BEFORE THE

OHIO ENVIRONMENTAL PROTECTION AGENCY

IN THE MATTER OF:

OCCIDENTAL CHEMICAL CORPORATION
5005 LBJ FREEWAY
DALLAS, TX 75244

WORK RESPONDENT

AND

MARIANA PROPERTIES, INC.
5 GREENWAY PLAZA, SUITE 110
HOUSTON, TX 77046-0521

LANDOWNER RESPONDENT

FOR:

Operable Unit 3
DIAMOND SHAMROCK PAINESVILLE WORKS SITE
FAIRPORT NURSERY ROAD
PAINESVILLE, LAKE COUNTY, OHIO

DIRECTOR'S FINAL FINDINGS AND ORDERS FOR REMEDIAL DESIGN AND REMEDIAL ACTION AND COST RECOVERY

TABLE OF CONTENTS

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 Occidental Chemical Corporation ("Work Respondent"), and Mariana Properties, Inc., ("Landowner Respondent"), pursuant to the authority vested in the Director of Ohio EPA under Ohio Revised Code ("ORC") §§ 3734.02, 3734.13, 3734.20, 6111.03, and 3745.01.

II. PARTIES BOUND

2. These Orders, including the Appendices, shall apply to and be binding upon Respondents and their successors in interest liable under Ohio law.

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

4. Work 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 (as defined below) of these Orders or upon date of retention. Work Respondent shall require 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 Chapters 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 OU3 as set forth in the document attached to these Orders as Appendix A.

e. "Environmental Covenant" ("EC") 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.

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. "Landowner Respondent" means Mariana Properties, Inc., or its successors.

h. "NCP" means the National Oil and Hazardous Substances Pollution Contingency Plan, codified at 40 C.F.R. Part 300 (1990), as amended.

i. "Ohio EPA" means the Ohio Environmental Protection Agency and its designated representatives.

j. "Operable Unit 3" ("OU3") means the portion of the Site which is addressed by these Orders for Remedial Design and Remedial Action entered into by Respondents. OU3 is identified on the map attached hereto and incorporated herein as Appendix E.

k. "Orders" means these Director's Final Findings and Orders and all appendices hereto.

l. "Painesville PRP Group" means the following companies, individuals, and municipalities: Tierra (f/k/a Chemical Land Holdings, Inc.), Fairport Harbor Village Board of Education, Hach Excavation and Demolition, Inc., Paul W. and Marlene E. Hach, James Paul Management, Inc., Little Seedlings, Inc., Maxus Energy Corporation, OCC, Painesville Township Board of Trustees, RDL Properties, Schuster Service, Inc., Tartan Yachts, Inc. (a/k/a TLH Properties, Ltd.), Technical Engineered Products, Consolidated Tooling, John Grantham, Perseverance, LLC, Elm Street Properties, LLC, and the Village of Fairport Harbor. The Painesville PRP Group are signatories to the September 27, 1995, Director of Ohio EPA's Final Findings and Orders ("1995 DFFOs") for completion of a Remedial Investigation and Feasibility Study ("RI/FS") at the Site.

m. "Paragraph" means a portion of these Orders identified by an Arabic numeral or an uppercase or lowercase letter.

n. "Parties" means Respondents and the Ohio EPA.

o. "Respondents" means Work Respondent and Landowner Respondent.

p. "Remedial Action" ("RA") means those activities to be undertaken by Work Respondent to implement and maintain the effectiveness of the final plans and specifications submitted by Work Respondent pursuant to the Remedial Design and Remedial Action Work Plan.

q. "Remedial Design" ("RD") means those activities to be undertaken by Work Respondent to develop the final plans and specifications for the Remedial Action pursuant to the Remedial Design and Remedial Action Work Plan.

r. "Remedial Design and Remedial Action Work Plan" ("RD/RA Work Plan") means the document submitted by Work Respondent and approved by Ohio EPA pursuant to the Performance of Work Section of these Orders.

s. "Response Costs" means all costs incurred by Ohio EPA in a manner not inconsistent with the NCP and these Orders 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.

t. "Section" means a portion of these Orders identified by a roman numeral.

u. "Site" means the former Diamond Shamrock Painesville Works as depicted in Appendix E of these Orders and located in Lake County, Ohio, within the boundaries of the city of Painesville, Painesville Township, and the village of Fairport Harbor, where the treatment, storage, and/or disposal of hazardous or solid 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, solid wastes, industrial wastes, and/or other wastes have migrated or threaten to migrate.

v. "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 OU3, as set forth in Appendix B of these Orders. The SOW is generic and not specific to any Site, but shall be used as an outline for developing OU3-specific work plans.

w. "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.

x. "Transferee" means any future owner of any interest in OU3, including but not limited to, owners of an interest in fee simple, easement holders, and lessees.

y. "Work" means all activities Work Respondent is required to perform under the Performance of the Work by Work Respondent and Additional Work Sections of these Orders.

z. "Work Respondent" means Occidental Chemical Corporation.

IV. FINDINGS

6. All of the findings necessary for the issuance of these Orders pursuant to ORC Chapters 3734, 3745 and 6111 have been made and are outlined below. Nothing in these Orders shall constitute an admission by Respondents of any matter of fact or law. The Director of Ohio EPA has determined the following findings:

Site-Wide Findings:

a. The Site is located in northern Lake County, Ohio, as depicted in Appendix E of these Orders. The Site is bordered by industrial and vacant property to the east, residential and commercial/industrial properties to the west, Lake Erie to the north, and residential property to the south. The Grand River bisects the Site from east to west. The Site has been divided into 24 Operable Units ("OU").

b. The Diamond Shamrock Chemicals Company (formerly named Diamond Alkali Company and Diamond Shamrock Corporation) ("Diamond Shamrock") began operations at the Site in Lake County in 1912. Diamond Shamrock produced a variety of chemical products and by-products, including sodium hydroxide (caustic soda), hydrochloric acid (muriatic acid), chlorinated paraffins (Chlorowax), bicarbonate of soda (baking soda), magnesium oxide, coke, carbon tetrachloride, hydrogen and liquid hydrogen, ammonia, benzene, toluene and related hydrocarbons, calcium carbonate, cement, sal soda, lye, cleaners (soaps), sodium carbonate (Soda Ash), chlorine sodium bichromate, chromic acid, potassium bichromate, sodium sulfate, vinyl chloride monomer and polyvinyl chloride, pickle liquor (spent hydrochloric acid), fly ash, secondary metals, and others.

