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## **PREAMBLE**

It is agreed to by the Parties hereto as follows:

### **I. JURISDICTION**

1. These Director's Final Findings and Orders ("Orders") are issued to Sun Chemical Corporation, pursuant to the authority vested in the Director of Ohio EPA under Ohio Revised Code ("ORC") §§ 3734.13, 3734.20, 6111.03, and 3745.01.

### **II. PARTIES BOUND**

2. These Orders shall apply to and be binding upon Respondent and its successors in interest liable under Ohio law.

3. No change in ownership or legal status of the Respondent including, but not limited to, any transfer of assets or real or personal property shall in any way alter Respondent's obligations under these Orders.

4. Respondent shall provide a copy of these Orders to all contractors, subcontractors, laboratories and consultants retained to conduct any portion of the Work performed pursuant to these Orders, within fourteen (14) days of the effective date of these Orders or upon date of retention. Respondent shall ensure that all contractors, subcontractors, laboratories and consultants retained to perform the Work pursuant to these Orders also comply with the applicable provisions of these Orders.

### **III. DEFINITIONS**

5. Unless otherwise expressly provided herein, all terms used in these Orders or in any appendices shall have the same meaning as defined in ORC §§3734 and 6111, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and the rules promulgated thereunder. Whenever the terms listed below are used in these Orders or in any appendices, attached hereto and incorporated herein, the following definitions shall apply:

- a. "CERCLA" means the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended, 42 U.S.C. 9601 et seq.
- b. "Contaminant" and "Contamination" means (1) any "hazardous waste" under ORC § 3734.01(J); (2) any "industrial waste" under ORC § 6111.01(C); and/or (3) any "other wastes" under ORC § 6111.01(D), including any release of one or more of the same.

- c. "Day" means a calendar day unless expressly stated to be a business day. "Business day" shall mean a day other than a Saturday, Sunday, or state holiday. In computing any period of time under these Orders, where the last day would fall on a Saturday, Sunday, or state holiday, the period shall run until the close of the next business day.
- d. "Decision Document" means the document detailing the remedial action selected by Ohio EPA for the Site as set forth in the document attached to these Orders as Appendix A.
- e. "Environmental Covenant" means a servitude arising under an environmental response project that imposes activity and use limitations and that meets the requirements established in section 5301.82 of the Revised Code, as set forth in the document attached to these Orders as Appendix E.
- f. "Feasibility Study" ("FS") means a study undertaken to develop and evaluate options for remedial action. The FS is generally performed concurrently and in an interactive fashion with the Remedial Investigation. The term also refers to a report that describes the results of the study.
- g. "NCP" means the National Oil and Hazardous Substances Pollution Contingency Plan, codified at 40 C.F.R. Part 300 (1990), as amended.
- h. "Ohio EPA" means the Ohio Environmental Protection Agency and its designated representatives.
- i. "Orders" means these Director's Final Findings and Orders and all appendices hereto.
- j. "Paragraph" means a portion of these Orders identified by an Arabic numeral or an uppercase or lowercase letter.
- k. "Parties" means Respondent and the Ohio EPA.
- l. "Respondent" means Sun Chemical Corporation.
- m. "Remedial Action" ("RA") means those activities to be undertaken by Respondent to implement and maintain the effectiveness of the final plans and specifications submitted by Respondent pursuant to the Remedial Design and Remedial Action Work Plan.
- n. "Remedial Design" ("RD") means those activities to be undertaken by Respondent to develop the final plans and specifications for the Remedial Action pursuant to the Remedial Design and Remedial Action Work Plan.

- o. "Remedial Design and Remedial Action Work Plan" ("RD/RA Work Plan") means the document submitted by Respondent and approved by Ohio EPA pursuant to the Performance of Work Section of these Orders.
- p. "Response Costs" means all costs incurred by Ohio EPA including, but not limited to, payroll costs, contractor costs, travel costs, direct costs, overhead costs, legal and enforcement related costs, oversight costs, laboratory costs, and the costs of reviewing or developing plans, reports, and other items pursuant to these Orders, verifying the Work, or otherwise implementing or enforcing these Orders.
- q. "Section" means a portion of these Orders identified by a roman numeral.
- r. "Site" means the former Phthalchem facility located at 266 West Mitchell Avenue in Cincinnati, Hamilton County, Ohio which is approximately 3-acres in size, where the treatment, storage, and/or disposal of hazardous waste, and/or the discharge to waters of the state of industrial waste or other wastes have occurred, including any other area where such hazardous wastes, industrial wastes, and/or other wastes have migrated or threaten to migrate.
- s. "Statement of Work" ("SOW") means the "Model Statement of Work for Remedial Design and Remedial Action for the implementation of the Remedial Design and Remedial Action at the Site, as set forth in Appendix B of these Orders. The SOW is not specific to any Site.
- t. "Supporting Documents" means the field sampling plan ("FSP"), quality assurance project plan ("QAPP") and health and safety plan ("HASP") developed concurrently with the RD/RA Work Plan pursuant to these Orders and Section 4 of the SOW.
- u. "Transferee" means any future owner of any interest in the Site, including but not limited to, owners of an interest in fee simple, mortgagors, easement holders, and lessees.
- v. "Work" means all activities Respondent is required to perform under the Performance of the Work by Respondent and Additional Work Sections of these Orders.

#### **IV. FINDINGS**

6. The Director of Ohio EPA has determined the following findings:

- a. The former Phthalchem Site is located at 266 West Mitchell Avenue in Cincinnati, Hamilton County, Ohio. The Site is located north of the interchange of Mitchell Avenue and Interstate 75 between Mill Creek and the B&O Railroad in the

- Northwest Quarter of Section 16, Range 2 East, Township 3 North, on the Cincinnati West United States Geological Survey (USGS) 7.5-minute quadrangle.
- b. The Site is owned by Sun Chemical Corporation which is a subsidiary of Sun Chemical Group Coöperatief U.A., the Netherlands, and is headquartered in Parsippany, New Jersey, U.S.A.
  - c. The Phthalchem property was purchased by Sun Chemical Corporation in 1989.
  - d. Respondent is or has been a generator of Contaminants or Contamination at the Site. Respondent has directly or indirectly allowed Contamination and/or directed the placement and/or disposal of Contaminants at the Site.
  - e. In 1985, OEPA personnel observed pools of trichlorobenzene (TCB) on the bottom of Mill Creek during a low flow period. It was determined that the TCB was migrating from weep holes on the channel bottom adjacent to the Site. Shortly thereafter, remedial actions were initiated to mitigate the release. An ongoing monitoring program for ammonia and TCB through analysis of samples taken from weep holes in Mill Creek augmented the initial remedial efforts. Also, in 1985, a system was installed for product recovery from the subbase of Mill Creek. Between 1985 and 1989, over 5,300 gallons of TCB had been removed from below Mill Creek.
  - f. On February 19, 1987, the Director of Ohio EPA issued Director's Final Findings and Orders to Respondent to complete a remedial investigation and feasibility study (RI/FS) at the Site. Respondent entered into an Administrative Order on Consent (AOC) with the Ohio EPA. The objective of the AOC was to prepare a RI/FS to develop appropriate response measures. In 1989, Respondent agreed to undertake interim ground water removal actions requested by Ohio EPA as outlined in a Consent Order for Preliminary Injunctive Relief. Respondent designed and installed a ground water recovery and treatment system that began operating in 1990 with 11 wells for the removal of free phase TCB and DCB. The recovery system was installed at the downgradient property boundary and intended to prevent the migration and release of contaminants from the Site.
  - g. All manufacturing operations at the Site ceased in May and June 1996. Thereafter, all manufacturing equipment was removed from the Site, and the manufacturing building was razed. The operation of the ground water recovery and treatment and free product removal continued. In 1997, Ohio EPA approved the Work Plan for Additional Free Product Removal/Ground water Control ("1997 Work Plan"). The investigative results of the 1997 Work Plan were presented in the 1998 Report on Additional Investigative Work at the Phthalchem Site. In 2000, Respondent evaluated a number of removal action enhancement alternatives to select a ground water containment system to be installed at the Site, which would replace the existing product and ground water recovery

system. The results of this evaluation were presented in the Feasibility Analysis of Remediation Alternatives

- h. In the fall of 2001, the well recovery system was upgraded with the construction of a slurry wall and ground water interception trench along the south edge of the Site. By December 7, 2001 ground water was being collected via wells in the interception trench. The ground water recovery system is currently operating as it was in 2001. The slurry wall is providing containment for the Site ground water, which is pumped out of the interception trench to the wastewater treatment area. After treatment, the wastewater is discharged to the Metropolitan Sewer District. In addition, monthly product checks are performed on the drive points in the concrete base of Mill Creek. Any recoverable product is removed from these drive points on a monthly basis
- i. Ohio EPA approved the RI Report in 2005 and approved the FS Report in 2018. The RI identified public health and environmental risks at the Site resulting from the treatment, storage, or disposal of contaminated ground water, soil sediments, or other media. The RI characterized the nature and extent of the contaminants released at the Site and the potential risks to human health and safety and the environment. The RI revealed that the principal contaminants of concern (COCs) are TCB, dichlorobenzene (DCB), ammonia, copper, naphthalene, phthalate, di-n-butyl phthalate, arsenic, phenols, and diethyl phthalate. The threats at the Site include but are not limited to direct contact with contaminated soil and ground water, and the potential for inhalation of vapors from contaminated ground water, as detailed in the RI. In April 2005, the *Remedial Investigation/Feasibility Study Addendum Report* ("RI/FS Addendum") was submitted by Respondent to Ohio EPA. The RI/FS Addendum summarized the previous site investigation activities, presented a baseline risk assessment, the selected remedy for the site (the Ground Water Interception System), and presented a closure strategy for the site. The RI/FS Addendum concluded that there was no unacceptable risk at the Site or in the nearby Mill Creek.
- j. In June 2018 Ohio EPA approved the 2018 Revised FS Report which selected the Ground Water Interception System that was currently operational at the Site as the preferred alternative and final remedial action for the Site. The next steps were to be shut-down of the Ground Water Interception System followed by a period of monitoring to confirm that site conditions would not change after shutdown of the System.
- k. On May 21, 2019, Ohio EPA notified the public of its Preferred Plan for remediation of the Site and solicited public comments. The Preferred Plan summarizes the information presented in the RI and FS prepared by Sun Chemical Corporation and identifies and explains Ohio EPA's preferred alternative for the remedial action at the Site. The preferred remedial alternative in this Preferred Plan includes the following elements:

- i. Continued operation and maintenance of the ground water interceptor system and slurry wall, with long term ground water monitoring;
  - ii. Free product removal to maximum extent practicable;
  - iii. An environmental covenant that would limit the use of the Site to industrial/commercial; prohibit the use of ground water for any purpose other than sampling to monitor contamination; maintenance of the existing asphalt cap to prevent direct contact with soil; a risk mitigation plan and pre-approval from Ohio EPA for any construction or excavation activities at the Site, and evaluation of the vapor intrusion pathway, if any structures are constructed at the Site.
- l. On June 4, 2019, Ohio EPA held a public meeting and hearing on the Preferred Plan. The public comment period ended on June 14, 2019. Ohio EPA did not receive any comments during the meeting or the public comment period.
- m. On September 4, 2019, Ohio EPA issued a Decision Document which selected the remedy for the Site. The Decision Document is attached hereto as Appendix A and incorporated by reference herein.
- n. The Site is a hazardous waste facility, solid waste facility or other location where hazardous waste was treated, stored or disposed.
- o. Because of their quantity, concentration, physical or chemical characteristics, the COCs found at the Site are "hazardous waste" as defined under ORC § 3734.01(J).
- p. The COCs found at the Site are "industrial waste" or "other wastes" as defined under ORC §§ 6111.01(C) and (D).
- q. The ground and surface waters at the Site are "waters of the state" as defined in ORC § 6111.01(H).
- r. Ohio EPA has incurred Response Costs and continues to incur Response Costs associated with this Site.
- s. Respondent is a "person" as defined under ORC §§ 3734.01(G) and 6111.01(I).
- t. Conditions at the Site constitute a substantial threat to public health or safety or are causing or contributing or threatening to cause or contribute to air or water pollution or soil contamination as provided in ORC § 3734.20(B).
- u. The migration and threatened migration of Contaminants to ground water, or surface water at or from the Site constitutes a discharge to "waters of the state," as the term is defined in ORC § 6111.01(H).

- v. The Work required pursuant to these Orders will contribute to the prohibition or abatement of the discharge of Contaminants to waters of the State.
- w. In issuing these Orders, the Director has given consideration to, and based his determination on, evidence relating to technical feasibility and economic reasonableness of complying with these Orders, and to evidence relating to conditions calculated to result from compliance with these Orders, and their relation to the benefits to the people of the state to be derived from such compliance.
- x. The actions to be taken pursuant to these Orders are reasonable and necessary to protect the public health or safety or the environment as provided in ORC § 3734.20.

## **V. GENERAL PROVISIONS**

### **7. Objectives of the Parties**

The objectives of the Parties in entering into these Orders are to protect public health and safety and the environment from the disposal, discharge, or release of Contaminants through design, construction, implementation, operation, and maintenance of the remedy by Respondent as set forth in the Decision Document and in accordance with these Orders.

### **8. Commitment of Respondent**

Respondent agrees to perform the Work in accordance with these Orders including but not limited to the SOW, all relevant guidance documents, and all standards, specifications, and schedules as approved by Ohio EPA pursuant to these Orders. Respondent also agrees to reimburse Ohio EPA for all Response Costs and perform all other obligations of these Orders.

### **9. Compliance With Law**

- a. All activities undertaken by Respondent pursuant to these Orders shall be performed in accordance with the requirements of all applicable federal, state and local laws and regulations, and in a manner consistent with the NCP.
- b. Ohio EPA expects that activities conducted pursuant to these Orders, if approved by Ohio EPA, would be considered necessary and consistent with the NCP.
- c. Where any portion of the Work requires a permit, license or other authorization from Ohio EPA or any other state, federal or local government agency, Respondent shall submit applications in a timely manner and take all other

actions necessary to obtain such permit, license or other authorization. These Orders are not, and shall not be construed to be a permit, license or other authorization issued pursuant to any statute or regulation.

## **VI. PERFORMANCE OF THE WORK BY RESPONDENT**

### **10. Supervising Contractor**

All Work performed pursuant to these Orders shall be under the direction and supervision of a contractor with expertise in hazardous waste site investigation and remediation. Prior to the initiation of the Work, Respondent shall notify Ohio EPA in writing of the name of the supervising contractor and any subcontractor to be used in performing the Work under these Orders.

### **11. Remedial Design and Remedial Action**

- a. RD/RA project initiation meeting. Within seven (7) days of the effective date of these Orders, unless otherwise mutually agreed to by the Parties, Respondent shall meet with Ohio EPA to discuss the requirements of the RD/RA Work Plan.
- b. Submission of RD/RA Work Plan. Within thirty (30) days after the effective date of these Orders, unless otherwise specified in writing by Ohio EPA, Respondent shall submit to Ohio EPA a RD/RA Work Plan and schedule for implementation of the Work required under this Section of these Orders. The RD/RA Work Plan shall provide for the design, construction, final operation and maintenance of the remedy as set forth in the Decision Document.
- c. Criteria for RD/RA Work Plan development. The RD/RA Work Plan, Supporting Documents, and any other deliverables required under the approved RD/RA Work Plan shall be developed in conformance with the RD/RA SOW contained in Appendix B of these Orders, and the guidance documents listed in Appendix C of these Orders. The RD/RA Work Plan shall include a proposed schedule that includes a completion date for each task. If Ohio EPA determines that any additional or revised guidance documents affect the Work to be performed in implementing the RD/RA, Ohio EPA will notify Respondent, and the RD/RA Work Plan and other affected documents shall be modified accordingly.
- d. Handling any inconsistencies. Should Respondent identify any inconsistency between any of the laws and regulations and guidance documents that Respondent is required to follow by these Orders, Respondent shall notify Ohio EPA in writing of each inconsistency and the effect of the inconsistencies upon the Work to be performed. Respondent shall also recommend, along with a supportable rationale justifying each recommendation, the requirement that Respondent believes should be followed. Respondent shall implement the affected Work as directed in writing by Ohio EPA.

- e. Review of RD/RA Work Plan. Ohio EPA will review the RD/RA Work Plan and Supporting Documents pursuant to the procedures set forth in the Review of Submissions Section of these Orders.
- f. Implementation of the RD/RA Work Plan. Upon Ohio EPA's approval of the RD/RA Work Plan, Respondent shall implement the RD/RA Work Plan as approved. Respondent shall submit all plans, reports, or other deliverables required under the approved RD/RA Work Plan, in accordance with the approved schedule, for Ohio EPA's review and approval pursuant to the Review of Submissions Section of these Orders.

12. Operation and Maintenance Plan

The Operation and Maintenance ("O&M") Plan, including a schedule for implementation, shall be submitted in accordance with the approved RD/RA Work Plan. Ohio EPA will review the O&M Plan pursuant to the procedures set forth in the Review of Submissions Section of these Orders. Upon approval of the O&M Plan by Ohio EPA, Respondent shall implement the O&M Plan. Respondent shall submit all plans, reports, or other deliverables required under the approved O&M Plan, in accordance with the approved O&M schedule set forth therein, for Ohio EPA's review and approval pursuant to the Review of Submissions Section of these Orders.

13. Completed Work

Notwithstanding any other provision of these Orders, Ohio EPA acknowledges that in accordance with the Decision Document, Respondent has completed the design, construction, and operations and maintenance of the ground water interceptor system and slurry wall with the oversight of Ohio EPA. Documents and reports outlining these activities have been submitted and approved by Ohio EPA. Consistent with the Decision Document, Respondent has operated and maintained the current remedial systems and conducted required ground water monitoring for approximately 18 years. Results of ongoing activities at the site have been presented to Ohio EPA in monthly, quarterly, and semi-annual reports.

14. Remaining Work

Notwithstanding any other provision of these Orders, the sole remaining actions and work items that Ohio EPA requires Respondent to complete under these Orders, the Preferred Plan, and the Decision Document are the following: (i) preparation of a work plan for the system shutdown pilot test and for a ground water monitoring program to demonstrate continued decreasing and/or stable trends of COCs in accordance with U.S. EPA and Ohio EPA guidance; (ii) implementation of the environmental covenant on the property; (iii) maintenance of the existing treatment system such that it can be restarted should concentrations of COCs exhibit increasing trends; payment of Ohio

EPA's past costs; and payment of Ohio EPA's future costs. During completion of the foregoing work and the proposed ground water monitoring program, Respondent will submit semi-annual status reports to Ohio EPA.

## **VII. LAND USE AND CONVEYANCE OF TITLE**

### **15. Deed Notice**

Within thirty (30) days after the effective date of these Respondent shall record with the County Recorder's Office for Hamilton County, Ohio, a deed notice for the real property owned by Respondent for the Site. The deed notice shall be consistent with the template contained in Appendix D and shall be approved by Ohio EPA. The deed notice shall reference the existence of these Orders and the need to contact the Respondent before any construction or excavation is undertaken at the Property. A copy of the recorded deed notice shall be submitted to Ohio EPA within thirty (30) days of recording the notice. Thereafter, if Respondent conveys any interest in the property included in the Site, each deed, title, or other instrument shall contain a notice stating that the Property is subject to these Orders and shall reference the potential for any security, monitoring, treatment, or containment systems present on the Property as a result of these Orders. Respondent shall record a new deed notice for the Property to reflect the subsequent construction of any security, monitoring, treatment or containment systems at the Property.

To the extent that the Site, or any portion of the Site, is owned or controlled by persons other than Respondent, Respondent shall use its best efforts to secure the filing of deed notices by said property owners for all the properties affected by the Contamination at the Site. The deed notice shall be consistent with the template attached as Appendix D and shall be approved by Ohio EPA. Copies of all deed notices filed for properties affected by the Contamination on, underlying or emanating from the Site shall be obtained by Respondent and provided to Ohio EPA upon request.

### **16. Environmental Covenant**

Within thirty (30) days after the effective date of these Orders, or after acquiring an interest in the property, Respondent shall record with the Hamilton County Recorder's Office an Environmental Covenant for the property that is part of the Site owned by the Respondent. The Environmental Covenant shall be consistent with the template contained in Appendix E, shall be signed by Respondent, and shall be approved and signed by Ohio EPA. The Environmental Covenant shall be recorded in the deed or official records of the County Recorder of Hamilton County, Ohio pursuant to ORC § 5301.82. The terms and conditions of the Environmental Covenant are incorporated into these Orders and shall be binding upon Respondent. Thereafter, if Respondent conveys any interest in the property included in the Site, each deed, title, or

other instrument shall contain a notice stating that the property is subject to these Orders and shall reference any monitoring, treatment, or containment systems present on the property as a result of these Orders.

17. Proof of Filing Environmental Covenant

Within thirty (30) days after filing with the Hamilton County Recorder the executed Environmental Covenant, Respondent shall certify to Ohio EPA that the Environmental Covenant has been filed for recording and include with the certification a file and date-stamped copy of the recorded Environmental Covenant. If the Environmental Covenant is violated or breached by Respondent, the Respondent shall be in violation of these Orders.

18. Land Use Self-Reporting Requirement

Respondent shall ensure that no portion of the Site will be used in any manner that would adversely affect the integrity of any security, containment, treatment, or monitoring systems at the Site. Respondent shall submit on an annual basis, written documentation verifying that any security, containment, treatment, or monitoring systems are in place and operational.

19. Notice of Intention to Transfer Property

Prior to each conveyance by Respondent of an interest in any portion of the Site, including but not limited to easements, deeds, leases and mortgages, Respondent shall notify Transferee of the existence of any security, containment, treatment, or monitoring systems and/or activity and use limitations, and shall provide a copy of these Orders to Transferee. Respondent shall notify Ohio EPA at least thirty (30) days in advance of each conveyance of an interest in any portion of the Site that is owned by Respondent. Respondent's notice shall include the name and address of the Transferee and a description of the provisions made for the continued access to and maintenance of any security, containment, treatment, and monitoring systems.

20. Instrument and Confirmation of Conveyance

Upon each conveyance by Respondent of an interest in any portion of the Property, including but not limited to easements, deeds, leases and mortgages, Respondent shall include in the instrument of conveyance a restatement consistent with paragraph 10 of the Environmental Covenant. Within thirty (30) days after each conveyance of an interest in any portion of the Site that is owned by Respondent, Respondent shall submit to Ohio EPA, via certified mail, the following information:

- a. A copy of the deed or other documentation evidencing the conveyance;

- b. The name, address, and telephone number of the new property owner and the name, address, and telephone number of the contact person for the property owner;
- c. A legal description of the property, or the portion of the property, being transferred;
- d. A survey map of the property, or the portion of the property, being transferred; and
- e. The closing date of the transfer of ownership of the property, or portion of the property.

### **VIII. ADDITIONAL WORK**

21. Ohio EPA or Respondent may determine that in addition to the tasks defined in the approved RD/RA Work Plan, additional Work may be necessary to accomplish the Objectives of the Parties as provided in the General Provisions Section of these Orders. Additional Work may also include, pursuant to ORC § 3734.20 or other applicable law, the implementation of interim actions to address substantial threats to public health or safety or the environment should such threats be identified during the conduct of the RD/RA.

22. Within thirty (30) days of receipt of written notice from Ohio EPA that additional Work is necessary, unless otherwise specified in writing by Ohio EPA, Respondent shall submit a proposed addendum to the RD/RA Work Plan ("RD/RA Work Plan Addendum"), which contains (a) a work plan for the implementation of the additional Work, (b) any revisions to the Supporting Documents and other RD/RA deliverables, as appropriate, (c) a schedule for the performance of the additional Work, and (d) revisions to other schedules impacted by the additional Work, if any. If Respondent disputes the necessity of additional Work, Respondent shall initiate the procedures for dispute resolution set forth in the Dispute Resolution Section of these Orders within fourteen (14) days after receipt of Ohio EPA's notification of the need for additional Work. The RD/RA Work Plan Addendum shall conform to the standards and requirements set forth in the documents attached to these Orders as Appendices B and C, RD/RA SOW and List of Relevant Guidance Documents, respectively. Upon approval of the RD/RA Work Plan Addendum by Ohio EPA pursuant to the Review of Submissions Section of these Orders, Respondent shall implement the approved RD/RA Work Plan Addendum in accordance with the schedules contained therein.

23. If Respondent determines that additional Work is necessary, Respondent shall submit a proposal to Ohio EPA to explain what the additional Work is, why the additional Work is necessary, and what impact, if any, the additional Work will have on the RD/RA Work Plan and schedule. If Ohio EPA concurs with the request to perform additional Work, Respondent shall submit a RD/RA Work Plan Addendum, as described

above, for the performance of additional Work. The RD/RA Work Plan Addendum shall conform to the standards and requirements set forth in the documents attached to these Orders as Appendices B and C. Upon approval of the RD/RA Work Plan Addendum by Ohio EPA pursuant to the Review of Submissions Section of these Orders, Respondent shall implement the approved RD/RA Work Plan Addendum in accordance with the schedules contained therein. Additional Work does not include any activity performed in response to an emergency at the Site for which Respondent submits to Ohio EPA written notice of the performed activity.

#### **IX. SAMPLING AND DATA AVAILABILITY**

24. Unless otherwise agreed to by the Site Coordinators, Respondent shall notify Ohio EPA not less than fifteen (15) days in advance of all sample collection activity. Upon request, Respondent shall allow split and/or duplicate samples to be taken by Ohio EPA or its designated contractor. Ohio EPA shall also have the right to take any additional samples it deems necessary. Upon request, Ohio EPA shall allow Respondent to take split and/or duplicate samples of any samples Ohio EPA takes as part of its oversight of Respondent's implementation of the Work.

25. Within seven (7) days of Respondent's receipt of a request by Ohio EPA, Respondent shall submit to Ohio EPA copies of the results of all sampling and/or tests or other data, including raw data and original laboratory reports, generated by or on behalf of Respondent with respect to the Site and/or the implementation of these Orders. An electronic copy shall also be provided in a format approved by Ohio EPA. Respondent may submit to Ohio EPA any interpretive reports and written explanations concerning the raw data and original laboratory reports. Such interpretive reports and written explanations shall not be submitted in lieu of original laboratory reports and raw data. Should Respondent subsequently discover an error in any report or raw data, Respondent shall promptly notify Ohio EPA of such discovery and provide the correct information.

#### **X. ACCESS**

26. Ohio EPA and its contractors shall have access at all reasonable times to the Site and any other property to which access is required for the implementation of these Orders, to the extent access to the property is controlled by Respondent. Access under these Orders shall be for the purposes of conducting any activity related to these Orders including but not limited to the following:

- a. Monitoring the Work;
- b. Conducting sampling [including background monitoring wells];
- c. Inspecting and copying records, operating logs, contracts, and other documents related to the implementation of these Orders;

d. Conducting investigations, tests, and other activities associated with the implementation of these Orders; and

e. Verifying any data and/or other information submitted to Ohio EPA.

27. To the extent that the Site or any other property to which access is required for the implementation of these Orders is owned or controlled by persons other than Respondent, Respondent shall use its best efforts to secure from such persons access for Respondent and Ohio EPA and its contractors as necessary to effectuate these Orders. Copies of each access agreement obtained by Respondent shall be provided to Ohio EPA upon execution of the access agreement. If any access required to implement these Orders is not obtained prior to Respondent's submission of the RD/RA Work Plan, unless otherwise agreed to in writing by Ohio EPA, Respondent shall promptly notify Ohio EPA in writing of the steps Respondent has taken to attempt to obtain access. Ohio EPA may, as it deems appropriate, assist Respondent in obtaining access.

28. Notwithstanding any provision of these Orders, the State of Ohio retains all of its access rights and authorities, including enforcement authorities related thereto, under any applicable statute or regulation including but not limited to ORC §§ 3734.20 and 6111.05.

## **XII. DESIGNATED SITE COORDINATORS**

29. Within seven (7) days of the effective date of these Orders, Respondent shall notify Ohio EPA, in writing, of the name, address and telephone number and email address of its designated Site Coordinator and Alternate Site Coordinator.

30. As used in these Orders, the term "Site Coordinator" refers interchangeably to the Site Coordinator and the Alternate Site Coordinator designated for a named party. If any designated Site Coordinator is changed, the identity of the successor will be given to the other Party at least seven (7) days before the changes occur, unless impracticable, but in no event later than the actual day the change is made.

31. To the maximum extent practicable, except as specifically provided in these Orders, communications between Respondent and Ohio EPA concerning the implementation of these Orders shall be made between the Site Coordinators. Respondent's Site Coordinator shall be available for communication with Ohio EPA regarding the implementation of these Orders for the duration of these Orders. Each Site Coordinator shall be responsible for ensuring that all communications from the other Party are appropriately disseminated and processed. Respondent's Site Coordinator shall be present on the Site or on call during all hours of Work at the Site.

32. Without limitation of any authority conferred on Ohio EPA by statute or regulation, Ohio EPA's Site Coordinator's authority includes but is not limited to the following:

- a. Directing the type, quantity and location of samples to be collected by Respondent pursuant to an approved Work Plan;
- b. Collecting samples;
- c. Observing, taking photographs, or otherwise recording information related to the implementation of these Orders, including the use of any mechanical or photographic device;
- d. Directing that the Work stop whenever Ohio EPA's Site Coordinator determines that the activities at the Site may create or exacerbate a threat to public health or safety, or threaten to cause or contribute to air or water pollution or soil contamination;
- e. Conducting investigations and tests related to the implementation of these Orders;
- f. Inspecting and copying records, operating logs, contracts and/or other documents related to the implementation of these Orders; and
- g. Assessing Respondent's compliance with these Orders.

### **XIII. PROGRESS REPORTS AND NOTICE**

33. Unless otherwise directed by Ohio EPA, Respondent shall submit a written progress report to the Ohio EPA by the tenth (10) day of every month. At a minimum, the progress reports shall include that information designated in Section 10 of the SOW. Monthly reports may not be used to propose modifications to approved plans; Respondent shall submit such requests to Ohio EPA in a separate written correspondence.

34. Progress reports (one copy only) shall be sent either by e-mail with confirmed receipt or by hard copy to the address listed below. All other documents (two copies) required to be submitted pursuant to these Orders to Ohio EPA shall be sent to the following agency address(s):

Charles C. Mellon  
Ohio EPA, Southwest District Office  
401 E. Fifth St.  
Dayton, Ohio 45402

Email address: Charles.Mellon@epa.ohio.gov

All written (including electronic) correspondence to Respondent shall be directed to:

Barbara Coughlin, PhD, Site Coordinator  
Ramboll US Corporation  
One Indiana Square, Suite 2335  
Indianapolis, IN 46204  
[bcoughlin@ramboll.com](mailto:bcoughlin@ramboll.com)

Milind K. Pradhan, PE, Alternate Site Coordinator  
Ramboll US Corporation  
5747 Perimeter Drive, #220  
Dublin, OH 43017  
[mpradhan@ramboll.com](mailto:mpradhan@ramboll.com)

A Party may designate an alternative contact name or address upon written notification to the other Party and in accordance with the Designated Site Coordinators Section of these Orders, as applicable.

#### **XIV. REVIEW OF SUBMISSIONS**

35. Ohio EPA shall review any work plan, report, or other item required to be submitted pursuant to these Orders.

36. Upon review, Ohio EPA may in its sole discretion: (a) approve the submission in whole or in part; (b) approve the submission with specified conditions; (c) modify or, modify and approve, the submission; (d) disapprove the submission in whole or in part; or (e) any combination of the above. The results of Ohio EPA's review shall be detailed in writing and shall identify any conditions, modifications and/or deficiencies. Excluded from Ohio EPA approval pursuant to this Section are the health and safety plan (HASP), progress reports, and the Pre-Investigation Evaluation Report ("PER") (which is subject to approval as a constituent of the RI/FS Work Plan).

37. In the event that Ohio EPA approves an initial submission, Respondent shall proceed to take such action as required by Ohio EPA. In the event that Ohio EPA approves with conditions or modification an initial submission, Respondent shall either (a) proceed to take such action as required by Ohio EPA, or (b) initiate the procedures

for dispute resolution set forth in the Dispute Resolution Section of these Orders, within fourteen (14) days of receipt of Ohio EPA's written response to Respondent's submission. Respondent shall proceed to take any action required by an unmodified or unconditioned portion of the submission, as those portions are considered approved.

