for chemical-specific ARARs, but including other ARARs as appropriate;

3. distinguished for each technology considered, particularly for action-specific ARARs, but including other ARARs as appropriate; and

4. considered at each major step of the RI/FS where they are indicated.

In general, identification of chemical and location specific ARARs are more important in the beginning steps of the RI/FS, whereas the identification of action-specific ARARs gain importance later, during the more FS-oriented steps. If a requirement is determined to be not applicable, the Respondent shall subsequently consider whether it is relevant and appropriate. When any new site-specific information becomes available, ARARs should be re-examined.

As part of the Feasibility Study, the Respondent shall provide a list in the form of a chart of ARARs and publicly available EPA and State criteria, advisories, and guidance, and limitations which represent the Respondent's best efforts to identify such requirements. The description shall briefly describe the requirements and shall include: whether it is a numerical requirement; what it is based upon (i.e., health, technical practicality); and what media it is designed for (i.e., surface water, ambient air, etc.). The list shall indicate whether each requirement is: potentially applicable or relevant and appropriate; chemical-specific, location-specific, or action-specific; pertinent to surface water, ground water, soil, air, biota, or facilities; and affixed with specific levels or goals to be attained. If specific levels or goals are affixed, they must be enumerated in the chart.

The following shall be consulted during the ARAR identification process:

CERCLA Compliance with Other Laws Manual: Draft Guidance (August 1988, EPA/540/G-89/006).

CERCLA Compliance with Other Laws Manual: Part II. Clean Air Act and Other Environmental Statutes and State Requirements (August 1989, EPA/540/G-89/009).

Section 4 of Guidance of Feasibility Studies Under CERCLA (EPA, 1985c - EPA/540/G-85/003), and Appendix E of the Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (EPA/540/G-89/004,OSWER Directive 9355.3-01, EPA October 1988) present a partial list of potential ARARs.

Additional ARARs must be sought by the Respondent during a thorough search of applicable Federal and State environmental statutes and regulations.

The Respondent shall identify all site-specific ARARs.

C. Data Requirements for Potential Remedial Alternatives and Technologies

Potential Remedial Action objectives shall be identified for each contaminated medium, and a preliminary range of remedial action alternatives and associated technologies shall be identified. The Respondent shall identify, consistent with the National Contingency Plan and applicable guidance, all appropriate remedies that may be useful in remediating affected media. In discussing potential remedies, EPA describes an alternative as a group of technologies, including innovative ones, that will achieve certain remedial action goals (see Section 4). The Respondent shall identify the various technologies, showing the critical data needed to evaluate such technologies, and the performance of technologies grouped into an alternative. These data requirements shall be initially developed during the Work Plan for the RI/FS and shall be further incorporated in all subsequent field investigation Work Plans. The data shall be obtained during the Initial Site Characterization (Phase 1A of the RI, see Section 3), the Phase 1B Field Investigation (Phase 1B RI, Phase 1 FS, see section 4) and shall be further refined during the Post-Screening Field Investigation (Phase 2 RI, Phase 2 FS, see Section 5).

The identification of potential technologies shall help ensure that data needed to evaluate the technologies are collected in the Phase 1A and Phase 1B field investigations. Certain parameters may be common to several possible technologies and alternatives. For example, the following parameters for soils are common: chemical compounds, soil density, soil moisture, soil types, soil gradation, BTU values, total halogens, and total organic carbon. Where capping may be required, waste and soil properties such as moisture content, unit weight, strength parameters, and chemical and physical data may need to be obtained during the RI through field and laboratory testing to evaluate slope stability and rate of settlement. Continued settlement monitoring using surficial settlement platforms and settlement anchors may be appropriate within the waste areas to collect data to estimate post-construction subsidence. Similar common data requirements exist for alternative remedies for other media.

In addition to the common data requirements, any other data necessary to evaluate a particular technology or alternative leading to remedy selection shall be noted in the Work Plan and subsequently integrated into each field investigation. The EPA Guidance on Conducting Remedial Investigations and Feasibility Studies Under CERCLA, (EPA/540/G-89/004, OSWER Directive 9355.3-01, EPA October 1988), and the Technology Screening Guide for Treatment of CERCLA Soils and Sludges, (EPA/540/2-88/004, September 1988) shall be sources of additional information on

identifying alternative remedies and potential innovative technologies.

A preliminary list of broadly defined alternatives shall be developed by the Respondent. Consistent with Sections 4 and 5 of this document, this list shall include a range of alternatives in which treatment that significantly reduces the toxicity, mobility, or volume of waste is a principal element; one or more alternatives that involve containment with little or no treatment; and a no-action alternative. The Respondent shall present a chart, or a series of charts, showing the requirements and technologies to be considered for remedial alternatives. In the charts, data requirements shall be linked to the Work Plans for each field investigation.

D. Expanded Schedule for Remedial Investigation/Feasibility Study

The major deliverables are identified in Table 1. The established schedule along with a more detailed, expanded schedule for subtasks shall be included as a component of the Work Plan for the RI/FS. Modifications of the schedule must be approved by EPA prior to their implementation.

The schedule shall be presented as a chart, which shall include target data and time periods for each deliverable, to the extent possible. The chart shall be updated when the schedule changes by showing the original (planned) due date and revisions of the due date.

A copy of the schedule shall be in the preface of each major deliverable of the RI/FS and in each monthly progress report required by the RI/FS agreement.

SECTION 3: INITIAL SITE CHARACTERIZATION: Phase 1A Field Investigations

I. OBJECTIVES

At its onset, the goal of the Initial Site Characterization shall be to collect all field data which can reasonably be assumed to be necessary for the Remedial Investigation (RI) and Feasibility Study(FS) and sufficient to select a remedy. The Site characterization shall conform to the Work Plan for the RI/FS. The Respondent shall evaluate the previous studies to determine the extent to which those studies have satisfied the data requirements described in this section. The RI shall contain a detailed description of all completed studies and a description of how the data requirements of this section have been satisfied. As necessary to comply with the NCP and CERCLA guidance, the Respondent shall characterize and/or describe the following, at a minimum:

1. extent to which the sources of the hazardous substances can be adequately identified and characterized;

2. amount, concentration, toxicity, environmental fate, transport (e.g., bioaccumulation, persistence, mobility), phase (e.g., solid, liquid), and other significant characteristics of each hazardous substance present;

3. waste mixtures, the media of occurrence, interface zones between media, and critical parameters for decontamination (e.g., soil chemistry, soil types, porosity);

4. hydrogeologic factors (e.g., depth to groundwater, hydraulic gradients, hydraulic conductivity; proximity to residential wells, flood plains, and wetlands);

5. climate and water table fluctuation (e.g., precipitation, run-off, stream flow, water budget);

6. routes of exposure and receptors;

7. populations and environmental concerns, including biological communities and habitats on or potentially affected by the Site;

8. extent to which the hazardous substances have migrated or are expected to migrate from their original location;

9. contribution to the contamination of air, land, water, and the food chain;

10. surface water classifications and existing use designations;

11. groundwater characteristics and current and potential groundwater uses (e.g., characteristics related to the groundwater classes described in the Ground Water Protection Strategy, (EPA, 1984));

12. extent to which contamination levels exceed health-based levels prompting a necessary response action;

13. waste characteristics that affect the type of treatment possible (e.g., BTU values, pH, BOD);

14. extent to which substances at the Site may be reused or recycled;

15. potential extent and risk of future releases of substances or residuals remaining onsite;

16. physical characteristics of the Site, including important surface features, soils, geology, hydrogeology, meteorology, and ecology;

17. characteristics or classifications of air, surface water, and ground water;

18. general characteristics of the waste, including quantities, type, phase, concentration, toxicity, propensity to bioaccumulate, persistence, and mobility;

19. extent to which the source can be adequately identified and characterized;

20. actual and potential exposure pathways through environmental media;

21. actual and potential exposure routes, for example, inhalation and ingestion;

22. other factors, such as sensitive populations, that pertain to the characterization of the Site or support the analysis of potential remedial action alternatives; and

23. other physical factors, such as identifying actual or potential physical obstructions to conducting or acquiring site characterization information due to physical restrictions, obstacles, massive debris, high water, soft terrain, or other, and strategic planning to resolve such impediments.

Using this information, the Respondent shall further define the boundaries of the RI/FS study area by identifying and characterizing all source areas and determining the extent of existing contaminants and of environmental effects resulting from releases from the Site. The Site characterization shall provide information sufficient to refine the preliminary identification of potentially feasible remedial technologies, ARARs, and the data needed by EPA to perform the Baseline Risk Assessment.

II. WORK PLAN REQUIREMENTS

The Site characterization shall specifically consist of the activities and deliverables described in this section (Section 3). The investigative and analytical studies shall be tailored to site circumstances such that the scope and detail of the analysis is appropriate to the complexity of the site problems being addressed. EPA may decide that additional investigations are necessary, if remedial technologies are modified, which require additional data for the evaluation of alternatives. In this case, upon notification from EPA, the Respondent shall prepare a work plan for additional investigations which shall be reviewed by EPA before starting the additional investigations.

For each component of the site characterization, and as necessary to comply with the NCP and CERCLA guidance, the Respondent shall establish, at a minimum, and include in the Work Plan for the RI/FS the following:

1. a grid for the soil sampling program, and identification of proposed sampling locations for all other media on the developed Site map;

2. a description of the locations of suspected contaminated areas and the areas considered to represent background levels;

3. an anticipated number or schedule of samples, subject to the results of field activities;

4. quality assurance/quality control procedures, including blanks, duplicates, alternative analysis conditions, and standards;

5. a method for determining how the field program shall be adjusted according to the initial sampling results; and

6. the analytical methodology, with preference for field and rapid assay techniques as may be practical and allowable given the defined data objectives, to be used for each medium including instrumentation and detection limits.

III. SCHEDULE/DELIVERABLES

Respondent shall initiate the site characterization study upon EPA's notification to proceed. In planning the work, the Respondent shall provide, for EPA's review, proposed deviations from the procedures in the work plan before making changes in the field.

The Respondent shall submit a Data Report, consisting of all data collected during the Phase 1A field investigations, consistent with the schedule (Table 1 of this document). This report shall include all analytical and all validated data in the form of a data base management system that is compatible with hardware and software available to EPA Region I personnel, and a complete description of all sampling locations. An Initial Site Characterization Report which meets the reporting requirements in this section, shall be submitted consistent with the schedule (Table 1 of this document).

IV. COMPONENTS OF THE SITE CHARACTERIZATION

A. Site Survey

The Respondent shall use the base maps prepared for the Limited Field Investigation (Section II), or as may otherwise be directed to do so by the Agency, incorporate the use of Agency-derived base maps, as appropriate, to display survey data collected at the Site. The maps shall contain all standard topographic, physiographic, cultural, and facility features, the surveyed locations of all wells (including residential wells), and surface sampling locations. The Respondent shall provide to EPA and RIDEM copies of deeds and other materials used during the survey and survey field team notes.

The Respondent shall prepare maps of smaller scale that show far-field sampling locations and the courses of contaminants. The basis of one of these maps shall be the U.S. Geological Survey 7.5-minute quadrangle which includes the Site.

The Respondent shall determine the elevations and horizontal locations of all wells, piezometer, and other sampling locations. It may be necessary to extend the Site map based on the results of the Site characterization. The Site map shall encompass an area as generally described in Section I. Objectives and Description, and in a scale adequate to show all pathways of surface water to and from the Site and including run-off from the Site, groundwater flow and gradient, detailed surface topography, surface water mean depths, and special study locations. The Site survey shall be of sufficient detail to adequately support and present descriptions and explanations of areas into which contaminants may migrate and/or concentrate in the environment.