c. The Site is approximately 1100 acres in size. The Site includes all known areas of manufacturing or other industrial use, areas of waste disposal, and other areas which are or may be contaminated. Diamond Shamrock began shutting down the Site in 1972, and the last Site operations ceased in 1977. Portions of the Site were sold to other entities, which performed a variety of commercial and industrial activities within its boundaries.

d. On September 4, 1986, all the outstanding stock of the Diamond Shamrock Chemicals Company was acquired by Oxy-Diamond Alkali Corporation from Maxus Energy Corporation, and the Diamond Shamrock Chemicals Company name was changed to Occidental Electrochemicals Corporation. Subsequently, on November 30, 1987, Occidental Electrochemicals Corporation was merged into OCC. The Site property was transferred to Chemical Land Holdings, a subsidiary of Maxus Energy Corporation. Chemical Land Holdings changed its

name to Tierra in 2002. The Site was transferred to Mariana Properties, Inc., an affiliate of OCC, on August 11, 2017.

e. In May 1993, U.S. EPA proposed placing the Site on the National Priorities List ("NPL"), describing a threat to the drinking water intakes along Lake Erie, and to fisheries, wetlands, and sensitive environments in the Grand River and Lake Erie.

f. On October 1, 1992, the Ohio EPA entered into a Cooperative Agreement with U.S. EPA to act as lead agency under CERCLA with respect to the Site. In February 1995, Ohio EPA issued special notice letters with an invitation to participate in negotiations for an administrative consent order to 33 potentially responsible parties, including the Work Respondent.

g. The 1995 DFFOs were issued by the Director of Ohio EPA to Chemical Land Holdings, Inc., Maxus Energy Corporation, OCC, Painesville Township Board of Trustees, Uniroyal Chemical Company, Inc., Village of Fairport Harbor, and the Painesville PRP Group for completion of a RI/FS at the Site.

h. On October 5, 1995, Ohio EPA notified the Painesville PRP Group that Ohio EPA would not be pursuing NPL finalization for the Site.

i. On July 25, 1999, Ohio EPA approved the Remedial Investigation ("RI") Report for Phase I activities at the Site. These activities included the collection and analysis of soil, ground water, surface water and sediment samples across the Site.

j. On September 22, 2003 the Phase II RI Report was approved by Ohio EPA. The Phase I and Phase II RI Reports identified public health and environmental risks at the Site resulting from contaminated ground water, soil, surface water, and sediment. The RI Reports 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 Phase I and Phase II RIs revealed that the principal contaminants of concern ("COC") in soils were aluminum, manganese, vanadium, benzo(a)anthracene, benzo(a)pyrene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene.

k. On October 4, 2005, the State of Ohio, Chemical Land Holdings, and all of the signatories to the 1995 DFFOs, except Uniroyal Chemical Company, entered into a consent order in *State of Ohio v. Chemical Land Holdings*, et al, United States District Court for the Northern District Ohio Case No. 1:02CV0193, which required completion of the of the RI/FS for the Site, including OU3.

l. During the RI, the Site was divided into 22 land-based and three ground water-based OUs.

OU3 Findings:

m. OU3 is located in the northeastern corner of the Site adjacent to Lake Erie. It is bordered to the west by Operable Unit 10 ("OU10") and the former Operable Unit 6 ("OU6"); to the south by Operable Unit 18 ("OU18") and the former Operable Unit 2 ("OU2"); and to the east by a Cleveland Electric Illuminating Company ("CEI") fly ash disposal facility, which is located outside of the Site boundaries.

n. OU3 is currently owned by Mariana Properties, Inc., and consists of vacant land.

o. Access to the One Acre Landfill, a hazardous waste disposal facility operated by Diamond Shamrock and located in OU10, is through the western portion of OU3. A gas well, located in the southwestern portion of OU3, was abandoned on September 12, 2007. The central and eastern portions of OU3 have been used for material storage, parking, and other activities associated with the Site and OU10.

p. Information from LANXESS Solutions US Inc., formerly known as Chemtura Corporation, successor in interest to Uniroyal Chemical Company, Inc, indicates that approximately 16,700 cubic yards of wastes including scrap poly vinyl chloride ("PVC") resin, fly ash, spent vinyl chloride monomer ("VCM"), spent VCM reactor catalyst, distillation high boilers from VCM production, and mercuric chloride spent catalyst may have been disposed within OU3 in a 7.5-acre area referred to as "Site C." The Painesville PRP Group installed soil borings and conducted waste pit excavation activities to confirm the presence of the disposal area, but no evidence of waste disposal was found in this area.

q. In September 2007, Ohio EPA approved the FS Report for OU3, which presented an array of remedial alternatives to address remaining contamination within the OU.

r. In June 2008, Ohio EPA notified the public of its Preferred Plan for remediation of OU3 and solicited public comments. The Preferred Plan summarizes the OU3 information presented in the Phase I and Phase II RI and FS Reports prepared by SECOR Environmental and Hull and Associates on behalf of the Painesville PRP Group, and identifies and explains Ohio EPA's preferred alternative for the remedial action at OU3. The preferred remedial alternative in this Preferred Plan includes the following elements:

i. Delineation and remediation of the SB-3A1-25 area of concern identified in Appendix F. Remediation will include, excavation and off-site disposal, capping in place, or a combination of these two options.

ii. Establishment of an EC which would prohibit residential land use and the construction of buildings in a buffer zone within 150' of the slurry wall installed on OU10 (One Acre Landfill) in accordance with the recommended remedy for OU10; prohibit the construction of sub-grade habitable structures (i.e., basements and/or crawl spaces) within OU3;

prohibit the extraction of ground water for potable and non-potable use, with the exception of environmental investigation, monitoring and treatment; establishment of a 4' minimum point of compliance ("POC") across OU3; and prohibit excavation by construction workers, unless the excavation is performed in accordance with an Ohio EPA-approved risk management plan ("RMP"). This RMP would address health and safety precautions to be taken by workers excavating below the POCs, as well as how to manage potentially contaminated soils, materials, and ground water.