38. In the event that Ohio EPA disapproves an initial submission in whole or in part and notifies Respondent in writing of the deficiencies Respondent shall within fourteen (14) days, or such longer period of time as specified by Ohio EPA in writing, correct the deficiencies, and/or incorporate the conditions, and submit a revised submission to Ohio EPA for approval. The revised submission shall incorporate all of the changes, additions, and/or deletions specified by Ohio EPA in its notice of disapproval. Revised submissions shall be accompanied by a letter indicating how and where each of Ohio EPA's comments was incorporated into the revised submission. To facilitate review of the revised submission, those portions of the document not affected by the Ohio EPA comments should remain unchanged. The letter accompanying the submission should indicate, however, any indirect changes necessitated by Ohio EPA's comments.

39. To the extent that Respondent disputes any of Ohio EPA's changes, additions, and/or deletions to an initial submission, Respondent shall initiate the procedures for dispute resolution set forth in the Dispute Resolution Section of these Orders, within fourteen (14) days after receipt of Ohio EPA's written notice of disapproval. Notwithstanding the disapproval, Respondent shall proceed to take any action required by a portion of the submission that is not specified as disapproved in the notice of disapproval.

40. In the event that Ohio EPA disapproves or modifies a revised submission, in whole or in part, and notifies Respondent in writing of the deficiencies, Respondent shall within fourteen (14) days, or such longer period of time as specified in writing by Ohio EPA, correct the deficiencies and incorporate all changes, additions, and/or deletions, and submit the revised submission to Ohio EPA for approval. If Respondent fails to submit a revised submission incorporating all changes, additions, modifications and/or deletions within fourteen (14) days, or such longer period of time as specified by Ohio EPA in writing, Respondent shall be considered in breach and/or violation of these Orders. If Respondent is in breach and/or violation of these Orders, Ohio EPA retains the right to perform any additional remediation, conduct a complete or partial Remedial Investigation or Feasibility Study, conduct a complete or partial Remedial Design or Remedial Action; and/or enforce the terms of these Orders as provided in the Reservation of Rights Section of these Orders.

41. All work plans, reports, or other items required to be submitted to Ohio EPA under these Orders shall, upon approval by Ohio EPA, be deemed to be incorporated in and made an enforceable part of these Orders. In the event that Ohio EPA approves a portion of a work plan, report, or other item, the approved portion shall be deemed to be incorporated in and made an enforceable part of these Orders.

## **XV. DISPUTE RESOLUTION**

42. The Site Coordinators shall, whenever possible, operate by consensus.

43. In the event of a disapproval, or an approval with conditions or modifications by Ohio EPA of a submission by Respondent, or a disagreement regarding the Work performed under these Orders, Respondent's Site Coordinator shall notify Ohio EPA's Site Coordinator in writing that Respondent wishes to invoke an informal dispute pursuant to this Section. The notification to invoke an informal dispute shall occur prior to the submission deadline.

44. The Parties shall have ten (10) days from the date written notice of the informal dispute is received by Ohio EPA's Site Coordinator to negotiate in good faith to resolve the dispute. This informal dispute resolution period may be extended by agreement of the Site Coordinators for up to twenty (20) additional days.

45. In the event that the dispute is not resolved during the informal dispute resolution period, Respondent's Site Coordinator shall notify Ohio EPA's Site Coordinator in writing by the end of the informal dispute resolution period that Respondent wishes to invoke a formal dispute pursuant to this Section. This notice shall include a brief description of the item(s) in dispute. Within twenty (20) days of receipt of the written notice invoking the formal dispute resolution procedure, the Site Coordinators shall exchange written positions, including technical rationale supporting their positions. The Site Coordinators shall have ten (10) days from the date they have exchanged written positions to negotiate in good faith to resolve the formal dispute. This formal dispute period may be extended by agreement of the Site Coordinators for up to twenty (20) additional days.

46. In the event the dispute is not resolved in the formal dispute resolution period, Respondent's Site Coordinator shall notify Ohio EPA's Site Coordinator in writing by the end of the formal dispute resolution period whether Respondent wishes to submit final written positions to a DERR Manager for review and resolution. The Site Coordinators shall have ten (10) days from the end of the formal dispute resolution period to submit their written positions. The DERR Manager will resolve the dispute based upon and consistent with these Orders, the SOW, the RD/RA Work Plan, and applicable or relevant and appropriate federal and state laws. The decision of the DERR Manager is considered final for the purposes of these Orders.

47. The pendency of a dispute under this Section shall extend only the time period for completion of the item(s) in dispute, except that upon mutual agreement of the Site Coordinators, any time period may be extended as is deemed appropriate under the circumstances. Such agreement shall not be unreasonably withheld by Ohio EPA. Elements of the Work not affected by the dispute shall be completed in accordance with the applicable schedules and time frames.

48. This Section does not apply to the Reimbursement of Costs Section of these Orders.

#### **XVI. UNAVOIDABLE DELAYS**

49. Respondent shall cause all Work to be performed in accordance with applicable schedules and time frames set forth in these Orders or any approved work plan unless any such performance is prevented or delayed by an event that constitutes an unavoidable delay. For purposes of these Orders, an "unavoidable delay" shall mean an event beyond the control of Respondent that prevents, or delays performance of any obligation required by these Orders and that could not be overcome by due diligence on the part of Respondent. Increased cost of compliance, among other circumstances, shall not be considered an event beyond the control of Respondent for the purposes of these Orders.

50. Respondent shall notify Ohio EPA in writing within ten (10) days after the occurrence of an event that Respondent contends is an unavoidable delay. Such written notification shall describe the anticipated length of the delay, the cause or causes of the delay, the measures taken and to be taken by Respondent to minimize the delay, and the timetable under which these measures will be implemented. Respondent shall have the burden of demonstrating that the event constitutes an unavoidable delay.

51. If Ohio EPA does not agree that the delay has been caused by an unavoidable delay, Ohio EPA will notify the Respondent in writing of that finding and of the noncompliance with these Orders. If Ohio EPA agrees that the delay is attributable to an unavoidable delay, Ohio EPA will notify Respondent in writing of the length of the extension for the performance of the obligations affected by the unavoidable delay.

#### **XVII. REIMBURSEMENT OF COSTS**

52. Ohio EPA has incurred and continues to incur Response Costs in connection with the Site. Respondent shall reimburse Ohio EPA for all Response Costs incurred both prior to and after the effective date of these Orders.

53. Within thirty (30) days of receipt of an itemized invoice for the Response Costs incurred prior to the effective date of these Orders, Respondent shall remit a check to Ohio EPA for the full amount invoiced.

54. For Response Costs incurred after the effective date of these Orders, Ohio EPA will submit to Respondent on an annual basis an itemized invoice of its Response Costs for the previous year. Within thirty (30) days of receipt of such itemized invoice, Respondent shall remit payment for all of Ohio EPA's Response Costs for the previous year. In the event that Respondent does not remit payment of Response Costs within

sixty (60) days after receipt of such invoice, Respondent shall remit payment for unpaid balance and the interest accrued on the unpaid balance. Interest shall accrue beginning thirty (30) days from the date of the invoice until the date payment is remitted and shall be calculated at the rate specified by ORC § 5703.47(B) or any subsequent rate adjustments.

55. Respondent shall remit payments to Ohio EPA pursuant to this Section as follows:

- a. Payment shall be made by bank check payable to "Treasurer, State of Ohio / Hazardous Waste Special Cleanup Account" and shall be forwarded to the Fiscal Officer, DERR, Ohio EPA, P.O. Box 1049, Columbus, Ohio 43216-1049;
- b. A copy of the transmittal letter and check shall be sent to the Fiscal Officer, DERR, Ohio EPA, P.O. Box 1049, Columbus, Ohio 43216-1049, and to the Ohio EPA Site Coordinator; and
- c. Each payment shall identify the name and address of the party making payment, the Site name, and Ohio EPA's revenue number identified on the associated invoice.

### **XVIII. ACCESS TO INFORMATION**

56. Upon request, Respondent shall provide to Ohio EPA within fourteen (14) days, copies of all documents and information within its possession or control or that of its contractors or agents relating to events or conditions at the Site including but not limited to manifests, reports, correspondence, or other documents or information related to the Work. This provision shall not be a limitation on any request for information to the Respondent by Ohio EPA made under state or federal law for information relating to events or conditions at the Site.

57. Respondent may assert a claim that documents or other information submitted to Ohio EPA pursuant to these Orders are confidential under the provisions of OAC 3745-50-30(A) or ORC § 6111.05(A). If no such claim of confidentiality accompanies the documents or other information when it is submitted to Ohio EPA, it may be made available to the public without notice to Respondent.

58. Respondent may assert that certain documents or other information are privileged under the attorney-client privilege or any other privilege recognized by state law. If Respondent makes such an assertion, it shall provide Ohio EPA with the following: (1) the title of the document or information; (2) the date of the document or information; (3) the name and title of the author of the document or information; (4) the name and title of each addressee and recipient; (5) a general description of the contents of the document or information; and (6) the privilege being asserted by Respondent.

59. No claim of confidentiality shall be made with respect to any data or reports, including but not limited to laboratory or interpretive reports, and all sampling, analytical, and monitoring data.

60. Respondent shall preserve for the duration of these Orders and for a minimum of ten (10) years after termination of these Orders, all documents and other information within its possession or control, or within the possession or control of its contractors or agents, which in any way relate to the Work notwithstanding any document retention policy to the contrary. Respondent may preserve such documents by microfiche or other electronic or photographic device. At the conclusion of this document retention period, Respondent shall notify Ohio EPA at least sixty (60) days prior to the destruction of these documents or other information; and upon request, shall deliver such documents and other information to Ohio EPA.

#### **XIX. PERIODIC REVIEW**

61. Respondent shall conduct studies and investigations as requested by Ohio EPA in order to permit Ohio EPA to conduct reviews as to the effectiveness of the Remedial Action at least every five (5) years as described in section 121(c) of CERCLA and any applicable regulations.

62. If Ohio EPA determines that information received, in whole or in part, during a review conducted pursuant to the Periodic Review Section of these Orders indicates that the Remedial Action is not protective of public health and safety and the environment, the Respondent shall undertake any further response actions Ohio EPA has determined are appropriate. Respondent shall submit a plan for such work to Ohio EPA for approval in accordance with the procedures set forth in the Review of Submissions Section of these Orders, within thirty (30) days of receiving a request from Ohio EPA to submit such a work plan.

63. Respondent may invoke the procedures in the Dispute Resolution Section to dispute (1) Ohio EPA's determination that the Remedial Action is not protective of public health and safety and the environment, or (2) Ohio EPA's selection of further response actions.

#### **XX. MODIFICATIONS**

64. These Orders may be modified by agreement of the Parties. Modifications shall be in writing, signed by the authorized representative of the Respondent and by the Director, and shall be effective on the date entered in the Journal of the Director of Ohio EPA.

#### **XXI. INDEMNITY**

65. Respondent agrees to indemnify, save, and hold harmless Ohio EPA from any

and all claims or causes of action arising from, or related to, the implementation of these Orders or to events or conditions at the Site, including any acts or omissions of Respondent, and its successors in interest. Said indemnification shall not apply to acts or omissions of the State of Ohio, its employees, agents or assigns at, on, upon, or related to the Site if said acts are negligent, performed outside the scope of employment or official responsibilities, or performed with malicious purpose, in bad faith, or in a wanton or reckless manner. Ohio EPA shall not be considered a party to and shall not be held liable under any contract entered into by Respondent in carrying out the activities pursuant to these Orders. Ohio EPA agrees to provide notice to Respondent within thirty (30) days after receipt of any claim that may be the subject of indemnity as provided in this Section, and to cooperate with Respondent in the defense of any such claim or action against Ohio EPA.

## **XXII. CONTRIBUTION AND AGREEMENT NOT TO REFER**

66. With respect to matters addressed in these Orders, the Parties hereto agree that these Orders constitute an administrative settlement for purposes of CERCLA sections 113(f)(2) and 113 (f)(3)(B), 42 U.S.C. § 9613(f)(2) and § 9613(f)(3)(B), pursuant to which Respondent has resolved its liability to the State, and that Respondent is entitled to contribution protection and contribution rights as of the effective date of these Orders as to any liable persons who are not parties to these Orders, as provided by CERCLA section 113(f)(2) and (f)(3)(B), 42 U.S.C. § 9613(f)(2) and (f)(3)(B), provided that Respondent complies with these Orders. The "matters addressed" in these Orders are all investigative and remedial actions taken or to be taken and all response costs incurred or to be incurred by Ohio EPA or any other person with respect to the Site, including without limitation the Work and Response Costs under these Orders.

67. During the implementation of these Orders, and provided Respondent is considered by Ohio EPA to be in compliance with these Orders, Ohio EPA agrees not to refer Respondent to the Ohio Attorney General's Office for enforcement, or take administrative enforcement action against Respondent or its successors in interest liable under Ohio law for Work required under these Orders at the Site. Upon termination of these Orders pursuant to the Termination Section, Ohio EPA agrees to not refer Respondent to the Ohio Attorney General's Office for enforcement, or take administrative enforcement action against Respondent and its successors in interest liable under Ohio law for Work required under these Orders at the Site.

## **XXIII. OTHER CLAIMS**

68. Nothing in these Orders shall constitute or be construed as a release from any claim, cause of action, or demand in law or equity against any person, firm, partnership, or corporation not a Party to these Orders, for any liability arising from, or related to, events or conditions at the Site.

## **XXIV. RESERVATION OF RIGHTS**

69. Ohio EPA reserves the right to seek legal and/or equitable relief to enforce the terms and conditions of these Orders, including penalties against Respondent for noncompliance with these Orders. Except as provided herein, Respondent reserves any rights it may have to raise any legal or equitable defense in any action brought by Ohio EPA to enforce the terms and conditions of these Orders.

70. Ohio EPA reserves the right to terminate these Orders and/or perform all or any portion of the Work or any other measures in the event that the requirements of these Orders are not wholly complied with within the time frames required by these Orders.

71. Ohio EPA reserves the right to take any action, including but not limited to any enforcement action, action to recover costs, or action to recover damages to natural resources, pursuant to any available legal authority as a result of past, present, or future violations of state or federal laws or regulations or the common law, and/or as a result of events or conditions arising from, or related to, the Site. Upon termination pursuant to the Termination Section of these Orders, Respondent shall have resolved its liability to Ohio EPA only for the Work performed pursuant to these Orders.

#### **XXV. TERMINATION**

72. Respondent's obligations under these Orders shall terminate upon Ohio EPA's written approval of Respondent's written certification to Ohio EPA that all Work required to be performed under these Orders including payment of Response Costs has been completed. The Respondent's certification shall contain the following attestation: "I certify that the information contained in or accompanying this certification is true, accurate, and complete." This certification shall be submitted by Respondent to Ohio EPA and shall be signed by a responsible official of Respondent. The termination of Respondent's obligations under these Orders shall not terminate the Respondent's obligations under the Reservation of Rights, Access to Information, Indemnity, Other Claims, Contribution and Agreement Not to Refer, and Land Use and Conveyance of Title Sections of these Orders.

#### **XXVI. WAIVER AND AGREEMENT**

73. In order to resolve disputed claims, without admission of fact, violation, or liability, Respondent consents to the issuance of these Orders, and agrees to comply with these Orders.

74. Respondent hereby waives the right to appeal the issuance, terms and conditions, and service of these Orders and Respondent hereby waives any and all rights that it may have to seek administrative or judicial review of these Orders either in law or equity.

75. Notwithstanding the waiver herein of Respondent's right to appeal or seek

administrative or judicial review, Ohio EPA and Respondent agree if these Orders are appealed by any other party to the Environmental Review Appeals Commission, or any court, Respondent retains the right to intervene and participate in such appeal. In such event, Respondent shall continue to comply with these Orders notwithstanding such appeal and intervention unless these Orders are stayed, vacated or modified.

#### **XXVII. EFFECTIVE DATE**

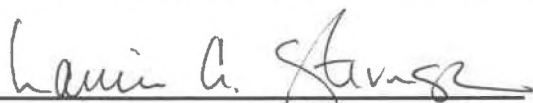
76. The effective date of these Orders shall be the date these Orders are entered in the Journal of the Director of Ohio EPA.

#### **XXVIII. SIGNATORY AUTHORITY**

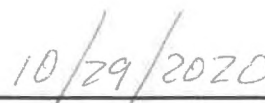
77. Each undersigned representative of a Party to these Orders certifies that he or she is fully authorized to enter into these Orders and to legally bind such Party to these Orders.

**IT IS SO ORDERED AND AGREED:**

**OHIO ENVIRONMENTAL PROTECTION AGENCY**

A handwritten signature in cursive script, appearing to read "Laurie A. Stevenson", written over a horizontal line.

Laurie A. Stevenson, Director  
Ohio Environmental Protection Agency

A handwritten date "10/29/2020" written in a cursive style, positioned above a horizontal line.

Date

**IT IS SO AGREED:**

Sun Chemical Corporation

BY:

  
Signature

9-17-2020  
Date

GARY Andreejewski, Corporate VP, ENVN Affairs.  
Printed Name & Title

**APPENDIX A**

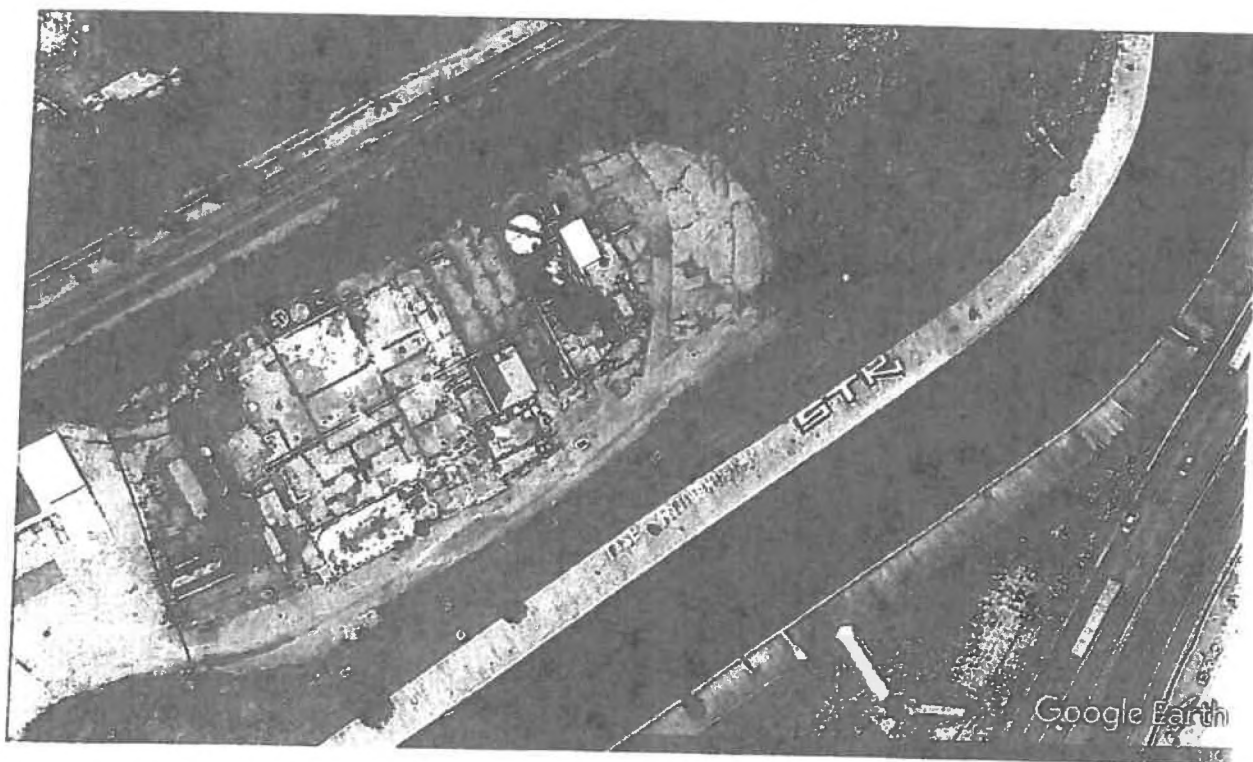
**DECISION DOCUMENT**



Ohio EPA SEP 4 '19  
Entered Directors Journal

## Decision Document

**FOR THE REMEDIATION OF THE  
FORMER PHTHALCHEM SITE  
266 West Mitchell Avenue  
Cincinnati, Hamilton County, Ohio**



**Division of Environmental Response and Revitalization  
Southwest District Office**

**August 2019**

<b>Ohio EPA's Division of Environmental Response and Revitalization (DERR) - Remedial Response Program</b>			<b>Decision Document For the Remediation of the Former Phthalchem Site Cincinnati, Hamilton County, Ohio</b>		
<b>THE REMEDIAL RESPONSE PROCESS</b>					
<b>(1) Preliminary Assessment &amp; Site Inspection</b>	<b>(2) Remedial Investigation &amp; Feasibility Study</b>	<b>(3) Remedy Selection (Preferred Plan &amp; Decision Document)</b>	<b>(4) Remedial Design</b>	<b>(5) Remedial Action</b>	<b>(6) Remedy Operation, Maintenance &amp; Monitoring</b>

### **OHIO EPA ANNOUNCES THE DECISION DOCUMENT**

On May 21, 2019, Ohio EPA issued a Preferred Plan that outlined Ohio EPA's preferred alternative to remediate contamination at the Phthalchem site. Ohio EPA held a public meeting on June 4, 2019 at the St. Bernard City Hall, 110 Washington Ave., St. Bernard, Ohio, to explain the Preferred Plan. Oral and written comments were accepted at this meeting and during the comment period which ran from May 21, 2019 through June 14, 2019. No comments were received either at the public meeting or during the commenting period.

Based on the Preferred Plan, Ohio EPA is issuing this Decision Document identifying the selected remedial alternative for the cleanup of the contaminated ground water at the site and providing the rationale for the selection.

Ohio EPA is issuing this Decision Document in a manner consistent with Section 300.430(f)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). It summarizes information found in detail in the remedial investigation and feasibility study reports and other documents contained in the administrative record file for this site. Ohio EPA encourages the public to review these documents to gain a better understanding of the site and the activities that have been conducted there.

**ERAC Appeal Period:** As a final action of the Director of Ohio EPA, the Decision Document may be appealed to the Environmental Review Appeals Commission (ERAC) pursuant to Section 3745.04 of the Ohio Revised Code. The appeal must be in writing and set forth the action complained of and the grounds upon which the appeal is based. The appeal must be filed with ERAC (77 South High Street, 17<sup>th</sup> Floor, Columbus, OH 43215) within thirty (30) days after notice of the Director's action.

**Additional Information:** Available from the Southwest District Office, located at 401 E. Fifth St., Dayton, Ohio, (937)285-6357.

## DECLARATION

Former Phthalchem Site  
266 Mitchell Avenue  
Cincinnati, Hamilton County, Ohio

## STATEMENT OF BASIS AND PURPOSE

This Decision Document presents the selected remedial action for the Phthalchem site in Cincinnati, Hamilton County, Ohio, chosen in accordance with the policies of the Ohio Environmental Protection Agency, statutes and regulations of the State of Ohio, and the National Contingency Plan, 40 CFR Part 300.

## ASSESSMENT OF THE SITE

Actual and threatened releases of hazardous waste at the site, if not addressed by implementing the remedial action selected in this Decision Document, constitute a substantial threat to public health or safety, and are causing or contributing to air or water pollution or soil contamination.

In 1978, 7,000 gallons of trichlorobenzene (TCB) were accidentally released when a tanker truck carrying TCB overturned at the Site.

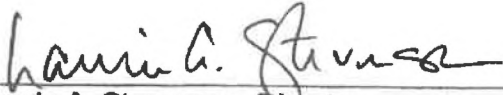
## DESCRIPTION OF THE SELECTED REMEDY

The major components of the selected remedial alternative include:

- Institutional controls through the establishment of an Environmental Covenant, including limiting the facility property to commercial/industrial use.
- A maintenance and repair program for the asphalt and concrete building foundations.
- Operation of the ground water interception trench.
- A Risk Mitigation Plan (RMP) for implementation under the Environmental Covenant for the facility.
- Free product recovery.

## STATUTORY DETERMINATIONS

The selected remedial action is protective of human health and the environment, complies with legally applicable state and federal requirements, is responsive to public participation and input, and is cost-effective. The remedy uses permanent solutions to the maximum extent practicable to reduce toxicity, mobility and volume of hazardous substances at the Site. The effectiveness of the remedy will be reviewed regularly.

  
Laurie A. Stevenson, Director

8/28/19  
Date

## SUMMARY

On February 19, 1987, Phthalchem, Inc. signed Director's Final Findings and Orders (DFFOs) with Ohio EPA to investigate the extent of contamination and, if appropriate, develop remedial alternatives to address the problem. The Remedial Investigation (RI) documented the existence of contamination (e.g., TCB, dichlorobenzene [DCB], ammonia, copper, naphthalene, phthalate, di-n-butyl phthalate, arsenic, phenols, and diethyl phthalate) on the Site. An evaluation of the risk to human health and environment was performed.

In the process of scoping and conducting the RI, generic preliminary remediation goals (PRGs) were established. These PRGs were converted to site-specific remediation goals (RGs) following completion of the RI and Feasibility Study (FS) phase of the project. The FS includes a list of RGs for protection of human health, established using the acceptable excess lifetime cancer risk and non-cancer hazard goals identified in the DERR Technical Decision Compendium (TDC) document titled "Human Health Cumulative Carcinogenic Risk and Non-Carcinogenic Hazard Goals for DERR Remedial Response and Federal Facility Oversight," dated August 21, 2009. These goals are given as a cumulative excess lifetime cancer risk of  $1 \times 10^{-5}$  (i.e., 1 in 100,000) and a cumulative non-cancer hazard goal equal to a Hazard Index (HI) of 1 and were established using the default exposure parameters provided by U.S. EPA or site-specific information. This TDC can be found at <http://www.epa.ohio.gov/portals/30/rules/riskgoal.pdf>

The Site poses unacceptable human health and environmental risks based on direct contact with contaminated subsurface soil and ground water, and inhalation of vapors from contaminated ground water. Additional details concerning the primary contaminants of concern (COCs) and the RGs, now considered to be final remediation levels (RLs), and the health risks associated with them are presented in Table 1.

TABLE 1: CONTAMINANTS OF CONCERN (COCs) / REMEDIATION LEVELS (RLs)			
Medium	COC	RL	RL Basis
Soils: Human Direct Contact- Industrial Exposure Scenario	Acenaphthene	4.5E+04 mg/kg	Non-Carcinogenic
	Aluminum, Total	1.1E+06 mg/kg	Non-Carcinogenic
	Anthracene	2.3E+05 mg/kg	Non-Carcinogenic
	Aroclor 1248	9.5E+00 mg/kg	Carcinogenic
	Arsenic, Total	3.00E+01 mg/kg	Carcinogenic
	Benzo(a)anthracene	2.1E+02 mg/kg	Carcinogenic
	Benzo(b)fluoranthene	2.1E+02 mg/kg	Carcinogenic
	Benzo(k)fluoranthene	2.1E+03 mg/kg	Carcinogenic
	Benzo(a)pyrene	2.1E+01 mg/kg	Carcinogenic
	Beryllium, Total	2.3E+03 mg/kg	Non-Carcinogenic
	Bis(2-ethylhexyl)phthalate	1.60E+03 mg/kg	Carcinogenic

**TABLE 1: CONTAMINANTS OF CONCERN (COCs) / REMEDIATION LEVELS (RLs)**

Medium	COC	RL	RL Basis
Ground Water Potable	Calcium, Total	9.8E+02 mg/kg	Non-Carcinogenic
	Carbon Disulfide	3.5E+03 mg/kg	Non-Carcinogenic
	Chlorobenzene	1.3E+03 mg/kg	Non-Carcinogenic
	Chromium, Total	6.3E+01 mg/kg	Carcinogenic, based on Cr(VI)
	Chrysene	2.1E+04 mg/kg	Carcinogenic
	Cobalt, Total	3.5E+02 mg/kg	Non-Carcinogenic
	Copper, Total	4.70E+04 mg/kg	Non-Carcinogenic
	Cyanide, Total	1.5E+02 mg/kg	Non-Carcinogenic, based on CN-
	Dibenzo(a,h)anthracene	2.1E+01 mg/kg	Carcinogenic
	Dibenzofuran	1.0E+03 mg/kg	Non-Carcinogenic
	1,2-Dichlorobenzene	9.30E+03 mg/kg	Non-Carcinogenic
	1,4-Dichlorobenzene	1.10E+02 mg/kg	Carcinogenic
	2,4-Dichlorophenol	2.5E+03 mg/kg	Non-Carcinogenic
	Di-n-butyl phthalate	8.20E+04 mg/kg	Non-Carcinogenic
	Di-n-octyl phthalate	8.2E+03 mg/kg	Non-Carcinogenic
	Fluoranthene	3.0E+04 mg/kg	Non-Carcinogenic
	Fluorene	3.0E+04 mg/kg	Non-Carcinogenic
	Hexachlorobenzene	9.6E+00 mg/kg	Carcinogenic
	Iron, Total	8.2E+05 mg/kg	Non-Carcinogenic
	Lead, Total	8.0E+02 mg/kg	Industrial Lead Standard
	Mercury, Total	3.5E+02 mg/kg	Non-Carcinogenic, based on mercury salts
	2-Methylnaphthalene	3.0E+03 mg/kg	Non-Carcinogenic
	Naphthalene	1.70E+02 mg/kg	Carcinogenic
	Nickel, Total	2.2E+04 mg/kg	Non-Carcinogenic, based on nickel soluble salts
	Phenol	2.50E+05 mg/kg	Non-Carcinogenic
	Phthalic Acid	8.2E+05 mg/kg	Non-Carcinogenic
	Pyrene	2.3E+04 mg/kg	Non-Carcinogenic
	Silver, Total	5.8E+03 mg/kg	Non-Carcinogenic
	1,2,3-Trichlorobenzene	9.30E+02 mg/kg	Non-Carcinogenic
	1,2,4-Trichlorobenzene	1.10E+02 mg/kg	Non-Carcinogenic
	Vanadium, Total	5.8E+03 mg/kg	Non-Carcinogenic
	Zinc, Total	3.5E+05 mg/kg	Non-Carcinogenic
	Acetophenone	1.9E+03 µg/l	Non-Carcinogenic

<b>TABLE 1: CONTAMINANTS OF CONCERN (COCs) / REMEDIATION LEVELS (RLs)</b>			
<b>Medium</b>	<b>COC</b>	<b>RL</b>	<b>RL Basis</b>
<b>Use</b>	4-Chloroaniline	3.7E+00 µg/l	Carcinogenic
	2-Chlorophenol	9.1E+01 µg/l	Non-Carcinogenic
	1,2-Dichlorobenzene	3.0+02 µg/l	Non-Carcinogenic
	1,4-Dichlorobenzene	4.8E+00 µg/l	Carcinogenic
	2,4-Dichlorophenol	4.6E+01 µg/l	Non-Carcinogenic
	Naphthalene	1.7E+00 µg/l	Carcinogenic
	Phenol	5.8E+03 µg/l	Non-Carcinogenic
	o-Toluidine	4.7E+01 µg/l	Carcinogenic
	1,2,4-Trichlorobenzene	1.2E+01 µg/l	Carcinogenic
	2,4,5-Trichlorophenol	1.2E+03 µg/l	Non-Carcinogenic
	2,4,6-Trichlorophenol	4.1E+01 µg/l	Carcinogenic
<b>Ground Water: Vapor Intrusion to Indoor Air-Industrial Exposure Scenario</b>	Free Product	Remove to the Extent Practicable	
	Ammonia	3.30E+06 µg/l	Non-Carcinogenic
	1,2-Dichlorobenzene	1.10E+04 ug/l	Non-Carcinogenic
	1,4-Dichlorobenzene	1.10E+02 ug/l	Carcinogenic
	Naphthalene	2.00E+02 ug/l	Carcinogenic
<b>Ground Water: Ground Water to Surface Water Exposure Human Health (non-drinking water)</b>	1,2,4-Trichlorobenzene	1.50E+02 ug/l	Non-Carcinogenic
	2-Chlorophenol	4.00E+02 µg/l	Non-Carcinogenic
	1,2-Dichlorobenzene	1.7E+04 µg/l	Non-Carcinogenic
	1,3-Dichlorobenzene	2.6E+03 µg/l	Non-Carcinogenic
	1,4-Dichlorobenzene	2.6E+03 µg/l	Non-Carcinogenic
	2,4-Dichlorophenol	7.9E+02 µg/l	Non-Carcinogenic
	Phenol	4.6E+06 µg/l	Non-Carcinogenic
	1,2,4-Trichlorobenzene	9.4E+02 µg/l	Non-Carcinogenic
	2,4,5-Trichlorophenol	9.8E+03 µg/l	Non-Carcinogenic
	2,4,6-Trichlorophenol	6.5E+01 µg/l	Carcinogenic
<b>Ground Water: Ground Water to Surface Water Exposure Aquatic Life (Outside Mixing Zone Average)</b>	Free Product	Remove to the Extent Practicable	NA
	Ammonia	3.4E+03 µg/l	Non-Carcinogenic
	2-Chlorophenol	3.2E+01 µg/l	Non-Carcinogenic
	1,2-Dichlorobenzene	2.3E+01 µg/l	Non-Carcinogenic
	1,3-Dichlorobenzene	2.2E+01 µg/l	Non-Carcinogenic
	1,4-Dichlorobenzene	9.4E+00 µg/l	Non-Carcinogenic
	2,4-Dichlorophenol	1.1E+01 µg/l	Non-Carcinogenic
	Naphthalene	2.1E+01 µg/l	Non-Carcinogenic
	Phenol	4.0E+02 µg/l	Non-Carcinogenic
	2,4,6-Trichlorophenol	4.9E+00 µg/l	Non-Carcinogenic
	Free Product	Remove to the Extent Practicable	NA

Based on this information, remedial alternatives were developed to address human health and environmental risks posed by the Site. The FS documents the remedial alternatives developed for the Site, and the Remedial Action Objectives (RAOs) to ensure protectiveness of human health and the environment. This Decision Document summarizes the range of remedial alternatives evaluated, identifies Ohio EPA's selected remedial alternative, and explains the reasons for selection of the remedial alternative. The selected remedial alternative is designed to reduce human health risks to within acceptable limits, and to protect

human health and the environment from exposure to soil, ground water, and indoor air contamination.