B. Soils and Sources of Contaminants

1. Objectives

To assess sources of contamination, the Respondent shall, as necessary to comply with the NCP and CERCLA guidance, identify/determine the following, at a minimum:

a. the nature and concentration of each contaminant in the shallow subsurface over the entirety of study area, particularly in currently known potential source areas within the study area;

b. the mode of existence of the contaminants, whether as free products or chemical complexes (e.g., dissolved in ground water, adsorbed by grains);

c. the critical parameters for each soil and rock type and layer that is contaminated (e.g., soil moisture, soil profile, soil type, density, porosity, grain size distribution). This information shall be reported on charts, maps, and cross sections;

d. the waste characteristics and mixtures that affect the type of treatment possible. All pertinent physical and chemical characteristics of each compound shall be reported in a chart;

e. the extent to which the contaminants, and/or debris may be recycled;

f. the background levels for each soil type and stratum at a sufficient number of upgradient locations;

g. the physical properties, limitations and other materials handling aspects of the contaminated material, soil and/or other media sources that are contaminated;

and

h. the estimated volumes of materials, soils and other sources that are contaminated for a range of contaminant levels.

2. Work Plan Requirements

The detailed plan for the investigation of soils and contaminant sources shall be part of the FSP. The plan shall describe and justify the approximate numbers and locations of borings, test pits, and samples. The Soil Screening Guidance, (OSWER Dir. 9355.4-14FS, EPA/540/R-94/101, December 1994) shall be used as a tool to assess soils. The plan shall identify and describe appropriate soil and source media sampling protocols and techniques (such as: rapid bio-assessment technologies, x-ray fluorescence (XRF) analysis, ENCORE®, California Modified Split Spoon, or equivalent soil sampling protocols, vertical profiling techniques) as may be instrumental in assessing the study area. The plan shall also provide for the additional sampling, analyses, and quality assurance/quality control procedures needed to fulfill the objectives listed previously.

3. Reporting Requirements

As necessary to comply with the NCP and CERCLA guidance, the onsite sampling work shall be sufficient to support, at a minimum, the following analyses which shall be performed by the Respondent:

a. a characterization of the vertical and horizontal extent of contamination by sampling, based on a range of potential clean-up levels. The extent of contamination shall be bounded by sampling points yielding non-detect or background concentrations. Analysis shall be supported by isocon maps, area calculations, and volume calculations;

b. an identification and verification of all contaminated source areas within the boundaries of OU-2 that may pose a threat to human health or the environment;

c. a "short list" of indicator compounds (i.e., due to their relative frequency of occurrence, toxicity, persistence, concentration, mobility, etc.) that are expected to create the worst potential hazard to human health or the environment or as related to treatability;

d. a review of the data to determine if further sampling and analysis are needed to accomplish the goals of the investigations;

e. a determination of the background levels of chemicals for each soil type and stratum based on sampling at a sufficient number of locations;

f. fate and transport modeling to estimate soil concentration action limits based on the contamination levels that are preventive of ground-water contamination by leaching of contaminants from soil;

g. enough data on soil and other surface media characteristics to understand the requirements of onsite materials handling and pretreatment so that complete and accurate cost estimates can be developed for potential non-time critical removal and/or the evaluation of remedial alternatives;

h. an estimate of the volumes of contaminated soils and levels of confidence for various action level soil contamination and a plot of these estimates on a graph of volume versus clean-up concentration;

i. an estimate of present and future contamination levels for soil at points of potential exposure;

j. an estimate of the volume and significance of (temporary) storage of waste on the flood plain;

k. an estimate describing the probability or incidence of ground water and/or surface water contact with contaminated media, and if likely, an estimate of the volume, depth, extent of such wastes in contact with ground water and/or surface water;

l. an estimate in quantitative terms of the impacts on wetlands; and

m. an estimate of the damage by water level changes related to Site drainage, frequence of flooding and pumping.

Techniques that may be used to identify and delineate potential sources are visual observations and interpretations coupled with subsurface observations including, but not limited to, test pits and geophysical techniques such as ground-penetrating radar and magnetic surveys. When such geophysical techniques are used, results shall be verified by borings and test pits and analytical field screening techniques and/or laboratory analyses. For geophysical investigations, the Initial Site Characterization Report shall include maps that fully delineate anomalies and explain the results.

Results of the source determination study shall be presented in maps, cross sections, charts, tables, and computer data bases. Based on the definition of initial soil sampling, the possible need for additional sampling and analysis shall be specified. The analysis of data shall be sufficient to map the sources, to show contaminant concentrations in three dimensions, and to estimate accurately the volumes of soil should a soil excavation and/or decontamination program be required later. Parameters needed to evaluate the residual concentrations, characteristics, and behaviors of contaminants

shall also be evaluated.

C. Subsurface and Hydrogeological Investigations

1. Objectives

The Respondent shall plan, conduct, and report subsurface and hydrogeological investigations sufficient to characterize and/or describe, at a minimum, the following, as necessary to comply with the NCP and CERCLA guidance:

a. the nature and extent of contamination sufficiently to define the boundaries of all contaminant plumes and to quantify in three dimensions every aquifer, including bedrock;

b. a quantitative estimate of the number of years necessary to achieve clean-up goals for groundwater extraction, and treatment, monitored natural attenuation, and/or other remedial alternatives;

c. the subsurface stratigraphy and structure, for each rock and soil type including, but not limited to, lithologies, grain sizes, sorting, permeability, fracturing (orientation, frequency, and effects), plasticity index, moisture content, dry density, and mineralogy;

d. the concentration, environmental fate, transport mechanisms, and other significant characteristics of each contaminant;

e. the waste mixtures and partitioning of contaminants between groundwater and soil or rock, and determine the phases, including their partitioning coefficients;

f. a quantification of the hydrogeological factors (e.g., in situ permeability, conductivity, and storage capacity of each soil and rock type; depth of saturated zone; hydraulic and pressure gradients);

g. the routes of groundwater migration, transport rates, and receptors. Also specifically determine the locations, flow rates, contaminant concentrations, and variability for discharge to bodies of surface water;

h. the seasonal fluctuations in the water table, flow gradients, and contaminant concentrations, simultaneously with other factors such as precipitation, run-off, and stream flow;

i. the condition of existing monitoring wells and the need to replace them or a portion of their installation materials;

j. the construction, location, and proximity, of residential, municipal, and previously installed monitoring wells;

k. the populations and environments at risk;

l. the extent to which the hazardous substances will migrate once the limits of plumes are determined (if modeling studies are involved, the parameters, assumptions, accuracy, contingencies of the studies must be explicitly stated, and a plan established to verify the modeling if a significant risk is indicated for a specific population or environment);

m. a review and illustration of groundwater classifications and zoning (the need for institutional controls on ground-water use and land use, considering such controls as adjuncts to remedial action, must be assessed);

n. all physical and chemical waste characteristics that may affect the possible type of treatment (this information must be reported in a chart for each detected compound);

o. the potential risks associated with future releases resulting from onsite residuals;

p. the background levels for ground water at a sufficient number of horizontal and vertical locations, including unconsolidated overburden and bedrock; and

q. engineering properties of soils and wastes for settlement and slope stability analyses if capping is considered.

2. Work Plan Requirements

The Respondent shall design investigations that are sufficient to fully address the objectives listed above for the RI/FS. The plan for the subsurface and hydrogeological investigations shall be presented in the FSP. The FSP shall also describe the locations, methods, field forms, procedures, and types of analyses to be used in performing the subsurface and hydrogeological investigations. This description shall include specific drilling methods and protocols to be followed and used. In addition, innovative field assessment technologies shall be considered to complement the investigation and provide real-time analyses for in-field determinations. The Ground Water Technical Enforcement Guidance Document (OSWER Directive 9950, September 1986) and the Guidance on Remedial Actions for Contaminated Ground Water at Superfund Sites (OSWER Dir. 9283.1-2, EPA, December 1988) shall provide the framework of these investigations. The plan shall include sampling procedures for groundwater following Region I's Low Stress Purging and Sampling Procedure for the Collection of Ground Water Samples from Monitoring Wells, USEPA-Region I SOP

GW 0001, Rev. 2, July 1996). The plan shall clearly show the relations between the objectives and the studies to be performed (see Sections 1 and 3). The plan shall identify a proposed number of new monitoring well installations to support of the hydrogeologic investigations. In addition, and as a part of the Initial Field Investigation, the previously installed monitoring wells located within the study area, including but not limited to, those located at the Lennox Street Municipal Well location, the Quinnville Wellfield location and wells located along the perimeter of, and both up gradient and down gradient to, the landfill shall be identified and evaluated for use in support of this RI/FS. The plan shall include protocols for evaluating natural attenuation as further described in the Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water, (Office of Research and Development, EPA/600/R-98/128, September 1998). The plan shall provide, for EPA and RIDEM review, contingency procedures that may be followed in the event of unforeseen field conditions. The plan shall allow for additional work contingent on the results of the studies described in the Work Plan for the RI/FS.

3. Reporting Requirements

For the subsurface and hydrogeological investigations, the Respondent shall present the results and describe the actual procedures, including when the actual procedures differ from those in the work plan, in a section of the Initial Site Characterization Report. The section shall contain all data, analyses, maps, cross sections, and charts necessary to meet the objectives for which the investigations were performed. Illustrations shall clearly identify the data points, values, and the degree of interpolation or extrapolation necessary to draw conclusions.

D. Air Quality Assessment

1. Objectives

The Respondent shall characterize and/or describe, the impact of the Site on air quality, which may require, at a minimum, the following activities:

a. identification of all point and area emissions of particulate (for locations where intrusive field work may dictate this requirement), volatiles, semi-volatiles, and including methane, hydrogen sulfide, and carbon dioxide for the existing landfill area, including volatilization from soil, leachate, the river, water, waste piles, and other contaminant areas, as necessary to comply with the NCP and CERCLA guidance. (Note: For initial characterizations, the organic vapor analyzer (OVA) monitoring results would be preferable to photo ionization detector (PID) results for this purpose, as methane interferes with the ionization of many organic compounds).

b. determination of background levels at a sufficient number of upgradient and

upwind locations;

c. characterization of emissions as indicated above and which may be a threat to human health and the environment (i.e., particulate, vapors, precipitates, and gases), and identify the compounds, chemicals, and other complexes of concern;

d. estimation of the emission rates and worst case impacts on and off-site for the study area (detailed techniques for characterizing air emissions and impacts, including but not limited to the use of SUMMA Canisters and Flux Chambers, shall be used if screening data indicate a potentially significant concentration);

e. supplementation of ambient air monitoring with the collection of meteorological data including ambient temperature, wind speed, wind direction, and barometric pressure;

f. provision for monitoring of ambient air quality as described in plans that shall include a description of (a) the sampling methodology (including instrumentation, sampling times, locations, detection limits, QA/QC procedures) and (b) the analytical methodology including instrumentation, detection limits and QA/QC procedures;

g. provision for modeling for potential emission sources, including documentation of (a) source characteristics (e.g., emission rates, release height, velocity, temperature, source configuration, etc.), (b) meteorological conditions, (c) receptor locations, and (d) background concentrations; and

h. evaluation of the factors that are critical in characterizing the nature and extent of airborne contaminants from the Site, such as background air quality.

2. Work Plan Requirements

The Respondent shall prepare a plan for the air quality assessment during the scoping of the RI/FS. This plan shall become part of the FSP. Most aspects of the plan shall be performed during the Initial Site Characterization. As early as possible in the RI/FS, the Respondent shall gather data on the factors critical to assessing impacts on air quality, with consideration for the use of innovative, real-time assessment technologies in the field. The plan shall allow EPA to review differences between the specifications for the field work and the actual field work. The plan shall also provide for additional monitoring and studies, if EPA determines they are necessary.

3. Reporting Requirements

The results of the air quality assessment shall be submitted to EPA for review, and as

part of the Initial Site Characterization Report. Some of the monitoring work shall continue throughout the RI/FS. The Respondent shall address the control of gaseous emissions, including fugitive emissions (e.g., control by minimizing interfaces between soil and air and between soil and water, and materials-handling aspects of remedial design).

E. Surface Water and Sediments

1. Objectives

The Respondent shall determine the nature, extent, and risks associated with the release of each contaminant from the Site to all surface water bodies including but not limited to the Blackstone River and associated wetlands. Releases of concern may occur through overland flow and ground-water migration. The Respondent shall determine the extent to which contamination from the Site has affected or threatens to affect human health and the environment.