s. On July 31, 2008, Ohio EPA held a public meeting and hearing on the Preferred Plan. The public comment period ended on August 8, 2008. Shortly following the end of the public comment period elevated levels of contamination were found in OU18, immediately to the south of OU3. Ohio EPA was concerned that the contamination identified within OU18 might impact OU3 ground water in the future and instructed the Painesville PRP Group to perform additional ground water studies within OU18. On June 12, 2015, the Painesville PRP Group submitted documentation that contaminated ground water from OU18 was unlikely to impact OU3 in the future and proposed moving the OU3/OU 18 boundary to the north in order to provide a larger buffer zone between the OU18 contamination and OU3. Ohio EPA approved the proposal from the Painesville PRP Group to relocate the boundary on July 16, 2015.

t. On December 1, 2015, Ohio EPA issued a Decision Document, which selected the remedy for the OU3 and included responses to the public comments in the form of a responsiveness summary. The Decision Document is attached hereto as Appendix A, and incorporated by reference herein. Ohio EPA's responsiveness summary, dated December 1, 2015, is attached to the Decision Document.

u. OU3 is a hazardous waste facility, solid waste facility or other location where hazardous waste or solid waste was treated, stored or disposed.

v. Because of their quantity, concentration, physical or chemical characteristics, the contaminants found at the Site are "hazardous waste" as defined under ORC § 3734.01(J).

w. The contaminants found at the Site are "industrial waste" or "other wastes" as defined under ORC §§ 6111.01(C) and (D).

x. The ground waters at OU3 are "waters of the state" as defined in ORC § 6111.01(H).

y. Ohio EPA has incurred Response Costs and continues to incur Response Costs associated with OU3.

z. Each Respondent is a "person" as defined under ORC §§ 3734.01(G) and 6111.01(1).

aa. Work Respondent and/or its predecessors were generators of contaminants or contamination at OU3. Work Respondent's predecessors directly or indirectly allowed contamination and/or directed the placement and/or disposal of contaminants at the Site.

bb. Without implementation of the proposed Remedial Action, conditions at OU3 constitute a substantial threat to public health or safety or are causing or contributing to, or threatening to cause or contribute to air or water pollution or soil contamination as provided in ORC § 3734.20(B).

cc. The migration or threatened migration of contaminants to ground water, or surface water at or from OU3 constitutes a discharge or threatened discharge to "waters of the state," as the term is defined in ORC § 6111.01(H).

dd. The Work required pursuant to these Orders will contribute to the prohibition or abatement of any discharge of contaminants to waters of the State.

ee. 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.

ff. 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 Work Respondent as set forth in the Decision Document and in accordance with these Orders.

8. Commitment of Work Respondent

Work Respondent agrees to perform the Work in accordance with these Orders, including but not limited to consideration of all applicable and relevant criteria set forth in: the SOW, all guidance documents, and all standards, specifications, and schedules as approved by Ohio EPA pursuant to these Orders. Work Respondent also agrees to reimburse Ohio EPA for all Response Costs (as required by Section XVI of these Orders) and perform all other obligations of these Orders.

9. Compliance With Law

a. All activities undertaken by Work 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. The activities conducted pursuant to these Orders, if approved by Ohio EPA, are 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, Work Respondent shall submit applications in a timely manner and take all other reasonable actions necessary to obtain such permit, license or other authorization, unless the Director determines that such permit, license or other authorization is not necessary. These Orders are not, and shall not be construed to be a permit, license or other authorization issued pursuant to any statute or regulation. Any delay in the issuance of a permit, license or other authorization shall extend the time for performance of any Work for which the permit, license or other authorization is necessary.

VI. PERFORMANCE OF THE WORK BY WORK 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, 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, Work 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, Work 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 Work Respondent, and the RD/RA Work Plan and other affected documents shall be modified accordingly.

d. *Handling any inconsistencies.* Should Work Respondent identify any inconsistency between any of the laws and regulations and guidance documents that Work Respondent is required to follow by these Orders; Work Respondent shall notify Ohio EPA in writing of each inconsistency and the effect of the inconsistencies upon the Work to be performed. Work Respondent shall also recommend, along with a supportable rationale justifying each recommendation, the requirement that Work Respondent believe should be followed. Work 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[1] 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, Work Respondent shall implement the RD/RA Work Plan as approved. Work 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.

VII. LAND USE AND CONVEYANCE OF TITLE

12. Environmental Covenant

Within thirty (30) days after Ohio EPA approves the final Operation and Maintenance Plan, Landowner Respondent shall record with the Lake County Recorder's Office an EC for OU3. The EC shall be consistent with the template contained in Appendix D, shall be signed by Landowner Respondent, and shall be approved and signed by Ohio EPA. The EC shall be recorded in the deed or official records of the County Recorder of Lake County, Ohio pursuant to ORC § 5301.82. The terms and conditions of the EC are incorporated into these Orders and shall be binding upon Landowner Respondent. Thereafter, if Landowner Respondent conveys any interest in OU3, each deed, title, or other instrument shall contain a notice stating that OU3 is subject to these Orders and shall reference any monitoring, treatment, or containment systems present on OU3 as a result of these Orders.

[1] The Health and Safety Plan is a Supporting Document.

13. Proof of Filing Environmental Covenant

Within thirty (30) days after filing with the Lake County Recorder the executed EC, Landowner Respondent shall certify to Ohio EPA that the EC has been filed for recording, and include with the certification a file and date-stamped copy of the recorded EC.

14. Land Use Self-Reporting Requirement

Landowner Respondent shall comply with the EC. Landowner Respondent shall submit on an annual basis, written documentation verifying that any security, containment, treatment, monitoring systems or EC use limitations are in place and operational for so long as Landowner Respondent owns any interest in OU3.

15. Notice of Intention to Transfer Property

Prior to each conveyance by Landowner Respondent of an interest in any portion of OU3, including but not limited to, easements, deeds, leases and mortgages, Landowner Respondent shall notify the prospective Transferee of the existence of the activity and use limitations and shall provide a copy of these Orders to the prospective Transferee. Landowner Respondent shall notify Ohio EPA at least thirty (30) days in advance of each conveyance of an interest in any portion of OU3 that is owned by Landowner Respondent. Landowner Respondents' notice shall include the name and address of the Transferee and a description of the provisions made for the continuance of the activity and use limitations.