The expectations for the selected remedial alternative include:

1. Reduction of risks to human health and the environment from exposure to COCs in soil, ground water, and indoor air, to applicable remediation levels.
2. Compliance with applicable or relevant and appropriate requirements (ARARs).
3. Cost-effectiveness and limitation of expenses to what is necessary to achieve the remedial action objectives.
4. Continued operation and maintenance of the existing remedial action and monitoring systems.

The major elements of the selected remedial alternative include:

1. Institutional controls through the establishment of an Environmental Covenant, including limiting the facility property to commercial/industrial use.
2. A maintenance and repair program for the asphalt and concrete building foundations.
3. Operation of the ground water interception trench.
4. A Risk Mitigation Plan (RMP) for implementation under the Environmental Covenant for the facility.
5. Free product recovery.

## **SITE HISTORY**

The former Phthalchem facility is located at 266 West Mitchell Avenue in Cincinnati, Hamilton County, Ohio and is approximately 3-acres in size (see Figure 1). The Site is located north of the interchange of Mitchell Avenue and Interstate 75, between Mill Creek and the B&O Railroad in the Northwest Quarter of Section 16, Range 2 East, Township 3 North, on the Cincinnati West United States Geological Survey (USGS) 7.5-minute quadrangle. It is within an industrial corridor along Mill Creek at the Cincinnati-St. Bernard corporation boundary. The current layout of the Site is shown on Figure 2. The Site has been divided into two operable units (OUs). OU1 consists of the on-property area of contamination which includes the former production area. OU2 consists of the off-property area of contamination, which includes Mill Creek.

The Site, which is currently owned by Sun Chemical, is vacant. Prior to development, the Site was reportedly vacant of structures for at least 80 years. The northern section of the property was backfilled in the early 1970s. Phthalchem began operations at the facility in 1977 and ceased operations in 1996. During that time, Phthalchem manufactured phthalocyanine chemicals. The methodology for the manufacturing of the phthalocyanine blue chemical consisted of reacting urea and phthalic anhydride with a copper salt in the presence of catalysts. TCB was used as a non-reactive solvent in the process. A wastewater treatment system, including solvent separation and recovery, was and currently is, present at the Site. During plant operations, wastewater containing ammonia and copper was treated prior to discharge to the Metropolitan Sewer District. The wastewater treatment system is currently used to treat ground water pumped from the on-site recovery wells.

During the early years of the plant's operation, Phthalchem reported having significant losses of TCB and aqueous ammonia as a result of leaks, spills, and scrubber system discharges. Plant modifications and system improvements were made in 1980 and 1981 that curtailed these losses. Only one incident has been recorded that resulted in a sudden release. Reportedly, 7,000 gallons of TCB were accidentally released in 1978 when a tanker truck carrying TCB overturned at the Site. In 1981, Environmental Enterprises Incorporated conducted chemical analyses of soil samples from an abandoned lagoon (a low-lying area located to the east of the plant) that indicated the presence of ammonia, copper, and TCB.

In 1983, the Army Corps of Engineers channelized Mill Creek and constructed a concrete structure in the portion of the creek adjacent to the Site. The channel structure has a 10-inch thick concrete floor overlying a 12-inch-thick sand and gravel base with sloped concrete sides. The channel is over 18 feet deep from the top edge of the walls to the surface of the concrete floor. Four-inch diameter weep holes were drilled through the concrete in rows across the structure. During channelization of the creek, the area of the old lagoon on the Site was covered with approximately 5 to 10 feet of fill material and the area to the northeast of the Site was regraded.

## **SITE CONDITIONS**

In 1985, OEPA personnel observed pools of TCB on the bottom of Mill Creek during a low flow period. It was determined that the TCB was migrating from weep holes on the channel bottom adjacent to the Site. Shortly thereafter, remedial actions were initiated to mitigate the release. An ongoing monitoring program for ammonia and TCB through analysis of samples taken from weep holes in Mill Creek augmented the initial remedial efforts. Also, in 1985, a system was installed for product recovery from the subbase of Mill Creek. Between 1985 and 1989, over 5,300 gallons of TCB had been removed from below Mill Creek.

In 1987, Phthalchem entered into an Administrative Order of Consent (AOC) with Ohio EPA. The objective of the AOC was to investigate the entire Site, and to develop appropriate response measures. In 1989, Phthalchem agreed to undertake immediate ground water removal actions that were requested by Ohio EPA, as outlined in a Consent Order for Preliminary Injunctive Relief. Westinghouse Environmental and Geotechnical Services, Inc. (Westinghouse) was retained by Phthalchem to design and install a ground water recovery and treatment system for the removal of free-phase TCB and DCB. In addition, the recovery system was intended to prevent the migration and release of contaminants from the Site. A series of 11 ground water recovery wells were installed in the shallow ground water-bearing unit on the Site and the system began operation in 1990.

In 1992, Phthalchem entered into a Consent Order with the state of Ohio and the City of St. Bernard (the "1992 Consent Order"). Under this Consent Order, Phthalchem is enjoined to remove free-phase DCB and TCB from the ground water, as well as prevent the off-site migration of DCB, TCB, ammonia, copper, and any potential breakdown products. SCS Engineers, Inc. (SCS) assumed responsibility for the operation and maintenance of the ground water recovery and treatment system in 1992.

All manufacturing operations at the Site ceased in May and June of 1996. Thereafter, all manufacturing equipment was removed from the Site, and the manufacturing building was razed. The only structures remaining at the Site are an office building, a warehouse building, an office trailer, the former boiler building, and a metal building that houses the wastewater treatment system, all of which are unoccupied.

In 1996, David E. Estes Engineering, Inc. (Estes Engineering) assumed responsibility for operation and maintenance of the ground water and product recovery systems. In 1997, Ohio EPA approved the current work plan titled Work Plan for Additional Free Product Removal/Ground-water Control (Revision 4) (the "1997 Work Plan"). In 1998, ENVIRON was retained by Phthalchem to provide additional engineering consulting services associated with the 1992 Consent Order. In 1999, PSARA Technologies (PSARA) took over the operation and maintenance of the Phthalchem product and ground water recovery systems from Estes Engineering.

In the fall of 2001, the well recovery system was upgraded with the construction of a slurry wall and ground water interception trench along the south edge of the Site. By December 2001, ground water was being collected via wells in the interception trench. The ground water recovery system is currently operating as it was in 2001. The slurry wall is providing containment for the Site ground water, which is pumped out of the interception trench to the wastewater treatment area. After treatment, the wastewater is discharged to the Metropolitan Sewer District. In addition, monthly product checks are performed on the drive points in the concrete base of Mill Creek. Any recoverable product is removed from these drive points on a monthly basis.

The Site is underlain by four distinctive unconsolidated stratigraphic units followed by bedrock, as detailed below:

- Surficial fill and soil material (7.5 to 18 feet thick),
- Upper sand and gravel unit (up to 17 feet thick) – uppermost ground water bearing zone at the Site,
- Lacustrine unit (83 to 87 feet thick) – low permeability silt and clay layer,
- Lower sand and gravel unit (1 to 10 feet thick) – confined aquifer, and
- Bedrock (several hundred feet thick) – interbedded shale and limestone.

Shallow ground water flows toward the southwest toward Mill Creek. During the operation of the ground water/product recovery wells, the saturated thickness of the shallow sand and gravel unit decreased across the Site from north (where it was approximately 8 feet) to south (where there was no saturated thickness).

The downgradient and vertical extent of the ground water impact were evaluated as part of the Phase II RI. The ground water contamination does not extend beyond Mill Creek in the downgradient direction or into the deep ground water bearing unit in the vertical direction.

The ground water ingestion pathway is not considered complete at the Site based on the following information:

- There is no ground water use or planned ground water use at the Site. Ground water is not used as drinking water within a 2-mile radius of the Site.
- Drinking water for the city of Cincinnati is provided by Greater Cincinnati Water Works, with potable water being sourced from surface water from the Ohio River (~88% of the drinking water) and ground water from the Great Miami Aquifer (~12% of the drinking water). The closest Cincinnati ground water well used for potable water is approximately 14 miles northwest of the Phthalchem Site, which is upgradient of the Site.
- In the 1930s and 1940s, industrial companies in the Mill Creek Valley realized that the ground water resources in the industrialized region of southwestern Ohio were being depleted by substantial industrial use of the aquifer. Eleven industries joined together to form the Southwestern Ohio Water Company to supply the water needs of the industrial companies. The Southwestern Ohio Water Company currently draws water from two production wells near the Great Miami River in Ross, Ohio. These two production wells are located approximately 11 to 12 miles northwest of the Phthalchem Site, which is upgradient of the Site.

Free product is currently located in two areas: (1) below the lacustrine interface with the upper sand and gravel unit in the former manufacturing area, and (2) in the sub-base of Mill Creek. The free product in the former manufacturing area is controlled by the ground water interception trench system. Product has only been recovered from 3 of the 11 wells that have been monitored on a routine basis from 2002 through the present, with a total of only 24.5 gallons of product/water mixture being collected from the monitoring wells over the past 14 years of monitoring. The free product currently located in the sub-base of Mill Creek is being controlled by regularly pumping the free product out of the drive points (installed 1997), preventing accumulation of free product. The free product area in the Mill Creek sub-base is bounded by upstream and downstream drive points, in which free product has not been detected. Since 1997, several of the drive points have "silted in," preventing monitoring of these locations for free product. Rehabilitation of these drive points will be considered as part of an appropriate long-term monitoring program that will be determined as part of the active remedy completion evaluation. The extent of free product in 1997 in OU1 and OU2 (prior to the installation of the ground water interceptor system) is shown on Figure 3. The extent of free product detected in OU1 after 11 to 15 years of operation of the ground water interceptor system is shown on Figure 4. The extent of free product under the channelized portion of Mill Creek (OU2) is shown on Figure 5.

The 2018 FS has taken into consideration that ground water may become surface water and that this water resource represents an important hydrologic pathway. The ground water at the Site does not appear to be significantly impacting Mill Creek. In 2011, the Metropolitan Sewer District of Greater Cincinnati (MSD) conducted a biological, chemical, and physical monitoring study of Mill Creek from the border of Butler and Hamilton counties to the Ohio River, the West Fork of the Mill Creek, the East Fork of the Mill Creek, and tributaries to each. Both the upstream (MC07) and downstream (MC75) monitoring stations of the Phthalchem facility were in "Full" attainment status for aquatic life use. Copper, bis(2-ethylhexyl)phthalate, and ammonia were not detected in surface water above their respective reference target limits in either location.

## **SITE RISKS**

The conceptual site model (CSM) and baseline risk assessment (BRA) for OU1 (On-Site) and OU2 (Mill Creek) were presented in the 2005 RI/FS Addendum. The BRA was performed for the Site as it currently exists, i.e., zoned for industrial/commercial use, with most of the surface covered with pavement, and an operating ground water interception system. The CSM was updated, and the risk assessment was performed in accordance with U.S. EPA's Risk Assessment Guidance for Superfund (RAGS). The BRA indicated that the Site does not pose any unacceptable exposure under current site zoning, pavement covering, and the ground water interception system.

Potential receptors evaluated in the BRA included trespasser/visitor, site worker, construction worker, and ecological receptors. Completed pathways evaluated in the BRA included exposure to surface soils (construction worker at OU1), subsurface soils (construction worker at OU1), sediments (construction worker and trespasser/visitor at OU2), ground water (construction worker at OU1), and ground water to surface water (human and ecological receptors). For the purposes of the BRA reported in this RI/FS Addendum Report, the potential COCs were assumed to be only the chemicals that have been detected. Risks associated with potential COCs were evaluated based on the potential exposure routes.

Exposure of trespasser/visitor and site worker to surface soils at OU1 was not considered as the soils at the Site are covered by pavement or building foundations. However, this may be a potential future risk if the pavement or building foundations are compromised. Exposure to surface water for construction worker and trespasser/visitor at OU2 was not considered as there were no COCs detected in Mill Creek. The construction worker also has the potential to encounter free product in OU2. Exposure to air contamination and inhalation risks were considered in the evaluation of the various exposure sources (surface soils, subsurface soils, surface water, ground water, and free product).

The calculated risks for OU1 and OU2 under current site conditions (ground-water interceptor operating, asphalt and concrete pavement in place and no occupied structures) were less than the acceptable cancer risk level of  $1 \times 10^{-5}$  and the acceptable hazard index (HI) of 1. The calculated risks for OU1 were cancer risk equal to  $2 \times 10^{-7}$  and HI equal to 0.3. For OU2, the highest calculated cancer risk was  $2 \times 10^{-9}$  and HI equal to 0.03.

## **REMEDIAL ACTION OBJECTIVES**

RAOs were developed for the Site to identify goals that a remedy should achieve in order to ensure protection of human health and the environment. The RAOs for the Site are listed in Table 2.

**TABLE 2: REMEDIAL ACTION OBJECTIVES**

<b>Ground Water</b>	
<b>Human Health Risk</b>	Prevent ingestion/direct contact of ground water at the site having a COC in excess of its MCL or having carcinogens in excess of a total excess lifetime cancer risk (for all contaminants) greater than $1 \times 10^{-6}$ .
<b>Human Health Risk</b>	Prevent ingestion/direct contact of ground water at the site having non-carcinogens in excess of MCLs or having non-carcinogens in excess of a HQ or HI greater than 1.
<b>Human Health Risk</b>	Prevent inhalation in future site structures of carcinogens 1,4-dichlorobenzene (1,4-DCB) and naphthalene in vapors emanating from ground water in excess of a $1 \times 10^{-5}$ excess lifetime cancer risk.
<b>Human Health Risk</b>	Prevent inhalation in future site structures of non-carcinogens ammonia; 1,2-DCB; and 1,2,4-trichlorobenzene (1,2,4-TCB) in vapors emanating from ground water in excess of a hazard quotient (HQ) or HI of 1.
<b>Human Health Risk</b>	Reduce migration of potential contaminants of concern (PCOCs) from ground water to surface water to levels that are protective of human health.
<b>Environmental Risk</b>	Reduce migration of PCOCs from ground water to surface water to levels that are protective of biota.

<b>Soil</b>	
<b>Human Health Risk</b>	Prevent ingestion/direct contact with Site soils having carcinogenic COCs in excess of a total excess lifetime cancer risk greater than $1 \times 10^{-6}$ .
<b>Human Health Risk</b>	Prevent ingestion/direct contact of Site soils having non-carcinogenic COCs in excess of a HI greater than 1.
<b>Note:</b> Ecological evaluations of Mill Creek adjacent to the Site have been conducted. These evaluations indicate that the Site does not pose any unacceptable aquatic risks to Mill Creek (2005 Remedial Investigation/Feasibility Study Addendum Report, Phthalchem Facility). Also, given the highly urbanized/industrial conditions of the Site and surrounding areas, and the channelization of Mill Creek, there is a lack of habitat that would support ecological receptors.	

## SUMMARY OF REMEDIAL ALTERNATIVES

A total of 7 remedial alternatives were considered in the FS. A brief description of the major features of each are as follows:

### RA-1: No Action

The National Contingency Plan (NCP) requires that a No Action alternative be incorporated into the evaluation and selection of an RA. The No Action alternative serves as a point of comparison to the other alternatives under consideration at the Site. This alternative assumes that no remedial technologies or controls would be implemented and the exposures at the Site would remain unchanged in the near and long-term.

## **RA-2: Institutional Controls and Long-Term Monitoring**

Institutional controls for the Site would consist of the limitation of land/resource use to prevent exposure to on-site contamination in OU1. This alternative would be implemented using an environmental covenant (EC). The property where OU1 is located would be limited to industrial/commercial land use. The EC would also require the property owner to submit a risk mitigation plan (RMP) to Ohio EPA for approval prior to any construction or excavation activities at the site. Long-term monitoring of the site ground water would also be performed as part of this alternative.

## **RA-3: Ground-water Interception Trench and Slurry Wall**

This alternative consists of an interception trench that contains a perforated pipe to transfer captured ground water for ex-situ treatment and a slurry wall down-gradient adjacent to Mill Creek. This alternative would capture and contain contaminated ground water at the Site using a trench and perforated pipe, and would include the following components:

- Simultaneous trenching and slurry wall construction utilizing guar gum bio-slurry (trench construction will include installation/submersion of collection system piping).
- Installation of collection system pumps.
- Installation of on-site treatment system or modification of the existing treatment system.
- Periodic monitoring of downgradient monitoring wells.
- Periodic collection system and on-site treatment system maintenance and sampling.

Perforated ground water collection piping and any necessary pumping equipment would be laid in the excavation during the trenching operations. The pipe would be designed to ensure that the maximum ground water flow through the Site would be captured. Through gravity flow and/or pumping, the captured ground water would be transported via the pipe to a treatment system, with discharge of the treated ground water to MSD. The system described in this alternative was installed at the Site in 2001 and continues to operate. The work was performed in accordance with the 2001 Design Report, which was approved by Ohio EPA in May 2001, and the subsequent construction modifications approved by the OEPA. In August 2014, the MSD approved direct discharge of the extracted ground water without pretreatment to the MSD sewer system.

## **RA-4: In-Situ Chemical Oxidation (ISCO)**

This RA would attempt to chemically degrade contaminants using Fenton's chemistry (generation of hydroxyl radicals with iron and peroxide). COCs, in theory, would be degraded to carbon dioxide and water, in addition to possible degradation products if the reactions are incomplete. The most commonly used oxidants are hydrogen peroxide, permanganate, ozone, and persulfate. The two most critical factors in ISCO implementation are the effective distribution of oxidants to the treatment zone and the reactivity of the oxidant with the

contaminants present. There are several options for delivery, including: vertical wells, well points, horizontal or inclined wells, infiltration galleries, and treatment fences. Other techniques such as deep soil mixing, and hydraulic fracturing have been used for media with low permeability. The application of chemical oxidation to the former production area of the Facility would include the following activities:

- Installation of injection points.
- Injection (and possible re-injection) of Fenton's reagent.
- Collection and treatment of vapors generated during the process.
- Pre- and post-injection monitoring.

The effectiveness of in-situ chemical oxidation of chlorinated benzenes in contaminated soils has been reviewed by others. In a critical analysis of field-scale applications of chemical oxidation assessing a range of case studies (242 overall, 5 involving chlorinated benzenes), the mean and median % reductions of chlorinated benzenes in ground water were only 16% and 23%, respectively. In addition, USEPA's CLU-IN database and the Interstate Technical and Regulatory Council (ITRC) databases were both reviewed, but there were no reported studies on the removal effectiveness for chlorinated benzenes. Peer reviewed literature was also searched for Fenton's reagent and chlorinated benzenes, but no reported studies were found.

A chemical oxidation pilot test was conducted by GCI on a small portion of the Site in August 1998. As reported by Estes Engineering in their pilot-scale test report, ground water samples collected prior to and following the injection of chemicals indicated an approximately 85 percent reduction in TCB within the test area. In-situ technologies rely heavily on various delivery mechanisms to contact the oxidant with the impacted medium. As depth increases, the delivery methods inherently become more problematic and costlier. Contact with contaminants and diffusion of the injected chemical oxidant is typically a limiting factor for effective ISCO. Delivery via injection is generally limited to a relatively small radius of influence. Thus, for a site with relatively large treatment areas, a very large number of oxidant injection points are required.

Natural minerals and organic matter in the target soil will consume the oxidant and consequently less oxidant will be available to oxidize the Site COCs. A complete understanding of the native oxidant demand is necessary to determine the amount of oxidant necessary to treat the Site COCs. If there is a large amount of natural organic matter, a large amount of oxidant will need to be injected in order to treat the COCs to levels below the RAOs. There has been limited success in applying ISCO to remediate chlorinated benzenes in vadose zone soils. However, ISCO was retained as a remedial alternative for addressing source area impacts. Long-term monitoring of the site ground water would also be conducted as part of this alternative.

#### **RA-5: Free Product Removal**

Continued removal of free product is consistent with the 1992 Consent Order and would continue until removal volumes approach asymptotic levels. Long-term monitoring of ground water would also be conducted as part of this alternative. However, this remedial alternative does not, by itself, meet the RAOs and would likely need to be paired with another remedial alternative. It is assumed that free product removal activities may be required for up to 30 years.

#### **RA-6: Soil/Free Product Excavation and Off-Site Disposal**

This alternative consists of excavation of pooled free product and soils with COC concentrations greater than the soil saturation concentration ( $C_{sat}$ ) for specific COCs. Long-term monitoring of the site ground water would also be conducted as part of this alternative.

Based on soil borings conducted during previous investigations, an area of approximately 47,350 square feet is estimated to be impacted by either free product ganglia or free-phase product in the former manufacturing area (not including the concrete-lined Mill Creek area). The impacted zones are near the interface of the fill/shallow sand unit with the lacustrine unit. The lacustrine unit is generally 15 to 20 feet below the current ground surface in the former manufacturing area of the Site. Removal of the soils above the lacustrine interface would be required for this excavation and off-site disposal alternative. The cost and safety concerns for removal of 15 to 20 feet of soil to gain access to the impacted materials and pooled free product makes this alternative impractical. Excavation to remove free product beneath the concrete-lined Mill Creek area is not considered a part of this alternative.

An alternative to excavate and dispose of impacted soils and free product from the Site would include the following components:

- Excavation of the approximately 47,350 square-foot area in sections to a depth of 15 to 20 feet and stockpiling on-site. This clean overburden will be used to backfill the excavation.
- Excavation of approximately 5 feet thickness of soils at the lacustrine interface (the contaminated soils). These soils will be containerized on-site pending waste characterization activities.
- Transportation of waste soils and disposal at a local landfill. It is assumed that the contaminated soils would be characterized as non-hazardous wastes.
- Backfilling of excavation with stockpiled shallow soils and imported fill as needed.
- Surface restoration.

#### **RA-7: Institutional Controls with Long-Term Monitoring, Ground-water Interception Trench and Slurry Wall, and Free Product Removal**

This alternative consists of a combination of Alternatives RA-2, RA-3, and RA-5 as described above. It includes a method to capture the ground water at the Site, a mechanism to control site access through means of enforcement tools, permitting tools, and information tools and continued removal of the source contamination.

## **COMPARISON CRITERIA**

Eight (8) criteria have been established to evaluate the various remedial alternatives individually and compare them with each other to select a preferred remedy. Consisting of threshold, balancing, and modifying criteria, they include:

### **Threshold Criteria**

1. Overall protection of public health and the environment which evaluates whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, treatment, etc.
2. Compliance with ARARs which evaluates whether the alternative meets federal and state environmental statutes, regulations, and other requirements that pertain to the site, or whether a waiver is justified.

Any acceptable remedy must minimally comply with both criteria.

### **Balancing Criteria**

1. Long-Term Effectiveness and Permanence, which evaluates the ability of an alternative to maintain protection of human health and the environment over time.
2. Reduction of Toxicity, Mobility, or Volume of Contaminants Through Treatment, which evaluates the amount of contamination present, the ability of the contamination to migrate, and the use of treatment to reduce harmful effects.
3. Short-Term Effectiveness, which evaluates the length of time needed to implement an alternative and the risks the alternative poses during implementation.
4. Implementability, which evaluates the technical and administrative feasibility of implementing the alternative.
5. Cost, which is an estimate of the capital and annual operation and maintenance costs. Evaluation of the Balancing Criteria are used to select the most appropriate remedial alternative.

### **Modifying Criterion**

The Modifying Criterion is Community Acceptance, which considers whether the local community agrees with the analyses and preferred alternative as proposed. This criterion is evaluated through comments on the alternatives that are received during the comment period.

## EVALUATION OF ALTERNATIVES

A summary of the evaluation of the Site remedial alternatives and the costs associated with each is included in **Table 3** below.

TABLE 3: EVALUATION OF SITE REMEDIAL ALTERNATIVES								
Remedial Alternatives	Threshold Criteria		Balancing Criteria				Modifying Criteria	
	1. Protects Human Health and Environment	2. Complies with ARARs	3. Long-Term Effectiveness	4. Reduces T, M, or V through Treatment	5. Short-Term Effectiveness	6. Implementability	7. Cost	8. Community Acceptance
RA-1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	\$0	TBD
RA-2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	\$594,000	TBD
RA-3	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	\$3,304,500	TBD
RA-4	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	\$5,634,000	TBD
RA-5	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	\$465,000	TBD
RA-6	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	\$8,460,000	TBD
RA-7	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	\$3,983,000	TBD
<input checked="" type="checkbox"/> = Fully Meets Criteria <input type="checkbox"/> = Partially Meets Criteria <input type="checkbox"/> = Does Not Meet Criteria								

## SELECTED REMEDIAL ALTERNATIVE

Ohio EPA's selected remedial alternative for the former Phthalchem Site is RA-7, which is a combination of RA-2, RA-3 and RA-5. This alternative relies on various institutional controls to restrict the use of the Site, and engineering controls to prevent direct contact with contamination remaining at the Site. The engineering and institutional controls on which the preferred alternative relies are commonly used strategies and have been widely applied at other sites with soil and ground water impacts. This preferred remedial alternative, as detailed below, may change in response to Ohio EPA's consideration of public comment or new information.

The selected alternative for OU1 includes the following components:

- An environmental covenant that would limit the use of the Site to industrial/commercial; prohibit the use of ground water for any purpose other than sampling to monitor contamination; maintenance of the existing asphalt cap to prevent direct contact with soil; a risk mitigation plan and pre-approval from Ohio EPA for any construction or excavation activities at the Site, and evaluation of the vapor intrusion pathway, if any structures are constructed at the Site.

- Continued operation and maintenance of the ground water interceptor system and slurry wall, with long term ground water monitoring and free product removal to maximum extent practicable.

The selected alternative for OU2 is to continue to monitor selected weep holes in Mill Creek with removal of free product to the maximum extent practicable.

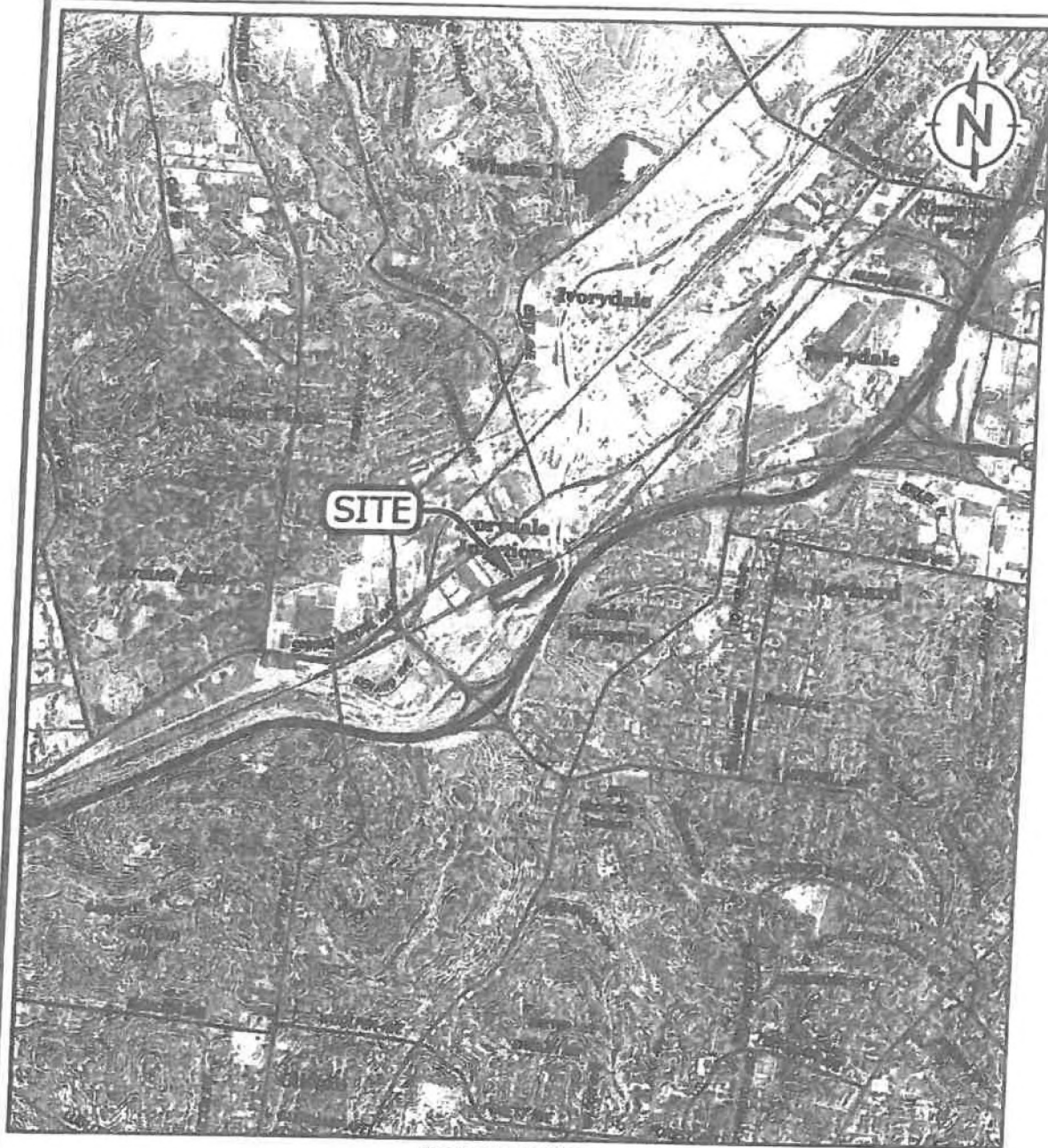
Based on information presently available, it is Ohio EPA's judgment that the selected remedial alternative best satisfies the criteria defined in Table 3: Evaluation of Site Remedial Alternatives.