The Respondent shall determine the nature and extent of contaminants in the water and sediments of all surface drainage areas, both perennial and intermittent, potentially affected by contaminants from the Site. Upgradient samples of water and sediment shall be collected and analyzed from several locations in each surface water flow path that may be affected by contaminants within the study area. The collection and analysis of the upgradient samples shall be sufficient to determine background concentrations of analytical parameters. Sampling schedules shall include the monitoring of seasonal changes, including low flow periods, and shall conform to the procedures and requirements of the Project Operations Plan (Section 2).

2. Work Plan Requirements

The Respondent shall prepare a plan for surface water and sediment sampling and assessment for the Blackstone River during the scoping of the RI/FS. This plan shall be part of the FSP. It shall contain provisions for sampling the River extent from upstream of the study area (Hope Webbing parcel) to the Pratt Dam, including river bank deposits, seasonal flood plain, and potentially affected nearby wetlands, vernal pools, and other aquatic locations identified through site reconnaissance. Hydrologic assessments shall include surface water velocity measurements, available data on flood and dry weather flow patterns, streambed seepage and volumetric flow measurements, vertical hydraulic gradients, groundwater/surface water interactions (identifying gaining/losing stream reaches), and seasonal flow variations. The plan shall allow for EPA's review of proposed differences between the actual field work and the specifications for the field work.

3. Reporting Requirements

The surface water and sediment sampling and assessment data shall be compiled and presented in the Initial Site Characterization Report and shall include tables, graphs, charts, and other visual aids. These illustrations shall indicate the static levels and seasonal fluctuations of water levels and the impacts of those changes on contaminant concentration and migration.

F. Baseline Risk Assessment --Human Health

1. Objectives

The Respondent shall conduct a Baseline Risk Assessment for human health and the ecology and prepare the necessary risk assessment documents once the evaluation of the field investigation information is underway and appropriate the data base for the Site is established. The objective of this assessment is to characterize, and quantify where appropriate, the current and potential human health and environmental risks that would prevail if no further remedial action is taken. The Baseline Risk Assessment shall be separated into two components: 1) the human health risk assessment; and 2) the ecological risk assessment. The interim deliverables and drafts shall be self-supporting documents that can be independently reviewed and approved. As final draft documents, each will then be appropriately merged as subsections within the Remedial Investigation Report. The following paragraphs outline the requirements for the Human Health Baseline Risk Assessment. Section G below outlines the requirements for the Ecological Risk Assessment. The risk assessment must be done in accordance with the guidance, procedures, assumptions, methods, and formats listed below.

US EPA Region I Waste Management Division Risk Updates:
December, 1992
August, 1994
August, 1995
November, 1996
September, 1999

Risk Assessment Guidance for Superfund (RAGS), Volume I: Human Health Evaluation Manual:

Part A, Baseline Risk Assessment. Interim Final. December 1989. EPA 540/1-89/002. NTIS PB90-155581.

Part B, Development of Risk-Based Preliminary Remediation Goals. December,1991. EPA 540/R-92/003. OSWER Directive 9285.7-01B. NTIS PB92-963333.

Part C, Risk Evaluation of Remedial Alternatives. December 1991. EPA/540/R-92/004. OSWER Directive 9285.7-01C. NTIS PB92-963334.

Part D, Standardized Planning, Reporting and Review of Superfund Risk Assessments. January 1998. EPA 540-R-97-033. OSWER Directive 9285.7-01D. NTIS PB97-963305.

Risk Assessment Guidance for Superfund (RAGS). Volume III - Part A. Process for Conducting Probablistic Risk Assessment. Draft, December 1999. EPA 000-0-99-000.

Supplemental Guidance to RAGS: Calculating the Concentration Term. June 22, 1992. OSWER Directive 9285.7-08I.

The Lognormal Distribution in Environmental Applications. EPA Technology Support Center Issue. December 1997

Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03. March 25, 1991.

Final Guidance Data Usability in Risk Assessment (Part A). April 1992. OSWER Directive 9285.7-09A. NTIS PB92-963356.

Guidance for Data Usability in Risk Assessment (Part B). May 1992. OSWER Directive 9285.7-09B. NTIS PB92-963362.

Dermal Exposure Assessment: Principles and Applications. January 1992. EPA 600/8-91/011B.

Exposure Factors Handbook, Volume 1.1997. EPA/600/P-95/002Fa.

Exposure Factors Handbook, Volume 2.1997. EPA/600/P-95/002Fb.

Exposure Factors Handbook, Volume 2.1997. EPA/600/P-95/002Fc.

Air/Superfund National Technical Guidance Study Series, Volumes I, II, III, and IV (EPA 450/1-89-001,002,003,004, July 1989).

Final Soil Screening Guidance, May 17, 1996. Soil Screening Guidance User's Guide. Office of Solid Waste and Emergency Response. EPA/540/R-96/018.

Soil Screening Guidance: Technical Background Document. EPA 540/R-94/126.

EPA Risk Characterization Program. Memorandum from Administrator Carol

Browner. Office of the Administrator, Washington, DC. March 21, 1995.

Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons. Office of Research and Development, Washington, DC. EPA/600/R-93/C89.

PCBs: Cancer Dose-Response Assessment and Application to Environmental Mixtures. Office of Research and Development, Washington, DC. EPA/600/P-96/001A.

Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities. July 14, 1994. OSWER Directive 9355.4-12.

Additional guidance that may be used to prepare and do the risk assessment are:

Guidelines for:

a. Carcinogen Risk Assessment (51 FR 33992, September 24, 1986);

b. Mutagenicity Risk Assessment (51 FR 34006, September 24, 1986);

c. The Health Risk Assessment of Chemical Mixtures (51 FR 34014, September 24, 1986);

d. The Health Assessment of Suspect Developmental Toxicants (56 FR 63798, December 5, 1991);

e. Exposure Assessment Guidelines (57 FR 22887, 1992); and

f. Guidelines for Neurotoxicity Risk Assessment. May 1998. EPA/630/R-95-001Fa. NTIS PB98-117831.

Attachment 3 to this document also offers additional selected EPA guidance and directives which identify and outline methods and techniques for data gathering in support of the Baseline Risk Assessment.

2. Work Plan and Reporting Requirements

a. Components of the Human Health Risk Assessment

The human health risk assessment must address the following five categories at a minimum:

1. hazard identification;

2. dose-response assessment;

3. exposure assessment;

4. risk characterization; and

5. limitations/uncertainties.

b. Data Acquisition

The Baseline Risk Assessment shall be based upon information gathered prior to and during the RI/FS investigation at the site, as well as on data available through peer-reviewed literature. The contractor shall, at the direction of the EPA Work Assignment Manager, collect additional field data to support the Baseline Risk Assessment. The decision regarding the need for supplemental data collection will be made after review of the Phase I RI data by the Remedial Project Manager, the Region I Superfund Environmental Assessment Team, and the EPA Risk Assessor. Primary importance will be placed upon data collected in the field at the site, with data collected from the literature used to support or explain field results.

c. Deliverables

The final product shall be the Draft Baseline Risk Assessment Report comprised of the completed human health assessment. Prior to submission of the final report, portions of the Baseline Risk Assessment in the form of interim deliverables (as described below) shall be submitted. These interim deliverables shall be reviewed and accepted by the Remedial Project Manager prior to the Respondent proceeding with the next interim deliverable. Once all interim deliverables are accepted a Draft Baseline Risk Assessment Report shall be submitted. This shall include the interim deliverables as well as the additional information required for the report. Following review and feedback from EPA on the Draft Baseline Risk Assessment Report a Revised Draft Baseline Risk Assessment Report may be required incorporating EPA's comments and any additional validated data that may have bearing on the risk assessment, acquired after the completion of the draft report.

i. First Interim Deliverable--Selection of Exposure Pathways

A completed Standardized Table 1 (See RAGS Part D) will be submitted. The purpose of this deliverable is to identify all plausible present and potential future exposure pathways and exposure parameters in accordance with the Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive

9285.6-03 (EPA, March 25, 1991)and Region I Risk Updates.

ii. Selection of Contaminants of Concern

A completed Standardized Table 2 will be submitted for each unique combination of : scenario time frame, medium, exposure medium and exposure point. (See RAGS Part D.) The objective of this deliverable is to present an orderly compilation of the available sampling data on the hazardous substances present at the site, to identify data sets suitable for use in a quantitative risk evaluation and to identify contaminants of concern upon which the quantitative assessment of risk will be based.

If the number of contaminants detected is so large that quantification of health risks for each contaminant would be infeasible then contaminants of concern may be selected. Important factors in choosing contaminants of concern include contaminant concentration and frequency of detection, potential contaminant releases, potential routes and magnitude of exposure, environmental fate and transport, and toxicity.

iii. Second Interim Deliverable--Revised Exposure Pathways

The contractor shall incorporate any comments received from the Agency on Standardized Tables 1 and 2.

iv. Exposure Point Concentration and Exposure Parameters

Completed Tables 3 and 4 will be submitted. The purpose of this deliverable is to estimate a range of possible exposures which may result from actual or threatened releases of hazardous substances from the site, i.e., the Reasonable Maximum Exposure and the Central Tendency (average). The average and reasonable maximum exposure levels which are to be characterized, are defined by the manner in which the contaminant concentration (average, upper bound or maximum) is coupled with conservative exposure parameters developed for each exposure scenario per the first deliverable. The exposure levels shall be revised in the draft and/or final risk assessment report, if additional validated data is received.

v. Toxicity Data

Completed Tables 5 and 6 shall be submitted for the contaminants of concern.

vi. Third Interim Deliverable

A complete set of Standardized Tables shall be submitted, completed Tables 7, 8, 9 and 10 shall be submitted, and revised Tables 1,2,3,4,5, and 6 shall be submitted.

The contractor shall incorporate any comments received from the Agency on the second interim deliverable. In addition, any newly acquired validated data shall be incorporated into this deliverable.

d. Draft Baseline Human Health Risk Assessment

The draft Baseline Risk Assessment document shall be submitted after the completion and acceptance of the interim deliverables described above.

The Uncertainties and Limitations section shall address shall clearly address the major limitations, sources of uncertainty, and if possible, provide an indication as to whether they have resulted in an over- or under-estimation of the risk.

The format of this report shall conform to the chapters and sections as follows:

I. Draft Human Health Risk Assessment

1.0 Introduction/Hazard Identification
1.1. Site description and history
1.1.1 Present and future land use
1.1.2. Human receptors (including type, location and numbers)
1.2. Nature and extent of contamination found at site
1.3. Selection of contaminants of concern
1.3.1. Health based ARARs (eg MCL/MCLG)
1.4. Fate and transport
2.0 Exposure Assessment
2.1. Exposure pathways
2.2. Exposure scenarios
2.2.1. Exposure point concentrations (ug/l, mg/kg, ug/m^3)
2.2.2. Exposure dose levels (mg/kg/day)
3.0 Dose Response Evaluation
3.1. Dose response criteria for carcinogenic effects
3.2. Dose response criteria for noncarcinogenic effects
4.0 Risk Characterization
4.1. Narrative and tables summarizing the carcinogenic and noncarcinogenic risks by exposure pathway for the present and potential future exposure scenarios

5.0 Uncertainty/Limitations
6.0 References
7.0 Appendices
7.1. Documentation/data
7.2. Toxicity profiles for contaminants of concern

Once the draft Risk Assessment document has been reviewed by EPA, a Final Human Health Risk Assessment revised in response to EPA, and RIDEM comments of the Draft Risk Assessment shall be incorporated into the draft Remedial Investigation Report.

G. Baseline Risk Assessment --Ecological

1. Objectives

The Respondent shall conduct an ecological risk assessment to determine the nature and extent of the effects of contamination to the ecological resources on, nearby, or otherwise influenced by the Site. A reference site may be required by EPA to be designated and sampled for use in determining the impact of the Site on the ecological receptors. The extent of the area to be studied shall be determined by the results of the Site Characterization, and upon the collection and review of available information concerning the biota expected to occur on or near the Site as either resident or transient species. As the ecological risk assessment progresses in response to the Site Characterization and any additional information obtained and under review by the Respondent, EPA or others, it may be necessary to extend, modify and/or redirect the scope of the assessment to ensure that the approach is tailored and detailed to the complexity of the ecology and environmental setting under study.