16. Instrument and Confirmation of Conveyance

Upon each conveyance by Landowner Respondent of an interest in any portion of OU3, including but not limited to easements, deeds, leases and mortgages, Landowner Respondent shall include in the instrument of conveyance a restatement consistent with paragraph 10 of the EC. Within thirty (30) days after each conveyance of an interest in any portion of OU3 that is owned by Landowner Respondent, Landowner 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

17. Ohio EPA or Work 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.

18. 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, Work 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 Work Respondent disputes the necessity of additional Work, 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, Work Respondent shall implement the approved RD/RA Work Plan Addendum in accordance with the schedules contained therein.

19. If Work Respondent determines that additional Work is necessary, Work 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, 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, Work 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 OU3 for which Work Respondent submits to Ohio EPA written notice of the performed activity.

IX. SAMPLING AND DATA AVAILABILITY

20. Unless otherwise agreed to by the Site Coordinators, Work Respondent shall notify Ohio EPA not less than fifteen (15) days in advance of all sample collection activity. Upon request, Work 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 Work Respondent to take split and/or duplicate samples of any samples Ohio EPA takes as part of its oversight of Work Respondent's implementation of the Work. Unless such samples are taken on an emergency basis, Ohio EPA shall make reasonable efforts to provide three (3) working days notice of such sampling to allow Work Respondent to participate as indicated. In the event of an emergency sampling event, Work Respondent shall make reasonable efforts to inform the Ohio EPA Site Coordinator as soon as practicable.

21. Within seven (7) days of Work Respondent's receipt of a request by Ohio EPA, Work Respondents shall electronically 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 Work Respondent with respect to OU3 and/or the implementation of these Orders. An electronic copy shall also be provided in a format approved by Ohio EPA. Work 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 Work Respondent subsequently discover an error in any report or raw data, Work Respondent shall promptly notify Ohio EPA of such discovery and provide the correct information.

X. ACCESS

22. Ohio EPA and its contractors shall have access at all reasonable times to OU3 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 Respondents. 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.

23. To the extent that OU3 or any other property to which access is required for the implementation of these Orders is owned or controlled by persons other than Respondents, Respondents shall use all reasonable efforts to secure from such persons access for Respondents and Ohio EPA and its contractors as necessary to effectuate these Orders. All reasonable efforts shall not be construed to include payment of money for access. Copies of each access agreement obtained by Respondents 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 Work Respondent's submission of the RD/RA Work Plan, unless otherwise agreed to in writing by Ohio EPA, Respondents shall promptly notify Ohio EPA in writing of the steps Respondents have taken to attempt to obtain access. Ohio EPA may, as it deems appropriate, assist Respondents in obtaining access.

24. 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.

XI. DESIGNATED SITE COORDINATORS

25. Within seven (7) days of the Effective Date, Work Respondent shall notify Ohio EPA, in writing, of the name, address and telephone number and email address of their designated Site Coordinators and Alternate Site Coordinators. Ohio EPA shall also notify the Work Respondent, in writing, of the name, address and telephone number and email address of its designated Site Coordinator.

26. 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.

27. To the maximum extent practicable, except as specifically provided in these Orders, communications between Work Respondent and Ohio EPA concerning the implementation of these Orders shall be made between the Site Coordinators. Work Respondent's Site Coordinators 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. Work Respondent's Site Coordinators shall be present on the Site or on call during all hours of Work at the Site.

28. 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 Work 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 OU3 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 Work Respondent's compliance with these Orders.

XII. PROGRESS REPORTS AND NOTICE

29. Unless otherwise directed or agreed to by Ohio EPA, Work 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; Work Respondent shall submit such requests to Ohio EPA in a separate written correspondence.

30. Progress reports (one copy only) shall be sent by e-mail. All other documents required to be submitted pursuant to these Orders to Ohio EPA shall be sent electronically to the designated Ohio EPA Site Coordinator, identified in accordance with Paragraph 25.

31. All written (including electronic) correspondence to Work Respondent shall be directed to the Work Respondent's Site Coordinator, identified in accordance with Paragraph 25.

32. 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.

XIII. REVIEW OF SUBMISSIONS

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

34. Upon review, Ohio EPA may in its sole discretion, based on thorough consideration of all submittals: (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") and progress reports.

35. In the event that Ohio EPA approves an initial submission, Work 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, Work 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 Work Respondent's submission. Work Respondent shall proceed to take any action required by an unmodified or unconditioned portion of the submission, as those portions are considered approved.

36. In the event that Ohio EPA disapproves an initial submission in whole or in part and notifies Work Respondent electronically or in writing of the deficiencies Work 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. Revised submissions shall be accompanied by a letter indicating how and where each of Ohio EPA's comments were 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.

37. To the extent that Work Respondent disputes any of Ohio EPA's changes, additions, and/or deletions to an initial submission, 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 electronic or written notice of disapproval. Notwithstanding the disapproval, Work 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.

38. In the event that Ohio EPA disapproves or modifies a revised submission, in whole or in part, and notifies Work Respondent in writing of the deficiencies, Work Respondent shall within fourteen (14) days, or such longer period of time as specified in writing by Ohio EPA, (a) correct the deficiencies and incorporate all changes, additions, and/or deletions, and submit the revised submission to Ohio EPA for approval. If Work 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, or alternatively, fails to initiate dispute resolution pursuant to the Dispute Resolution Section of these Orders, Work Respondent shall be considered in breach and/or violation of these Orders. If Work Respondent are in breach and/or violation of these Orders, Ohio EPA retains the right to perform any

additional remediation, conduct a complete or partial RI or FS, conduct a complete or partial RD or RA; and/or enforce the terms of these Orders as provided in the Reservation of Rights Section of these Orders.

39. 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.

XIV. DISPUTE RESOLUTION

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

41. In the event of disapproval, or an approval with condition(s) or modification(s) by Ohio EPA of a submission by Work Respondent, or a disagreement regarding the Work performed under these Orders, Work Respondent's Site Coordinators shall notify Ohio EPA's Site Coordinator in writing that Work 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.