#### **DOCUMENTATION OF SIGNIFICANT CHANGES**

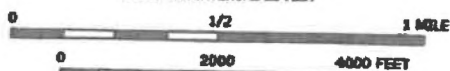
Ohio EPA did not receive any comments on the Preferred Plan, and no significant changes have been made to the selected remedial alternative.

#### **RESPONSIVENESS SUMMARY**

Ohio EPA did not receive any comments at the public meeting/hearing nor during the public comment period.



CONTOUR INTERVAL 10 FEET



**LEGEND:**

— PROPERTY BOUNDARY  
(APPROXIMATE)

**SOURCE:**  
2013 USGS 7.5 Minute Series Cincinnati West and Cincinnati East, Ohio Topographic Quadrangles.  
Site Location: N: 39.168176° W: 84.906885° WGS84

OHIO

QUADRANGLE LOCATION

**RAMBOLL ENVIRON**

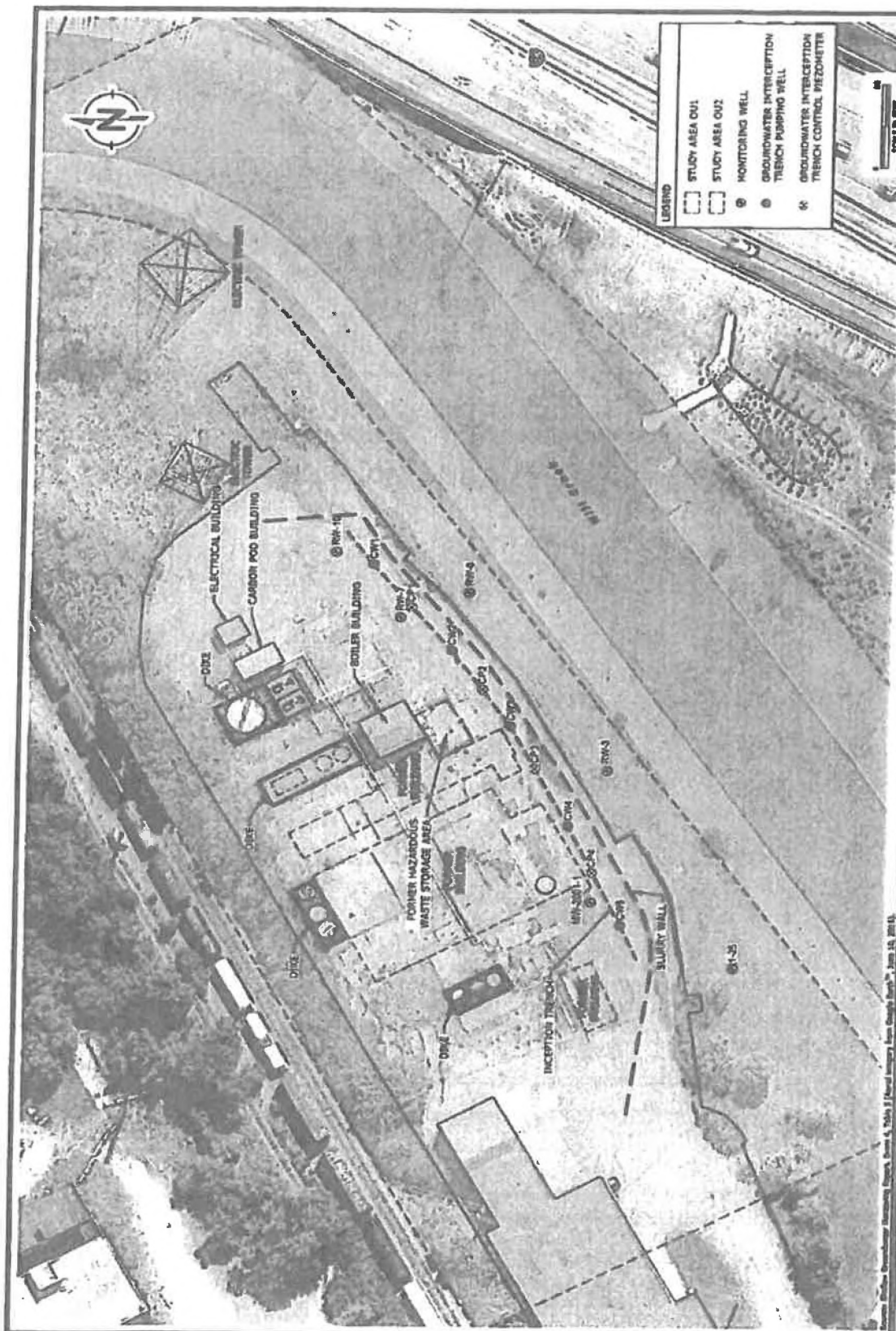
**SITE LOCATION MAP**  
PHTHALCHEM, INC.  
266 WEST MITCHELL AVENUE  
CINCINNATI, OHIO

**FIGURE**  
**1**

DRAFTED BY: BLS

DATE: 2/15/17

215772A

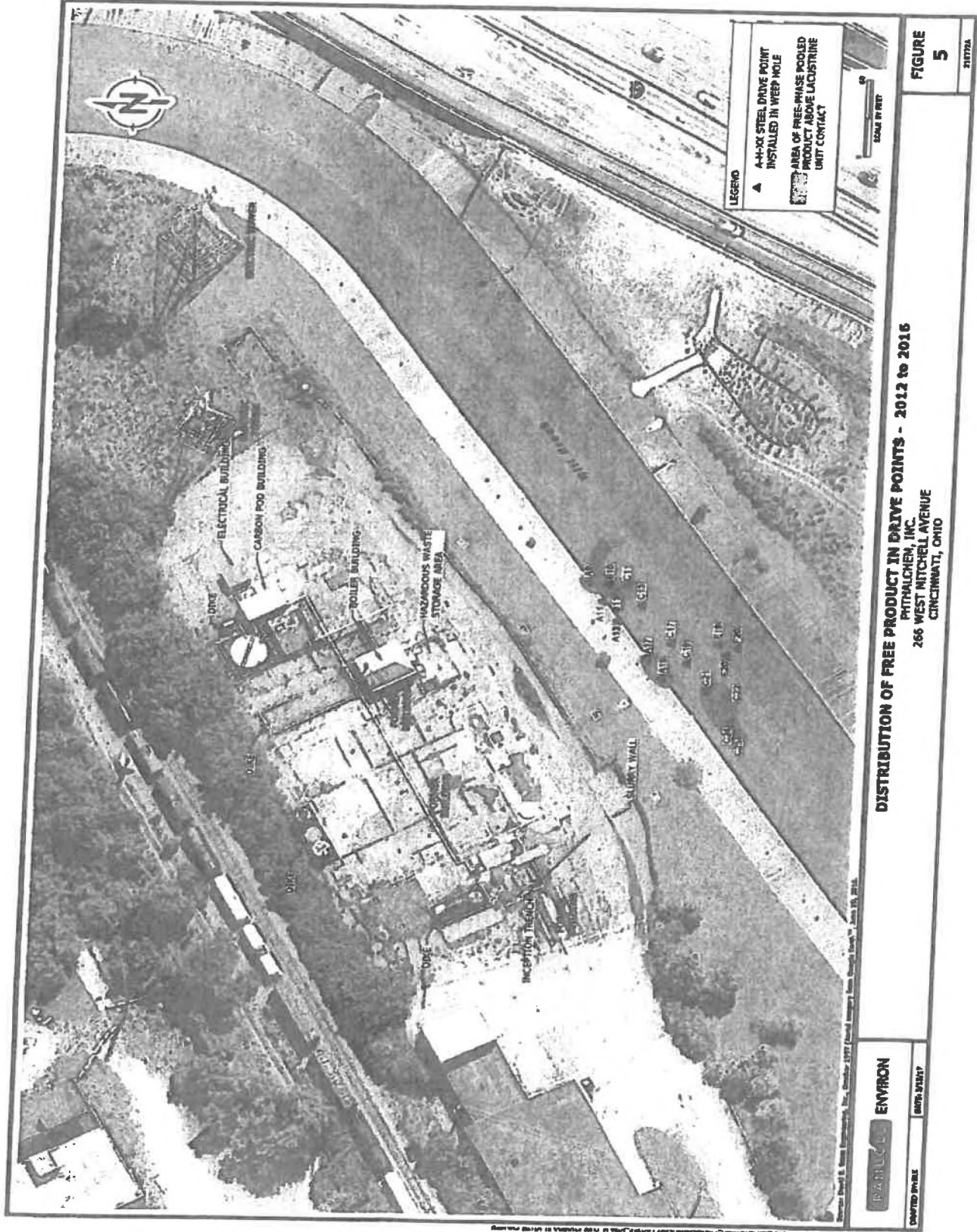


**FIGURE 2**

**SITE LAYOUT**  
**PITALCHEN, INC.**  
**266 WEST MITCHELL AVENUE**  
**CINCINNATI, OHIO**







## **APPENDIX B**

RD/RA SOW

**GENERIC STATEMENT OF WORK  
FOR CONDUCTING  
REMEDIAL DESIGNS AND REMEDIAL ACTIONS  
(RD/RA SOW)**

**OHIO ENVIRONMENTAL PROTECTION AGENCY  
DIVISION OF ENVIRONMENTAL RESPONSE AND REVITALIZATION  
REMEDIAL RESPONSE PROGRAM**

**1.0 PURPOSE**

The purpose of this Remedial Design/Remedial Action Statement of Work (RD/RA SOW) is to define the procedures the Respondent(s) shall follow in designing and implementing the selected remedy for the Site as described in this SOW and the Director's Final Findings and Orders (Orders) to which it is attached. The Division of Environmental Response and Revitalization (DERR) documented the selection of a remedy for the Site in the Decision Document, which is attached to the Orders. The intent of the remedy is to protect the public health and/or the environment from the actual or potential adverse effects of the contaminants discovered at and related to the site. Further guidance for performing the RD/RA work tasks may be found in the U.S. EPA Superfund Remedial Design and Remedial Action Guidance document (OSWER Directive 9355.0-4A). All applicable regulatory requirements pertaining to the selected remedy and RD/RA activities shall be followed.

The Ohio EPA shall provide oversight of the Respondent's activities throughout the RD/RA. The Respondent's shall support the Ohio EPA's initiatives and conduct of activities related to the implementation of oversight activities.

**2.0 DESCRIPTION OF THE REMEDIAL ACTION/ PERFORMANCE STANDARDS**

Performance standards and specifications of the major components of the remedial action to be designed and implemented by the Respondent(s) are described below. Performance standards shall include cleanup standards, standards of control, quality criteria, and other requirements, criteria or limitations as established in the Decision Document, this SOW and the Orders to which it is attached.

**See Appendix A, Decision Document, for description of the Remedial Action components and associated performance standards.**

### **3.0 SCOPE OF THE REMEDIAL DESIGN AND REMEDIAL ACTION**

The Remedial Design/Remedial Action (RD/RA) shall consist of seven principal tasks described below. Each task shall be completed and required documentation shall be submitted in accordance with the schedules established in the Orders and in the RD/RA Work Plan approved by Ohio EPA. All work related to this SOW shall be performed by the Respondent(s) in a manner consistent with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) as amended, 42 USC 9601, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Part 300 (1990), and other applicable federal and state rules and regulations.

#### **Task Summary**

- 3.1 Task I: RD/RA Work Plan**
  - 3.1.1 Site Access**
  - 3.1.2 Pre-Design Studies Plan**
  - 3.1.3 Regulatory Compliance Plan**
  - 3.1.4 Natural Resource Damage Assessment**
- 3.2 Task II: Pre-Design Studies**
- 3.3 Task III: Remedial Design**
  - 3.3.1 General Requirements for Plans and Specifications**
  - 3.3.2 Design Phases**
  - 3.3.3 Estimated Cost for Remedial Action**
  - 3.3.4 Remedial Action Implementation Plan**
  - 3.3.5 Community Relations Support**
- 3.4 Task IV: Remedial Action Construction**
  - 3.4.1 Preconstruction Inspection and Conference**
  - 3.4.2 Design Changes During Construction**
  - 3.4.3 Remedial Action Construction Completion and Acceptance**
  - 3.4.4 Community Relations Support**
- 3.5 Task V: Five-Year Reviews**
- 3.6 Task VI: Operation and Maintenance/Performance Monitoring**
  - 3.6.1 Reporting During Operation and Maintenance**
  - 3.6.2 Completion of Remedial Action Report**
- 3.7 Task VII: Reporting Requirements**
  - 3.7.1 Monthly Progress Reports during RD and RA Construction**
  - 3.7.2 Summary of Reports and Submittals**

### **3.1 TASK I: RD/RA WORK PLAN**

The Respondent(s) shall submit a work plan for the Remedial Design and Remedial Action (RD/RA) to the Ohio EPA for review and approval, which presents the overall strategy for performing the design, construction, operation, maintenance and monitoring of the Remedial Action (RA). The work plan shall provide a detailed discussion of the specific tasks necessary to implement the selected remedy, including a description of the technical approach, personnel requirements, plans, specifications, permit requirements and other reports described in this SOW.

The work plan shall document the responsibilities and authority of all organizations and key personnel involved with the development and implementation of the RD/RA. The qualifications of key personnel directing the RD/RA tasks, including contractor personnel, shall be described.

The work plan shall include schedules fixed in real time for the development of the (RD) and implementation of the RA, including milestones for the submittal of the document packages for Ohio EPA review and meetings for discussion of the submittals. The RD/RA Work Plan must be reviewed and approved by the Ohio EPA prior to initiation of field activities or proceeding with the RD.

Specific requirements to be addressed by the RD/RA Work Plan are described in the following sections.

#### **3.1.1 Site Access**

All site access agreements necessary to implement the RD and RA shall be obtained by the Respondent(s) prior to the initiation of any activities to be conducted under the Work Plan. Site access agreements shall extend for the duration of all remedial activities and shall include allowances for all operation and maintenance considerations and State oversight activities. The work plan shall describe the activities necessary to satisfy these requirements.

#### **3.1.2 Pre-Design Studies Plan**

The Respondent(s) shall develop a plan to complete the following pre-design studies, which are required to design and fully implement the remedial action.

**[Describe any pre-design studies required to support the RD/RA.]**

The Pre-Design Studies Plan (PDSP), as a component of the RD/RA Work Plan, will identify and describe, in detail, activities necessary to conduct the pre-design

studies identified above. The plan shall include sufficient sampling, testing, and analyses to develop quantitative performance, cost and design data for the selected remedy.

At the discretion of the Site Coordinator for the Ohio EPA, the PDSP may be submitted for review and comment under separate cover from the work plan in accordance with the schedule established in the Orders. The PDSP must be approved by the Ohio EPA prior to initiation of associated field activities or treatability studies.

The Pre-Design Studies Plan shall include, as necessary, a Field Sampling Plan (FSP), a Quality Assurance Project Plan (QAPP) and a Health and Safety Plan (HSP). Section 4.0 of this SOW describes the required content of supporting plans such as the Field Sampling Plans, Quality Assurance Project Plans and Health and Safety Plans.

Prior to development of the Pre-Design Studies Plan, there shall be a meeting of the Site Coordinator for the Ohio EPA and the Project Manager representing the Respondent(s) to discuss scope, objectives, quality assurance and quality control issues, resources, reporting, communication channels, schedule, and roles of personnel involved. Other personnel representing the Respondent(s) and Ohio EPA, who may be needed to fully discuss the issues involved, should also participate in this meeting. Guidance documents to be consulted in developing the Pre-Design Studies Plan include U.S. EPA's Guidance for Conducting Remedial Investigations and Feasibility Studies (EPA/540/G-89/004, October 1988) and Guide for Conducting Treatability Studies Under CERCLA (EPA/540/2-89/058, December 1989), as well as others listed in Appendix A, attached to this SOW.

The pre-design studies will be conducted as described under Task II.

### **3.1.3 Regulatory Compliance Plan**

It shall be the responsibility of the Respondent(s) to ensure compliance with all applicable regulatory state and federal requirements for the RD/RA activities to be conducted at the site. The Respondent(s) shall develop a plan to identify and to satisfy all applicable state and federal laws and regulations for the RD/RA. The plan will include the following information:

- 1) Permitting authorities
- 2) Permits required to conduct RD/RA activities
- 3) Time required by the permitting agency(s) to process permit applications
- 4) Identification of all necessary forms
- 5) Schedule for submittal of applications

6) All monitoring and/or compliance testing requirements

The Respondent(s) shall identify in the plan any inconsistencies between any regulatory requirements or permits that may affect any of the work required. The plan shall also include an analysis of the possible effects such inconsistencies may have on the remedial action, recommendations, and supporting rationale for the recommendations. The Regulatory Compliance Plan shall be submitted to the Ohio EPA as part of the RD/RA Work Plan.

### **3.1.4 Natural Resource Damage Assessment**

If natural resources are or may be injured as a result of a release, the Respondent(s) shall ensure that the trustees of the effected natural resources are notified. The trustees will initiate appropriate actions and provide input into the RD/RA in order to minimize or mitigate natural resource damages in accordance with the NCP and 43 CFR part 11. Trustees define "injury" as "a measurable adverse change, either long- or short-term, in the chemical or physical quality of a natural resource resulting either directly or indirectly from exposure to a discharge of oil or release of a hazardous substance. The Respondent(s) shall make available to the trustees all necessary information and documentation needed to assess actual or potential natural resource injuries.

## **3.2 TASK II: PRE-DESIGN STUDIES**

The Respondent(s) shall schedule and detail the work necessary to accomplish the pre-design studies described in the Pre-Design Studies Plan submitted with the RD/RA Work Plan. The requirements of this section shall apply to studies undertaken to refine the understanding of the nature and extent of contamination at the site, as well as to bench and pilot scale treatability studies.

For any such studies required, the Respondent(s) shall furnish all services, including necessary field work, materials, supplies, labor, equipment, supervision, and data interpretation. Sufficient sampling, testing, and analyses shall be performed to provide the technical data necessary to support the remedial design effort with the goal of optimizing the required treatment and/or disposal operations and systems.

The Respondent(s) shall submit a draft Pre-Design Studies report for Ohio EPA's review and comment when the investigation and/or testing required by the Pre-Design Studies Plan is complete. The draft report shall present investigation/testing data and results along with an analysis of the implications those results have on the RD/RA, including a cost analysis, when appropriate. The draft report shall be submitted prior to the preliminary design submittal in accordance with the schedule specified in the Orders and approved RD/RA Work Plan. After making any required corrections or modifications based on Ohio EPA comments, the Respondent(s) shall submit the final report with the Preliminary Design Report, unless otherwise specified in the approved

### **3.2.1. Reporting Requirements for Groundwater data.**

The Respondent(s) shall submit all groundwater data and monitoring well construction data. The Respondent(s) shall implement a groundwater monitoring program as identified in the RD workplan or as required by Ohio EPA. Respondent(s) shall submit all groundwater data and monitoring well construction data on a 3.5 inch diskette using the most current version of the U.S. EPA developed Ground Water Information Tracking System (GRITS) database software. GRITS is free software, and can be obtained by calling EPA office of Research and Development (ORD), at 513-569-7562, ask for Document # EPA/625/11-91/002. Respondent(s) shall submit one copy of each round of sampling data on printed paper in addition to the diskette format. The printed copy will be the official copy of the data.

## **3.3 TASK III: REMEDIAL DESIGN**

The Respondent(s) shall prepare and submit to the Ohio EPA, in accordance with the schedule set forth in the compliance schedule of the Orders, construction plans, specifications and supporting plans to implement the remedial action at the Site as defined in the Purpose and Description of the Remedial Action sections of this SOW, the Decision Document, and/or the Orders.

### **3.3.1 General Requirements for Plans and Specifications**

The construction plans and specifications shall comply with the standards and requirements outlined below. All design documents shall be clear, comprehensive and organized. Supporting data and documentation sufficient to define the functional aspects of the remedial action shall be provided. Taken as a whole, the design documents shall demonstrate that the remedial action will be capable of meeting all objectives of the Decision Document, including any performance standards.

The plans and specifications shall include the following:

- 1) Discussion of the design strategy and design basis including:
  - a. Compliance with requirements of the Decision Document and the Orders and all applicable regulatory requirements;
  - b. Minimization of environmental and public health impacts;
- 2) Discussion of the technical factors of importance including:
  - a. Use of currently accepted environmental control measures and technologies;

- b. The constructability of the design;
  - c. Use of currently accepted construction practices and techniques;
- 3) Description of the assumptions made and detailed justification for those assumptions;
- 4) Discussion of possible sources of error and possible operation and maintenance problems;
- 5) Detailed drawings of the proposed design including, as appropriate:
  - a. Qualitative flow sheets;
  - b. Quantitative flow sheets;
- 6) Tables listing equipment and specifications;
- 7) Tables giving material and energy balances;
- 8) Appendices including:
  - a. Sample calculations (one example presented and clearly explained for significant or unique calculations);
  - b. Derivation of equations essential to understanding the report;
  - c. Results of laboratory tests, field tests and any additional studies.

### **3.3.2 Design Phases**

The Respondent(s) shall meet when necessary with Ohio EPA representatives to discuss design issues. The design shall be developed and submitted in the phases outlined below to facilitate progression toward an acceptable and functional design.

Submittals shall be made in accordance with the compliance schedule in the Orders, and the schedule in the approved RD/RA Work Plan.

#### **3.3.2.1 Preliminary Design**

A Preliminary Design, which reflects the design effort at approximately 30% completion, shall be submitted to the Ohio EPA for review and comment. At this stage of the design process, the Respondent(s) shall have verified existing conditions at the site that may influence the design and implementation of the selected RA. The Preliminary Design shall demonstrate that the basic technical requirements of the remedial action and any permits required have been addressed. The Preliminary Design shall be reviewed to determine if the final design will provide an operable and usable RA that will be in compliance with all permitting requirements

and response objectives. The Preliminary Design submittal shall include the following elements, at a minimum:

- ! Preliminary plans, drawings and sketches, including design calculations;
- ! Results of treatability studies and additional field sampling;
- ! Design assumptions and parameters, including design restrictions, process performance criteria, appropriate unit processes for treatment systems, and expected removal or treatment efficiencies for both the process and waste (concentration and volume);
- ! Proposed cleanup verification methods, including compliance with applicable laws and regulations;
- ! Outline of design specifications;
- ! Proposed sitting/locations of processes/construction activity;
- ! Expected long-term operation and monitoring requirements;
- ! Real estate and easement requirements;
- ! Preliminary construction schedule, including contracting strategy.

The supporting data and documentation necessary to define the functional aspects of the RA shall be submitted with the Preliminary Design. The technical specifications shall be outlined in a manner that anticipates the scope of the final specifications. The Respondent(s) shall include design calculations with the Preliminary Design completed to the same degree as the design they support.

If the Pre-Design Studies Report required under Task II have not been submitted prior to submission of the Preliminary Design, it shall be submitted with the Preliminary Design. Any revisions or amendments to the Preliminary Design required by the Ohio EPA shall be incorporated into the subsequent design phase.

### **3.3.2.2 Intermediate Design**

Complex project designs necessitate preparation and Ohio EPA review of design documents between the preliminary and pre-final design phases. The Respondent(s) shall submit intermediate design plans and specifications to the Ohio EPA for review and comment when the design is approximately 60% complete in accordance with the schedule in the approved RD/RA Work Plan. All plans, specifications, design analyses and design calculations submitted to the Ohio EPA shall reflect the same degree of completion. The Respondent(s) shall ensure that any required revisions or amendments resulting from the Ohio EPA's review of the Preliminary Design are incorporated into the Intermediate Design.

The Intermediate Design submittal shall include the following components:

- ! Design Plans and Specifications;
- ! Draft Construction Quality Assurance Plan;
- ! Draft Performance Standard Verification Plan;
- ! Draft Operation and Maintenance Plan;
- ! Health and Safety Plan.

The design shall include a Construction Quality Assurance Plan, a Performance Standard Verification Plan, an Operation and Maintenance Plan, and a Health and Safety Plan. The Performance Verification Plan shall include a Field Sampling Plan and a Quality Assurance Project Plan, as necessary. Section 4.0 of this SOW describes the required content of the supporting plans. The final Pre-Design Studies Report shall also be included, if it has not already been submitted. Revisions or amendments to the Intermediate Design required by Ohio EPA shall be incorporated into the Pre-final Design.

#### **3.3.2.3 Pre-final Design**

The Respondent(s) shall submit a Pre-final Design for Ohio EPA review in accordance with the schedule in the approved RD/RA Work Plan when the design effort is at least 90% complete. The Respondent(s) shall ensure that any modifications required by the Ohio EPA's prior review of related Pre-design Studies Reports, technical memoranda, the Preliminary and Intermediate Designs, and the QAPP and HSP are incorporated into the Pre-final Design submittal. The Pre-final Design submittal shall consist of the following components, at a minimum:

- ! Design Plans and Specifications;
- ! Construction Quality Assurance Plan;
- ! Performance Standard Verification Plan;
- ! Operation and Maintenance Plan;
- ! Remedial Action Implementation Plan;
- ! Cost Estimate;
- ! Health and Safety Plan.

General correlation between drawings and technical specifications is a basic requirement of any set of working construction plans and specifications. Before submitting the remedial design specifications with the Pre-final Design, the Respondent(s) shall: (1) Coordinate and cross-check the specifications and drawings; (2) Complete the proofing of the edited specifications and required cross-checking of all drawings and

specifications.

The Respondent(s) shall prepare and include in the technical specifications governing any treatment systems; contractor requirements for providing appropriate service visits by qualified personnel to supervise the installation, adjustment, startup and operation of the treatment systems; and appropriate training on operational procedures once startup has been successfully accomplished.

The Ohio EPA will provide written comments to the Respondent(s) indicating any required revisions to the Pre-final Design. Comments may be provided as a narrative report and/or markings on design plan sheets. Revisions to the plans and specifications required by Ohio EPA shall be incorporated into the Final Design. At the discretion of the Site Coordinator, the Respondent(s) shall also return to Ohio EPA all marked-up prints as evidence that the plans have been completely checked. The Pre-final Design submittal may serve as the Final Design, if Ohio EPA has no further comments and notifies the Respondent(s) that the Pre-final Design has been approved as the Final Design.

#### **3.3.2.4 Final Design**

Following incorporation of any required modifications resulting from the Ohio EPA's review of the Pre-final Design submittal, the Respondent(s) shall submit to the Ohio EPA the Final Design which is 100% complete in accordance with the approved schedule described in the RD/RA Workplan.

The Final Design submittal shall include all the components of the Pre-final Design and each of those components shall be complete. At the discretion of the Site Coordinator, any marked-up prints or drawings, which the Ohio EPA may have provided by way of comments on previous design submittals shall be returned to the Ohio EPA, if they have not already been returned.

The Respondent(s) shall make corrections or changes based on Ohio EPA comments on the Final Design submittals. The revised Final Design shall then be submitted in their entirety to the Ohio EPA for approval as the completed Final Design. Upon approval of the Site Coordinator, final corrections may be made by submitting corrected pages to the Final Design documents. The quality of the Final Design submittal should be such that the Respondent(s) would be able to include them in a bid package and invite contractors to submit bids for the construction project.

### **3.3.3 Estimated Cost of the Remedial Action**

The Respondent(s) shall refine the cost estimate developed in the Feasibility Study to reflect the detailed plans and specifications being developed for the RA. The cost estimate shall include both capital and operation and maintenance costs for the entire project. To the degree possible, cost estimates for operation and maintenance of any treatment system shall be based on the entire anticipated duration of the system's operation. The final estimate shall be based on the final approved plans and specifications. It shall include any changes required by the Ohio EPA during Final Design review, and reflect current prices for labor, material and equipment.

The refined cost estimate shall be submitted by the Respondent(s) with the Pre-final Design and the final cost estimate shall be included with the Final Design submittal.

### **3.3.4 Remedial Action Implementation Plan**

The Respondent(s) shall develop a Remedial Action Implementation Plan (RAIP) to help coordinate implementation of the various components of the RA. It shall include a schedule for the RA that identifies timing for initiation and completion of all critical path tasks. The Respondent(s) shall specifically identify dates for completion of the project and major interim milestones in conformance with the approved RD/RA Workplan schedule. The Remedial Action Implementation Plan is a management tool which should address the following topics:

- 1) Activities necessary to fully implement each of the components of the RA;
- 2) How these activities will be coordinated to facilitate construction/implementation in accordance with the approved schedule;
- 3) Potential major scheduling problems or delays, which may impact overall schedule;
- 4) Lines of communication for discussing and resolving problems, should they arise;
- 5) Common and/or anticipated remedies to overcome potential problems and delays.

The Remedial Action Implementation Plan shall be submitted with the Pre-final Design for review and comment by the Ohio EPA. The final plan and RA project schedule shall be submitted with the Final Design for review and approval.

### **3.3.5 Community Relations Support**

A community relations program will be implemented by the Ohio EPA. The Respondent(s) shall cooperate with the Ohio EPA in community relations efforts.

Cooperation may include participation in preparation of all appropriate information disseminated to the public, and in public meetings that may be held or sponsored by the Ohio EPA concerning the Site.

### **3.4 TASK IV: REMEDIAL ACTION CONSTRUCTION**

Following approval of the Final Design submittal by the Ohio EPA, the Respondent(s) shall implement the designed remedial action(s) at the Site in accordance with the plans, specifications, Construction Quality Assurance Plan, Performance Standard Verification Plan, Health and Safety Plan, Remedial Action Implementation Plan, Quality Assurance Project Plan, and Field Sampling Plan approved with the final design. Implementation shall include the activities described in the following sections.

#### **3.4.1 Preconstruction Inspection and Conference**

The Respondent(s) shall participate in a preconstruction inspection and conference with the Ohio EPA to accomplish the following:

- ! Review methods for documenting and reporting inspection data;
- ! Review methods for distributing and storing documents and reports;
- ! Review work area security and safety protocol;
- ! Discuss any appropriate modifications to the Construction Quality Assurance Plan to ensure that site specific considerations are addressed. The final CQAP shall be submitted to the Ohio EPA at this time, if it has not already been submitted;
- ! Introduce key construction contractor, engineering and project management personnel and review roles during construction activities;
- ! Conduct a site walk-around to verify that the design criteria, plans, and specifications are understood and to review material and equipment storage locations.

The Respondent(s) shall schedule the preconstruction inspection and conference to be held within 10 days of the award of the construction contract. The preconstruction inspection and conference shall be documented by a designated person and minutes shall be transmitted to all parties by the Respondent(s) to all parties in attendance.

#### **3.4.2 Design Changes During Construction**

During construction, unforeseen site conditions, changes in estimated quantities of required construction materials and other problems associated with the project are likely to develop. Such changing conditions may require either major or minor changes to the approved final design. Certain design changes will require approval of the Ohio EPA prior to implementation to ensure that the intent and scope of the remedial action is maintained. Changes, which could alter the intent

or scope of the RA, may require a revision to the Decision Document and a public comment period. Changes to the remedial design which require Ohio EPA written approval prior to implementation include:

- ! Those that involve the deletion or addition of a major component of the approved remedy (e.g. changing one treatment system for another; deleting any designed layer of a multi-layer cap);
- ! Those that result in a less effective treatment for wastes associated with the site;
- ! Any changes that may result in an increase of the exposure to chemicals of concern and/or risk to human health or the environment as compared to the goals for the completed remedial action as stated in the Orders and this SOW;
- ! Those that result in a significant delay in the completion of the RA;
- ! Other changes that alter or are outside the scope/intent of the approved remedial design.

Ohio EPA shall be notified of other changes made during construction through daily inspection reports and monthly progress reports.

### **3.4.3 Remedial Action Construction Completion and Acceptance**

As the construction of the remedial action nears completion, the following activities and reporting shall be completed by the Respondent(s) to ensure proper project completion, approval, closeout and transition to the operation and maintenance/ monitoring phase.