The Respondent shall use, at a minimum, the following as guidance in developing the Ecological Risk Assessment:

a. Ecological Assessment of Hazardous Waste Sites: A Field and Laboratory Reference Document (EPA 600/3-89/013, March 1989).

b. Framework for Ecological Risk Assessment (EPA 630/R-92/001, February 1992).

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

d. Developing a Work Scope for Ecological Assessments, ECO Update, Intermittent Bulletin, Volume 1, Number 4. Washington, D.C: Office of Emergency and Remedial Response, Hazardous Site Evaluation Division; Publication 9345.0-05I, 1992.

e. Ecological Risk Assessment Issue Papers, Office of Research and Development, EPA/630/R-94/009, 1994.

f. Guidelines for Ecological Risk Assessment, Office of Research and Development, Risk Assessment Forum, Washington, D.C. EPA/630/R-95/002f. May 1998.

g. Ecological Risk Assessment Guidance For Superfund: Process for Designing and Conducting Ecological Risk Assessments, Interim Final. Environmental Response Team, Edison New Jersey. (EPA540-R-97-006), June 5, 1997.

h. Special Report of the Massachusetts Weight-of-Evidence Workgroup: A Weight-of-Evidence Approach for Evaluating Ecological Risks. Menzie et al., 1996. Human and Ecological Risk Assessment. Vol. 2, No. 2, pp.. 277-304.

i. Issuance of Final Guidance: Ecological Risk Assessment and Risk Management Principles for Superfund Sites. OSWER Directive 9285-7-28P. October 1999.

At a minimum, a qualitative study shall be conducted to determine the basic environmental characteristics at the Site, and to identify and characterize ecological communities, habitat types, and species, which are present on or surrounding the Site. The assessment shall also include a discussion of the potential exposure pathways based upon the Site Characterization, combined with the qualitative study. If necessary, further qualitative or quantitative assessments, bioassays, or tissue sampling may be required to support an ecological risk assessment, or to better determine the actual impact of the Site on the environment. A discussion of the impacts of proposed remedial alternatives shall be included.

Specific attention shall be placed on the Section 404(b)(1) Guidelines of the Clean Water Act regarding wetlands. Specifically, Executive Order 11990 "Protection of Wetlands", May 24, 1977, concerns all impacts to wetlands and Executive Order 11988 "Floodplain Management" is involved where actions are to be evaluated in regard to projects which may impact a floodplain. Additionally, the Rhode Island Rules and Regulations Governing the Freshwater Wetlands Act, (12-100-003), August 1990, as full compliance with these guidelines shall be required in implementing the remedial action.

2. Work Plan Requirements

The Respondent shall submit a plan for an ecological assessment as part of the FSP. This plan shall contain an evaluation of the applicability of the following elements, and a plan to implement those elements determined to be applicable: (Note: for items a. and b. below, assessment of wetland functions and values shall be performed using Army Corps of Engineers methodology.)

a. i) an accurate delineation of the wetland boundary using the Federal Manual for Identifying and Delineating Jurisdictional Wetlands (USGPO 024-010-00683-8), and classification of the wetland types using the Classification of Wetlands and Deepwater Habitats of the United States (FWS/OBS-79/31, US Fish and Wildlife Service, 1979) and determination of the functions and values of the wetland.
ii) an accurate description and delineation of the ten year and hundred year floodplain, and the wetland buffer zone as defined by regulations enforced by the State of Rhode Island;

b. a description of all potential habitat types including a list of plant and animal species, both resident and transient, on and abutting to the study area;

c. a determination of the status of those species identified in terms of sport or commercial usage, protected status, endangered, threatened, or of special concern;

d. sampling of environmental receptors for analysis of community composition, abundance, or body burden of contaminants;

e. sampling of chemical and physical parameters (e.g., grain size, total organic carbon, dissolved oxygen, etc.);

f. toxicity testing of indicator species to determine acute and chronic effects of contaminated media on the environment;

g. an evaluation of how the contamination from the Site has affected the receptors, including a discussion of fate and transport of the contaminants to the various habitat types or organisms residing within and near field to the study area;

h. an evaluation of whether contamination has affected the health of the wetland (e.g., reduced plant growth or vigor or contributed contaminants to the food web); and

i. a discussion of how each remedial alternative under consideration affects the wetland, biota, and their functions and values.

3. Reporting Requirements and Interim Deliverables

Much like the Human Health Baseline Risk Assessment described above, the Ecological Risk Assessment shall also be developed through a series of Interim Deliverables. The three Interim Deliverables are: Problem Formulation Statement, Risk Analysis, and Risk Characterization. Each of these deliverables shall presented in draft for review and approval.

a. Interim Deliverable 1--Problem Formulation Statement

Based upon the above, the Respondent shall prepare a Problem Formulation Statement. Much of the Problem Formulation stage for the Ecological Assessment can be performed during the development of the investigations being conducted and/or by consultation with EPA, RIDEM, USFWS, NOAA (the Trustees), and/or ACOE. The components of the ecological scope and the requirements for the Ecological Assessment are outlined below.

Definition of "Stressors": The primary stressor(s) identified as a contaminant(s) of concern shall be identified. The Ecological Assessment shall conduct a review of all data collected in the Initial Site Characterization, in consultation with EPA and the Trustees to determine the final list of COCs which shall be carried forward. Potential COCs that may be anticipated, based on the previous and very preliminary monitoring conducted within the site study area, may include, but would not be limited to, metals (arsenic, copper, lead, barium, chromium, zinc, cadmium, and mercury), and semi-volatile organics (polychlorinated biphenyls, naphthalene, dimethyl phthalate, dieldrine, and acetophenone).

Ecosystem Potentially at Risk: The ecosystem potentially at risk includes the Blackstone River and its associated riverine sediments, bank deposits, wetlands, and floodplain.

Selection of Assessment Endpoints: Assessment endpoints must be defined in the Ecological Assessment. Assessment endpoints are explicit expressions of the actual environmental value that is to be protected. Well-defined assessment endpoints provide clear direction for the risk characterization, promote clear communication of risks, and reduce the uncertainties in the assessment.

Measures of Exposure and Measures of Effect: The definition of measurement for the exposure and effect endpoints will be developed and discussed in this Interim Deliverable. Measurement exposure and effect are measurable responses to a stressor that are related to the valued characteristics chosen as the assessment endpoints.

Conceptual Model Development: The conceptual model will be developed in the Ecological Assessment based upon stressors, ecosystem at risk and assessment and measurement endpoints. The model will tie together the measurement endpoints with the appropriate assessment endpoints. The "weight of evidence" (e.g., Menzie et al., 1996) attributes will be used to evaluate the measurement endpoints and their relationship to assessment endpoints.

Each measurement endpoint will be evaluated using the weight of evidence attributes to estimate the relative strengths, weaknesses, and uncertainties. This will provide an estimate of how data may be considered during the weighing of the lines of evidence during the risk characterization.

b. Interim Deliverable 2– Risk Analysis

The analysis stage focuses on the technical evaluation of the data, characterizing ecological effects and exposure.

The Analysis section of the Ecological Assessment will contain the following information:

Characterization of Exposure

- Summary of sediment, water and biota data, including tabular or graphical displays;
- Definition of any equations, statistics or other procedures or assumptions for each appropriate measurement endpoint, where needed; and
- Discussion of uncertainties.

Characterization of Ecological effects

- Discussion of primary and secondary ecological effects associated with COCs, receptors, and mode of exposure;
- Definition of reference toxicity values (RTVs) defining the stressor/response relationship for COCs for each appropriate measurement endpoint, where needed; and
- Discussion of extrapolations and other assumptions, and uncertainties associated with the ecological effects.

The Respondent shall meet with EPA, Trustees and Rhode Island Department of Environmental Management (RIDEM) after the development of initial analysis phase assumptions and submission of an interim deliverable summarizing these assumptions. This deliverable is not expected to incorporate the full discussion of the analysis component of the Ecological Assessment, but should present succinctly the assumptions, RTVs, formulas, etc. that will be used in generating the analysis section. This interim deliverable will be revised following receipt of EPA, Trustee and RIDEM comments.

c. Interim Deliverable 3--Risk Characterization and Development of the Draft Ecological Assessment Report

The final phase of the Ecological Assessment, risk characterization, evaluates the likelihood of adverse effects occurring as the result of the exposure of the receptors to the stressors, as defined in the assessment and measurement endpoints. There are two

primary components of this phase; an estimation of the risks, and a description and interpretation of the risks, using the weight of evidence (e.g., Menzie et al., 1996) approach and including a full discussion of uncertainties.

The Draft Ecological Assessment will evaluate, for each measurement endpoint, the relevant data according to the approach defined in the conceptual model. The uncertainties specific to each estimate will be fully outlined.

The risk description section summarizes all of the risk estimates, discusses the evidence supporting the estimates (weight of evidence), and interprets the significance of the evidence, resulting in a finding regarding the baseline ecological risks.

Utilizing all assessment endpoints, the Ecological Assessment will include an evaluation of the evidence of risk and the relative significance of the evidence with regard to nature, magnitude, spatial, and temporal characteristics of the response(s), and the uncertainties surrounding the responses. The discussion should culminate in a finding of the baseline ecological risk.

d. Draft Final Ecological Assessment Report

The Respondent shall prepare and submit a Draft Final Ecological Assessment revised in response to EPA, Trustee and RIDEM comments on above described Interim Deliverables. A Final Ecological Assessment revised in response to EPA, Trustee, and RIDEM comments of the Draft Final Ecological Assessment shall be incorporated into the draft Remedial Investigation Report.

H. Long-Term Monitoring and Sampling

1. Objectives

The Respondent shall monitor the soil and water, as necessary to comply with the NCP and CERCLA guidance, to determine the long-term changes in the nature, extent, quantity, seasonal variability, climatological influence, environmental fate and transport, background levels, and migration pathways for each contaminant at the Site. Long-term-monitoring and sampling shall commence with the completion of RI/FS field work and continue, as needed, to the issuance of the ROD. A work plan for long-term monitoring, if required by the Agency, shall be delivered with the Feasibility Study.

2. Work Plan Requirements

The Respondent shall submit a plan for periodically sampling and monitoring contaminants in ground water, leachate, surface water, sediments and residential wells on a long-term basis. The Long-Term Monitoring and Sampling Plan shall be submitted at the same time as the FS, if required. The plan shall include provisions for needed

expansions of the type, quantity, and coverage of the monitoring.

The plan shall also include a thorough discussion of the statistical and mathematical techniques to be used in comparing the results of each sampling round to previous sampling results. Notable differences shall be explained and resolved by repeating sampling and analyses, if necessary. The plan shall be consistent with the procedures and requirements established in the Project Operations Plan (Section 2), the overall objectives (Section 1), and the other components of the site characterization (Section 3). The plan shall accommodate expansion, including further studies that may be required by EPA. The plan shall also allow EPA review before deviating from the original work plan specifications for field work.

3. Reporting Requirements

Results shall be presented after the sampling and in accordance with the procedures described in the Project Operations Plan (Section 2). Results of each round of sampling shall be statistically and mathematically compared with results of previous rounds. Deviations and trends shall be illustrated and explained.

I. Treatability and Pilot Studies

1. Objectives

The objective of the treatability and pilot studies is to obtain the information necessary to evaluate the effectiveness of potential remedial treatment technologies. The Respondent shall, if required by the Agency, conduct laboratory-scale simulations of treatment processes to evaluate the treatability of contaminated ground water, surface water, soils, and other environmental media. In any treatability and/or pilot studies, the Respondent shall evaluate treatment options, including biological treatments, physical separation, chemical conditioning, and in situ treatments.

The data from additional sampling programs and previously published data on the Site may be sufficient to develop a well-designed pilot program. Before dynamic modeling, bench-scale tests may be performed to establish the "preliminary" treatability of contaminated media. Through the bench-scale tests, the Respondent may initially evaluate the applicability of treatments. Treatability studies to determine the most effective technologies to remediate the contaminant plume and protect the public water supplies shall be initiated as early as possible but no later than the Post Screening Field Investigation (Phase 2 RI, Phase 2 FS).