42. The Parties shall have ten (10) days from the date of the electronic or 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, or as otherwise agreed.

43. In the event that the dispute is not resolved during the informal dispute resolution period, Work Respondent's Site Coordinator shall notify Ohio EPA's Site Coordinator electronically or in writing by the end of the informal dispute resolution period that Work 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 electronic or 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, or as otherwise agreed.

44. In the event the dispute is not resolved in the formal dispute resolution period, Work Respondent's Site Coordinator shall notify Ohio EPA's Site Coordinator in writing by the end of the formal dispute resolution period whether Work Respondent wishes to submit final written positions to a DERR Chief 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 Chief 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 and regulations. The decision of the DERR Chief is considered final for the purposes of these Orders.

45. 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.

46. To the extent Work Respondent disputes either the accuracy of Ohio EPA's request for reimbursement under the Reimbursement of Costs Section of these Orders or whether costs are inconsistent with the NCP, Work Respondent shall initiate the formal dispute provisions of the Dispute Resolution Section within fourteen (14) days after receipt of Ohio EPA's request for reimbursement of costs. Should Work Respondent dispute a portion of the response costs set forth in an itemized statement, but not all the costs, Work Respondent shall timely pay the uncontested portion pursuant to the provisions of the Reimbursement of Costs Section.

XV. UNAVOIDABLE DELAYS

47. Work 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 Work 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 Work Respondent. Increased cost of compliance, shall not be considered an event beyond the control of Work Respondent for the purposes of these Orders.

48. Work Respondent shall notify Ohio EPA electronically or in writing within ten (10) days after the occurrence of an event that Work Respondent contend 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 Work Respondent to minimize the delay, and the timetable under which these measures will be implemented. Work Respondent shall have the burden of demonstrating that the event constitutes an unavoidable delay.

49. If Ohio EPA does not agree that the delay has been caused by an unavoidable delay, Ohio EPA will notify the Work 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 Work Respondent in writing of the length of the extension for the performance of the obligations affected by the unavoidable delay.

XVI. REIMBURSEMENT OF COSTS

50. Ohio EPA has incurred and continues to incur Response Costs in connection with OU3. Work Respondent shall reimburse Ohio EPA for all Response Costs incurred for OU3 both prior to and after the Effective Date of these Orders.

51. Upon receipt of an itemized invoice for the Response Costs incurred prior to the Effective Date of these Orders, Work Respondent shall either (a) dispute the invoice in part or in its entirety by initiating 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 invoice, or (b) remit payment for all, or the undisputed part, of Ohio EPA's Response Costs incurred prior to the Effective Date of these Orders within thirty (30) days after receipt of the invoice. In the event that Work Respondent does not dispute the invoice or remit payment of Response Costs within sixty (60) days after receipt of such invoice, Work Respondent shall remit payment for the unpaid balance and the interest accrued of 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.

52. For Response Costs incurred on or after the Effective Date of these Orders, Ohio EPA will submit to Work Respondent on an annual basis an itemized invoice of its Response Costs for the previous year; informational invoices will be provided upon request from Work Respondent. Upon receipt of such itemized invoice, Work Respondent shall either (a) dispute the invoice in part or in its entirety by initiating 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 invoice, or (b) remit payment for all, or the undisputed part, of Ohio EPA's Response Costs for the previous year within thirty (30) days after receipt of the invoice. In the event that Work Respondent does not dispute the invoice or remit payment of Response Costs within sixty (60) days after receipt of such invoice, Work Respondent shall remit payment for the unpaid balance and the interest accrued of 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.

53. Work 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 Office of Fiscal Administration, Attn: Revenues Section, Ohio EPA, Lazarus Government Center, P.O. Box 1049, Columbus, Ohio 43216-1049;

b. A copy of the transmittal letter and check shall be sent to the Fiscal Officer, 21 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 (i.e., Diamond Shamrock Painesville Works Site OU3), and Ohio EPA's revenue number identified on the associated invoice.

XVII. ACCESS TO INFORMATION

54. Upon request, Work 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 OU3 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 Work Respondent by Ohio EPA made under state or federal law for information relating to events or conditions at OU3.

55. Work 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 Work Respondent.

56. Work 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 Work Respondent makes such an assertion, Work Respondent 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 Work Respondent.

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

58. Work 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. Work Respondent may preserve such documents by microfiche or other electronic or photographic device. At the conclusion of this document retention period, Work 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.

XVIII. PERIODIC REVIEW

59. Work Respondent shall conduct studies and investigations as reasonably requested by Ohio EPA in order to permit Ohio EPA to conduct reviews as to the effectiveness of the RA at least every three (3) years as described in section 121(c) of CERCLA and any applicable regulations.

60. 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 RA is not protective of public health and safety and the environment, Work Respondent shall undertake any further response actions Ohio EPA has determined are appropriate. Work 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.

61. Work Respondent may invoke the procedures in the Dispute Resolution Section with respect to any disputes relating to Ohio EPA's periodic review of the RA, including: (1) Ohio EPA's request for further studies and investigations; (2) Ohio EPA's determination that the RA is not protective of public health and safety and the environment; or (3) Ohio EPA's selection of further response actions.

IXX. MODIFICATIONS

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

XX. INDEMNITY

63. Respondents agree 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 OU3, caused by the negligent acts or omissions of Respondents, 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 OU3 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 Respondents in carrying out the activities pursuant to these Orders. Ohio EPA agrees to provide notice to Respondents 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 Respondents in the defense of any such claim or action against Ohio EPA.

XXI. CONTRIBUTION PROTECTION AND AGREEMENT NOT TO REFER

64. With respect to matters addressed in these Orders, the Parties agree that these Orders constitute an administrative settlement for purposes of CERCLA sections 113(0(2) and 113 (f)(3)(B), 42 U.S.C. § 9613(0(2) and § 9613(f)(3)(B), pursuant to which Respondents have resolved their liability to the State, and that Respondents are 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(0(2) and (f)(3)(B), 42 U.S.C. § 9613(0(2) and (f)(3)(B), provided that

Respondents comply 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 OU3, including without limitation the Work and Response Costs under these Orders.