#### **3.4.3.1 Pre-final Construction Conference**

Within seven days of making a preliminary determination that construction is complete, the Respondent(s) shall provide written notification to the Ohio EPA and a pre-final construction conference shall be held with the construction contractor(s) to discuss procedures and requirements for project completion and close-out. The Respondent(s) shall have responsibility for making arrangements for the conference. Participants should include the Project Manager for the Respondent(s), the Site Coordinator for the Ohio EPA, all contractors involved with construction of the remedial action(s) and the remedial design agent (person(s) designed the remedy), if requested.

A list of suggested items to be covered at the conference includes, but is not limited to the following:

- ! Final Operation and Maintenance (O&M) Plan submission, if it has not been submitted already;
- ! Cleanup responsibilities;
- ! Demobilization activities;
- ! Security requirements for project transfer;
- ! Pre-final inspection schedule;
- ! Operator training.

The pre-final conference shall be documented by a designated person and conference minutes shall be transmitted to all parties in attendance by the Respondent(s).

#### **3.4.3.2 Pre-final Inspection**

Following the pre-final construction conference, a pre-final inspection of the project will be conducted. The pre-final inspection will be led by the Ohio EPA with assistance from the party with primary responsibility for construction inspection, if requested.

The pre-final inspection will consist of a walk-through inspection of the entire site. The completed site work will be inspected to determine whether the project is complete and consistent with the contract documents and the approved RD/RA Work Plan. Any outstanding deficient or incomplete construction items should be identified and noted during the inspection.

When the RA includes construction of a treatment system, the facility start-up and "shakedown" shall have been completed as part of the RA. "Shakedown" is considered to be the initial operational period following start-up during which adjustments are made to ensure that the performance standards for the system are reliably being achieved. The contractor shall have certified that the equipment has performed to meet the purpose and intent of the contract specifications. Retesting shall have been successfully completed where deficiencies were revealed. Such shakedown may take several months. Determination of remedy effectiveness for other types of remedial actions will be based on the Performance Standard Verification Plan (PSVP).

If construction of major components of a remedial action is performed in distinct phases or under separate contracts due to the complex scope of the site remedy, it may be appropriate to conduct the pre-final inspections

of those components separately. The approved RAIP should identify those projects and components, which should be handled in that manner.

Upon completion of the pre-final inspection, an inspection report shall be prepared by the Respondent(s) and submitted to Ohio EPA with the minutes from the pre-final conference. A copy of the report will be provided to all parties in attendance at the inspection. The report will outline the outstanding construction items, actions required to resolve those items, completion date for those items and a date for the final inspection. Ohio EPA will review the inspection report and notify the Respondent(s) of any disagreements with it.

#### **3.4.3.3 Final Inspection**

Within seven days following completion of any outstanding construction items, the Respondent(s) shall provide written notification to the Ohio EPA and schedule a final inspection. A final inspection will be conducted by the Ohio EPA with assistance from the party having primary responsibility for construction inspection, if requested.

The final inspection will consist of a walk-through inspection of the project site focusing on the outstanding construction items identified during the pre-final inspection. The Pre-final Inspection Report shall be used as a checklist. The contractor's demobilization activities shall have been completed, except for equipment and materials required to complete the outstanding construction items. If any items remain deficient or incomplete, the inspection shall be considered a pre-final inspection requiring another pre-final inspection report and final inspection.

As with the pre-final inspection, it may be appropriate to conduct final inspections of major components of a remedial action separately. Such projects and components should be identified in the approved Remedial Action Implementation Plan.

#### **3.4.3.4 Construction Completion Report and Certification**

Upon satisfactory completion of the final inspection, a Construction Completion Report shall be prepared by the Respondent(s) and submitted to the Ohio EPA within 30 days after the final inspection. The report shall include the following elements:

- 1) A brief description of the outstanding construction items from the pre-final inspection and an indication that the items were satisfactorily resolved;

- 2) A synopsis of the work defined in the approved RD/RA Work Plan and the Final Design and certification that this work was performed;
- 3) An explanation of any changes to the work defined in the approved RD/RA Work Plan and Final Design, including as-built drawings of the constructed RA facilities, and why the changes were necessary or beneficial for the project;
- 4) Certification that the constructed RA or component of the RA is operational and functional.

The construction completion report will be reviewed by the Ohio EPA. If the review indicates that corrections or amendments are necessary, then comments will be provided to the Respondent(s). The Respondent(s) shall submit a revised construction completion report based on Ohio EPA comments to the Ohio EPA within 30 days of receipt of those comments. Upon determination by the Ohio EPA that the report is acceptable, written notice of Ohio EPA's approval of the construction completion report will be provided to the Respondent(s).

#### **3.4.4 Community Relations Support**

The Respondent(s) shall provide support for Ohio EPA's community relations program during remedial action implementation as described in Section 3.3.5.

### **3.5 TASK V: FIVE-YEAR REVIEWS**

At sites where contaminants will remain at levels that will not permit unrestricted use of the site, a review will be conducted no less frequently than once every five years to ensure that the remedy continues to be protective of human health and the environment. This is known as the "five-year review". The Respondent(s) shall complete Five-Year Review Reports no less often than every five years after the initiation of the remedial action or until contaminant levels allow for unrestricted use of the site. Further guidance for performing five-year review work tasks may be found in the U.S. EPA OSWER Directive 9355.7-02, Structure and Components of Five-Year Reviews.

The more specific purpose of the reviews is two-fold: (1) to confirm that the remedial action as specified in the Decision Document and as implemented continues to be effective in protecting human health and the environment (e.g., the remedy is operating and functioning as designed, institutional controls are in place and are protective); and (2) to evaluate whether original cleanup levels remain protective of human health and the environment. A further objective is to evaluate the scope of operation and

maintenance, the frequency of repairs, changes in monitoring indicators, costs at the site, and how each of these relates to protectiveness.

Fifteen months prior to the due date for completion of a five-year review, the Respondent(s) shall meet with Ohio EPA to discuss the requirements of the five-year review. The review must be completed within five years following the initiation of the remedial action. The scope and level of review will depend on conditions at the site. The scoping effort should include a determination by the Site Coordinator and Respondent(s) as to whether available monitoring data and other documentation will be sufficient to perform the five-year review or whether a field sampling effort will be a necessary component of the review. Within three months of the meeting, the Respondent(s) shall develop and submit a workplan to Ohio EPA that shall describe, at a minimum, the following activities and documentation:

1. Document Review
  - a. Background Information
    1. Decision Document
    2. Decision Document Summary
    3. Administrative or Judicial Order for RD/RA
    4. Completion of Remedial Action Report
  - b. Design Review
  - c. Maintenance and Monitoring
    1. O&M Manual
    2. O&M Reports
    3. Groundwater Monitoring Plan
    4. Monitoring Data and Information
2. Standards Review
  - a. Specific performance standards required by Decision Document
  - b. Changing Standards
    1. Laws and Regulations applicable to conditions and activities at the site
  - c. Risk Assessment
    1. As summarized in the Decision Document
    2. Review for changes in exposure pathways not previously evaluated
3. Interviews
  - a. Background Information
    1. Previous Staff Management
    2. Nearest Neighbors, Respondent(s)
  - b. Local Considerations
    1. State Contacts
    2. Local Government Contacts
  - c. Operational Problems

1. Plant Superintendent
2. O&M Contractors
4. Site Inspection/Technology Review
  - a. Performance and Compliance
    1. Visual Inspection
  - b. Offsite Considerations
  - c. Recommendations
5. Report
  - a. Background
    1. Introduction
    2. Remedial Objectives
    3. Review of Applicable Laws and Regulations
  - b. Site Conditions
    1. Summary of Site Visit
    2. Areas of Noncompliance
  - c. Risk Assessment
  - d. Recommendations
    1. Technology Recommendations
    2. Statement on Protectiveness
    3. Timing and Scope of Next Review
    4. Implementation Requirements

If sampling and analysis of environmental samples is required under the five-year review, the Respondent(s) are required to prepare and submit with the workplan other supporting plans. Supporting plans may include a Quality Assurance Project Plan, Field Sampling Plan and Health and Safety Plan. The purpose and content of these supporting plans are discussed in Section 4 of this SOW. The Five-Year Review Workplan must be reviewed and approved by the Ohio EPA prior to initiation of field activities or proceeding with the five-year review.

The Five-Year Review Report will be reviewed by the Ohio EPA. If the Ohio EPA review indicates that corrections or amendments are necessary, then comments will be provided to the Respondent(s). The Respondent(s) shall submit a revised Five-Year Review Report based on Ohio EPA comments to the Ohio EPA within 30 days of receipt of those comments.

### **3.6 TASK VI: OPERATION AND MAINTENANCE/PERFORMANCE MONITORING**

The Respondent(s) shall implement performance monitoring and operation and maintenance procedures as required by the approved Performance Standard Verification Plan and approved Operation and Monitoring (O&M) Plan for the RA once it is demonstrated that the RA components are operational and functional.

### **3.6.1 Reporting During Operation and Maintenance**

#### **3.6.1.1 Operation and Maintenance Sampling and Analysis Data**

Unless otherwise specified in the approved O&M Plan, sampling, analysis, and system performance data for any treatment system or other engineering systems required to be monitored during the O&M Phase shall be submitted by the Respondent(s) to the Ohio EPA on a monthly basis. These monthly submittals will form the basis for the annual progress report described below in Section 3.6.1.2

#### **3.6.1.2 Progress Reports During Operation and Maintenance**

The Respondent(s) shall prepare and submit annual progress reports during the operation and maintenance/performance monitoring phase of the RA. When appropriate, the RD/RA Work Plan shall specify progress reports during O&M to be submitted more frequently.

The O&M progress reports shall contain the same information as required for the monthly progress reports for the RD and RA construction phases, as specified in Section 3.6.1 of this SOW. It shall also include an evaluation of the effectiveness of any treatment and engineering systems in meeting the cleanup standards, performance standards and other goals of the RA as defined in the Orders, this SOW, the RD/RA Work Plan and the approved Final Design.

### **3.6.2 Completion of Remedial Action Report**

At the completion of the remedial action, the Respondent(s) shall submit a Completion of Remedial Action Report to the Ohio EPA. The RA shall be considered complete when the all of the goals, performance standards and cleanup standards for the RA as stated in the Decision Document, this SOW, and the approved Final Design (including changes approved during construction) have been met. The report shall document that the project is consistent with the design specifications, and that the RA was performed to meet or exceed all required goals, cleanup standards and performance standards. The report shall include, but not be limited to the following elements:

- 1) Synopsis of the remedial action and certification of the design and construction;
- 2) Listing of the cleanup and performance standards as established in the Decision Document and the Orders, any amendments to those standards with an explanation for adopting the amendments;

- 3) Summary and explanation of any changes to the approved plans and specifications. An explanation of why the changes were necessary should be included and, where necessary, Ohio EPA approval of the changes should be documented;
- 4) Summary of operation of treatment systems including monitoring data, indicating that the remedial action met or exceeded the performance standards or cleanup criteria;
- 5) Explanation of any monitoring and maintenance activities to be undertaken at the site in the future as outlined in Section 3.0 of this RD/RA SOW.

### **3.7 TASK VII: REPORTING REQUIREMENTS**

The Respondent(s) shall prepare and submit work plans, design plans, specifications, and reports as set forth in Tasks I through V of this SOW to document the design, construction, operation, maintenance, and performance monitoring of the remedial action. Monthly progress reports shall be prepared, as described below, to enable the Ohio EPA to track project progress.

#### **3.7.1 Monthly Progress Reports during RD and RA Construction**

The Respondent(s) shall at a minimum provide the Ohio EPA with monthly progress reports during the design and construction phases of the remedial action containing the information listed below. When appropriate, the RD/RA Work Plan shall specify progress reports to be submitted more frequently.

- 1) A description of the work performed during the reporting period and estimate of the percentage of the RD/RA completed
- 2) Summaries of all findings and sampling during the reporting period
- 3) Summaries of all changes made in the RD/RA during the reporting period, indicating consultation with Ohio EPA and approval by the Ohio EPA of those changes, when necessary
- 4) Summaries of all contacts with representatives of the local community, public interest groups or government agencies during the reporting period
- 5) Summaries of all problems or potential problems encountered during the reporting period, including those which delay or threaten to delay completion of project milestones with respect to the approved work plan schedule or RAIP schedule
- 6) Summaries of actions taken and being taken to rectify problems
- 7) Summaries of actions taken to achieve and maintain cleanup standards and performance standards
- 8) Changes in personnel during the reporting period
- 9) Projected work for the next reporting period
- 10) Copies of daily reports, inspection reports, sampling data, laboratory/monitoring data, etc.

### 3.7.2 Summary of Reports and Submittals

A summary of the information reporting requirements contained in this RD/RA SOW is presented below:

- ! **Draft RD/RA Work Plan**
  - Health and Safety Plan (HSP)
  - Regulatory Compliance Plan
- ! **Final RD/RA Work Plan**
  - HSP
  - Regulatory Compliance Plan
- ! **Draft Pre-Design Studies Plan**
  - Quality Assurance Project Plan (QAPP)
  - Field Sampling Plan (FSP)
- ! **Final Pre-Design Studies Plan**
  - QAPP
  - FSP
- ! **Pre-Design Studies Reports - Draft**
- ! **Preliminary Design Documents**
- ! **Pre-Design Studies Reports - Final**
- ! **Intermediate Design Documents**
  - Draft Construction Quality Assurance Plan (CQAP)
  - Draft Performance Standard Verification Plan (PSVP)
  - Draft O & M Plan
  - Health and Safety Plan
- ! **Pre-final Design Documents**
  - CQAP
  - PSVP
  - O & M Plan
  - Draft Remedial Action Implementation Plan (RAIP)
  - Health and Safety Plan
- ! **Final Design Documents**
  - CQAP
  - PSVP
  - O & M Plan
  - Draft RAIP
  - Health and Safety Plan
- ! **Preconstruction Inspection and Conference Report**
- ! **Monthly Progress Reports During RD/RA**
- ! **Notification of Preliminary Completion of Construction**
- ! **Final O & M Plan**
- ! **Pre-final Inspection Report**

- ! **Notification for Final Inspection**
- ! **Construction Completion Report**
- ! **O & M Sampling Data**
- ! **Progress Reports during O&M/Performance Monitoring period**
- ! **Completion of Remedial Action Report**
- ! **Five-Year Review Workplan**
- ! **Five-Year Review Report**

#### **4.0 CONTENT OF SUPPORTING PLANS**

The documents listed in this section shall be prepared and submitted as outlined in Section 3.0 of this SOW to support the activities necessary to design and fully implement the RA. These supporting documents include a Quality Assurance Project Plan (QAPP), a Field Sampling Plan (FSP), a Health and Safety Plan (HSP), a Construction Quality Assurance Plan (CQAP) and a Performance Standard Verification Plan (PSVP). The following sections describe the required contents of each of these supporting documents.

##### **4.1 QUALITY ASSURANCE PROJECT PLAN**

The Respondent(s) shall prepare a site-specific Quality Assurance Project Plan (QAPP) to cover sample analysis and data handling based on guidance provided by the Ohio EPA. Refer to the list of Ohio EPA and U.S. EPA guidance documents in Appendix B attached to the Orders.

A QAPP shall be developed for any sampling and analysis activities to be conducted as predesign studies and submitted with the Pre-Design Studies Plan for Ohio EPA review and approval.

During the remedial design phase the Respondent(s) shall review all remedial design information and modify or amend the QAPP developed for the Pre-Design Studies Plan, as necessary, to address the sampling and analysis activities to be conducted during implementation of the Remedial Action, including activities covered by the PSVP and O&M Plan. An amended QAPP shall be submitted with the Intermediate Design documents for review and comment by Ohio EPA. A final Quality Assurance Project Plan, which incorporates comments made by the Ohio EPA, shall be submitted for approval with the Final Design documents. Upon agreement of the Site Coordinator, the Respondent(s) may submit only the amended portions of the QAPP developed for the PDSP with the Intermediate, Pre-Final and Final Design documents.

The Respondent(s) shall schedule and attend a pre-QAPP meeting with representatives of Ohio EPA to discuss the scope and format of the QAPP. For sites where the Site Coordinator and Project Manager agree that a pre-QAPP meeting is not needed, this meeting may be omitted. The QAPP shall, at a minimum, include:

1. Data Collection Strategy - The strategy section of the QAPP shall include but not be limited to the following:
  - a. Description of the types and intended uses for the data, relevance to remediation or restoration goals, and the necessary level of precision, accuracy, and statistical validity for these intended uses;
  - b. Description of methods and procedures to be used to assess the precision, accuracy and completeness of the measurement data;
  - c. Description of the rationale used to assure that the data accurately and precisely represent a characteristic of a population, variation of physical or chemical parameters throughout the Site, a process condition or an environmental condition. Factors which shall be considered and discussed include, but are not limited to:
    - i) Environmental conditions at the time of sampling;
    - ii) Sampling design (including number, location and distribution);
    - iii) Representativeness of selected media, exposure pathways, or receptors; and
    - iv) Representativeness of selected analytical parameters.
    - v) Representativeness of testing procedures and conditions; and
    - vi) Independence of background or baseline from site influences.
  - d. Description of the measures to be taken to assure that the following data sets can be compared quantitatively or qualitatively to each other:
    - i) RD/RA data collected by the Respondent over some time period;
    - ii) RD/RA data generated by an outside laboratory or consultant employed by the Respondent versus data collected by the Respondent, and;
    - iii) Data generated by separate consultants or laboratories over some time period not necessarily related to the RD/RA effort.
    - iv) Data generated by Ohio EPA or by an outside laboratory or consultant employed by Ohio EPA;
  - e. Details relating to the schedule and information to be provided in quality assurance reports. These reports should include but not be limited to:
    - i) Periodic assessment of measurement data accuracy, precision and completeness;
    - ii) Results of performance audits;
    - iii) Results of system audits;
    - iv) Significant quality assurance problems and recommended solutions; and

- v) Resolutions of previously stated problems.
2. Sample Analysis - The Sample Analysis section of the Quality Assurance Project Plan shall specify the following:
- a. Chain-of-custody procedures, including:
    - i) Identification of a responsible party to act as sample custodian at the laboratory facility authorized to sign for incoming field samples, obtain documents of shipment and verify the data entered onto the sample custody records;
    - ii) Provision for a laboratory sample custody log consisting of serially numbered lab-tracking report sheets; and
    - iii) Specification of laboratory sample custody procedures for sample handling, storage and disbursement for analysis.
  - b. Sample storage procedures and storage times;
  - c. Sample preparation methods;
  - d. Analytical procedures, including:
    - i) Scope and application of the procedure;
    - ii) Sample matrix;
    - iii) Potential interferences;
    - iv) Precision and accuracy of the methodology;
    - v) Method detection limits;
    - vi) Special analytical services required to ensure contract required detection limits do not exceed known toxicity criteria; and
    - vii) Verification and reporting of tentatively identified compounds.
  - e. Calibration procedures and frequency;
  - f. Data reduction, validation and reporting;
  - g. Internal quality control checks, laboratory performance and systems audits and frequency, including:
    - i) Method blank(s);
    - ii) Laboratory control sample(s);
    - iii) Calibration check sample(s);
    - iv) Replicate sample(s);
    - v) Matrix-spiked sample(s);
    - vi) "Blind" quality control sample(s);
    - vii) Control charts;
    - viii) Surrogate samples;
    - ix) Zero and span gases; and
    - x) Reagent quality control checks.
  - h. Preventative maintenance procedures and schedules;
  - i. Corrective action (for laboratory problems); and
  - j. Turnaround time.

3. Modeling - The Modeling section of the Quality Assurance Project Plan shall apply to all models used to predict or describe fate, transport or transformation of contaminants in the environment and shall discuss:
  - a. Model assumptions and operating conditions;
  - b. Input parameters; and
  - c. Verification and calibration procedures.
4. In Situ or Laboratory Toxicity Tests - The Toxicity Test section of the Quality Assurance Project Plan shall apply to all tests or bioassays used to predict or describe impacts of contaminants on a population, community, or ecosystem level.
5. Data Record - The QAPP shall also provide the format to be used to present the raw data and the conclusions of the investigation, as described in a, b, and c below:
  - a. The data record shall include the following:
    - i) Unique sample or field measurement code;
    - ii) Sampling or field measurement location and sample or measurement type;
    - iii) Sampling or field measurement raw data;
    - iv) Laboratory analysis ID number;
    - v) Property or component measured; and
    - vi) Result of analysis (e.g., concentration).
  - b. Tabular Displays - The following data shall be presented in tabular displays:
    - i) Unsorted (raw) data;
    - ii) Results for each medium, organism, or for each constituent measured;
    - iii) Data reduction for statistical analysis;
    - iv) Sorting of data by potential stratification factors (e.g., location, soil layer, topography, vegetation form);
    - v) Summary data (i.e., mean, standard deviation, min/max values, and sample number); and
    - vi) Comparisons with background or reference data.
  - c. Graphical Displays - The following data shall be presented in graphical formats (e.g., bar graphs, line graphs, area or plan maps, isopleth plots, cross-sectional plots or transects, three dimensional graphs, etc.):
    - i) Display sampling locations and sampling grid;
    - ii) Indicate boundaries of sampling area, and areas where more data are required;
    - iii) Display levels of contamination at each sampling location or location from which organism was taken;
    - iv) Display geographical extent of contamination;

- v) Display contamination levels, averages and maxima;
- vi) Illustrate changes in concentration in relation to distance from the source, time, depth or other parameters;
- vii) Indicate features affecting intramedia transport and show potential receptors;
- viii) Compare nature and extent of contamination with results of ecological or biological sampling or measurements; and
- ix) Display comparisons with background or reference analyses or measurements.

## 4.2 FIELD SAMPLING PLAN

1. Sampling - The Sampling section of the Field Sampling Plan shall discuss:
  - a. Sufficient preliminary sampling to ensure the proper planning of items b. through o. below;
  - b. Selecting appropriate sampling locations, depths, vegetation strata, organism age, etc. and documenting relevance of sample for intended biological toxicity tests or analyses;
  - c. Providing a sufficient number of samples to meet statistical or other data useability objectives;
  - d. Measuring all necessary ancillary data such as ambient conditions, baseline monitoring, etc.;
  - e. Determining environmental conditions under which sampling should be conducted;
  - f. Determining which media, pathways, or receptors are to be sampled (e.g., ground water, air, soil, sediment, biota, etc.);
  - g. Determining which parameters are to be measured and where;
  - h. Selecting the frequency and length of sampling period;
  - i. Selecting the sample design (e.g., composites, grabs, random, repeated, etc.);
  - j. Selecting the number, location, media or organisms for determining background conditions or reference conditions (refer to Risk Assessment Guidance for Superfund: Volume I - Human Health Evaluation Manual (Part A), Interim Final, EPA/540/1-89/002, December 1989);
  - k. Measures to be taken to prevent contamination of the sampling equipment and cross contamination between sampling points;
  - l. Documenting field sampling operations and procedures, including:
    - i) Documentation of procedures for preparation of reagents or supplies which become an integral part of the sample (e.g., filters and adsorbing reagents);
    - ii) Procedures and forms for recording the exact location and specific considerations associated with sample acquisition;
    - iii) Documentation of specific sample preservation method;

- iv) Calibration of field devices;
  - v) Collection of replicate and field duplicate samples;
  - vi) Submission of field-biased and equipment blanks, where appropriate;
  - vii) Potential interferences present at the site or facility;
  - viii) Construction materials and techniques associated with monitoring wells and piezometers;
  - ix) Field equipment listing and sample containers;
  - x) Sampling order; and
  - xi) Decontamination procedures.
  - m. Selecting appropriate sample containers;
  - n. Sample preservation; and
  - o. Chain-of-custody, including:
    - i) Standardized field tracking reporting forms to establish sample custody in the field prior to and during shipment;
    - ii) Sample sealing, storing and shipping procedures to protect the integrity of the sample; and,
    - iii) Pre-prepared sample labels containing all information necessary for effective sample tracking.
2. Field Measurements - The Field Measurements section of the Field Sampling Plan shall discuss:
- a. Selecting appropriate field measurement locations, depths, organism age etc.;
  - b. Providing a sufficient number of field measurements that meet statistical or data useability objectives;
  - c. Measuring all necessary ancillary data such as ambient or baseline environmental conditions;
  - d. Determining conditions under which field measurement should be conducted;
  - e. Determining which media, pathways, or receptors are to be addressed by appropriate field measurements (e.g., ground water, air, soil, sediment, biota, etc.);
  - f. Determining which physical, chemical, or biological parameters are to be measured and where;
  - g. Selecting the frequency and duration of field measurement; and
  - h. Documenting field measurement operations and procedures, including:
    - i) Procedures and forms for recording raw data and the exact location, time and Site specific considerations associated with the data acquisition;
    - ii) Calibration of field devices;
    - iii) Collection of replicate measurements;
    - iv) Submission of field-biased blanks, where appropriate;

- v) Potential interferences present at the Site;
- vi) Construction materials and techniques associated with monitoring wells and piezometers used to collect field data;
- vii) Field equipment listing;
- viii) Order in which field measurements were made; and
- ix) Decontamination procedures; and
- i) Selecting the number, location, media, and organisms for determining background or reference conditions.

#### **4.3 SITE HEALTH AND SAFETY PLAN**

The Respondent(s) shall submit a Health and Safety Plan (HSP) to the Ohio EPA with the RD/RA Work Plan for any on-site activities taking place during the design phase. The Respondent(s) shall review the remedial design information and modify the HSP developed for the RD/RA Work Plan, as necessary, to address the activities to be conducted on the site during implementation of the Remedial Action. It shall be designed to protect on-site personnel and area residents from physical, chemical and other hazards posed by the construction, operation and maintenance activities of the Remedial Action.

The Respondent(s) shall prepare a site HSP which is designed to protect on-site personnel and area residents from physical, chemical and all other hazards posed by RD/RA activities. The HSP shall address the following topics:

1. Major elements of the Health and Safety Plan shall include:
  - a. Facility or site description including availability of resources such as roads, water supply, electricity and telephone service;
  - b. Description of the known hazards and an evaluation of the risks associated with the incident and with each activity conducted;
  - c. Listing of key personnel (including the site safety and health officer) and alternates responsible for site safety, response operations, and for protection of public health;
  - d. Delineation of work area, including a map;
  - e. Description of levels of protection to be worn by personnel in the work area;
  - f. Description of the medical monitoring program for on-site responders;
  - g. Description of standard operating procedures established to assure the proper use and maintenance of personal protective equipment;
  - h. The establishment of procedures to control site access;
  - i. Description of decontamination procedures for personnel and equipment;
  - j. Establishment of site emergency procedures;
  - k. Availability of emergency medical care for injuries and toxicological

- problems;
  - l. Description of requirements for an environmental monitoring program. (This should include a description of the frequency and type of air and personnel monitoring, environmental sampling techniques and a description of the calibration and maintenance of the instrumentation used.);
  - m. Specification of any routine and special training required for responders; and
  - n. Establishment of procedures for protecting workers from weather related problems.
2. The Health and Safety Plan shall be consistent with:
- a. NIOSH Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (1985);
  - b. CERCLA Sections 104(f) and 111(c)(6)
  - c. EPA Order 1440.3 -- Respiratory Protection;
  - d. EPA Order 1440.2 -- Health and Safety Requirements for Employees Engaged in Field Activities;
  - e. EPA Occupational Health and Safety Manual;
  - f. EPA Interim Standard Operating Safety Procedures and other EPA guidance as developed by EPA;
  - g. OSHA regulations particularly in 29 CFR 1910 and 1926;
  - h. State and local regulations; and
  - i. Site or facility conditions.

#### **4.4 CONSTRUCTION QUALITY ASSURANCE PLAN**

The Respondent(s) shall develop a Construction Quality Assurance Plan (CQAP) based on the plans and specifications and performance standards for the RA. The CQAP is a site specific document that shall specify procedures to ensure that the completed remedial action work meets or exceeds all design criteria and specifications. A draft CQAP shall be submitted with the Intermediate Design submittal for review and comment by the Ohio EPA. Subsequent drafts shall be submitted with the Pre-final and Final Design submittals that incorporate comments made by the Ohio EPA. Certain aspects of the CQAP, for example personnel names and qualifications, may not be known at the time of design approval. A complete and final CQAP shall be submitted to Ohio EPA for approval prior to the start of construction. At a minimum, the CQAP shall address the elements listed below.

##### **4.4.1 Responsibility and Authority**

The responsibility and authority of all organizations (i.e. technical consultants, construction firms, etc.) and key personnel involved in the construction of the remedial action(s) shall be described fully in the CQAP. The Respondent(s) shall

provide a copy of the approved CQAP to each organization with responsibility and authority for implementing the CQAP. The Respondent(s) shall also identify a CQA officer and the necessary supporting inspection staff.

#### **4.4.2 Construction Quality Assurance Personnel Qualifications**

The qualifications of the Construction Quality Assurance officer and supporting inspection personnel shall be presented in the CQAP to demonstrate that they possess the training and experience necessary to fulfill their identified responsibilities.

#### **4.4.3 Inspection Activities**

The observations and tests that will be used to monitor the construction and/or installation of the components of the remedial action shall be described in the CQAP. The plan shall include scope and frequency of each type of inspection. Inspections shall verify compliance with the design, applicable requirements of state and federal law and performance standards. Inspections shall also ensure compliance with all health and safety standards and procedures. The CQAP shall include provisions for conducting the preconstruction, pre-final and final inspections and associated meetings as described in Section 5.4 of this SOW.

#### **4.4.4 Sampling Requirements**

The sampling activities necessary to ensure that the design specifications and performance standards are achieved shall be presented in the CQAP. The description of these activities shall include sample sizes, sample locations, frequency of sampling, testing to be performed, acceptance and rejection criteria, and plans for correcting problems as addressed in the design specifications.

#### **4.4.5 Documentation**

Reporting requirements for CQA activities shall be described in detail in the CQAP. This shall include such items as daily summary reports, meeting reports, inspection data sheets, problem identification and corrective measures reports, design acceptance reports and final documentation. Provisions for the storage of all records shall be presented in the CQAP.

### **4.5 PERFORMANCE STANDARD VERIFICATION PLAN**

A Performance Standard Verification Plan (PSVP) shall be prepared to consolidate information for required testing, sampling and analyses to ensure that both short-term and longterm performance standards for the RA are met. Performance standards may include clean-up standards for contaminated environmental media as well as the

measurement of the effectiveness of engineering controls or other controls used to control migration of or exposure to contaminants. For example, the containment of a plume of contaminated ground water by pumping wells would be a performance standard requiring verification. The PSVP should describe the measurements to be taken, such as water levels in monitoring wells and piezometers, along with any analyses to be conducted on the data obtained, such as ground water modeling, to verify that the plume is contained. The PSVP shall include a FSP and a QAPP for any sampling and analyses to be conducted.

The Draft PSVP shall be submitted with the Intermediate Design for review and comment by the Ohio EPA. The final PSVP, which fully addresses comments made by the Ohio EPA must be submitted with and approved as part of the Final Design.

#### **4.6 OPERATION AND MAINTENANCE PLAN**

The Respondent(s) shall prepare an Operation and Maintenance Plan (O&M Plan) to cover long term operation and maintenance of the RA. Operation and maintenance for all components of the Remedial Action, shall begin after it is demonstrated that those components are operational and functional. The plan, at a minimum, shall be composed of the elements listed below.