The treatability studies may be conducted anytime during the RI upon approval of EPA. EPA may require treatability or pilot studies at any time during the RI/FS.

2. Work Plan Requirements

The Respondent shall, if required by the Agency, prepare a work plan for the treatability and pilot studies and shall include this in the Work Plan for the RI/FS. A Treatability Study Work Plan shall be submitted to EPA for approval prior to the performance of treatability and pilot studies or upon the request of EPA. The Treatability Study Work Plan must clearly define the purpose of the study and include a detailed test plan including drawings and a step-by-step procedure, if applicable.

3. Reporting Requirements

Results of treatability and pilot studies shall be submitted to EPA in the form of a report describing methods, analyses, and results.

V. PHASE 1A DELIVERABLES

A. Initial Site Characterization Report

The Respondent shall submit an Initial Site Characterization Report for Agency review. The Respondent shall include also include the information required by this section in the Remedial Investigation Report. Deficiencies in satisfying the objectives shall be clearly stated in the Post Screening Work Plan. During the course of the Respondent shall provide compilations of data and other facts in technical memoranda as data is gathered and findings are made which directly impacts the progress of the RI/FS. Data shall be presented in formats that can accommodate the results of additional studies. To the extent practical, the Respondent shall provide data compilations on computer data bases that are compatible with those used by EPA Region I. The Respondent shall work closely with EPA during the development of the data bases and follow required data presentation requirements as described in section IV. F above relating to Risk Assessment.

B. Phase 1B Work Plan

Based on data gaps identified during the Initial Site Characterization, the Respondent shall include the studies necessary to satisfy the objectives of this section and the completion of a Feasibility Study in the Post Screening Work Plan.

SECTION 4: PHASE 1B FIELD WORK

I. OBJECTIVES

The Respondent shall use the information that has been collected to date to generate the following deliverables:

A. Draft Remedial Investigation Report;

B. Development and Initial Screening of Alternatives Report; and

C. Post-Screening Field Investigation Work Plan.

II. THE DEVELOPMENT AND INITIAL SCREENING OF ALTERNATIVES

A. Development of Alternatives

The Respondent shall develop an appropriate range of waste management options in a manner consistent with the National Contingency Plan (NCP) (40 CFR Part 300), the Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (OSWER Directive 9355.3-01), Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites (OSWER 9355.3-11), and any format or guidance provided by EPA, Region I. Alternatives for remediation shall be developed by assembling combinations of technologies (including innovative ones) and the media to which they would be applied, into alternatives that address contamination at OU-2.

1. Objectives

Alternatives shall be developed that:

a. protect human health and the environment by recycling waste or by, eliminating, reducing, and/or controlling risks to human health and the environment posed through each pathway at the Site;

b. consider the long-term uncertainties associated with land disposal;

c. consider the goals, objectives, and requirements of the Solid Waste Disposal Act and the Rhode Island Solid Waste Regulation #2, Solid Waste Landfills;

d. consider the persistence, toxicity, mobility, and propensity to bioaccumulate of hazardous substances and their constituents;

e. consider the short and long term potential for human exposure;

f. consider the potential threat to human health and the environment if the remedial alternative proposed was to fail; and

g. consider the threat to human health and the environment associated with the excavation, transportation, and re-disposal or containment of contaminated substances and/or media.

2. Development

In addition, the Respondent shall perform, at a minimum, the following activities:

a. development of remedial action objectives specifying the contaminants and media of concern, potential exposure pathways, and preliminary remediation goals that are based on chemical specific ARARs, EPA risk assessments, and Site characterization data;

b. development of response actions for each media of interest defining engineering controls, treatment, excavation, pumping, or other actions, separately and in combinations;

c. identification of volumes or areas of media to which response actions shall apply;

d. identification and screening of technologies, including innovative ones, that would be applicable to each response action;

e. identification and evaluation of technology process options;

f. assembly of the selected technologies into alternatives representing a range of treatment and containment options; and

g. identification and evaluation of all the handling, treatment, and final disposal of all treatment residuals (e.g., ash, decontaminated soil, sludge, decontamination fluids).

B. Initial Screening of Alternatives

1. Criteria

In screening the alternatives, the Respondent shall consider, but not be limited to, the short and long term aspects of the following three criteria:

Effectiveness. This criterion focuses on the degree to which an alternative reduces toxicity, mobility, or volume through treatment; minimizes residual risks and affords

long term protection; complies with ARARs, and minimizes short-term impacts. It also focuses on how quickly the alternative achieves protection with a minimum of short term impact in comparison to how quickly the protection shall be achieved.

Implementability. This criterion focuses on the technical feasibility and availability of the technologies that each alternative would employ and the administrative feasibility of implementing the alternative.

Cost. The costs of construction and any long-term costs to operate and maintain the alternatives shall be considered.

2. Range of Alternatives

The Respondent shall develop a series of alternatives for the site including, but not limited to, the following:

a. An alternative that throughout the entire soil, source, and/or groundwater plume reduces the contaminant concentrations to meet or exceed all MCLs, ARARs, and a 10^{-6} excess cancer risk. It shall achieve this objective as rapidly as possible and must be completed in less than ten (10) years and shall require no long term maintenance.

b. A no action alternative that would rely solely upon natural attenuation to meet clean-up standards. This may be "no further action", if some removal or remedial action has already occurred at the Site.

c. For source control actions, as appropriate:

   i. A range of alternatives in which treatment that reduces the toxicity, mobility, or volume of the hazardous substances, pollutants, or contaminants is a principal element. As appropriate, this range shall include an alternative that removes or destroys hazardous substances, pollutants, or contaminants to the maximum extent feasible, eliminating or minimizing, to the degree possible, the need for long-term management. The Respondent also shall develop, as appropriate, other alternatives which, at a minimum, treat the principal threats posed by the Site but vary in the degree of treatment employed and the quantities and characteristics of the treatment residuals and untreated waste that must be managed; and

   ii. One or more alternatives that involve little or no treatment, but provide protection of human health and the environment primarily by preventing or controlling exposure to hazardous substances, pollutants, or contaminants through engineering controls, for example, containment,

and, as necessary, institutional controls to protect human health and the environment and to assure continued effectiveness of the response action.

d. For groundwater response actions, the Respondent shall develop a limited number of remedial alternatives that attain site-specific remediation levels within different restoration time periods utilizing one or more different technologies if they offer the potential for comparable or superior performance or implementability; fewer or lesser adverse impacts than others available approached; or lower costs for similar levels of performance than demonstrated treatment technologies.

The Respondent shall give special consideration to innovative technologies. One or more such technologies shall be evaluated beyond the initial screening.

An alternative that involves no need for long-term maintenance and the no action alternative shall be carried through the development and screening and shall be analyzed during the Detailed Analysis of Alternatives.

C. Reporting

All alternatives shall be presented in the Development and Initial Screening Report (see next section). If an alternative is to be eliminated it must be screened out for clearly stated reasons contained in the NCP (40 CFR Part 300) and other EPA guidance.

III. PHASE 1B DELIVERABLES

A. Development and Initial Screening of Alternatives Report

Development and Initial Screening of Alternatives Report shall be submitted to EPA for review as a Phase 1B deliverable. The report shall contain a chart of all alternatives and the analysis of the basic factors described in Section 4, II. The report shall justify deleting, refining, or adding alternatives. It shall also identify the data needed to select a remedy and the work plans for studies designed to obtain the data. The deliverable may also include a summary report of Phase 1B field work results, and revised Baseline Risk Assessments as may be required to resolve Phase 1B results and conclusions. The report shall contain charts, graphs, and other graphics to display the effectiveness of the alternatives including but not limited to:

1. maps showing the three-dimensional extent of contamination across the Site;

2. maps showing equal concentration lines for various potential soil clean-up levels and correlated to the 10^{-4} through 10^{-6} cancer risks;

3. graphs of soil volume to be treated or removed plotted against concentration; and

4. graphs showing the predicted concentration reduction over time for potential ground water remedial alternatives.

B. Draft RI

A Draft Remedial Investigation Report (Draft RI) shall be prepared by the Respondent and submitted to EPA for review as a Phase 1B deliverable. The Draft RI shall describe and display in appropriate maps, tables, and figures, any results from the pre- RI/FS sampling, the Phase 1A and Phase 1B Field Investigations. The Draft RI shall include the Site Characterization Report which shall consider, and if appropriately valid, use of all available pre-RI/FS, Phase 1A, Phase 1B, and government field sample results. The Draft RI shall meet the requirements and objectives of the National Contingency Plan, the Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (EPA/540/G-89/004, OSWER Directive 9355.3-01, October 1988), and Sections 1, 2, 3, and 4 of this Statement of Work.

C. Post-Screening Field Investigation Work Plan

A Post-Screening Field Investigation Work Plan shall also be prepared by the Respondent and submitted to EPA for review as a Phase 2B deliverable. Alternatives, particularly those involving innovative technologies, may require additional field investigations to obtain data needed for the further evaluation of Site characteristics and the detailed analysis of alternatives. The Post-Screening Field Investigation Work Plan (Phase 2 RI), if required by the Agency, shall include, but not be limited to:

a. supplemental literature searches to obtain additional data on treatment technologies;

b. bench and pilot scale treatability tests, as necessary to comply with the NCP and CERCLA guidance; and

c. the collection of additional field data to assess further the characteristics of the Site.

The Post-Screening Field Investigation Work Plan shall conform to the objectives, procedures, and methods described in Sections 1-4 of the Statement of Work. The investigations shall include the collection of data needed to evaluate the effectiveness of the remedial alternatives, conceptually design remedial actions, select a remedy, and sign a record of decision. In the Post-Screening Field Investigation Work Plan the Respondent shall describe the methods and procedures to be followed to perform field investigations necessary to fill the remaining data gaps. If the Respondent believe that no further field investigations are necessary, they must provide an explanation of how the previous studies fulfilled all of the data objectives and requirements of the National Contingency Plan and the Statement of Work. The EPA shall have the final authority to determine if further field investigations are necessary to comply with the NCP and CERCLA guidance.

SECTION 5: POST-SCREENING FIELD INVESTIGATION AND DETAILED ANALYSIS OF ALTERNATIVES

I. OBJECTIVES

The purpose and objective of this phase of the OU 2 RI/FS is to provide for the information required to fill all relevant data gaps and to provide information necessary to perform the Detailed Analysis of Alternatives and the preparation of the first draft RI/FS. This may include, but not be limited to, bench and pilot studies of potential technologies, literature searches, and field investigations. Field investigations must be performed by the Respondent, if information relevant to the selection of a remedial action alternative is not sufficient to perform a Detailed Analysis of Alternatives that shall result in a remedy consistent with the National Contingency Plan. The Respondent must also perform additional field investigations if new areas of concern are identified that require characterization to accurately define the Site boundaries.

II DETAILED ANALYSIS OF ALTERNATIVES

A. Analysis

The detailed analysis of alternatives consists of an assessment of individual alternatives against each of the nine (9) evaluation criteria and a comparative analysis that focuses upon the relative performance of each alternative against those criteria. The analysis shall be consistent with the National Contingency Plan (NCP) (40 CFR Part 300) and shall consider the Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (OSWER Directive 9355.3-01). The nine criteria are as follows:

1. Overall protection of human health and the environment
2. Compliance with ARARs
3. Long term effectiveness and permanence
4. Reduction of toxicity, mobility, or volume through treatment
5. Short term effectiveness
6. Implementability
7. Cost
8. State Acceptance
9. Community Acceptance

Criteria one (1) and two (2) from the above list are considered threshold criteria. This means that an alternative must meet these two (2) criteria or must contain a statutory basis for waiving compliance with specific ARARs in order for it to be eligible for selection. Criteria three (3) through seven (7) on the above list are considered primary balancing criteria. These five (5) criteria are used to further evaluate alternatives that satisfy the threshold criteria. The final two

(2) criteria, state acceptance and community acceptance, are modifying criteria that shall be considered by EPA in remedy selections.