65. During the implementation of these Orders, and provided Respondents are considered by Ohio EPA to be in compliance with these Orders, Ohio EPA agrees not to refer Respondents to the Ohio Attorney General's Office for enforcement, or take administrative enforcement action against Respondents or their successors in interest liable under Ohio law for Work required under these Orders at OU3. Upon termination of these Orders pursuant to the Termination Section, Ohio EPA agrees to not refer Respondents to the Ohio Attorney General's Office for enforcement, or take administrative enforcement action against Respondents and their successors in interest liable under Ohio law for Work required under these Orders at OU3.

XXII. OTHER CLAIMS

66. 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 OU3.

XXIII. RESERVATION OF RIGHTS

67. Ohio EPA reserves the right to seek legal and/or equitable relief to enforce the terms and conditions of these Orders, including penalties against Respondents for noncompliance with these Orders. Except as provided herein, Respondents reserve 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.

68. 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 provided that the Work at issue is not being disputed pursuant to the Dispute Resolution Section of these Orders.

69. 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, OU3. Work Respondent reserves its right to defend any such enforcement action, action to recover costs, or action to recover damages to natural resources and to raise any counterclaim, affirmative defense, third party claim or cross claim which it may have with respect to these actions. 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.

70. Respondents reserve all rights, claims, demands, defenses and causes of action it may have against any all persons and entities who are not parties to these Orders, including rights of contribution against any other persons who may be liable for actual or threatened releases of Contamination at or from OU3.

XXIV. TERMINATION

71. Work Respondent's obligations under these Orders shall terminate upon Ohio EPA's written approval of Work 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 Work 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 Work Respondent to Ohio EPA and shall be signed by a responsible official of Work 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. Ohio EPA and Respondents shall review any written certifications for approval or disapproval and approve or disapprove such certification within forty-five (45) days of receipt.

XXV. WAIVER AND AGREEMENT

72. In order to resolve disputed claims, without admission of fact, violation, or liability, Respondents consent to the issuance of these Orders, and agrees to comply with these Orders.

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

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

XXVI. EFFECTIVE DATE

75. The Effective Date of these Orders shall be the date these Orders are entered in the Journal of the Director of Ohio EPA.

XXVII. SIGNATORY AUTHORITY

76. 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

Craig W. Butler, Director
Ohio Environmental Protection Agency

9/25/18
Date

IT IS SO AGREED:

Occidental Chemical Corporation

BY: _____ 8/15/18
Signature Date

MICHAEL ANDERSON, VP Occidental Chemical
Printed Name & Title

Mariana Properties, Inc.

BY: _____ 8/20/18
Signature Date

FRANK A. PARISI, V.P. AND GENERAL COUNSEL
Printed Name & Title

APPENDIX A

DECISION DOCUMENT

APPENDIX B

RD/RA SOW

APPENDIX C

LIST OF RELEVANT GUIDANCE DOCUMENTS

APPENDIX D

ENVIRONMENTAL COVENANT TEMPLATE

APPENDIX E

SITE MAP

APPENDIX F

CHROMITE ORE PROCESSING RESIDUE AREA

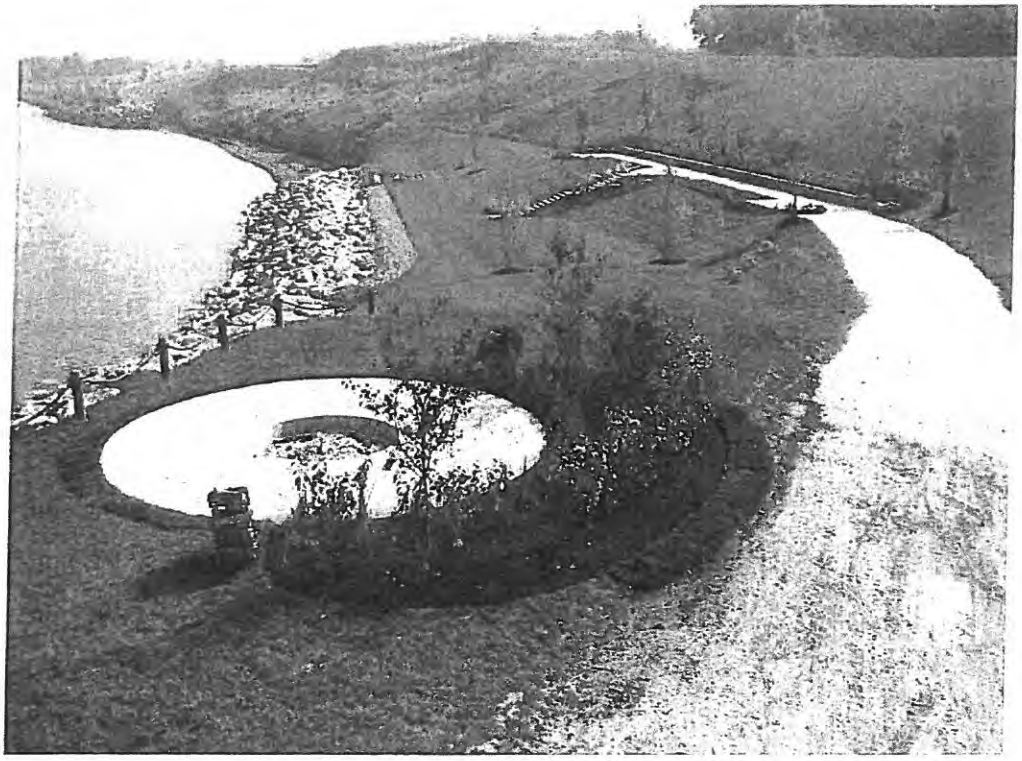
APPENDIX A

Decision Document

Ohio Environmental Protection Agency

DECISION DOCUMENT

FOR THE REMEDIATION OF OPERABLE UNIT 3 DIAMOND SHAMROCK PAINESVILLE WORKS SITE PAINESVILLE TOWNSHIP, LAKE COUNTY, OHIO



Ohio Environmental Protection Agency
Division of Environmental Response and Revitalization
Northeast District Office
November 2015