1. Normal Operation and Maintenance
  - a. Description of tasks for operation
  - b. Description of tasks for maintenance
  - c. Description of prescribed treatment or operating conditions
  - d. Schedules showing the frequency of each O&M task
2. Potential Operating Problems
  - a. Description and analysis of potential operating problems
  - b. Sources of information regarding potential operating problems
  - c. Description of means of detecting problems in the operating systems
  - d. Common remedies for operating problems
3. Routine Monitoring and Laboratory Testing
  - a. Description of monitoring tasks
  - b. Description of required laboratory tests and interpretation of test results
  - c. Required QA/QC procedures to be followed
  - d. Schedule of monitoring frequency and provisions to discontinue, if appropriate

Note: Information on monitoring and testing that is presented in the PSVP should be referenced, as appropriate, but should not be duplicated in the

## O&M Plan.

4. Alternative O&M
  - a. Description of alternate procedures to prevent undue hazard, should systems fail
  - b. Analysis of the vulnerability and additional resources requirements should a failure occur
5. Safety Plan
  - a. Description of safety procedures, necessary equipment, etc. for site personnel
  - b. Description of safety tasks required in the event of systems failure (may be linked to the Site Safety Plan developed for the RD/RA)
6. Equipment
  - a. Description of equipment necessary to the O&M Plan
  - b. Description of installation of monitoring components
  - c. Description of maintenance of site equipment
  - d. Replacement schedule for equipment and installed components
7. Annual O&M Budget
  - a. Costs for personnel
  - b. Costs for preventative and corrective maintenance
  - c. Costs of equipment and supplies, etc.
  - d. Costs of any contractual obligations (e.g., lab expenses)
  - e. Costs of operation (e.g., energy, other utilities, etc.)
8. Records and Reporting Mechanisms Required
  - a. Daily operating logs
  - b. Laboratory records
  - c. Records for operating costs
  - d. Mechanism for reporting emergencies
  - e. Personnel and maintenance records
  - f. Monthly/semi-annual reports to Ohio EPA

The Respondent(s) shall submit a draft O&M Plan to the Ohio EPA for review and comment with the Intermediate Design submittal. Subsequent drafts of the O&M Plan shall be submitted with the Pre-final and Final Design submittals, which reflect the refined plans and specifications of those submittals and any comments made by the Ohio EPA. The final O&M Plan shall be submitted by the Respondent(s) prior to or at the completion of construction of the remedial action and shall incorporate any modifications or corrections required by the Ohio EPA.

## **APPENDIX C**

### **LIST OF RELEVANT GUIDANCE DOCUMENTS**

## Ohio EPA Division of Environmental Response and Revitalization (DERR)

### General Guidance Document and Reference List to Support Remedial Response Program Statements of Work and Orders

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#### Purpose and Use

This document provides an evolving "working list" of primary guidance documents and references which may be added as needed to the core guidance lists established for RI/FS and RD/RA statements of work (SOW) and orders. This general list of guidance and references is periodically updated by Ohio EPA. Ohio EPA recognizes that some remedial response sites may have conditions or circumstances that are not fully addressed by the documents in this working list of general guidance documents and references. Accordingly, Remedial Response orders should be supported as necessary by current guidance, professional publications, research and U.S. EPA and Ohio EPA policy directives. For sites where activities are conducted in response to an administrative or judicial order, the list of selected reference documents will be attached to the order as an appendix and will govern the work conducted. Ohio EPA reserves the right to modify this list as needed to fully and appropriately address site conditions.

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**Analytical Methods & U.S. EPA Contract Laboratory Program**

U.S. EPA & Other Guidance

SW-846, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods; Hazardous Waste Test Methods / SW-846 (webpage)

Standard Methods for the Examination of Water and Waste Water, American Public Health Association, 22<sup>nd</sup> Edition and updates (webpage) ; updated table of standard methods approved under the Clean Water Act, and updated table of standard methods approved under the Safe Drinking Water Act

U.S. EPA Drinking Water Analytical Methods, U.S. EPA webpage

U.S. EPA Superfund Analytical Services / Contract Laboratory Program, U.S. EPA webpage

Compendium of Methods for Determination of Toxic Organic Compounds in Ambient Air, 2<sup>nd</sup> Edition, U.S. EPA, EPA/625/R-96/010b, January 1999, and Ambient Monitoring Technology Information Center, Air Toxics – Monitoring Methods

Introduction to the Contract Laboratory Program, U.S. EPA, EPA 540-R-07-02, January 2007

Contract Laboratory Program Guidance for Field Samplers, U.S. EPA, EPA-540-R-014-013, October 2014

**Applicable or Relevant and Appropriate Requirements (ARARs)**

Ohio EPA Guidance

Ohio EPA Rules and Laws, webpage (as applicable for ARARs)

ARARs Table, Ohio EPA DERR Remedial Response Program (provides a generic list of ARARs that is updated periodically and subject to change)

Use of Applicable or Relevant and Appropriate Requirements (ARARs) in the Ohio EPA Remedial Response Program, U.S. EPA, DERR-00-RR-034, September 2003 (Draft)

**Ohio EPA DERR Remedial Response Program  
General Guidance and Reference List for SOWs and Orders**

U.S. EPA & Other Guidance

*Applicable or Relevant and Appropriate Requirements (ARARS)*, U.S. EPA

*CERCLA Compliance with Other Laws Manual, Interim Final (Part I)*, U.S. EPA, EPA/540/G-89/006, August 1988

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

*CERCLA Compliance with Other Laws Manual, CERCLA Compliance with State Requirements*, U.S. EPA, EPA 9234.2-05/FS, December 1989

*Permits and Permit 'Equivalency' Processes for CERCLA On-site Response Actions*, U.S. EPA, OWSER 9355.7-03, February 1992

*Clarification of the Role of Applicable, or Relevant and Appropriate Requirements in Establishing Preliminary Remediation Goals Under CERCLA*, U.S. EPA, OSWER 9200.4-23, August 22, 1997

**Attainment of Cleanup Goals (Statistical Assessment Methods)**

U.S. EPA & Other Guidance

*Methods for Evaluating the Attainment of Cleanup Standards, Volume 1: Soils and Solid Media*, U.S. EPA, EPA 230/02-89-042, February 1989

*Methods for Evaluating the Attainment of Cleanup Standards, Volume 2: Ground Water*, U.S. EPA, EPA 230-R-92-014, July 1992

*Statistical Methods for Evaluating the Attainment of Cleanup Standards, Volume 3: Reference-Based Standards for Soils and Solid Media*, U.S. EPA, EPA 230-R-94-004, December 1992

*An Overview of Methods for Evaluating the Attainment of Cleanup Standards for Soils, Solid Media, and Ground water, EPA Volumes 1, 2, and 3*, prepared for U.S. EPA under Contract DE-AC06-76RLO 1830 by Pacific Northwest National Laboratory (U.S. DOE and Battelle), January 1996

**Ohio EPA DERR Remedial Response Program  
General Guidance and Reference List for SOWs and Orders**

**Background Guidance**

Ohio EPA Guidance

Use of Background for Remedial Response Sites, Technical Decision Compendium, Ohio EPA DERR, August 2009

U.S. EPA & Other Guidance

Engineering Forum Issue: Determination of Background Concentrations of Inorganics in Soils and Sediments at Hazardous Waste Sites, U.S. EPA, EPA/540/S-96/500, December 1995

NAVFAC Guidance for Environmental Background Analysis, Volume I: Soil, NFESC User's Guide, UG-2049-ENV, prepared by Battelle Memorial Institute, Earth Tech, Inc., and NewFields, Inc., April 2002

Role of Background in the CERCLA Cleanup Program, OSWER 9285.6-07P, April 2002

Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites, U.S. EPA, EPA 540-R-01-003, September 2002

Statistical Software ProUCL 5.0.00 for Environmental Applications for Data Sets with and without Nondetect Observations, U.S. EPA; ProUCL Version 5.0.00 User Guide, U.S. EPA, EPA/600/R-07/041, September 2013; ProUCL Version 5.0.00 Technical Guide, U.S. EPA, EPA/600/R-07/041, September 2013

Geochemical and Mineralogical Data for Soils of the Conterminous United States, U.S. Geological Survey Data Series 801, 2013

**Conceptual Site Models**

Ohio EPA Guidance

Conceptual Site Models Guidance Document, Ohio EPA DERR, April 2015

U.S. EPA & Other Guidance

Model Site Conceptual Model for RI/FS Baseline Risk Assessments of Human and Ecological Health, U.S. EPA Region 8 Superfund Technical Guidance, SOP # 8RA-05, December 1994

**Ohio EPA DERR Remedial Response Program  
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Environmental Cleanup Best Management Practices: Effective Use of the Project Life Cycle Conceptual Site Model, U.S. EPA, EPA 542-F-11-011, July 2011

Standard Guide for Developing Conceptual Site Models for Contaminated Sites, ASTM E1689 – 95 (2014)

**Data Quality Assessment, Data Verification, and Data Validation**

Ohio EPA Guidance

Tier I Data Validation Manual for the Ohio EPA Division of Environmental Response and Revitalization, Ohio EPA DERR, March 2012

U.S. EPA & Other Guidance

Guidance for Data Quality Assessment: Practical Methods for Data Analysis (EPA QA-G9, QA00 Update), U.S. EPA, EPA/600/R-96/084, July 2000

Guidance on Environmental Data Verification and Data Validation (QA/G-8), U.S. EPA, EPA/240/R-02/004, November 2002

Data Quality Assessment: A Reviewer's Guide (QA/G-9R), U.S. EPA, EPA/240/B-06/002, February 2006

Data Quality Assessment: Statistical Tools for Practitioners (QA/G-9S), U.S. EPA, EPA/240/B-06/003, February 2006

U.S. EPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review (SOM01.2), U.S. EPA, EPA-540-R-08-01, June 2008

Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use, U.S. EPA, EPA-540-R-08-005, January 2009 and OSWER Directive No. 9200.1-85

U.S. EPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review (ISM01.2), U.S. EPA, EPA 540-R-10-011, January 2010

U.S. EPA Contract Laboratory Program National Functional Guidelines for Chlorinated Dioxin/Furan Data Review, U.S. EPA, EPA-540-R-11-016, September 2011

U.S. EPA National Functional Guidelines for Inorganic Superfund Data Review (ISM02.2), U.S. EPA, EPA 540-R-013-001, August 2014

**Ohio EPA DERR Remedial Response Program  
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U.S. EPA National Functional Guidelines for Superfund Organic Methods Data Review (SOM02.2), U.S. EPA, EPA 540-R-014-002, August 2014

**Data Quality Objectives**

Ohio EPA Guidance

Data Quality Objectives Process Summary, DERR-00-DI-32, Ohio EPA DERR, January 2002

U.S. EPA & Other Guidance

Data Quality Objectives Process for Superfund, Interim Final Guidance, U.S. EPA, EPA540-R-93-071, September 1993

Data Quality Objectives Process for Hazardous Waste Site Investigations, EPA QA/G-4HW Final, U.S. EPA, EPA/600/R-00/007, January 2000

Data Quality Objectives Decision Error Feasibility Trials Software (DEFT) – Users Guide, EPA QA/G-4D, U.S. EPA, EPA/240/B-01/007, September 2001; DEFT software is available at EPA Quality System Agency-wide Quality System Documents

Current Perspectives in Site Remediation and Monitoring: Clarifying DQO Terminology Usage to Support Modernization of Site Cleanup Practice, U.S. EPA, EPA 542-R-01-014, October 2001

Guidance on Systematic Planning Using the Data Quality Objectives Process, EPA QA/G-4, U.S. EPA, EPA/240/B-06/001, February 2006

Systematic Planning: A Case Study for Hazardous Waste Site Investigations EPA QA/CS-1, U.S. EPA, EPA/240/B-06/00, February 2006

Systematic Planning: A Case Study of Particulate Matter Ambient Air Monitoring EPA QA/CS-2, U.S. EPA, EPA/240/B-07/001, March 2007

**Data Usability in Risk Assessment**

U.S. EPA & Other Guidance

Guidance for Data Usability in Risk Assessment (Part A), U.S. EPA Office of Emergency and Remedial Response, Publication 9285.7-09A, April 1992

Guidance for Data Usability in Risk Assessment (Part B), U.S. EPA Office of Emergency and Remedial Response, Publication 9285.7-09B, May 1992

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**Ecological Risk Assessment**

Ohio EPA Guidance

*Ecological Risk Assessment Guidance Document*, Ohio EPA DERR, April 2008

U.S. EPA & Other Guidance

*Ecological Soil Screening Level (Eco-SSL)*, U.S. EPA

*ECOTOX Database*, U.S. EPA

*Framework for Ecological Risk Assessment*, U.S. EPA, EPA/630/R-92/001, February 1992

*Wildlife Exposure Factors Handbook (Volumes I and II)*, U.S. EPA, EPA/600/R-93/187, December 1993

*Guidelines for Ecological Risk Assessment*, U.S. EPA, EPA/630/R-95/002F, April 1998

*Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, Interim Final*, U.S. EPA, EPA 540-R-97/006, June 1997

*Issuance of Final Guidance: Ecological Risk Assessment and Risk Management Principles for Superfund Sites*, U.S. EPA, OSWER Directive 9285.7-28 P, October 1999

*Guidance for Developing Ecological Soil Screening Levels*, U.S. EPA, OSWER Directive 9285.7-55, February 2005

**Federal Facilities, Munitions, and Explosives**

U.S. EPA & Other Guidance

*Cleanups at Federal Facilities*, U.S. EPA webpage

*Uniform Federal Policy for Quality Assurance Project Plans – Evaluating, Assessing, and Documenting Environmental Data Collection and Use Programs, Part 1: UFP-QAPP Manual, Final*, Intergovernmental Data Quality Task Force, EPA: EPA-505-B-04-900A, DoD: DTIC ADA 427785, Version 1, March 2005

**Ohio EPA DERR Remedial Response Program  
General Guidance and Reference List for SOWs and Orders**

Workbook for Uniform Federal Policy for Quality Assurance Project Plans – Evaluating, Assessing, and Documenting Environmental Data Collection and Use Programs, Part 2A: UFP-QAPP Workbook, Final, Intergovernmental Data Quality Task Force, EPA: EPA-505-B-04-900C, DoD: DTIC ADA 427486, Version 1, March 2005

Uniform Federal Policy for Quality Assurance Project Plans: Part 2B, Quality Assurance/Quality Control Compendium: Minimum QA/QC Activities, Final, Intergovernmental Data Quality Task Force, EPA: EPA-505-B-04-900B, DoD: DTIC ADA 426957, Version 1, March 2005

Handbook on the Management of Munitions Response Actions, Interim Final, U.S. EPA, OSWER, EPA 500-B-01-001, May 2005

Munitions and Explosives of Concern Hazard Assessment Methodology, Interim, U.S. EPA, U.S. Department of Defense and U.S. Department of the Interior, EPA: 505B08001, October 2008

Quality Considerations for Munitions Response Projects, The Interstate Technology & Regulatory Council Unexploded Ordnance Team, UXO-5, October 2008

Program Management Manual for Military Munitions Response Program (MMRP) Active Installations: Information for Managing and Overseeing MMRP Projects at US Army Active Installations, Final, U.S. Army Environmental Command, September 2009

EPA Munitions Response Guidelines, Interim Final, U.S. EPA, OWSER Directive 9200.1-101, July 2010

**Geologic/Hydrogeologic Investigation and Modeling**

Ohio EPA Guidance

Technical Guidance Manual for Hydrogeologic Investigations and Ground Water Monitoring Programs, Ohio EPA Division of Drinking and Ground Waters, February 1995 (as updated)

Vadose Zone Modeling in RCRA Closure, Ohio EPA Division of Hazardous Waste Management, January 2005

Soil Leaching to Ground Water Evaluation for Total Petroleum Hydrocarbons (TPH) Guidance, Ohio EPA DERR, January 2004

**Ohio EPA DERR Remedial Response Program  
General Guidance and Reference List for SOWs and Orders**

U.S. EPA & Other Guidance

Superfund Ground Water Issue: Facilitated Transport, U.S. EPA, EPA/540/4-89/003, August 1989

Ground Water Issue: Basic Concepts of Contaminant Sorption at Hazardous Waste Sites, U.S. EPA, EPA/540/4-90/053, October 1990

Ground Water Issue: Fundamentals of Ground-Water Modeling, U.S. EPA, EPA/540/S-92/005, April 1992

Handbook of RCRA Ground-Water Monitoring Constituents: Chemical and Physical Properties, EPA/530/R-92/022, September 1992

Ground Water Issue: Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures, U.S. EPA, EPA/540/S-95/504, April 1996

BIOSCREEN, Natural Attenuation Decision Support System, Version 1.4, U.S. EPA, July 1997; BIOSCREEN, Natural Attenuation Support System – User's Manual, Version 1.3, U.S. EPA, 600/R-96/087, August 1996

Ground Water Issue: Fundamentals of Soil Science as Applicable to Management of Hazardous Wastes, U.S. EPA, EPA/540/S-98/500, April 1999

BIOCHLOR, Natural Attenuation Decision Support System, Version 2.2, U.S. EPA, June 2002; BIOCHLOR, Natural Attenuation Decision Support System – User's Manual Addendum, Version 2.2, U.S. EPA (National Risk Management Research Laboratory), March 2002; BIOCHLOR, Natural Attenuation Decision Support System – User's Manual, Version 1.0, U.S. EPA, EPA/600/R-00/008, January 2000

Proceedings of the Ground-Water/Surface-Water Interactions Workshop, and Poster Session Abstracts, U.S. EPA, EPA 542/R-00/007, July 2000

Monitoring Well Comparison Study: An Evaluation of Direct-Push Versus Conventional Monitoring Wells, A Study Conducted by BP Corporation North America Inc. and U.S. EPA Regions 4 and 5 Underground Storage Tank Programs, May 2002

Groundwater Sampling and Monitoring with Direct Push Technologies, U.S. EPA, EPA 540/R-04/005, August 2005

The Use of Direct-push Well Technology for Long-term Environmental Monitoring in Groundwater Investigations, The Interstate Technology & Regulatory Council (ITRC) Sampling, Characterization and Monitoring Team, March 2006

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Vadose Zone Leaching (VLEACH), Version 2.2a, U.S. EPA, May 2007; VLEACH: A One-Dimensional Finite Difference Vadose Zone Leaching Model, Version 2.2a, U.S. EPA, Office of Research and Development, Robert S. Kerr Environmental Research Laboratory, Center for Subsurface Modeling Support, May 2007

Natural Attenuation Software (NAS), Version 2.2.3, Naval Facilities Engineering Command (NAVFAC), Virginia Polytechnic Institute and State University, and the United States Geological Survey, May 2008

Use and Measurement of Mass Flux and Mass Discharge, The Interstate Technology & Regulatory Council Integrated DNAPL Site Strategy Team, MASSFLUX-1, August 2010

**Health and Safety**

U.S. EPA & Other Guidance

U.S. Department of Labor, Occupational Safety & Health Administration (OSHA) Laws and Regulations, United States Department of Labor – OSHA website

29 CFR 1910.120: Hazardous Waste Operations and Emergency Response, U.S. Department of Labor – OSHA website

29 CFR 1910.134: Respiratory Protection, U.S. Department of Labor – OSHA website

29 CFR 1926: Construction, U.S. Department of Labor, OSHA – OSHA website

CERCLA Section 111(c)(6), U.S. Senate Committee on Environmental & Public Works website

Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, DHHS (NIOSH) Publication No. 85-115, October 1985

U.S. EPA Standard Operating Safety Guides, Publication 9285.1-03, PB92-963414, June 1992

NIOSH Pocket Guide to Chemical Hazards (online), Centers for Disease Control and Prevention (CDC), National Institute for Occupational Safety and Health (NIOSH)

2015 American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices (TLVs and BEIs), ACGIH Publication #0115, ISBN: 978-1-607260-77-6

**Ohio EPA DERR Remedial Response Program  
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**Human Health Risk Assessment**

Ohio EPA Guidance

*Use of Risk-Based Numbers in the Remedial Response Process Overview*, Ohio EPA DERR, June 2005

*Application of Bioavailability in the Assessment of Human Health Hazards and Cancer Risk*, Ohio EPA DERR, August 2009

*Human Health Cumulative Carcinogenic Risk and Non-carcinogenic Hazard Goals for DERR Remedial Response Program*, Ohio EPA DERR, August 2009

*Assessing Compounds without Formal Toxicity Values Available for Use in Human Health Risk Assessment*, Ohio EPA DERR, April 2010

U.S. EPA & Other Guidance

*Risk Assessment*, U.S. EPA

*Integrated Risk Information System (IRIS)*, U.S. EPA

*Superfund Exposure Assessment Manual*, U.S. EPA, EPA/540/1-88/001, OWSER Directive 9285.5-1, April 1988

*Risk Assessment Guidance for Superfund (RAGS) Volume 1: Human Health Evaluation Manual (Part A, Interim Final)*, U.S. EPA, EPA/540/1-89/002, December 1989

*Supplemental Guidance to RAGS: Calculating the Concentration Term*, U.S. EPA, OSWER Publication 9285.7-081, May 1992

*Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals, Interim)*, U.S. EPA, EPA/540/R-92/003, December 1991

*Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual, (Part C, Risk Evaluation of Remedial Alternatives, Interim)*, U.S. EPA Office of Emergency and Remedial Response, Publication 9285.7-01C, October 1991

*Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part D, Standardized Planning, Reporting and Review of Superfund Risk Assessments, Final)*, U.S. EPA Office of Emergency and Remedial Response, Publication 9287.7-47, December 2001

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*Risk Assessment Guidance for Superfund: Volume III – Part A, Process for Conducting Probabilistic Risk Assessment*, U.S. EPA Office of Emergency and Remedial Response, EPA 540-R-02-002, OWSER 9285.7-45, December 2001

*Calculating Upper Confidence Limit for Exposure Point Concentrations at Hazardous Waste Sites*, U.S.EPA, OSWER Directive 9285.6-10, December 2002

*Human Health Toxicity Values in Superfund Risk Assessments*, memorandum from Michael B. Cook, Director, U.S. EPA Office of Superfund Remediation and Technology Innovation, to Superfund National Policy Managers, Regions 1-10, OSWER Directive 9285.7-53, December 3, 2003

*Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment, Final)*, U.S. EPA Office of Emergency and Remedial Response, EPA/540/R/99/005, OSWER 9285.7-02EP, PB99-963312, July 2004

*Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment, Final)*, U.S. EPA Office of Superfund Remediation and Technology Innovation, EPA-540-R-070-002, OSWER 9285.7-82, January 2009

*Exposure Factors Handbook: 2011 Edition*, U.S. EPA, EPA/600/R-090/052F, September 2011

*Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors*, U.S. EPA Office of Superfund Remediation and Technology Innovation, OSWER Directive 9200.1-120, February 2014; also *Frequently Asked Questions (FAQs) About Update of Standard Default Exposure Factors*, U.S. EPA, September 2015

## **Institutional Controls**

### **U.S. EPA & Other Guidance**

*Superfund Institutional Controls: Guidance and Policy*, U.S. EPA webpage

*Institutional Controls: A Site Manager's Guide to Identifying, Evaluating and Selecting Institutional Controls at Superfund and RCRA Corrective Action Cleanups*, U.S. EPA, EPA 540-F-99-005, September 2000

*Institutional Controls: A Guide to Planning, Implementing, Maintaining, and Enforcing Institutional Controls at Contaminated Sites*, U.S. EPA, EPA-540-R-09-001, December 2012

**Ohio EPA DERR Remedial Response Program  
General Guidance and Reference List for SOWs and Orders**

*Institutional Controls: A Guide to Preparing Institutional Control Implementation and Assurance Plans at Contaminated Sites*, U.S. EPA, EPA-540-R-08-002, December 2012

**Landfills, Waste Containment Facilities, and Engineered Barriers**

Ohio EPA Guidance

*Geotechnical and Stability Analyses for Ohio Waste Containment Facilities*, Ohio EPA Geotechnical Resources Group (GeoRG), September 14, 2004

U.S. EPA & Other Guidance

*Technical Guidance Document: Final Covers on Hazardous Waste Landfills and Surface Impoundments*, U.S. EPA, EPA-530-SW-89-047, July 1989

*Seminar Publication - Requirements for Hazardous Waste Landfill Design, Construction, and Closure*, U.S. EPA, EPA/625/4-89/022, August 1989

*Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites*, U.S. EPA, EPA/540/P-91/001, February 1991

*Superfund Accelerated Cleanup Bulletins: Presumptive Remedies for Municipal Landfill Sites*, U.S. EPA Office of Solid Waste and Emergency Response Publication 9203.1-021: April 1992, Vol. 1, No. 1; August 1992, Vol. 1, No. 3; and February 1993, Vol. 2, No. 1

*Presumptive Remedy for CERCLA Municipal Landfill Sites*, U.S. EPA, EPA 540-F-93-035, September 1993

*MSW Landfill Criteria Technical Manual*, U.S. EPA, EPA530-R-93-017, November 1993

*Feasibility Study Analysis for CERCLA Municipal Landfill Sites*, U.S. EPA, EPA540/R-94/081, August 1994

*Presumptive Remedies: CERCLA Landfill Caps RI/FS Data Collection Guide*, U.S. EPA, EPA/540/F-95/009, August 1995

*Quality Assurance and Quality Control for Waste Containment Facilities (Summary)*, U.S. EPA, EPA/600/SR-93/182, September 1995

*Application of the CERCLA Municipal Landfill Presumptive Remedy to Military Landfills*, U.S. EPA, EPA/540/F-96/020, December 1996

**Ohio EPA DERR Remedial Response Program  
General Guidance and Reference List for SOWs and Orders**

*Implementing Presumptive Remedies: A Notebook of Guidance and Resource Materials*, U.S. EPA, EPA 540-R-97-029, October 1997

*Evaluation of Subsurface Engineered Barriers at Waste Sites*, U.S. EPA, EPA 542-R-98-005, August 1998

*Control of Subsurface Contaminant Migration by Vertical Engineered Barriers*, U.S. EPA, EPA/600/F-10/017, July 2010

**Land Redevelopment and Reuse**

**U.S. EPA & Other Guidance**

*Superfund Redevelopment*, U.S. EPA

*Land Use in the CERCLA Remedy Selection Process*, U.S. EPA, OSWER Directive No. 9355.7-04, May 25, 1995

*Reuse Considerations During CERCLA Response Actions*, U.S. EPA, OSWER 9365.0-30

*Guidance for Preparing Superfund Ready for Reuse Determinations*, U.S. EPA, OSWER 9365.0-33

*Reuse of CERCLA Landfill and Containment Sites*, U.S. EPA, EPA 540-F-99-015, September 1999

*Reuse Assessments: A Tool To Implement The Superfund Land Use Directive*, U.S. EPA, OSWER 9355.7-06P, June 4, 2001

*Reusing Cleaned Up Superfund Sites: Golf Facilities Where Waste is Left on Site*, U.S. EPA, EPA-540-R-03-003, October 2003

*Considering Reasonably Anticipated Future Land Use and Reducing Barriers to Reuse at EPA-lead Superfund Remedial Sites*, U.S. EPA, OSWER Directive 9355.7-19, March 17, 2010

**Lead**

**U.S. EPA & Other Guidance**

*Lead at Superfund Sites*, U.S. EPA

*Lead at Superfund Sites: Software and User's Manuals*, U.S. EPA (Integrated Exposure Uptake Biokinetic Model for Lead in Children and Adult Lead Methodology)

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USGS Background Soil – Lead Survey, USGS

Memorandum: OSWER Directive: Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, U.S. EPA, OSWER Directive #9355.4-12, August 1994

Memorandum: OSWER Directive: Clarification to the 1994 Revised Interim Soil Lead (Pb) Guidance for CERCLA Sites and RCRA Corrective Action Facilities, U.S. EPA, EPA/540/F-98/030, August 1998

Short Sheet: TRW Recommendations for Sampling and Analysis of Soil at Lead (Pb) Sites, U.S. EPA, EPA #540-F-00-010, April 2000

Assessing Intermittent or Variable Exposures at Lead Sites, U.S. EPA, EPA-540-R-03-008, OSWER # 9285.7-76

TRW Recommendations for Performing Human Health Risk Analysis on Small Arms Shooting Ranges, U.S. EPA, OSWER #9285.7-37, March 2003

Superfund Lead-Contaminated Residential Sites Handbook, U.S. EPA, OSWER 9285.7-50, August 2003

Chemical Stabilization of Lead in Small Arms Firing Range Soils, U.S. Army Corps of Engineers, ERDC/EL TR-03-20, September 2003

Best Management Practices for Lead at Outdoor Shooting Ranges, U.S. EPA Region 2, EPA-902-B-01-001, Revised June 2005

Technical Review Workgroup Recommendations Regarding Gardening and Reducing Exposure to Lead-Contaminated Soils, U.S. EPA, OSWER 9200.2-142, May 2014

**Monitored Natural Attenuation**

Ohio EPA Guidance

Remediation Using Monitored Natural Attenuation, Ohio EPA DERR Remedial Response Program Fact Sheet, January 2001

Distinction between Monitored Natural Attenuation and Enhanced Monitoring at DERR Remedial Response Sites, Ohio EPA DERR Technical Decision Compendium, October 2002

**Ohio EPA DERR Remedial Response Program  
General Guidance and Reference List for SOWs and Orders**

U.S. EPA & Other Guidance

Natural Attenuation of Hexavalent Chromium in Ground Water and Soils – EPA Ground Water Issue, U.S. EPA, EPA/540/5-94/505, October 1994

Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water, U.S. EPA, EPA/600/R-98/128, September 1998

Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action and Underground Storage Tank Sites, U.S. EPA, OSWER Directive 9200.4-17P, April 1999

Microbial Processes Affecting Monitored Natural Attenuation of Contaminants in the Subsurface – Ground Water Issue, U.S. EPA, EPA/540/S-99/001, September 1999

Natural Attenuation for Groundwater Remediation, Committee on Intrinsic Remediation, Water Science and Technology Board and Board on Radioactive Waste Management, Commission on Geosciences, Environment, and Resources, National Academy of Sciences, 2000, ISBN 0-309-06932-7

Calculation and Use of First-Order Rate Constants for Monitored Natural Attenuation Studies, U.S. EPA, EPA/540/S-02/500, November 2002

Performance Monitoring of MNA Remedies for VOCs in Ground Water, U.S. EPA, EPA/600/R-04/027, April 2004

Natural Attenuation of Chlorinated Solvent Ground-Water Plumes Discharging into Wetlands, U.S. Geological Survey, Scientific Investigations Report 2004-5220, 2004

Monitored Natural Attenuation of Inorganic Contaminants in Ground Water – Volume I, Technical Basis for Assessment, U.S. EPA, EPA/600/R-07/139, October 2007

A Guide for Assessing Biodegradation and Source Identification of Organic Ground Water Contaminants Using Compound-Specific Isotope Analysis (CSIA), U.S. EPA, EPA/600/R-08/148, December 2008

Identification and Characterization Methods for Reactive Minerals Responsible for Natural Attenuation of Chlorinated Organic Compounds in Ground Water, U.S. EPA, U.S. EPA/600/R-09/115, December 2009

Framework for Site Characterization for Monitored Natural Attenuation of Volatile Organic Compounds in Ground Water, U.S. EPA, EPA 600/R-12/712, December 2012

**Ohio EPA DERR Remedial Response Program  
General Guidance and Reference List for SOWs and Orders**

**Natural Resource Damage Assessments**

U.S. EPA & Other Guidance

Natural Resource Damages, U.S. EPA

**Non-Aqueous Phase Liquid (LNAPL, DNAPL) Assessment**

U.S. EPA & Other Guidance

Ground Water Issue: Dense Nonaqueous Phase Liquids, U.S. EPA, EPA/540/4-91-002, March 1991

Evaluation of the Likelihood of DNAPL Presence at NPL Sites, National Results, U.S. EPA, EPA 540R-93-073, September 1993

DNAPL Site Characterization, U.S. EPA, EPA/540/F-94/049, September 1994

Ground Water Issue: Light Nonaqueous Phase Liquids, U.S. EPA, EPA/540/S-95/500, July 1995

Dense Non-Aqueous Phase Liquids (DNAPLs): Review of Emerging Characterization and Remediation Technologies, Interstate Technology and Regulatory Cooperation (ITRC) Work Group, DNAPLs/Chemical Oxidation Work Team, DNAPLs-1, June 2000

An Introduction to Characterizing Sites Contaminated with DNAPLs, The Interstate Technology & Regulatory Council (ITRC) Dense Nonaqueous Phase Liquids Team, DNAPLs-4, September 2003

Site Characterization Technologies for DNAPL Investigations, U.S. EPA, EPA 542-R-04-017, September 2004

Ground Water Issue: Assessment and Delineation of DNAPL Source Zones at Hazardous Waste Sites, U.S. EPA, EPA/600/R-09/119, September 2009

**Oversight**

U.S. EPA & Other Guidance

Guidance on EPA Oversight of Remedial Designs and Remedial Actions Performed by Potentially Responsible Parties, Interim Final, U.S. EPA, EPA/540/G-90/001, April 1990