B. Reporting

The Detailed Analysis of alternatives report, which shall be presented in the FS, shall contain the following:

1. further definition of each alternative with respect to the volumes or areas of contaminated media to be addressed, the technologies to be used, and any performance requirements associated with those technologies;

2. a process scheme for each alternative which describes how each process stream, waste stream, emission residual, or treatment product shall be handled, treated and/or disposed;

3. an assessment and a summary profile of each alternative against the nine (9) evaluation criteria; and

4. a comparative analysis among the alternatives to assess the relative performance of each alternative with respect to each evaluation criterion.

In addition, since the containment of the waste material through capping will be among the alternatives retained for detailed analysis, the Respondent must include a discussion as to how the combination of source control and management of migration will prevent contamination from leaving the waste management unit. The discussion will also focus upon the time frame required to reach compliance with M.C.L. and other cleanup goals at the edge of the waste management unit. Any alternative which leaves the waste in place must also consider institutional controls which will ensure that the effectiveness of the remedy is maintained.

Even if the groundwater is contained within the waste management unit, the Respondent shall evaluate alternatives that will remediate the contamination that has migrated from the Site, if such alternatives are found to be practicable.

III. DELIVERABLES FROM POST-SCREENING FIELD INVESTIGATIONS

A. Draft RI/FS

Respondent shall submit a complete Draft Remedial Investigation/Feasibility Study to EPA for review after completing the Post-Screening Field Investigation. This and any subsequent drafts of the RI/FS shall conform to the N.P. (40 CFR Part 300), the Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (EPA/540/G-89/004, OSWER

Directive 9355.3-01, October 1988), and any additional format, guidance, or examples provided by EPA. The FS section shall include a chart that delineates each criteria listed in Section 5.II for each alternative. Other graphics shall be included that allow for comparisons of multiple alternatives at various risk, cost, and clean-up levels of soil, sediment, or water. These may include but are not limited to graphs of the cost of potential remediation alternatives plotted against a range of soil clean-up levels; graphs of soil/sediment/waste volumes plotted against a range of soil clean-up volumes; and projected ground water and surface water concentrations plotted against time for ground water and surface water alternatives. The Respondent shall compare the alternatives by using the listed criteria and other appropriate criteria consistent with the National Contingency Plan and all previous Sections of this Statement of Work.

B. Work Plan

If EPA or the Respondent deem that additional studies are needed, the Respondent shall submit a work plan for approval by EPA, and perform the studies consistent with an EPA approved work plan.

SECTION 6: ALL REMEDIAL INVESTIGATION/FEASIBILITY STUDY DRAFTS, REVIEWS, AND REVISIONS

The Respondent shall be prepared to submit work plans and perform studies and/or revise the RI/FS until approval of the RI/FS is received from EPA. Following EPA comments on the Draft RI/FS, the Respondent shall prepare a Final RI/FS incorporating all EPA comments and requested changes which EPA determines is satisfactory for public comment.

The Final Remedial Investigation/Feasibility Study shall be submitted for public comment by EPA. EPA may, subject to the public comments received, require the Respondent to revise or update portions of the RI/FS to accommodate such public comments.

After the public comment period, the Respondent shall assist EPA in preparing a responsiveness summary. This assistance shall include, but not be limited to, providing EPA with draft responses to any comments provided by EPA to the Respondent within two weeks of the date EPA provides the comments to the Respondent. If EPA seeks assistance from the Respondent to numerous technical or extensive comments and an extension is requested, EPA shall extend the two week deadline by an appropriate time period.

ATTACHMENT 1

Description of Requirements for the Projection Operations Plan

I. Project Operations Plan

Before commencing the RI/FS field activities, several site-specific plans shall be written to establish procedures to be followed by the Respondent in performing field, laboratory, and analysis work and community and agency liaison activities. These site-specific plans include the:

1) Site Management Plan;
2) Sampling and Analysis Plan (SAP) which includes the Field Sampling Plan (FSP) and the Quality Assurance Project Plan (QAPP);
3) Health and Safety Plan (HSP); and
4) Community Relations Support Plan.

The Respondent shall combine these plans to prepare the Project Operations Plan (POP). The POP is part of the Work Plan for the RI/FS. The POP is subject to EPA review, subsequent requests by EPA for revision, and rewriting by the Respondent before the commencement of RI field work at the Site. The four components of the POP are discussed below.

The Respondent shall modify the format and scope of each plan as needed to describe the sampling, analyses, and other activities that are clarified as the RI/FS progresses. These activities include on-site pilot studies of remedial treatment methods, laboratory bench scale studies, and subsequent rounds of field sampling. EPA may modify the scopes of these activities at any time during the RI/FS at the discretion of EPA in response to the evaluation of RI/FS results, changes in RI/FS requirements, and other developments or circumstances.

1. Site Management Plan

The overall objective of the Site Management Plan is to provide EPA with a written understanding and commitment of how various project aspects such as access, security, contingency procedures, management responsibilities, waste disposal, budgeting, and data handling are being managed by the Respondent. As part of the plan, the Respondent shall include, at a minimum:

a. a map and list of properties, the current property owners, and addresses of owners to whose property access may be required;

b. a clear indication of the exclusion zone, contamination reduction zone, and clean area for on-site activities;

c. necessary procedures and sample letters, for EPA review and approval, to land owners to arrange field activities and to ensure EPA and RIDEM are abreast of access-related problems and issues;

d. a provision for the security of government and private property on the Site;

e. measures to prevent unauthorized entry to the Site, which might result in exposure of persons to potentially hazardous conditions;

f. the location of a field office for on-site activities;

g. contingency and notification plans for potentially dangerous activities associated with the RI/FS;

h. provision for the monitoring of airborne contaminants released by Site activities which may affect the local populations;

i. communication to EPA, State and local governments, (and the public as may be requested by EPA) the organization and management of the RI/FS, including key personnel and their responsibilities;

j. a list of potential contractors and subcontractors of the Respondent in the RI/FS and a description of their activities and roles;

k. provisions to provide regular financial reports of Respondent expenditures on RI/FS activities to EPA (EPA-NE, in its sole discretion, may elect to waive such requirement);

l. provision for the proper disposal of materials used and wastes generated during the RI/FS (e.g., drill cuttings, extracted ground water, protective clothing, disposable equipment). These provisions shall be consistent with the offsite disposal aspects of SARA, RCRA, and applicable state laws. The Respondent, a representative of the Respondent, or another party acceptable to EPA shall be identified as the generator of wastes for the purpose of regulatory or policy compliance; and

m. plans and procedures for organizing, manipulating, and presenting the data generated and for verifying its quality before and during the RI/FS. These plans shall include the description of the proposed computer data base management system that is compatible with hardware and software available to EPA Region I personnel for handling media-specific sampling results obtained before and during the RI/FS. The description shall include data input fields, appropriate quality assurance/quality control to ensure accuracy, and capabilities of data manipulation. To the degree possible, the data base management parameters shall be compatible with the EPA Region I data storage and analysis system. Most importantly, a risk assessment data base shall be instituted and revised accordingly throughout the RI/FS process in accordance with Risk Assessment

Guidance for Superfund (RAGS) Volume 1-Human Health Evaluation Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments), OSWER 9285.7-01D-1, January, 1998 (AKA: the "TARA" Tables) which will require electronic data transfer capabilities (LOTUS ® and EXCEL® formats) of summary level site-specific risk information for a National Superfund Database.

2. Sampling and Analysis Plan (SAP)

The purpose of the Sampling and Analysis Plan is to ensure that sampling data collection activities will be comparable to and compatible with previous data collection activities performed at the site while providing a mechanism for planning and approving field activities.

The overall objectives of the sampling and analysis plan are as follows:

a. to document specific objectives, procedures, and rationales for field work and sample analytical work;

b. to provide a mechanism for planning and approving site and laboratory activities;

c. to ensure that sampling and analysis activities are necessary and sufficient; and

d. to provide a common point of reference for all parties to ensure the comparability and compatibility of all objectives and of sampling and analysis activities.

The first SAP shall be the framework of all anticipated field activities (e.g., sampling objectives, evaluation of existing data, standard operating procedures) and contain specific information on the Phase 1A field work (e.g., sampling locations and rationale, sample numbers and rationale, analyses of samples). During the RI/FS, the SAP shall be revised as necessary to cover each round of field or laboratory activities. Revisions or a statement regarding the need for revisions shall be included in each deliverable describing new field work, including the Phase 1B Work Plan and the Post-Screening Field Investigation Work Plan.

The SAP consists of two parts: (1) a Quality Assurance Project Plan (QAPP) and (2) the Field Sampling Plan (FSP). Components of these two individual plans are described in the following sections. In addition, the FSP and QAPP should be submitted as a single document (although they may be bound separately to facilitate use of the FSP in the field).

Guidance on the topics covered in the QAPP and FSP and their integration into each of these plans and the integration of the QAPP and the FSP into the SAP can be found in the following several references and shall be used to develop the SAP:

Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (OSWER Directive 9355.3-01, EPA/540/G-89/004, October 1988);

Data Quality Objectives for Remedial Response Activities Development Process (OSWER Directive 9355.0-7, EPA/540/G-87/003, March 1987);

Draft Data Quality Objectives for Remedial Response Activities, Example Scenario: RI/FS Activities at a Site with contaminated Soil and Ground Water (OSWER Directive 9355.0-7B, EPA/540/G-87/002, March 1987); and

Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (EPA Pub. SW-846, Third Edition).

2A. Quality Assurance Project Plan (QAPP)

The Quality Assurance Project Plan (QAPP) shall document in writing site-specific objectives, policies, organizations, functional activities, and specific quality assurance/ quality control activities designed to achieve the data quality objectives (DQOs) of the RI/FS. The QAPP shall cover all environmentally related measurements. The QAPP developed for this project shall document quality control and quality assurance policies, procedures, routines, and specifications.

All project activities throughout the RI/FS shall comply with the QAPP. All QAPP sampling and analysis objectives and procedures shall be consistent with Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans (EPA, 1983 - EPA/QAMS 005/80) and appropriate EPA handbooks, manuals, and guidelines including Guidelines Establishing Test Procedures for the Analysis of Pollutants (40 CFR, Part 136).

The 16 basic elements of the QAPP are:

1) title page with provision for approval signatures of principal investigators;

2) table of contents;

3) project description;

4) project organization and responsibility;

5) quality assurance objectives for measurement data, in terms of precision, accuracy, completeness, representativeness, and comparability;

6) sampling procedures;

7) sample custody;

8) calibration procedures and frequency;

9) analytical procedures, which must be EPA approved or equivalent methods;

10) data reduction, validation, and reporting;

11) internal quality control checks and frequency;

12) performance and system audits and frequency;

13) preventive maintenance procedures and schedules;

14) specific routine procedures to be used to assess the precision, accuracy, and completeness of data and to assess specific measurement parameters involved;

15) corrective action; and

16) quality assurance reports to management.

As indicated in EPA/QAMS-005/80, the above list of essential elements must be considered in the QAPP for the RI/FS. If a particular element is not relevant to a project and therefore excluded from the QAPP, specific and detailed reasons for exclusion must be provided.

Information in a plan other than the QAPP may be cross-referenced clearly in the QAPP provided that all objectives, procedures, and rationales in the documents are consistent, and the reference material fulfills the requirements of EPA/QAMS-005/80.

EPA-approved references, or equivalent, or alternative methods approved by EPA shall be used, and their corresponding EPA-approved guidelines shall be applied when they are available and applicable.

Laboratory QA/QC Procedures

The QA/QC procedures for any laboratory used during the RI/FS shall be included in the Respondent's QAPP. When this work is performed by a contractor to a private party, each laboratory performing chemical analyses shall meet the following requirements:

1) be approved by the State Laboratory Evaluation Program, if available;

2) have successful performance in one of EPA's National Proficiency Sample Programs (i.e., Water Supply or Water Pollution Studies or the State's proficiency sampling program);

3) be familiar with the requirements of 48 CFR Part 1546 contract requirements for quality assurance; and

4) have a QAPP for the laboratory including all relevant analysis. This plan shall be referenced as part of the contractor's QAPP.