Ohio EPA's Division of Environmental Response and Revitalization (DERR) - Assessment, Cleanup & Reuse Section Remedial Response Program			Decision Document For the Remediation of the Operable Unit 3 of the Diamond Shamrock Painesville Works Site Painesville, Lake County, Ohio		
THE REMEDIAL RESPONSE PROCESS					
(1) Preliminary Assessment & Site Inspection	(2) Remedial Investigation & Feasibility Study	(3) Remedy Selection (Preferred Plan & Decision Document)	(4) Remedial Design	(5) Remedial Action	(6) Remedy Operation, Maintenance & Monitoring

Ohio EPA Announces Decision Document

On June 26, 2008, Ohio EPA issued a Preferred Plan that outlined Ohio EPA's preferred alternative to remediate contamination at Operable Unit 3 (OU3) of the Diamond Shamrock Painesville Works Site. Ohio EPA held a public meeting on July 31, 2008 at the Painesville Township Hall, 55 Nye Road, Painesville, Ohio, to explain the Preferred Plan. Oral and written comments were accepted at this meeting and during the comment period which ran from June 26, 2008 through August 8, 2008. Section 8.0, Responsiveness Summary, of this Decision Document summarizes the comments and Ohio EPA's responses.

Based on the Preferred Plan and the consideration of comments received during the comment period, Ohio EPA is issuing this Decision Document identifying the selected remedial alternative for the cleanup of contaminated soils and ground water, as well as to address inhalation risks from soil and ground water to indoor air at OU3, and to provide the rationale for the selection. It also includes summaries of other remedial alternatives evaluated for use at OU3.

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 OU3. Ohio EPA encourages the public to review these documents to gain a better understanding of OU3 and the activities that have been conducted at OU3.

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, 17th Floor, Columbus, Ohio 43215) within thirty (30) days after notice of the Director's action.

Additional Information: Available from **(1)** Ohio EPA's Northeast District Office, located at 2110 East Aurora Road, Twinsburg, Ohio 44087 (contact Teri Heer at (330) 963-1168 or teri.heer@epa.ohio.gov); and **(2)** locally from the information repositories located at the Fairport Harbor Public Library (335 Vine Street, Fairport Harbor, Ohio; (440) 354-8191; www.fairport.lib.oh.us) and Morley Public Library (184 Phelps Street, Painesville, Ohio; (440) 352-3383: www.morleylibrary.org. Information is also available at www.dscrt.com.

DECLARATION

SITE NAME AND LOCATION

Diamond Shamrock Painesville Works Site – OU3
North of 900 Fairport Nursery Road
Painesville Township, Ohio

STATEMENT OF BASIS AND PURPOSE

This Decision Document presents the selected remedial action for OU3 of the Diamond Shamrock Painesville Works Site in Painesville Township, Lake County, Ohio, chosen in accordance with the policies of the Ohio Environmental Protection Agency, statutes and regulations of the State of Ohio, and the N C P, 40 CFR Part 300.

ASSESSMENT OF THE SITE

Actual and threatened releases of hazardous substances at OU3, if not addressed by implementing the remedial action selected in the Decision Document, constitute a substantial threat to public health or safety and are causing or contributing to air or water pollution or soil contamination.

OU3 is part of the former Diamond Shamrock Painesville Works Site, which operated at this location from 1912 through 1977. Diamond Shamrock manufactured a variety of chemicals at the 1,100-acre Site. Access to the former Diamond Shamrock One Acre Site (OU10), a small hazardous waste landfill which accepted wastes from Diamond Shamrock research laboratories, was obtained through OU3.

DESCRIPTION OF THE SELECTED REMEDY

The major components of the selected remedial alternative include: (1) remediation of areas containing contaminated soils through excavation and/or placement of clean soils and (2) establishment of an environmental covenant to ensure appropriate risk-based land use, limit ground water use, prohibit construction within 150' of the OU10 slurry wall and prohibit construction below the applicable minimum points of compliance across OU3.

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 OU3. The effectiveness of the remedy will be reviewed regularly.

Craig W. Butler, Director

DEC 01 2015
Date

TABLE OF CONTENTS

TABLE OF ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirements
BERA	Baseline Ecological Risk Assessment
BHHRA	Baseline Human Health Risk Assessment
CEI	Cleveland Electric Illuminating Company
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC(s)	Contaminant(s) of Concern
DERR	Division of Environmental Response and Revitalization
DFFOs	Director's Final Findings and Orders
EC	Environmental Covenant
ELCR	Excess Lifetime Cancer Risk
ERA	Ecological Risk Assessment
FS	Feasibility Study
HI	Hazard Index
HQ	Hazard Quotient
NCP	National Contingency Plan
O&M	Operation and Maintenance
ORC	Ohio Revised Code
OU(s)	Operable Unit(s)
PCBs	Polychlorinated Biphenyls
POC(s)	Point(s) of Compliance
PPM	Parts Per Million = mg/kg or mg/L
PRG(s)	Preliminary Remediation Goal(s)
PRP	Potentially Responsible Party
RA	Remedial Action
RAO(s)	Remedial Action Objective(s)
RD	Remedial Design
RG(s)	Remediation Goal(s)
RI	Remedial Investigation
RL(s)	Remediation Level(s)
RMP	Risk Management Plan
TDC	Technical Decision Compendium

1.0 EXECUTIVE SUMMARY

On September 27, 1995, Chemical Land Holdings, Inc., Maxus Energy Corporation, Occidental Chemical Corporation, Painesville Township Board of Trustees, Uniroyal Chemical Company, Village of Fairport Harbor, and the Painesville PRP Group entered into Director's Final Findings and Orders ("DFFOs") with Ohio EPA to investigate and develop remedial alternatives for the Diamond Shamrock Painesville Works Site (Site; see **Figure 1, Site Location Map**). Chemical Land Holdings, Inc., Maxus Energy Corporation, Occidental Chemical Corporation, Painesville Township Board of Trustees, Village of Fairport Harbor, and the Painesville PRP Group are also subject to a U.S. District Court Judicial Consent Order ("Consent Order"), effective on October 4, 2005, which required the continued implementation of the DFFOs requirement to investigate contamination at the Site, including OU3. OU3 is subject to both the DFFOs and the Consent Order. Accordingly, the term "Orders" is used to refer to both the DFFOs and the Consent Order.