Remedial Design/Remedial Action Handbook, U.S. EPA, EPA 540/R-95/059, June 1995

**Ohio EPA DERR Remedial Response Program  
General Guidance and Reference List for SOWs and Orders**

Using RCRA's "Results-Based Approaches and Tailored Oversight Guidance" when Performing Superfund PRP Oversight, U.S. EPA Memorandum, December 2006 [Results-Based Approaches and Tailored Oversight Guidance for Facilities Subject to Corrective Action Under Subtitle C of the Resource Conservation and Recovery Act, EPA 530-R-03-012, September 2003 is attached]

Superfund Oversight Guidance, U.S. EPA, January 24, 2007 (Memorandum from Susan E. Bromm, Director, Office of Site Remediation Enforcement)

**Presumptive Remedies (see "Landfills" also)**

U.S. EPA & Other Guidance

Presumptive Remedies: Policy and Procedures (Quick Reference Fact Sheet), U.S. EPA, EPA 540-F-93-047, September 1993

Presumptive Remedies: Site Characterization and Technology Selection for CERCLA Sites with Volatile Organic Compounds in Soils, U.S. EPA, EPA 540-F-93-048, September 1993

Presumptive Remedies for Soils, Sediments, and Sludges at Wood Treater Sites, U.S. EPA, EPA/540/R-95/128, December 1995

User's Guide to the VOCs in Soils Presumptive Remedy, U.S. EPA, EPA 540/F-96/008, July 1996

Presumptive Response Strategy and Ex-Situ Treatment Technologies for Contaminated Ground Water at CERCLA Sites, Final Guidance, U.S. EPA, EPA 540/R-96/023, October, 1996

Presumptive Remedy: Supplemental Bulletin, Multi-Phase Extraction (MPE) Technology for VOCs in Soil and Groundwater, U.S. EPA, EPA 540-F-97-004, April 1997

Presumptive Remedy for Metals-in-Soil Sites, U.S. EPA, EPA 540-F-98-054, September 1999

**Quality Assurance Project Plans (QAPPs) and Quality Assurance**

Ohio EPA Guidance

Guidelines and Specifications for Preparing Quality Assurance Project Plans, DERR-00-RR-008, Ohio EPA DERR, September 1998

Laboratory and Field Data Screening for Preparing Quality Assurance Project Plans, DI-00-034, Ohio EPA DERR, August 2005

**Ohio EPA DERR Remedial Response Program  
General Guidance and Reference List for SOWs and Orders**

**U.S. EPA & Other Guidance**

Technical Guidance Document: Construction Quality Assurance and Quality Control for Waste Containment Facilities, U.S. EPA, EPA/600/R-93/182, September 1993

Guidance on Technical Audits and Related Assessments for Environmental Data Operations, EPA QA/G-7, U.S. EPA, EPA/600/R-99/080, January 2000; May 2006 reissue notice

EPA Requirements for Quality Management Plans, EPA QA/R-2, U.S. EPA, EPA/240/B-01/002, March 2001; May 2006 reissue notice

Guidance for Preparing Standard Operating Procedures, EPA QA/G-6, U.S. EPA, EPA/240/B-01/004, April 2007

Guidance for Quality Assurance Project Plans, EPA QA/G-5, U.S. EPA, EPA/240/R-02-009, December 2002

Guidance for Quality Assurance Plans for Modeling, EPA QA/G-5M, U.S. EPA, EPA/240-R02/007, December 2002

Guidance on Choosing a Sampling Design for Environmental Data Collection for Use in Developing a Quality Assurance Project Plan, EPA QA/G-5S, U.S. EPA, EPA/240/R-02/005, December 2002

Guidance for Geospatial Data Quality Assurance Project Plans, EPA QA/G-5G, U.S. EPA, EPA/240/R-03/003, March 2003

Guidance on Quality Assurance for Environmental Technology Design, Construction and Operation, EPA QA/G-11, U.S. EPA, EPA/240/B-05/001, January 2005

**Remedial Alternative Evaluation, Remedy Selection, and Proposed Plans**

**Ohio EPA Guidance**

Procedures for Evaluation of Response Action Alternatives and Remedy Selection for Remedial Response Program Sites, Ohio EPA DERR, Policy DERR-00-RR-019, Revised September 14, 1999

**U.S. EPA & Other Guidance**

Key Principles of Remedy Selection, U.S. EPA website

Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions, U.S. EPA, OWSER Directive 9355.0-30, April 22, 1991

**Ohio EPA DERR Remedial Response Program  
General Guidance and Reference List for SOWs and Orders**

*A Guide to Principal and Low level Threat Wastes*, U.S. EPA, OSWER 9380.3-06FS, November 1991

*Selecting a Combined Response Action Approach for Noncontiguous CECRLA Facilities to Expedite Cleanups*, U.S. EPA, OSWER Directive No. 9355.3-14FS, April 1992

*Land Use in the CERCLA Remedy Selection Process*, U.S. EPA, OSWER Directive No. 9355.7-04, May 25, 1995

*Coordination between RCRA Corrective Action and Closure and CERCLA Site Activities*, U.S. EPA, September 24, 1996

*The Role of Cost in the Superfund Remedy Selection Process*, U.S. EPA, EPA 540/F-96/018, September 1996

*Rules of Thumb for Superfund Remedy Selection*, U.S. EPA, EPA 540-R-97-013, August 1997

*A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents*, U.S. EPA, EPA 540-R-98-031, July 1999

**Remedial Design and Remedial Action (RD/RA)**

**General RD/RA References**

Ohio EPA Guidance

*State of Ohio Model Statement of Work for Remedial Design and Remedial Action*, Ohio EPA DERR, August 30, 2004

U.S. EPA & Other Guidance

*Remedial Design/Remedial Action Handbook*, U.S. EPA, EPA 540/R-95/059, June 1995

*Guidance for Scoping the Remedial Design*, U.S. EPA, EPA/540/R-95/025, March 1995

*Superfund Post-Construction Completion: An Overview*, U.S. EPA, EPA 540/F/01/009, June 2001

**Ohio EPA DERR Remedial Response Program  
General Guidance and Reference List for SOWs and Orders**

**Bioremediation**

U.S. EPA & Other Guidance

*Cost and Performance Reporting for In Situ Bioremediation Technologies (Final)*, The Interstate Technology and Regulatory Cooperation (ITRC) Work Group *In Situ* Bioremediation Technical Task Team *in partnership with* the Bioremediation Consortium of the Remediation technology Development Forum, December 1997

*Interstate Technology and Regulatory Cooperation Work Group (ITRC) In Situ Bioremediation Work Team, Closure Criteria Focus Group, FY-97 Report (Final)*, March 3, 1998

*General Protocol for Demonstration of In Situ Bioremediation Technologies (Revised Final)*, The Interstate Technology and Regulatory Cooperation (ITRC) Work Group, In Situ Bioremediation Work Team, September 1, 1998

*Ground Water Issue: In-Situ Bioremediation of Contaminated Ground Water*, U.S. EPA, EPA/540/S-92/003, February 1992

*Overview of In Situ Bioremediation of Chlorinated Ethene DNAPL Source Zones*, The Interstate Technology and Regulatory Council (ITRC) Bioremediation of Dense Nonaqueous Phase Liquids (Bio DNAPL) Team, BIODNAPL-1, October 2005

*In Situ Bioremediation of Chlorinated Ethene: DNAPL Source Zones*, The Interstate Technology & Regulatory Council (ITRC) Bioremediation of DNAPLs Team, BIODNAPL-3, June 2008

**Green and Sustainable Remediation**

U.S. EPA & Other Guidance

*Superfund Green Remediation*, U.S. EPA webpage

*Superfund Green Remediation Strategy*, U.S. EPA, September 2010

*Green and Sustainable Remediation: State of the Science and Practice*, The Interstate Technology & Regulatory Council (ITRC) Green and Sustainable Remediation Team, GSR-1, May 2011

*Green and Sustainable Remediation: A Practical Framework*, The Interstate Technology & Regulatory Council (ITRC) Green and Sustainable Remediation Team, GSR-2, May 2011

**Ohio EPA DERR Remedial Response Program  
General Guidance and Reference List for SOWs and Orders**

**Ground Water Remediation/Restoration**

U.S. EPA & Other Guidance

Guidance for Remedial Actions for Contaminated Ground Water at Superfund Sites, EPA/540/G-88/003, December 1988

General Methods for Remedial Operation Performance Evaluations, U.S. EPA, EPA/600/R-92/002, January 1992

Ground Water Issue: Chemical Enhancements to Pump-and-Treat Remediation, U.S. EPA, EPA/540/S-92/001, January 1992

Considerations in Ground-Water Remediation at Superfund Sites and RCRA Facilities –Update, U.S. EPA, OWSER Directive No. 9283.1-06, May 27, 1992

Guidance for Evaluating the Technical Impracticability of Ground Water Restoration (Interim Final), U.S. EPA, EPA/540-R-93-080, OSWER Directive 9234.2-25, September 1993

Methods for Monitoring Pump-and-Treat Performance, U.S. EPA, EPA/600/R-94/123, June 1994

Pump-and-Treat Ground-Water Remediation: A Guide for Decision Makers and Practitioners, U.S. EPA, EPA/625/R-95/005, July 1996

Presumptive Response Strategy and Ex-Situ Treatment Technologies for Contaminated Ground Water at CERCLA Sites (Final Guidance), U.S. EPA 540/R-96/023, October 1996

Use of Alternate Concentration Limits (CLs) in Superfund Cleanups, U.S. EPA, OWSER 9200.4-39, July 19, 2005

Recommendations from the EPA Ground Water Task Force, U.S. EPA, EPA-500-R-07-001, December 2007

Clarification of OSWER's 1995 Technical Impracticability Waiver Policy, OSWER Directive #9355.5-32, September 19, 2011

**Hazardous Waste Treatment and Stabilization/Solidification**

U.S. EPA & Other Guidance

Handbook for Stabilization/Solidification of Hazardous Wastes, U.S. EPA, EPA/540/2-86/001, June 1986

**Ohio EPA DERR Remedial Response Program  
General Guidance and Reference List for SOWs and Orders**

*A Compendium of Technologies Used in the Treatment of Hazardous Wastes*, U.S. EPA, EPA/625/8-87/014, September 1987

*Stabilization/Solidification of CERCLA and RCRA Wastes - Physical Tests, Chemical Testing Procedures, Technology Screening and Field Activities*, U.S. EPA, EPA/625/6-89/022, May 1989

***Incineration***

**U.S. EPA & Other Guidance**

*Hazardous Waste Combustion*, U.S. EPA webpage

*Handbook - Guidance on Setting Permit Conditions and Reporting Trial Burn Results - Volume II of the Hazardous Waste Incineration Guidance Series*, U.S. EPA, EPA/625/6-89/019, January 1989

*Handbook - Hazardous Waste Incineration Measurement Guidance Manual - Volume III of the Hazardous Waste Incineration Guidance Series*, U.S. EPA, EPA/625/6-89/021, June 1989

*Handbook - Quality Assurance/Quality Control (QA/QC) Procedures for Hazardous Waste Incineration*, U.S. EPA, EPA/625/6-89/023, January 1990

***In-Situ Chemical Oxidation***

**U.S. EPA & Other Guidance**

*Technical and Regulatory Guidance for In Situ Chemical Oxidation of Contaminated Soil and Groundwater (Second Edition)*, The Interstate Technology & Regulatory Council (ITRC) In Situ Chemical Oxidation Team, January 2005

*In-Situ Chemical Oxidation – Engineering Issue*, U.S. EPA, EPA/600/R-06/072, August 2006

***Non-Aqueous Phase Liquid (DNAPL, LNAPL) Remediation***

**U.S. EPA & Other Guidance**

*Evaluating Natural Source Zone Depletion at Sites with LNAPL*, The Interstate Technology & Regulatory Council (ITRC) LNAPLs Team, LNAPL-1, April 2001

*DNAPL Source Reduction: Facing the Challenge*, Interstate Technology & Regulatory Council (ITRC) Dense Nonaqueous Phase Liquids Team, DNAPLs-2, April 2002

**Ohio EPA DERR Remedial Response Program  
General Guidance and Reference List for SOWs and Orders**

Technical and Regulatory Guidance for Surfactant/Cosolvent Flushing of DNAPL Source Zones, The Interstate Technology & Regulatory Council (ITRC) Dense Nonaqueous Phase Liquids Team, DNAPLs-3, April 2003

The DNAPL Remediation Challenge: Is There a Case for Source Depletion?, U.S. EPA, EPA/600/R-03/143, December 2003

Strategies for Monitoring the Performance of DNAPL Source Zone Remedies, The Interstate Technology & Regulatory Council (ITRC) Dense Nonaqueous-Phase Liquids Team, DNAPLs-5, August 2004

DNAPL Remediation: Selected Projects Where Regulatory Closure Goals Have Been Achieved, U.S. EPA, EPA 542/R-09/008, August 2006

Evaluating LNAPL Remedial Technologies for Achieving Project Goals, The Interstate Technology & Regulatory Council (ITRC) LNAPLs Team, LNAPL-2, December 2009

Integrated DNAPL Site Strategy, The Interstate Technology & Regulatory Council (ITRC) Integrated DNAPL Site Strategy Team, IDSS-1, November 2011

**PCB Remediation**

U.S. EPA & Other Guidance

Guidance on Remedial Actions for Superfund Sites with PCB Contamination, U.S. EPA, EPA/540/G-90/007, August 1990 (**Please note:** After EPA's Office of Solid Waste and Emergency Response issued "Guidance on Remedial Actions for Superfund Sites with PCB Contamination" OSWER Directive 9355.4-01 (August 1990), the Agency published a final rule under the Toxic Substances Control Act (TSCA) that amended existing regulations governing PCBs (see 40 CFR Part 761). The regulations are controlling legal authority and any policy discussion in the OSWER Directives that is not consistent with those regulations should be disregarded.)

Engineering Issue: Technology Alternatives for the Remediation of PCB-Contaminated Soil and Sediment, U.S. EPA, EPA/540/S-93/506, October 1993

**Permeable Reactive Barriers**

U.S. EPA & Other Guidance

Interstate Technology & Regulatory Council, Permeable Reactive Barriers (PRBs) Documents and Training Courses

**Ohio EPA DERR Remedial Response Program  
General Guidance and Reference List for SOWs and Orders**

Regulatory Guidance for Permeable Reactive Barriers Designed to Remediate Inorganic and Radionuclide Contamination, Interstate Technology and Regulatory Cooperation (ITRC) Work Group, Permeable Reactive Barriers Work Team, PRB-3, September 1999

Regulatory Guidance for Permeable Barriers Designed to Remediate Chlorinated Solvents, Interstate Technology and Regulatory Cooperation (ITRC) Work Group, Permeable Reactive Barriers Work Group, Second Edition, PBW-1, December 1999

Design Guidance for Application of Permeable Reactive Barriers for Groundwater Remediation (Final), prepared by Battelle, Columbus, Ohio for the Air Force Research Laboratory, Tyndall Air Force Base, Florida, Contract No. F08637-95-D-6004, PBW-2, March 31, 2000

Permeable Reactive Barrier: Technology Update, The Interstate Technology & Regulatory Council (ITRC), PRB: Technology Update Team, PRB-5, June 2011

**Phytoremediation**

U.S. EPA & Other Guidance

Phytoremediation Resource Guide, U.S. EPA, EPA 542-B-99-003, June 1999

Introduction to Phytoremediation, U.S. EPA, EPA/600/R-99/107, February 2000

Ground Water Issue: Phytoremediation of Contaminated Soil and Ground Water at Hazardous Waste Sites, U.S. EPA, EPA/540/S-01/500, February 2001

**Sediment Remediation**

U.S. EPA & Other Guidance

Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites, U.S. EPA, OSWER Directive 9285.6-08, February 12, 2000

Contaminated Sediment Remediation Guidance for Hazardous Waste Sites, U.S. EPA, EPA-540-R-05-012, December 2005

Contaminated Sediments Remediation – Remedy Selection for Contaminated Sediments, The Interstate Technology & Regulatory Council (ITRC) Contaminated Sediments Team, CS-2, August 2014

**Ohio EPA DERR Remedial Response Program  
General Guidance and Reference List for SOWs and Orders**

**Soil Remediation**

U.S. EPA & Other Guidance

Handbook on In Situ Treatment of Hazardous Waste-Contaminated Soils, U.S. EPA, EPA/540/2-90/002, January 1990

Technical and Regulatory Guidelines for Soil Washing (Final), Interstate Technology and Regulatory Cooperation (ITRC) Work Group Metals in Soils Work Team, Soil Washing Project, December 1997

**Soil Vapor Extraction, Dual Phase Extraction, and Air Sparging**

U.S. EPA & Other Guidance

Ground Water Issue – Evaluation of Soil Venting Application, U.S. EPA, EPA/540/S-92/004, April 1992

Analysis of Selected Enhancements for Soil Vapor Extraction, U.S. EPA, EPA-542-R-97-007, September 1997

Ground Water Issue: Steam Injection for Soil and Aquifer Remediation, U.S. EPA, EPA/540/S-97/505, January 1998

Innovative Site Remediation Technology Design and Application, Volume 7: Vacuum Extraction and Air Sparging, U.S. EPA, WASTECH and the American Academy of Environmental Engineers, ISBN 1-883767-23-7 (also EPA 542-B-97-010), May 1998

Soil Vapor Extraction and Bioventing – Engineering and Design, U.S. Army Corps of Engineers, Engineer Manual EM 1110-1-4001, June 2002

Enhanced Attenuation Technologies: Passive Soil Vapor Extraction, prepared by GSI Environmental Inc. for the Savannah River National Laboratory, Aiken, South Carolina, SRNL-STI-2009-00571 (Rev. 1), March 2010

**Radioactive Site Remediation**

U.S. EPA & Other Guidance

Assessment of Technologies for the Remediation of Radioactively Contaminated Superfund Sites, U.S. EPA, EPA/540/2-90/001, January 1990

**Ohio EPA DERR Remedial Response Program  
General Guidance and Reference List for SOWs and Orders**

***Thermal Desorption***

U.S. EPA & Other Guidance

*Technical Requirements for On-site Low Temperature Thermal Treatment of Non-Hazardous Soils Contaminated with Petroleum/Coal Tar/ Gas Plant Wastes (Final)*, The Interstate Technology and Regulatory Cooperation (ITRC) Low Temperature Thermal Desorption Work Team, Final, May 1996

*Ground Water Issue: How Heat Can Enhance In-situ Soil and Aquifer Remediation: Important Chemical Properties and Guidance on Choosing the Appropriate Technique*, U.S. EPA, EPA/540/S-97/502, April 1997

*Technical Requirements for On-Site Thermal Desorption of Solid Media Contaminated with Hazardous Chlorinated Solvents (Final)*, The Interstate Technology and Regulatory Cooperation (ITRC) Work Group, Low Temperature Thermal Desorption Work Team, September 1997

*Technical Guidelines for On-Site Thermal Desorption of Solid Media Contaminated and Low Level Mixed Waste Contaminated with Mercury and/or Hazardous Chlorinated Organics (Final)*, The Interstate Technology and Regulatory Cooperation (ITRC) Work Group, Low Temperature Thermal Desorption Work Team, September 1998

**Remedial Investigation/Feasibility Study (RI/FS) General Guidance**

Ohio EPA Guidance

*Generic Statement of Work for Conducting Remedial Investigation and Feasibility Studies*, Ohio EPA DERR, September 2006

U.S. EPA & Other Guidance

*Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (Interim Final)*, U.S. EPA, EPA/540/G-89/004, October 1988

*Getting Ready: Scoping the RI/FS*, U.S. EPA, CERCLA Orientation and RI/FS Training (#116): Module 4

*Scoper's Notes – An RI/FS Costing Guide, Bringing in a Quality RI/FS On Time and Within Budget*, U.S. EPA, EPA/540/G-90/002, February 1990

*A Guide to Developing and Documenting Cost Estimates During the Feasibility Study*, U.S. EPA and U.S. Army Corps of Engineers, U.S. EPA, EPA 540-R-00-002, July, 2000

**Ohio EPA DERR Remedial Response Program  
General Guidance and Reference List for SOWs and Orders**

**RCRA Facility Investigation and Corrective Action**

U.S. EPA & Other Guidance

Region 5 RCRA Corrective Action, U.S. EPA

RCRA Policy and Guidance On-Line Resources, U.S. EPA

RCRA Corrective Action Plan, U.S. EPA, OSWER Directive 9902.3-2A, May 1994

RCRA Facility Investigation (RFI) Guidance (Interim Final), Volumes I –IV, U.S. EPA, EPA 530/SW-89-031, May 1989

Fact Sheet #2, Expectation for Final Remedies at RCRA Corrective Action Facilities, U.S. EPA, March 2000

Fact Sheet #3, Final Remedy Selection for Results-Based RCRA Corrective Action, U.S. EPA, March 2000

RCRA Waste Sampling Draft Technical Guidance – Planning, Implementation, and Assessment, U.S. EPA, EPA 530-D-02-002, August 2002

Guidance for Monitoring at Hazardous Waste Sites: Framework for Monitoring Plan Development and Implementation, U.S. EPA, OSWER Directive No. 9355.4-28, January 2004

Handbook of Groundwater Protection and Cleanup Policies for RCRA Corrective Action, U.S. EPA, EPA530-R-04-030, April 2004

Consistent Implementation of the FY 1993 Guidance on Technical Impracticability of Ground-Water Restoration at Superfund Sites, U.S. EPA, OSWER 9200.4-14, January 2005

Risk Management Strategy for Corrective Action Projects, EPA Region 5 RCRA Program, U.S. EPA Region 5 Waste Pesticides, and Toxics Division, May 2005

Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (Unified Guidance), U.S. EPA, EPA 530/R-09-007, March 2009

**Regional Screening Levels and Removal Management Levels**

Ohio EPA Guidance

Use of U.S. EPA's Regional Screening Levels as Screening Values in Human Health Risk Assessments, Ohio EPA DERR, August 2009

**Ohio EPA DERR Remedial Response Program  
General Guidance and Reference List for SOWs and Orders**

U.S. EPA & Other Guidance

Regional Screening Levels (RSLs), U.S. EPA webpage

Regional Removal Management Levels for Chemicals (RMLs), U.S. EPA webpage

Soil Screening Guidance: User's Guide, Second Edition, U.S. EPA, EPA/540/R-96/018, July 1996

Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, U.S. EPA, OSWER 9355.4-24, December 2002

Guidance for Developing Ecological Soil Screening Levels, U.S. EPA, OSWER Directive 9285.7-55, November 2003 (Revised February 2005)

**Site Assessment (or Inspection), Sampling, Monitoring and Field Screening**

Ohio EPA Guidance

Technical Guidance Manual for Hydrogeologic Investigations and Ground Water Monitoring Programs, Ohio EPA Division of Drinking and Ground Waters

Petroleum Contaminated Sites Guidance Document for Emergency Response Actions, Ohio EPA DERR, March 2005

U.S. EPA & Other Guidance

Visual Sampling Plan (Version 7.2), U.S. Department of Energy webpage

Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (Interim Final), U.S. EPA, EPA/540/G-89/004, October 1988

Superfund Ground Water Issue: Ground Water Sampling for Metals Analyses, U.S. EPA, EPA/540/4-89/001, March 1989

A Rationale for the Assessment of Errors in the Sampling of Soils, U.S. EPA, EPA/600/4-90/013, July 1990

Compendium of ERT Soil Sampling and Surface Geophysics Procedures, U.S. EPA, EPA/540/P-91/006, January 1991

Guidance for Performing Preliminary Assessments Under CERCLA, U.S. EPA, EPA/540/G-91/013, September 1991

Multi-Media Investigation Manual, U.S. EPA, EPA-330/9-89-003-R, Revised March 1992 (Note, this guidance document replaces SW-846 for field sampling protocol)

**Ohio EPA DERR Remedial Response Program  
General Guidance and Reference List for SOWs and Orders**

Guidance for Performing Site Inspections Under CERCLA (Interim Final), U.S. EPA, EPA540-R-92-021, September 1992

Hazard Ranking System Guidance Manual, U.S. EPA, EPA 540-R-92-026, November 1992

Ground Water Issue: Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures, U.S. EPA, EPA/540/S-95/504, April 1996

Multi-State Evaluation of An Expedited Site Characterization Technology: Site Characterization and Analysis Penetrometer System Laser-Induced Fluorescence (SCAPS-LIF), Western Governors' Association DOIT Initiative, Interstate Technology and Regulatory Cooperation (ITRC) Work Group Cone Penetrometer Task Group Report, May 1996

Chapter V: Direct Push Technologies, from Expedited Site Assessment Tools For Underground Storage Tank Sites: A Guide for Regulator, U.S.EPA, 510-B-97-001, March 1997

Field Analytical and Site Characterization Technologies – Summary of Applications, U.S. EPA, EPA-542-R-97-011, November 1997

Multi-State Evaluation of the Site Characterization and Analysis Penetrometer System Volatile Organic Compound (SCAPS-VOC) Sensing Technologies (Final), The Interstate Technology and Regulatory Cooperation (ITRC) Accelerated Site Characterization Work Team, December 1997

Requirements for the Preparation of Sampling and Analysis Plans, U.S. Army Corps of Engineers, Engineer Manual EM 200-1-3, February 2001

Methods for Collection, Storage and Manipulation of Sediments for Chemical and Toxicological Analyses: Technical Manual, U.S. EPA, EPA-823-B-01-002, October 2001

Ground-Water Sampling Guidelines for Superfund and RCRA Project Managers, Ground Water Forum Issue Paper, U.S. EPA, EPA 542-S-02-001, May 2002

A Compendium of Chemical, Physical and Biological Methods for Assessing and Monitoring the Remediation of Contaminated Sediment Sites, U.S. EPA, EPA Contract No. 68-W-99-033, Work Assignment 4-20, prepared by Battelle Memorial Institute, February 2003

Ground Water Sampling and Monitoring Using Direct Push Technologies, U.S. EPA, 540/R-04/005, August 2005

**Ohio EPA DERR Remedial Response Program  
General Guidance and Reference List for SOWs and Orders**

Field Portable X-Ray Fluorescence Spectrometry for the Determination of Elemental Concentrations in Soil and Sediment, U.S. EPA, SW-846 Method 6200, February 2007

Incremental Sampling Methodology, The Interstate Technology & Regulatory Council Incremental Sampling Methodology Team, ISM-1, February 2012

Ground Water Issue: Ground Water Sample Preservation at In-Situ Chemical Oxidation Sites – Recommended Guidelines, U.S. EPA, EPA/600/r-12/049, August 2012

**Treatability Studies**

U.S. EPA & Other Guidance

Guide for Conducting Treatability Studies Under CERCLA: Aerobic Biodegradation Remedy Screening (Interim Guidance), U.S. EPA, EPA/540 2-91 013A, July 1991

Guide for Conducting Treatability Studies Under CERCLA: Soil Vapor Extraction (Interim Guidance), U.S. EPA, EPA/540/2-91/019A, September 1991

Guide for Conducting Treatability Studies Under CERCLA: Soil Washing (Interim Guidance), U.S. EPA, EPA/540/2-91/020A, September 1991

Guide for Conducting Treatability Studies Under CERCLA: Chemical Dehalogenation, U.S. EPA, EPA/540/R-92/013a, May 1992

Guide for Conducting Treatability Studies under CERCLA: Thermal Desorption Remedy Selection (Interim Guidance), U.S. EPA, EPA/540/R-92/074A, September 1992

Guide for Conducting Treatability Studies Under CERCLA (Final), U.S. EPA, EPA/540/R-92/071a, October 1992

Guide for Conducting Treatability Studies Under CERCLA: Biodegradation Remedy Selection (Interim Guidance), U.S. EPA, EPA/540/R-93/519a, August 1993

**Triad Approach** (This intricate process is best utilized at fund-lead sites with technical assistance from U.S. EPA.)

U.S. EPA & Other Guidance

The Brownfields and Land Revitalization Technology Support Center, U.S. EPA, Argonne National Laboratory, and U.S. Army Corps of Engineers webpage

**Ohio EPA DERR Remedial Response Program  
General Guidance and Reference List for SOWs and Orders**

Triad Resource Center, U.S. EPA webpage

Summary of the Triad Approach, U.S. EPA, Deana M. Crumbling, Office of Superfund Remediation and Technology Innovation, March 25, 2004

Improving Sampling, Analysis and Data Management for Site Investigation and Cleanup, U.S. EPA, EPA-542-F-04-001a, April 2004

Use of Dynamic Work Strategies Under a Triad Approach for Site Assessment and Cleanup – Technology Bulletin, U.S. EPA, EPA 542-F-05-008, September 2005

Advancing Best Management Practices: Applying the Triad Approach in the Superfund Program, U.S. EPA, OSWER-9200.1-55, September 1, 2006

Demonstrations of Method Applicability under a Triad Approach for Site Assessment and Cleanup - Technology Bulletin, U.S. EPA, EPA 524-F-08-006, August 2008.

Triad Issue Paper: Using Geophysical Tools to Develop the Conceptual Site Model, U.S. EPA Office of Solid Waste and Emergency Response, 542-F-08-007, December 2008

Best Management Practices: Use of Systematic Project Planning Under a Triad Approach for Site Assessment and Cleanup, U.S. EPA, EPA 542-F-10-010, September 2010

## **Vapor Intrusion**

### Ohio EPA Guidance

Recommendations Regarding Response Action Levels and Timeframes for Common Contaminants of Concern at Vapor Intrusion Sites, Ohio EPA DERR, August 2016

Sample Collection and Evaluation of Vapor Intrusion to Indoor Air for Remedial Response and Voluntary Action Programs (Guidance Document), Ohio EPA DERR, May 2010 (NOTE: this document is currently under revision, please refer to the documents under "Principal Vapor Intrusion Guidance: U.S. EPA" below.)