Data Validation Procedures

The Respondent are required to certify that all data has been validated by an independent person according to the Region I Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses and the Region I Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses (amended as necessary to account for the differences between the approved analytical methods for the project and the Contract Laboratory Procedures (CLP) procedures). Approved validation methods shall be contained in the QAPP.

The independent person shall not be the laboratory conducting the analyses and should be a person with a working knowledge of or prior experience with EPA data validation procedures. The independent person shall certify that the data has been validated, discrepancies have been resolved if possible, and the appropriate qualifiers have been provided.

The Respondent must keep the complete data package and make it available to EPA on request in order for EPA to conduct an independent validation audit of the data. The complete data package shall consist of all results, the raw data, and all relevant QA/QC information. An example set of data package deliverables is listed below.

1) a summary of positive results and detection limits of non-detects with all raw data;

2) tabulated surrogate recoveries and QC limits from methods 3500 and 8000 in SW-846 and all validation and sample raw data;

3) tabulated matrix spike/matrix spike duplicate recoveries, relative percent differences, spike concentrations, and QC limits from methods 3500 and 8000 in SW-846 and all validation and sample raw data;

4) associated blanks (trip, equipment, and method) with accompanying raw data for tests;

5) tabulated initial and continuing calibration results (concentrations, calibration factors or relative response factors and mean relative response factors, % differences and % relative standard deviations) with accompanying raw data;

6) tabulated retention time windows for each column;

7) a record of the daily analytical scheme (run logbook, instrument logbook) which includes samples and standards order of analysis;

8) the chain of custody for the sample shipment groups, SAS packing slip, SAS request forms;

9) a narrative summary of method and any problems encountered during extraction or analysis;

10) tabulated sample weights, volumes, and % solids used in each sample calculation;

11) example calculations for positive values and detection limits; and

12) SW-846 method 3500 and 8000 validation data for all tests.

The forms contained in Chapter 1 of SW-846 (Second Edition 1982 as amended by Update I, April 1984, and Update II, April 1985) must be utilized to report the data when applicable. Raw data includes the associated chromatograms and the instrument printouts with area and height peak results. The peaks in all standards and samples must be labeled. The concentration of all standards analyzed with the amount injected must be included.

2B. Field Sampling Plan (FSP)

The objective of the Field Sampling Plan is to provide EPA and all parties involved with the collection and use of field data with a common written understanding of all fieldwork. The FSP. shall address the RI/FS objectives and conform to the procedures in Section 2 of this document and the National Contingency Plan (NCP).

The FSP. shall define in detail the sampling and data gathering methods used on a project. The FSP. should be written so that a field sampling team unfamiliar with the Site would be able to gather the samples and field information required. Guidance for the selection of field methods, sampling procedures, and custody can be acquired from the Compendium of Superfund Field Operations Methods, (OSWER Directive 9355.0-12, EPA/540/P-87/001), which is a compilation of demonstrated field techniques that have been used during remedial response activities at hazardous waste sites.

The SAP shall specify in the FSP. provisions for notifying EPA four (4) weeks before initiation of field sampling or monitoring activities. The plan shall also allow split, replicate, or duplicate samples to be taken by EPA, RIDEM (or their contractor personnel), and by other parties approved by EPA. At the request of EPA or RIDEM, the Respondent shall provide these samples in appropriate containers to the government representatives.

The FSP. shall be site-specific and shall include the following information:

Site Background The analysis of the existing Site details must be included in the FSP. This analysis shall include a conceptual Site model. A conceptual Site model includes a description of the Site and surrounding areas and a discussion of known and suspected contaminant sources, probable transport pathways, and other information about the Site. The FSP shall also include descriptions of specific data gaps and ways in which sampling is designed to fill those gaps.

Sampling Objectives Specific objectives of a sampling effort that describe the intended uses of data must be clearly and succinctly stated.

Sample Location, Analytes, and Frequency This section of the sampling plan identifies each sample matrix to be collected and the constituents to be analyzed. Tables shall be used to clearly identify the number of samples to be collected along with the appropriate number of replicates and blanks. Figures shall be included to show the locations of existing or proposed sample points.

Sample Designation A sample numbering system shall be established. The sample designation should include the sample or well number, the sample round, the sample matrix (e.g., surface soil, ground water, soil boring), and the name of the Site.

Sampling Equipment and Procedures Sampling procedures must be clearly written. Step-by-step instructions for each type of sampling are necessary to enable the field team to gather data that shall meet the Data Quality Objectives (DQOs). A list should include the equipment to be used and the material composition (e.g., Teflon, stainless steel) of equipment along with decontamination procedures.

Sampling Handling and Analysis A table shall be included that identifies sample preservation methods, types of sampling jars, shipping requirements, and holding times. Examples of paperwork such as traffic reports, chain of custody forms, packing slips, and sample tags filled out for each sample as well as instructions for filling out the paperwork must be included. Field documentation methods including field notebooks and photographs shall be described.

Each Field Sampling Plan submitted as a part of the Work Plan for the RI/FS shall be sufficiently detailed to carry out the study, and shall provide data needed to fully address the objective of the study and to complete the study. Each study shall be designed to achieve a high performance on the first attempt. Each work plan shall be related (by cross-references) to the other requirements in the Project Operations Plan.

In the initial Field Sampling Plan for the RI/FS (Phase 1A), the Respondent shall include plans that describe how each of the following studies shall be done during the Initial Site Characterization. See Section 3 of this document to facilitate understanding of the type and quality of the deliverable required for each activity of the Site characterization.

1) site survey;

2) soils and sources of contaminants;

3) subsurface and hydrogeological factors;

4) air quality;

5) surface water and sediment sampling;

6) ecological assessment;

7) long-term monitoring and sampling; and

8) treatability and pilot studies.

The complete results of these studies shall be described in the Initial Site Characterization Report. The validated data from these studies and the Initial Site Characterization Report shall be submitted according to the schedule (Table I of this document).

3. Health and Safety Plan

The objective of the site-specific Health and Safety Plan (HSP) is to establish the procedures, personnel responsibilities, and training necessary to protect the health or safety of all on-site personnel during the RI/FS. The plan shall provide for routine but hazardous field activities and for unexpected Site emergencies.

The site-specific health or safety requirements and procedures in the HSP shall be based on an ongoing assessment of Site conditions, including the most current information on each medium. For each field task during the RI/FS, the HSP shall identify:

a. possible problems and hazards and their solutions;

b. environmental surveillance measures;

c. specifications for protective clothing;

d. the appropriate level of respiratory protection;

e. the rationale for selecting that level; and

f. criteria, procedures, and mechanisms for upgrading the level of protection and for suspending activity, if necessary.

The HSP should be organized so that information that is repeated for the field tasks is presented in a table. Information of this type organized in a table will enable personnel to access

appropriate information for each field task, and eliminate the need to page through each page of text.

The HSP shall also include the delineation of exclusion areas on a map and describe provisions for this delineation in the field. The HSP shall indicate the on-site person responsible for implementing the HSP as a representative of the Respondent, protective equipment, personnel decontamination procedures, and medical surveillance. The following documents shall be consulted:

Interim Standard Operations Safety Guides, (Hazardous Response Support Division, Office of Emergency and Remedial Response EPA, Wash. D.C. 1982);

Hazardous Waste Operations and Emergency Response, (Department of Labor, Occupational Safety and Health Administration, (OSHA) 29 CFR Part 1910); and

Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities: Appendix B, (NIOSH/OSHA/USCG/EPA 1985).

OSHA regulations at 40 CFR 1910 and Chapter 9 of the Interim Standard Operating Safety Guide, which describes the routine emergency provisions of a site-specific health and safety plan, shall be the primary reference used by the Respondent in developing and implementing the Health and Safety Plan.

The measures in the HSP shall be developed and implemented to ensure compliance with all applicable State and Federal occupational health and safety regulations. The HSP shall be consistent with the objectives and contents of all other plans submitted by the Respondent. The HSP shall be updated at the request of EPA during the course of the RI/FS, and as necessary.

4. Community Relations Support Plan (CRSP)

EPA shall develop a Community Relations Plan (CRP) to describe public relations activities anticipated during the RI/FS. The Respondent shall develop a Community Relations Support Plan, whose objective is to ensure and specify adequate support from the Respondent for the community relations efforts of EPA. This support shall be at the request of EPA and may include, at a minimum:

a. participation in public informational or technical meetings, including the provision of visual aids and equipment;

b. publication and copying of fact sheets or updates; and

c. assistance in preparing a responsiveness summary after the RI/FS public comment period.

ATTACHMENT 2
Regulations and Guidance Documents

The following list, although not comprehensive, comprises many of the regulations and guidance documents that apply to the RI/FS process and not otherwise mentioned within the body of this Statement of Work :

1. American National Standards Practices for Respiratory Protection. American National Standards Institute Z88.2-1980, March 11, 1981.
2. 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.
3. Community Relations in Superfund — A Handbook, U.S. EPA, Office of Emergency and Remedial Response, June 1988, OSWER Directive No. 9230.0-3B.
4. 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.
5. Construction Quality Assurance for Hazardous Waste Land Disposal Facilities, U.S. EPA, Office of Solid Waste and Emergency Response, October 1986, OSWER Directive No. 9472.003.
6. 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.
7. Engineering Support Branch Standard Operating Procedures and Quality Assurance Manual, U.S. EPA Region IV, Environmental Services Division, April 1, 1986 (revised periodically).
8. EPA NEIC Policies and Procedures Manual, EPA-330/9-78-001-R, May 1978, revised November 1984.
9. Federal Acquisition Regulation, Washington, DC: U.S. Government Printing Office (revised periodically).
10. Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final, U.S. EPA, Office of Emergency and Remedial Response, October 1988, OSWER Directive NO. 9355.3-01.
11. Guidance on EPA Oversight of Remedial Designs and Remedial Actions Performed by Potential Responsible Parties, U.S. EPA Office of Emergency and Remedial Response, EPA/540/G-90/001, April 1990.
12. Guidance on Expediting Remedial Design and Remedial Actions, EPA/540/G-90/006, August 1990.
13. Guidance on Remedial Actions for Contaminated Ground Water at Superfund Sites, U.S. EPA Office of Emergency and Remedial Response (DRAFT), OSWER Directive No. 9283.1-2.
14. Guide for Conducting Treatability Studies Under CERCLA, U.S. EPA, Office of Emergency and Remedial Response, Prepublication version.
15. Guide to Management of Investigation-Derived Wastes, U.S. EPA, Office of Solid Waste and Emergency Response, Publication 9345.3-03FS, January 1992.
16. Guidelines and Specifications for Preparing Quality Assurance Project Plans, U.S. EPA, Office of Research and Development, Cincinnati, OH, QAMS-004/80, December 29, 1980.
17. Health and Safety Requirements of Employees Employed in Field Activities, U.S. EPA, Office of Emergency and Remedial Response, July 12, 1982, EPA Order No. 1440.2.
18. Interim Guidance on Compliance with Applicable of Relevant and Appropriate Requirements, U.S. EPA, Office of Emergency and Remedial Response, July 9, 1987, OSWER Directive No. 9234.0-05.
19. Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans, U.S. EPA, Office of Emergency and Remedial Response, QAMS-005/80, December 1980.
20. Methods for Evaluating the Attainment of Cleanup Standards: Vol. 1, Soils and Solid Media, February 1989, EPA 23/02-89-042; vol. 2, Ground water (Jul 1992).
21. National Oil and Hazardous Substances Pollution Contingency Plan; Final Rule, Federal Register 40 CFR Part 300, March 8, 1990.
22. NIOSH Manual of Analytical Methods, 2nd edition. Volumes I-VII for the 3rd edition, Volumes I and II, National Institute of Occupational Safety and Health.
23. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, National Institute of Occupational Safety and Health/Occupational Health and Safety Administration/United States Coast Guard/Environmental Protection Agency, October 1985.
24. Permits and Permit Equivalency Processes for CERCLA On-Site Response Actions, February 19, 1992, OSWER

Directive 9355.7-03.
25. Procedure for Planning and Implementing Off-Site Response Actions, Federal Register, Volume 50, Number 214, November 1985, pages 45933-45937.
26. Procedures for Completion and Deletion of NPL Sites, U.S. EPA, Office of Emergency and Remedial Response, April 1989, OSWER Directive No. 9320.2-3A.
27. Quality in the Constructed Project: A Guideline for Owners, Designers and Constructors, Volume 1, Preliminary Edition for Trial Use and Comment, American Society of Civil Engineers, May 1988.
28. Remedial Design and Remedial Action Handbook, U.S. EPA, Office of Emergency and Remedial Response, June 1995, OSWER Directive No. 9355.5-22.
29. Scoping the Remedial Design (Fact Sheet), February 1995, OSWER Publ. 9355-5-21 FS.
30. Standard Operating Safety Guides, U.S. EPA, Office of Emergency and Remedial Response, November 1984.
31. Standards for the Construction Industry, Code of Federal Regulations, Title 29, Part 1926, Occupational Health and Safety Administration.
32. Standards for General Industry, Code of Federal Regulations, Title 29, Part 1910, Occupational Health and Safety Administration.
33. Structure and Components of 5-Year Reviews, OSWER Directive No. 9355.7-02, May 23, 1991. [Guidance, p. 3-5]
34. Superfund Guidance on EPA Oversight of Remedial Designs and Remedial Actions Performed by Potentially Responsible Parties, April 1990, EPA/540/G-90/001.
35. Superfund Remedial Design and Remedial Action Guidance, U.S. EPA, Office of Emergency and Remedial Response, June 1986, OSWER Directive No. 9355.0-4A.
36. Superfund Response Action Contracts (Fact Sheet), May 1993, OSWER Publ. 9242.2-08FS.
37. TLVs-Threshold Limit Values and Biological Exposure Indices for 1987-88, American Conference of Governmental Industrial Hygienists.
38. Treatability Studies Under CERCLA, Final. U.S. EPA, Office of Solid Waste and Emergency Response, EPA/540/R-92/071a, October 1992.
39. USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis, U.S. EPA, Office of Emergency and Remedial Response, July 1988.
40. USEPA Contract Laboratory Program Statement of Work for Organic Analysis, U.S. EPA, Office of Emergency and Remedial Response, February 1988.
41. User's Guide to the EPA Contract Laboratory Program, U.S. EPA, Sample Management Office, August 1982.
42. Value Engineering (Fact Sheet), U.S. EPA, Office of Solid Waste and Emergency Response, Publication 9355.5-03FS, May 1990.

ATTACHMENT # 3

Bibliography of Selected EPA Guidance Documents and Directives on Risk Assessment

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U.S. ENVIRONMENTAL PROTECTION AGENCY

EPA Human Health Risk Assessment

- *Risk Assessment Guidance for Superfund: Volume I: Human Health Evaluation Manual, Part A, Interim Final.* EPA/540/1-89/002. Office of Emergency and Remedial Response, Washington, DC. March 1989.
- *Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions.* OSWER Directive 9355.0-30. Office of Solid Waste and Emergency Response, Washington, DC. April 22, 1991.
- *Guidance on Risk Characterization for Risk Managers and Risk Assessors.* Memorandum from Deputy Administrator, U.S. Environmental Protection Agency H. Habicht to Assistant and Regional Administrators. Feb. 26, 1992.

EPA Ecological Risk Assessment

- *Risk Assessment Guidance for Superfund: Volume II: Environmental Evaluation Manual, Interim Final.* EPA/540/1-89/001. Office of Emergency and Remedial Response, Washington, DC. March 1989.
- *Ecological Assessment of Hazardous Waste Sites: A Field and Laboratory Reference.* EPA/600/3-89/013. Environmental Research Laboratory, Corvallis, OR. March 1989.
- *Framework for Ecological Risk Assessment.* EPA/630/R-92/001. Risk Assessment Forum, Washington, DC. February 1992.

EPA Exposure Assessment

- *Superfund Exposure Assessment Manual.* OSWER Directive 9285.5-1. EPA/540/1-88/001. NTIS PB89-135859. Office of Emergency and Remedial Response, Washington, DC. April 1988.
- *Guidelines for Exposure Assessment.* Federal Register, Vol. 57, No. 104, pp22888-22938, Office of Health and Environmental Assessment, Washington, DC. 5/22/92.

EPA Standard Exposure Scenarios and Default Exposure Factors

- *Exposure Factors Handbook: Final Report.* EPA/600/8-89/043. Office of Health and Environmental Assessment, Office of Research and Development, Washington, DC. March 1989.
- *Exposure Factors Handbook (Update).* EPA/600/P-95/ 002F. Office of Research and Development, Washington, DC. August 1997.
- *Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors.* OSWER Directive 9285.6-03. Office of Emergency and Remedial Response, Washington, DC. March 25, 1991.
- *Radiation Site Cleanup Regulations: Technical Support Document for the Development of Radionuclide Cleanup Levels for Soil* (Review Draft). Office of Air and Radiation, Washington, DC. September 1994.
- *Soil Screening Guidance: User's Guide.* EPA/540/R-96/018, Office of Emergency and Remedial Response, Washington, DC. June 1996.
- *Soil Screening Guidance: Technical Background Document.* EPA/540/R-96/128, Office of Emergency and Remedial Response, Washington, DC. June 1996.

EPA-Approved Toxicity Criteria

- *Integrated Risk Information System* (IRIS). Cincinnati, OH.

- ***Health Effects Assessment Summary Tables (HEAST).*** **Annual Update, FY 1997. Environmental Criteria and Assessment Office, Office of Health and Environmental Assessment, Office of Research and Development, Cincinnati, OH. 1997.**
- *Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion: Federal Guidance Report No. 11.* EPA-520/1-88-020. Office of Radiation Programs, Washington, DC. September 1988.
- *External Exposure to Radionuclides in Air, Water, and Soil: Federal Guidance Report No. 12.* EPA 402-R-93-081. Office of Air and Radiation. September 1993.
- *Health Risks from Low-Level Environmental Exposure to Radionuclides: Federal Guidance Report No. 13 - Part 1 (Interim Version).* EPA 402-R-97-014. Office of Air and Radiation. January 1998.

EPA Methods for Deriving Preliminary Remediation Goals and Soil Screening Levels

- *Risk Assessment Guidance for Superfund: Volume I: Human Health Evaluation Manual, Part B, Development of Risk-Based Preliminary Remediation Goals, Interim.* EPA/540/R-92/003. Office of Research and Development, Washington, DC. December 1991.
- *Soil Screening Guidance: User's Guide.* EPA/540/R-96/018, Office of Emergency and Remedial Response, Washington, DC. June 1996.
- *Soil Screening Guidance: Technical Background Document.* EPA/540/R-96/128, Office of Emergency and Remedial Response, Washington, DC. June 1996.
- *Soil Screening Guidance for Radionuclides: User's Guide* (Draft). Office of Radiation and Indoor Air and Office of Emergency and Remedial Response, Washington, DC. September 1998.

EPA Modeling

- *OSWER Models Study: Promoting Appropriate Use of Models in Hazardous Waste / Superfund Programs: Phase I: Final Report.* Office of Program Management and Technology, Office of Solid Waste and Emergency Response, Washington, DC. May 26, 1989.
- *OSWER Models Management Initiative: Report on the Usage of Models in Hazardous Waste / Superfund Programs: Phase II: Final Report.* Office of Program Management and Technology, Office of Solid Waste and Emergency Response, Washington, DC. December 1990.
- *Environmental Pathway Models—Ground-Water Modeling in Support of Remedial Decision Making at Sites Contaminated with Radioactive Material.* EPA 402-R-93-009. Office of Air and Radiation, Washington, DC. March 1993.
- *Framework for Assessing Groundwater Modeling Applications.* EPA-500-B-94-004. Resource Management and Information Staff, Office of Solid Waste and Emergency Response, Washington, DC. 1994.
- *Groundwater Modeling Compendium, Second Edition.* EPA-500-B-94-003. Resource Management and Information Staff, Office of Solid Waste and Emergency Response, Washington, DC. 1994.
- *Modifications to the PRESTO-CPG Code to Facilitate the Analysis of Soil Contamination Sites.* RAE-9231/6-1. Rogers & Associates Engineering Corporation with S. Cohen & Associates, Inc. Jan. 14, 1994.

EPA Data Quality/Data Control (QA/QC) and Data Useability

- *Soil Sampling Quality Assurance User's Guide.* EPA 600/4-84-0043. Office of Emergency and Remedial Response, Washington, DC. May 1984.
- *Guidance for Data Useability in Risk Assessment (Part A): Final Advance Copy.* Publication 9285.7A. Office of Emergency and Remedial Response, Washington, DC. April 1992. [Covers data useability for hazardous chemicals.]
- *Guidance for Data Useability in Risk Assessment (Part B): Final.* Publication 9285.7B. PB92-963362. Office of Emergency and Remedial Response, Washington, DC. May 1992. [Covers data useability for radionuclides.]
- *Data Quality Objectives for Superfund: Interim Final Guidance.* EPA 540-R-93-071. Publication 9255.9-01. NTIS PB92-96338. Office of Emergency and Remedial Response, Washington, DC. 1993.
- *Quality Assurance for Superfund Environmental Data Collection Activities.* Quick Reference Fact Sheet. NTIS

PB93-963273.Office of Emergency and Remedial Response, Washington, DC. 1993.

- *Guidance for the Data Quality Objectives Process: Final.* EPA QA/G-4. Quality Assurance Management Staff, Office of Research and Development, Washington, DC. September 1994.
- *Guidance for the Data Quality Assessment.* EPA/600/R-96/084. Quality Assurance Management Staff, Office of Research and Development, Washington, DC. January 1998.

EPA Statistical Methods for Compliance Demonstration

- *Methods for Evaluating the Attainment of Soil Cleanup Standards: Volume 1: Soil and Soil Media.* EPA 230/02-89-042. Office of Policy, Planning and Evaluation, Washington, DC. February 1989.
- *Statistical Methods for Evaluating the Attainment of Cleanup Standards: Volume 2: Ground Water.* Draft Office of Policy, Planning and Evaluation, Washington, DC. February 1992.
- *Statistical Methods for Evaluating the Attainment of Cleanup Standards: Volume 3: Reference-Based Standards For Soils and Solid Media.* PB94 176831. Office of Policy, Planning and Evaluation, Washington, DC. December 1992.
- *Guidance for the Data Quality Assessment: External Working Draft.* EPA QA/G-9. Quality Assurance Management Staff, Office of Research and Development, Washington, DC. March 27, 1995.

EPA Survey/Measurement Methods

- *Samplers and Sampling Procedures for Hazardous Waste Streams.* EPA 600/2-80-018. Environmental Monitoring and Support Laboratory, Cincinnati, OH. 1980.
- *Handbook for Sampling and Sample Preservation of Water and Wastewater.* EPA-600/4-82-029. PB83-124503. Environmental Monitoring and Support Laboratory, Cincinnati, OH. September 1982.
- *Eastern Environmental Radiation Facility: Radiochemistry Procedures Manual.* EPA 520/5-84-006. Eastern Environmental Radiation Facility, Montgomery, AL. August 1984.
- *A Compendium of Superfund Field Operations Methods.* EPA/540/P-87/001. OSWER Directive 9355.0-14. Office of Emergency and Remedial Response, Washington, DC. December 1987.
- *Field Screening Methods Catalog—User's Guide.* EPA 540/2-88-005. Office of Emergency and Remedial Response, Washington, DC. September 1988.
- *Compendium of ERT Ground Water Sampling Procedures.* EPA 540/P-91-005. PB91-921274/CCE. January 1991.
- *Compendium of ERT Soil Sampling and Surface Geophysics Procedures.* EPA 540/P-91-006. PB91-921273/CCE. January 1991.
- *Compendium of ERT Ground Water Sampling Procedures.* EPA 540/P-91-007. PB91-921275/CCE. January 1991.
- *Description and Sampling of Contaminated Soils.* EPA 625/12-91-002. Office of Emergency and Remedial Response, Washington, DC. November 1991.
- *User's Guide to the Contract Laboratory Program.* PB91-921278CDH. Office of Emergency and Remedial Response, Washington, DC. 1991.