### **Principal Vapor Intrusion Guidance: U.S. EPA**

Vapor Intrusion: EPA Technical Guidance and Tools Prepared to Support Guidance Development, U.S. EPA webpage

**Ohio EPA DERR Remedial Response Program  
General Guidance and Reference List for SOWs and Orders**

OSWER Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air, U.S. EPA, Publication OWSER 9200.2-154, June 2015

Technical Guide for Addressing Petroleum Vapor Intrusion at Leaking Underground Storage Tank Sites, U.S. EPA, EPA 510-R-15-001, June 2015  
Vapor Intrusion Screening Levels (VISL) Calculator and User's Guide, U.S. EPA, May 2014

**Supporting Vapor Intrusion Guidance: U.S. EPA & Other**

Petroleum Vapor Intrusion: Fundamentals of Screening, Investigation, and Management, Interstate Technology & Regulatory Council (ITRC) webpage

Vapor Intrusion Pathway: A Practical Guideline, Interstate Technology & Regulatory Council (ITRC) Vapor Intrusion Team, January 2007

Vapor Intrusion Pathway: Investigative Approaches for Typical Scenarios (A Supplement to Vapor Intrusion Pathway: A Practical Guideline), Interstate Technology & Regulatory Council (ITRC) Vapor Intrusion Team, January 2007

Indoor Air Vapor Intrusion Mitigation Approaches, U.S. EPA, EPA/600/R-08-115, October 2008

Background Indoor Air Concentrations of Volatile Organic Compounds in North American Residences (1990-2005): A Compilation of Statistics for Assessing Vapor Intrusion, U.S. EPA, EPA 530-R-10-001, June 2011

Conceptual Site Model Scenarios for the Vapor Intrusion Pathway, U.S. EPA, EPA 530-R-10-003, February 2012

EPA's Vapor Intrusion Database: Evaluation and Characterization of Attenuation Factors for Chlorinated Volatile Organic Compounds and Residential Buildings, U.S. EPA, EPA 530-R-10-002, March 2012

3-D Modeling of Aerobic Biodegradation of Petroleum Vapors: Effect of Building Area Size On Oxygen Concentration Below the Slab, U.S. EPA, EPA 510-R-13-002, June 2013

Petroleum Vapor Intrusion – Fundamentals of Screening, Investigation, and Management, Interstate Technology & Regulatory Council (ITRC) Petroleum Vapor Intrusion (PVI) Team, October 2014

**Ohio EPA DERR Remedial Response Program  
General Guidance and Reference List for SOWs and Orders**

**Waste Management and Site Decontamination/Control**

Ohio EPA Guidance

Closure Plan Review Guidance for RCRA Facilities, Ohio EPA Division of Hazardous Waste Management, October 2009

U.S. EPA & Other Guidance

Guide for Decontaminating Buildings, Structures, and Equipment at Superfund Sites, U.S. EPA, EPA/600/2-85/028, March 1985

Handbook - Dust Control at Hazardous Waste Sites, U.S. EPA, EPA/540/2-85/003, November 1985

Management of Remediation Waste Under RCRA, U.S. EPA, EPA530-F-98-026, October 1998

**Water Quality Standards**

Ohio EPA Guidance

Biological Criteria for the Protection of Aquatic Life, Ohio EPA Division of Surface Water webpage

Biological Criteria for the Protection of Aquatic Life: Volume I: The Role of Biological Data in Water Quality Assessment, Ohio EPA Division of Surface Water, July 1987 (updated February 1988)

Biological Criteria for the Protection of Aquatic Life: Volume II: User's Manual for Biological Field Assessment of Ohio Surface Waters, Ohio EPA Division of Surface Water, October 1987 (updated January 1988); 2014 Volume II Updates (replaces 2013 updates), Volume II References, and Addendum to Volume II

Addendum to Biological Criteria for the Protection of Aquatic Life: Volume II: User's Manual for Biological Field Assessment of Ohio Surface Waters, Ohio EPA Division of Surface Water, September 1989 (updated January 1988)

Biological Criteria for the Protection of Aquatic Life: Volume III: Standardized Biological Field Sampling and Laboratory Methods for Assessing Fish and Macroinvertebrate Communities, Ohio EPA Division of Surface Water, First Update, September 1989; 2014 Volume III Updates (replaces 2013 updates)

U.S. EPA & Other Guidance

**Ohio EPA DERR Remedial Response Program  
General Guidance and Reference List for SOWs and Orders**

*The Water Quality Standards Handbook, Second Edition*, 2014 Update, U.S. EPA

**Wetland Delineation/Restoration and Stream Restoration**

Ohio EPA Guidance

*The Qualitative Habitat Evaluation Index [QHEI]: Rationale, Methods, and Application*, Ohio EPA Division of Surface Water, November 1989

*Ohio Rapid Assessment for Wetlands Version 5.0 (Final)*, Ohio EPA Division of Surface Water, February 2001

*Integrated Wetland Assessment Program, Part 4: Vegetation Index of Biotic Integrity (VIBI) and Tiered Aquatic Life Uses (TALUs) for Ohio Wetlands*, Ohio Environmental Protection Agency Division of Surface Water Wetland Ecology Group, Ohio EPA Technical Report WET/2004-4, 2004

*Integrated Wetland Assessment Program, Part 5: Biogeochemical and Hydrological Investigations of Natural and Mitigation Wetlands*, Ohio Environmental Protection Agency Division of Surface Water Wetland Ecology Group, Ohio EPA Technical Report WET/2004-5, 2004

*Integrated Wetland Assessment Program, Part 6: Standardized Monitoring Protocols and Performance Standards for Wetland Creation, Enhancement and Restoration, Version 1.0*, Ohio Environmental Protection Agency Division of Surface Water Wetland Ecology Group, Ohio EPA Technical Report WET/2004-6, 2004

*Integrated Wetland Assessment Program, Part 7: Amphibian Index of Biotic Integrity (AmphIBI) for Ohio Wetlands*, Ohio Environmental Protection Agency Division of Surface Water Wetland Ecology Group, Ohio EPA Technical Report WET/2004-7, 2004

*Integrated Wetland Assessment Program, Part 9: Field Manual for the Vegetation Index of Biotic Integrity for Wetlands, v 1.4*, Ohio Environmental Protection Agency Division of Surface Water Wetland Ecology Group, Ohio EPA Technical Report WET/2007-6, 2007

U.S. EPA & Other Guidance

*Wetlands*, U.S. EPA webpage (includes information on Clean Water Act Section 404 regulations and federal, state and local government programs)

*Corps of Engineers Wetlands Delineation Manual (Final Report)*, U.S. Army Corps of Engineers, Wetlands Research Program Technical Report Y-87-1, January 1987

**Ohio EPA DERR Remedial Response Program  
General Guidance and Reference List for SOWs and Orders**

National Guidance Water Quality Standards for Wetlands, U.S. EPA, Appendix D of the Water Quality Standard Handbook: Second Edition, August 1994

Treatment Wetlands, Robert H. Kadlec and Robert L. Knight, CRCX Lewis Publishers, ISBN 0-87371-930-1, 1996

Guiding Principles for Constructed Treatment Wetlands: Providing for Water Quality and Wildlife Habitat, U.S. EPA, EPA 843-B-00-003, October 2000

Channel Restoration Design for Meandering Rivers, P.J. Soar and C.R. Thorne, U.S. Army Corps of Engineers, ERDC/CHL CR-01-1, September 2001

Hydraulic Design of Stream Restoration Projects, R.R. Copeland, D. N. McComas, C.R. Thorne, P.J. Soar, M.M. Jonas and J.B. Fripp, U.S. Army Corps of Engineers, ERDC/CHL TR-01-28, September 2001

**APPENDIX D**

**DEED NOTICE TEMPLATE**

## DEED NOTICE TEMPLATE

THIS DEED NOTICE ON REAL PROPERTY ("Notice") is made on this \_\_\_\_ day of \_\_\_\_\_, 20\_\_, by [insert the name of the titled Property Owner] whose address is \_\_\_\_\_ ("Declarant").

### WITNESSETH:

**WHEREAS**, Declarant is the owner of real property more particularly described on the attached Exhibit A [requires a legal description] and identified as [insert location of property including parcel numbers, street address, County of \_\_\_\_\_] State of Ohio ("the Property"); and

**WHEREAS**, the Property is subject to Director's Final Findings and Orders (Orders) for [Choose one: Remedial Design and Remedial Action ("RD/RA"), or Remedial Investigation and Feasibility Study ("RI/FS"), or Interim Action ("IA")] issued to [Identify the Respondent] by Ohio Environmental Protection Agency (Ohio EPA) on \_\_\_\_\_. A copy of the Orders may be obtained by contacting Ohio EPA's Division of Emergency and Remedial Response at the [Insert name of appropriate District office including address and telephone number]; and

**WHEREAS**, the purpose of the Orders is [Insert details from objectives in the Orders]. [If RD/RA Deed Notice, insert: The final remedy is set forth in the Decision Document dated \_\_\_\_\_. The final remedy includes the following elements: (Identify the primary elements of the remedy)] Please contact the [Insert the name of Respondent/property owner] for additional information.

[If applicable, may insert: "**WHEREAS**, at the time this notice was recorded, the monitoring, treatment and containment devices/systems depicted on Exhibit B (attach map) are present and must not be adversely affected."]

For as long as the Property is subject to the Orders as described herein, each instrument hereafter conveying any interest in the Property, or any portion of the Property shall contain a recital acknowledging this Deed Notice and providing the recording location of this Deed Notice upon such conveyance substantially in the following form: "The real property described herein is subject to Ohio EPA Director's Final Findings and Orders issued on \_\_\_\_\_, 20\_\_ as stated in the Deed Notice recorded in the \_\_\_\_\_ County Deed Records on \_\_\_\_\_, 20\_\_ at [insert location of the Deed Notice (e.g., "Volume \_\_, Page \_\_" or "Document Number \_\_\_\_")]

as if the same were fully set forth herein."

[Name of Property Owner]

BY: \_\_\_\_\_

[Type name of authorized signatory]

TITLE: \_\_\_\_\_

DATE: \_\_\_\_\_

STATE OF \_\_\_\_\_ )

) SS:

COUNTY OF \_\_\_\_\_ )

BEFORE ME, a Notary Public in and for said County and State, personally came  
\_\_\_\_\_ by \_\_\_\_\_, its  
\_\_\_\_\_ who acknowledged that he/she did sign the foregoing Deed  
Notice as [*Choose one: owner, or authorized representative, or an officer of said  
company*] and that the same is his/her voluntary act, [Insert if applicable: and the  
voluntary act of said company]. In testimony whereof, I have subscribed my name and  
affixed my seal on this \_\_\_\_\_ of \_\_\_\_\_, 20\_\_.

\_\_\_\_\_  
NOTARY PUBLIC  
My commission expires:

**APPENDIX E**

**ENVIRONMENTAL COVENANT**

## ENVIRONMENTAL COVENANT

This Environmental Covenant is entered into by *[name all Owners of the Property and Holders]* and the Ohio Environmental Protection Agency ("Ohio EPA") pursuant to Ohio Revised Code ("ORC") §§ 5301.80 to 5301.92 for the purpose of subjecting the Property described herein ("the Property") to the activity and use limitations set forth herein.

This Environmental Covenant requires current and future Property owners to meet certain requirements, including, but not limited to:

- Comply with the activity and use limitations given by paragraph 5 that: *[Plain language summary of the activity and use limitations in paragraph 5]*.
- Provide an annual compliance report to Ohio EPA by *[enter Day Month]* of each year, as required by paragraph 9, describing that the Property continues to be used in compliance with the activity and use limitations.
- Give notice to new property owners (also known as "transferees") upon conveyance, as required by paragraph 10, of the activity and use limitations and the recorded location of this Environmental Covenant.
- Notify Ohio EPA within 10 days of each conveyance, as required by paragraph 10, of the property that was conveyed and new owner's contact information.

WHEREAS, the Property is owned by *[name of Owner]*, who resides or is located at *[address or location of owner]*.

WHEREAS, the remedy for the Property includes the activity and use limitations set forth in this Environmental Covenant.

WHEREAS, the activity and use limitations protect against exposure to the *[hazardous substances / petroleum / hazardous substances and petroleum]* in *[soil / ground water / soil and ground water, or describe other affected media]* on or underlying the Property.

*[WHEREAS, the Property is the subject to an operation and maintenance (O&M) agreement that provides for a central management entity to oversee engineering controls to maintain site protectiveness.]*

Now therefore, [name of each Owner and Holder other than Owner, if any] and Ohio EPA agree to the following:

1. Environmental Covenant. This instrument is an environmental covenant developed and executed pursuant to ORC §§ 5301.80 to 5301.92.

2. Property. This Environmental Covenant concerns an approximately \_\_\_\_\_-acre tract of real property located at [Address of Property], in [County], Ohio, and more particularly described in [Attachment #] attached hereto and incorporated by reference herein ("Property").

3. Owner. This Property is owned by [Owner Name] ("Owner"), [with a place of business located] at [Address of Owner].

4. Holder. Pursuant to ORC § 5301.81, the holder of this Environmental Covenant ("Holder") is the Owner listed above [and if applicable [Name of other Holder not the Owner], [with place of business located] at [Address of other Holder]].

5. Activity and Use Limitations. As part of the remedial action described in the Decision Document, Owner[s] hereby impose[s] and agree[s] to comply with the following activity and use limitations: *[Determine the activity and use limitations appropriate for the Property. Several types of restrictions may be appropriate as part of a remedial action, interim action, or closure plan where cleanup to an unrestricted land use is infeasible. These include: land use restrictions; ground water restrictions; disturbance restrictions; and construction restrictions. Each type of restriction must be considered on a site-specific basis to determine which restriction or combination of restrictions is suitable for the particular circumstances of the site or facility. Evaluate the possible use restrictions based on the nature of contamination, the type of affected media and the potential exposures. The restriction categories include: land use, ground water, disturbance and construction.]*

6. Running with the Land. This Environmental Covenant shall be binding upon the Owner, during the time that the Owner owns the Property or any portion thereof, and upon all assigns and successors in interest, including any Transferee, and shall run with the land, pursuant to ORC § 5301.85, subject to amendment or termination as set forth herein. The term "Transferee," as used in this Environmental Covenant, shall mean any future owner of any interest in the Property or any portion thereof, including, but not limited to, owners of an interest in fee simple, mortgagees, easement holders, and/or lessees.

7. Compliance Enforcement. Compliance with this Environmental Covenant may be enforced pursuant to ORC § 5301.91 and other applicable law. Failure to timely enforce compliance with this Environmental Covenant or the activity and use limitations contained herein by any party shall not bar subsequent enforcement by such party and shall not be deemed a waiver of the party's right to take action to enforce against any non-compliance. Nothing in this Environmental Covenant shall restrict the Director of Ohio EPA from exercising any authority under applicable law.

8. Rights of Access. Owner hereby grants to Ohio EPA's authorized representatives [*include, as applicable, name of local government and any Holders other than Owner, etc.; see ORC §§ 5301.82(A)(6) and 5301.91(A)*] the right of access to the Property for implementation or enforcement of this Environmental Covenant and shall require such access as a condition of any transfer of the Property or any portion thereof.

9. Compliance Reporting. Owner or Transferee, if applicable, shall annually submit to Ohio EPA [*include, as applicable, name of local government, any "Holders" other than Owner*] written documentation verifying that the activity and use limitations set forth herein remain in place and are being complied with. Documentation shall be due to Ohio EPA on July 1<sup>st</sup> of each year beginning the year after the effective date of this Environmental Covenant, unless otherwise directed by Ohio EPA.

10. Notice upon Conveyance. Each instrument hereafter conveying any interest in the Property or any portion thereof shall contain a notice of the activity and use limitations set forth in this Environmental Covenant, and provide the recorded location of this Environmental Covenant. The notice shall be substantially in the following form:

THE INTEREST CONVEYED HEREBY IS SUBJECT TO AN ENVIRONMENTAL COVENANT, RECORDED IN THE DEED OR OFFICIAL RECORDS OF [name of County Recorder's Office] ON \_\_\_\_\_, 201\_\_, IN [DOCUMENT \_\_\_\_\_, or BOOK\_\_\_\_, PAGE \_\_\_\_]. THE ENVIRONMENTAL COVENANT CONTAINS THE FOLLOWING ACTIVITY AND USE LIMITATIONS:

*[List or summarize the type of activity and use limitations in Paragraph 5 of the environmental covenant (i.e., a limitation to commercial or industrial land uses, a prohibition on ground water extraction and use, and a limitation on building occupancy – remedy or demonstration obligation).]*

Owner or Transferee, if applicable, shall notify Ohio EPA [*and "Holders" other than the Owner, if any*] within [*ten (10)*] days after each conveyance of an interest in the

Property or any portion thereof. The notice shall include the name, address, and telephone number of the Transferee, a copy of the deed or other documentation evidencing the conveyance, and a survey map that shows the boundaries of the property being transferred.

11. Representations and Warranties. Owner hereby represents and warrants to the other signatories hereto:

- A. that the Owner is the sole owner of the Property;
- B. that the Owner holds fee simple title to the Property and that the Owner conducted a current title search that shows that the Property *[choose one: is subject to [or] is not subject to any]* interests or encumbrances that conflict with the activity and use limitations set forth in this Environmental Covenant;

*[If other interests or encumbrances on the Property conflict with the activity and use limitations set forth in this Environmental Covenant, add the following provision as a separate subparagraph:*

*To the extent that any other interests in or encumbrances on the Property conflict with the activity and use limitations set forth in this Environmental Covenant, the persons who own such interests or hold such encumbrances have agreed to subordinate such interests or encumbrances to the Environmental Covenant, pursuant to ORC § 5301.86, and the subordination agreement(s) (attached as [Attachment #] to this Environmental Covenant; [or] recorded at [name of County Recorder's Office].)]*

- C. that the Owner has the power and authority to enter into this Environmental Covenant, to grant the rights and interests herein provided and to carry out all obligations hereunder;
- D. that this Environmental Covenant will not materially violate or contravene or constitute a material default under any other agreement, document or instrument to which Owner is a party or by which Owner may be bound or affected;

- E. that the Owner has identified all other persons that own an interest in or hold an encumbrance on the Property, and, if applicable, notified such persons of the Owner's intention to enter into this Environmental Covenant.

12. Amendment or Termination. This Environmental Covenant may be amended or terminated by consent of all of the following: the Owner, or a Transferee, if applicable; [*"Holders" other than Owner, if any;*] and the Director of the Ohio EPA, pursuant to ORC §§ 5301.82 and 5301.90 and other applicable law. The term, "Amendment," as used in this Environmental Covenant, shall mean any changes to the Environmental Covenant, including the activity and use limitations set forth herein, or the elimination of one or more activity and use limitations so long as there is at least one limitation remaining. The term, "Termination," as used in this Environmental Covenant, shall mean the elimination of all activity and use limitations set forth herein and all other obligations under this Environmental Covenant.

This Environmental Covenant may be amended or terminated only by a written instrument duly executed by the Director of Ohio EPA and by the Owner or Transferee, if applicable, of the Property or any portion thereof [, and *"Holders" or their assignees, if any*]. Within thirty (30) days of signature by all requisite parties on any amendment or termination of this Environmental Covenant, the Owner or Transferee, if applicable, shall file such instrument for recording with the [*name of County Recorder's Office*], and shall provide a file- and date-stamped copy of the recorded instrument to Ohio EPA [*and "Holders" or their assignees, if any*].

13. Severability. If any provision of this Environmental Covenant is found to be unenforceable in any respect, the validity, legality, and enforceability of the remaining provisions shall not in any way be affected or impaired.

14. Governing Law. This Environmental Covenant shall be governed by and interpreted in accordance with the laws of the State of Ohio.

15. Recordation. Within [*thirty (30)*] days after the date of the final required signature, Owner shall file this Environmental Covenant for recording, in the same manner as a deed to the Property, with the [*name of County Recorder's Office*].

16. Effective Date. The effective date of this Environmental Covenant shall be the date upon which the fully executed Environmental Covenant has been recorded as a deed record for the Property with the [*name of County Recorder's Office*].

17. Distribution of Environmental Covenant. Owner shall distribute a file- and date-stamped copy of the recorded Environmental Covenant to: Ohio EPA [, *include name other parties to the Environmental Covenant, if any*] and [*include the appropriate governmental entity applicable to property: City / County / Township*].

18. Notice. Unless otherwise notified in writing by any party hereto or Ohio EPA, any document or communication required by this Environmental Covenant shall be submitted to:

As to Ohio EPA:

Ohio EPA – Central Office  
Division of Environmental Response and Revitalization  
50 West Town Street  
Columbus, Ohio 43216  
Attn.: DERR Records Management Officer

Or, send electronically to: [records@epa.ohio.gov](mailto:records@epa.ohio.gov)

And

Ohio EPA - [applicable district office]  
[District office address]  
Attn.: DERR Site Coordinator for [Site Name]

As to Owner:

[Name, title, or position]  
[Address]

[As to Holder:]

[Name, title, or position]  
[Address]

The undersigned represents and certifies that the undersigned is authorized to execute this Environmental Covenant.

**[OWNER NAME]**

Printed Name and Title

State of \_\_\_\_\_ )  
County of \_\_\_\_\_ ) ss:

Before me, a notary public, in and for said county and state, personally appeared \_\_\_\_\_, a duly authorized representative of the Owner, who acknowledged to me the execution of the foregoing instrument on behalf of the Owner.

IN TESTIMONY WHEREOF, I have subscribed my name and affixed my official seal this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_.

**Notary Public**

**[HOLDER NAME]**

\_\_\_\_\_  
Signature of Holder

\_\_\_\_\_  
Printed Name and Title

State of \_\_\_\_\_ )  
County of \_\_\_\_\_ ) ss:

Before me, a notary public, in and for said county and state, personally appeared \_\_\_\_\_, a duly authorized representative of the Holder, who acknowledged to me the execution of the foregoing instrument on behalf of the Holder.

IN TESTIMONY WHEREOF, I have subscribed my name and affixed my official seal this \_\_\_\_\_ day of \_\_\_\_\_, 201\_\_.

\_\_\_\_\_  
Notary Public

**OHIO ENVIRONMENTAL PROTECTION AGENCY**

\_\_\_\_\_  
Laurie A. Stevenson, Director

State of Ohio                    )  
  )  
County of Franklin            )       ss:

Before me, a notary public, in and for Franklin County, Ohio, personally appeared Craig W. Butler, the Director of Ohio EPA, who acknowledged to me that she did execute the foregoing instrument on behalf of Ohio EPA.

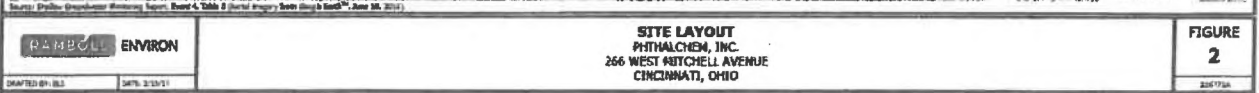
IN TESTIMONY WHEREOF, I have subscribed my name and affixed my official seal this \_\_\_\_\_ day of \_\_\_\_\_, 201\_\_.

\_\_\_\_\_  
Notary Public

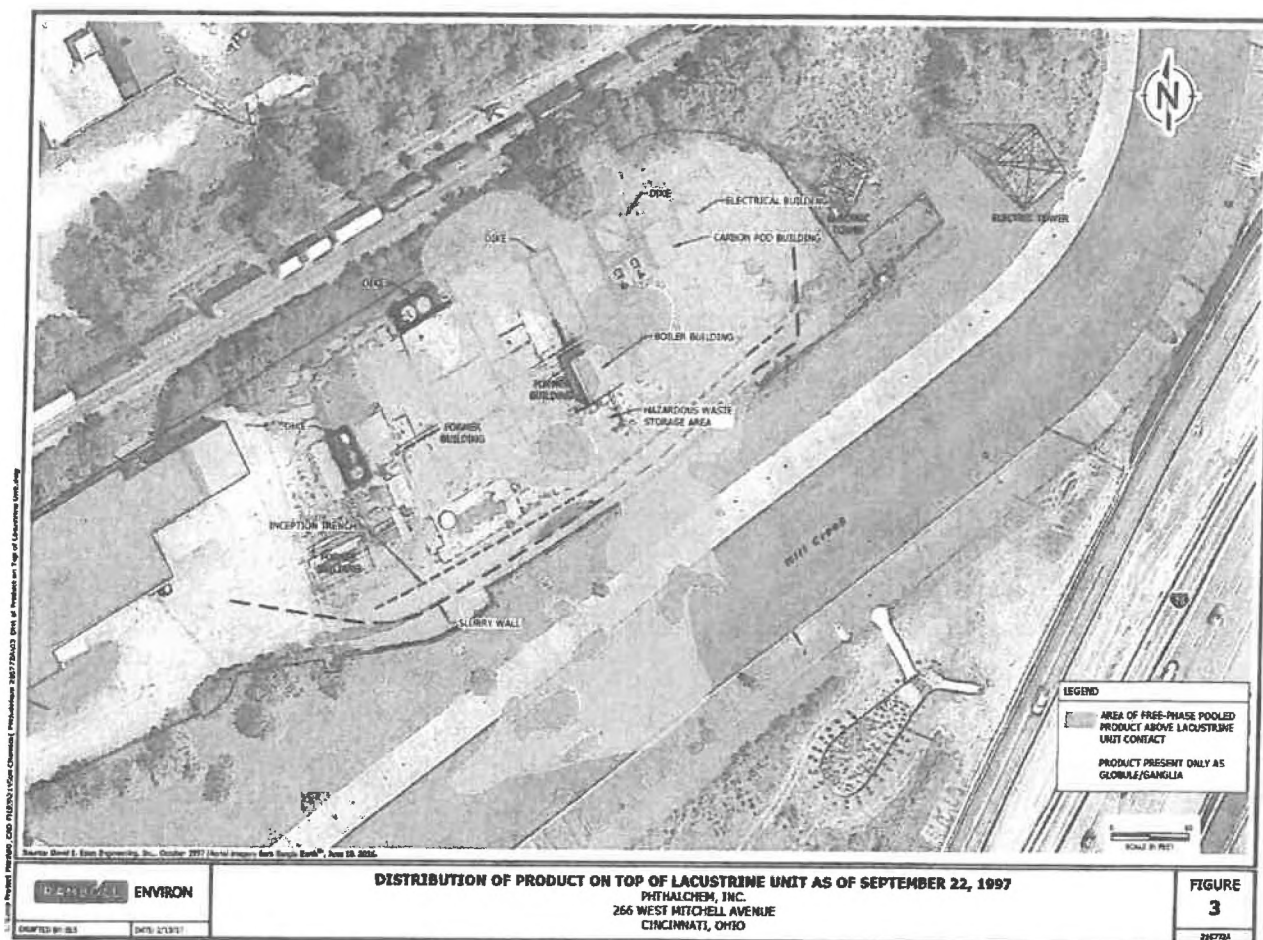
## **APPENDIX F**

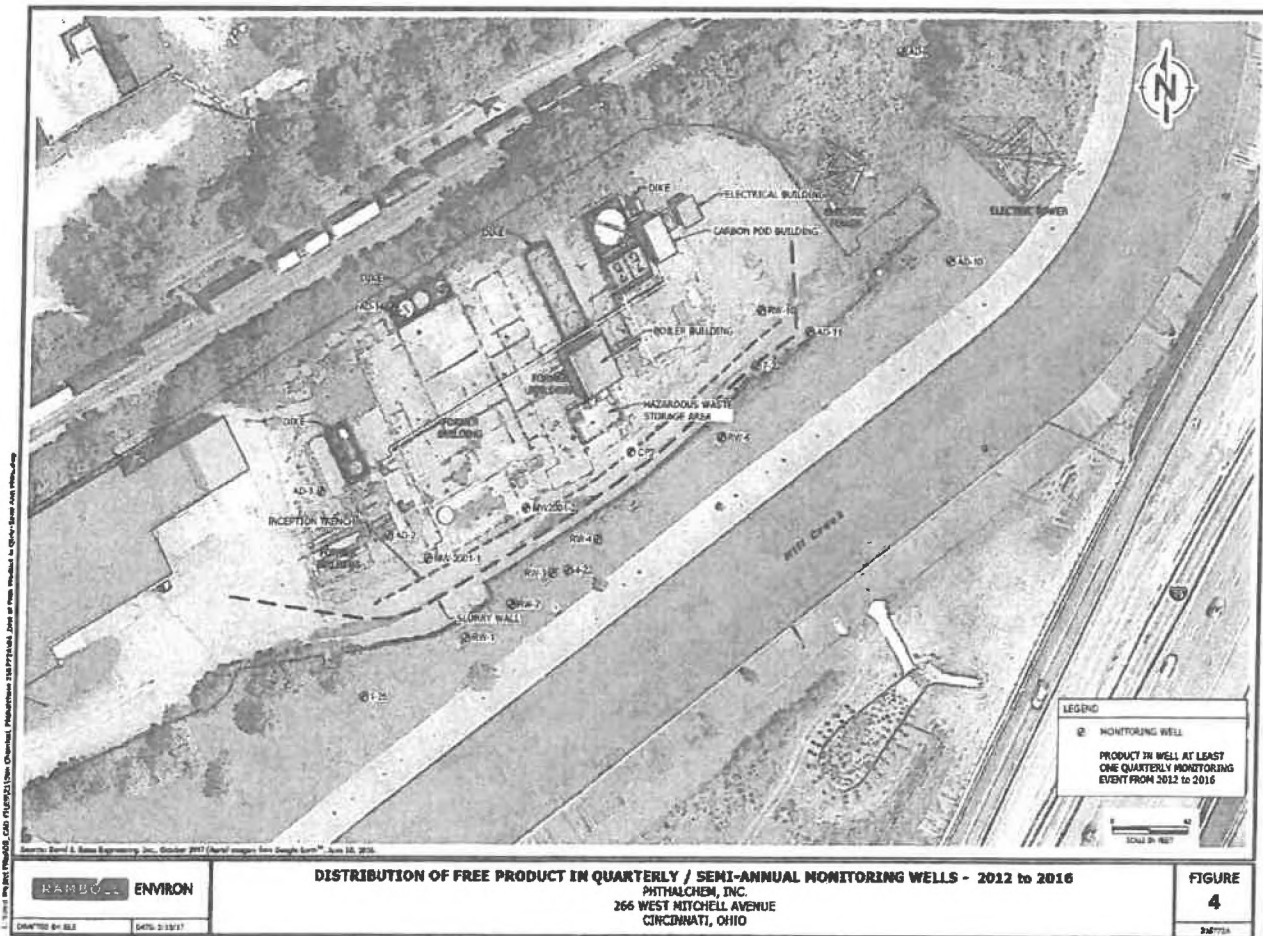
### **SITE MAP**

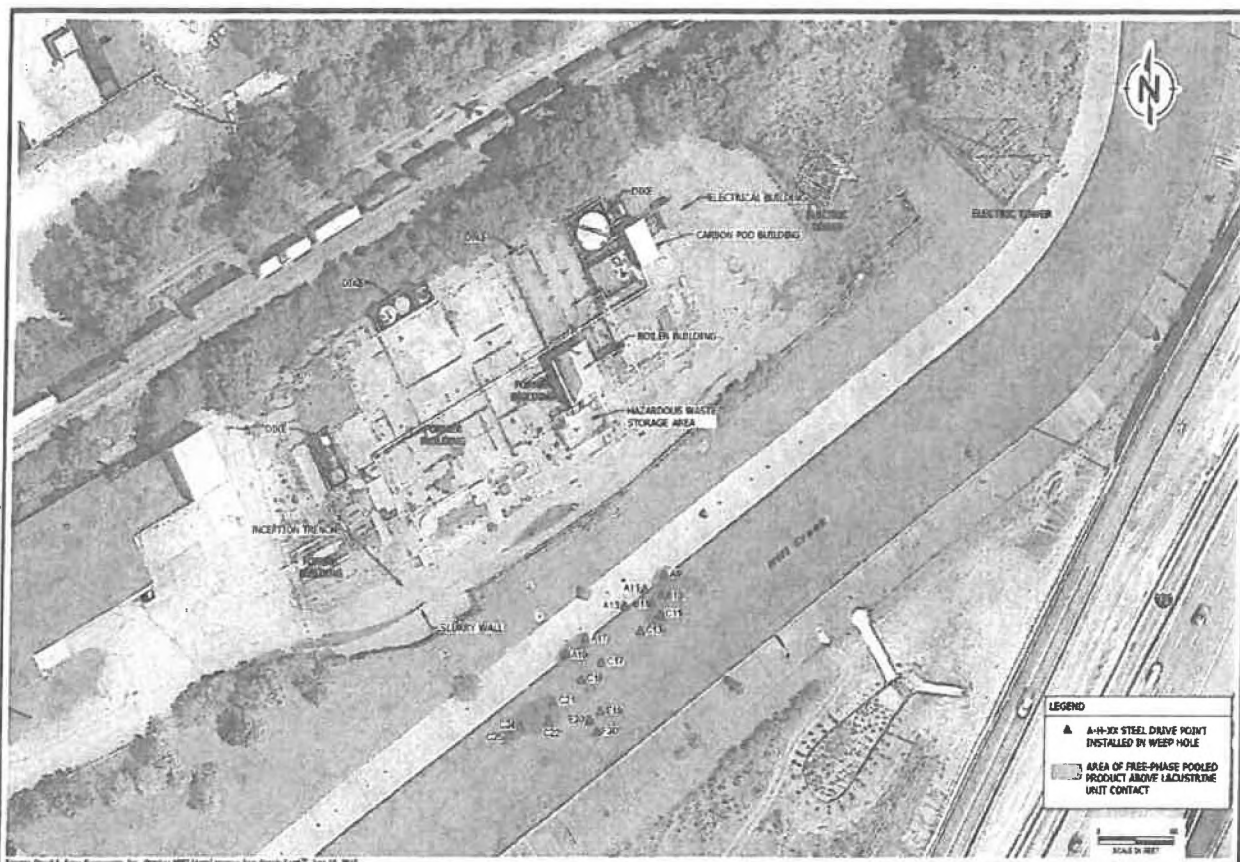




2261744







**DISTRIBUTION OF FREE PRODUCT IN DRIVE POINTS - 2012 to 2016**  
 PHTHALCOHEN, INC.  
 266 WEST MITCHELL AVENUE  
 CINCINNATI, OHIO

**FIGURE**  
**5**

JANUARY

ENVIRON

ENVIRO

DATE: 2/18/17