The Painesville PRP Group developed Phase I Remedial Investigation (RI) and Phase II RI Work Plans, pursuant to the Orders, to determine where contamination exists at the Site and at what concentrations. The Phase I RI Work Plan was approved in August 1997 and the Phase II RI Work Plan was approved in August 2000, to investigate the Site for potential contamination of soil, ground water, surface water and indoor air.

On July 25, 1999 and September 22, 2003, respectively, the Phase I RI and Phase II RI Reports were approved by Ohio EPA. These reports documented the existence of contamination within the Site boundaries that would require clean up.

During the course of RI activities, the Site was divided into 21 land-based and three ground water-based operable units (OUs). This Decision Document applies to OU3, which is located north of 900 Fairport Nursery Road (see **Figure 2, Operable Unit 3 Location Map**).

A ground water divide, which separates ground water flowing north to Lake Erie and ground water flowing south to the Grand River, is located under the southeastern corner of OU3. Ground water north of the divide is included in Operable Unit 1 North-Lake (OU1N-Lake) and ground water south of the divide is included in Operable Unit 1 North-River (OU1N-River). Therefore, OU3 is impacted by ground water from both OU1N-Lake and OU1-N River.

On May 28, 2006, the Painesville PRP Group submitted the Feasibility Study (FS) Report for OU3, which included baseline human health and terrestrial ecological risk assessments. Risk to ecological receptors was slightly in excess of acceptable levels due to the presence of elevated concentrations of aluminum, chromium and vanadium. Human health risks for the child and adult resident, child and adult recreational user, recreational trespasser, construction/excavation worker and commercial/industrial worker were calculated. Carcinogenic risk was exceeded for the child resident, necessitating a remedial action.

A Preferred Plan was issued in June 2008, which presented a range of remedial alternatives for public consideration and comment. The alternatives evaluated in the Preferred Plan are included in **Section 4.0, Summary of Remedial Alternatives**.

Following issuance of the Preferred Plan, ground water contamination was identified in Operable Unit 18 (OU18), located immediately to the south of OU3. As with OU3, both OU1N-Lake and OU1N-River underlie OU18. Due to the proximity of OU3 to OU18 and the potential for ground water to flow from ground water underlying OU18 to that underlying OU3, Ohio EPA halted issuance of the Decision Document for OU3. Once initial investigations were completed for ground water underlying OU18 and documentation was submitted on June 12, 2015 by the Painesville PRP Group, indicating that contaminants in ground water underlying OU18 were not impacting OU3, Ohio EPA proceeded with issuance of the Decision Document for OU3.

All of the documents referenced above can be found in the public repositories identified in **Section 8.0, Responsiveness Summary**.

This Decision Document summarizes information on the range of remedial alternatives evaluated, identifies Ohio EPA's selected remedial alternative, and explains the reasons for selection of the remedial alternative. The Decision Document is based on the Ohio EPA-approved RI and FS reports completed by SECOR, Inc. and Hull & Associates, Inc., on behalf of the Painesville PRP Group.

Ohio EPA's selected remedial alternative should yield a permanent solution for risks associated with the contaminated media at OU3. The expectations for the selected alternative include:

- Reduction of human health risks to within acceptable limits, and protection of human health and the environment from exposure to contaminants of concern (COCs) in soils and ground water, which are above acceptable limits.
- Short and long-term protection of public health and the environment.
- Compliance with applicable or relevant and appropriate requirements (ARARs).
- Cost-effectiveness and limitation of expenses to what is necessary to achieve the selected alternative expectations.

The major components of the selected remedial alternative include remediation of contaminated soils within the southeastern corner of OU3, establishment of an Environmental Covenant (EC) to restrict property and ground water use, and establishment of a Risk Management Plan (RMP) for future construction activities which occur below the applicable 4' minimum point of compliance (POC).

Ohio EPA finds that these measures will protect public health and the environment by reducing risk to acceptable levels once the remedial action objectives (RAOs) have been achieved.

2.0 SUMMARY OF OPERABLE UNIT CONDITIONS

2.1 Operable Unit History

The Diamond Shamrock Painesville Works Site is an approximately 1,100 acre former chemical manufacturing facility located in a mixed industrial/residential area. The Site is situated in the northern portion of Lake County, within the municipalities of the city of Painesville, Painesville Township and the Village of Fairport Harbor. East Street borders the Site to the west, Elm Street to the south and Lake Erie to the north. The Site borders the former Uniroyal Chemical Company and Cleveland Electric Illuminating Company (CEI) property to the east. The Grand River and Fairport Nursery Road bisect the Site from east to west (see **Figure 1, Diamond Shamrock Location Map**).

In order to facilitate the Remedial Investigation/ Feasibility Study (RI/FS) and Remedial Design/ Remedial Action (RD/RA) processes, the Site has been divided into 24 OUs – 21 land-based and 3 ground water-based OUs. OU3, which is approximately 25 acres in size, is located in the north-eastern corner of the Site, adjacent to Lake Erie (see **Figure 2, Operable Unit 3 Location Map**) and is also known as Parcel 3A1.

A list of owners, operators and/or disposers that may have contributed to the contamination within OU3 is shown in **Table 1 Owners, Operators and/or Disposers**.

TABLE 1 OWNERS, OPERATORS AND/OR DISPOSERS

Owners, Operators and/or Disposers	Property Usage	Period
Diamond Alkali / Diamond Shamrock	*Access to former One Acre Site (OU10) hazardous waste disposal area.*	*1912 – Present*

OU3, currently owned by Tierra Solutions, Inc., contains a "pocket park" on the northeast corner, which has historically been used for social events, and equipment and clean material storage for other Site-related remedial activities. The remainder of OU3 is currently vacant. Lakeview Bluffs, LLC has entered into a 99-year lease for the majority of the Site, including OU3, and has plans to utilize it for residential development.

Chemical Land Holdings, Inc., Maxus Energy Corporation, Occidental Chemical Corporation, Painesville Township Board of Trustees, Village of Fairport Harbor, and the Painesville PRP Group are subject to the Orders, which require them to investigate contamination at the Site, including OU3.

2.2 Site Characteristics and Investigation

Pursuant to the 1995 DFFOs for the RI/FS, the Painesville PRP Group, on behalf of all of the signatories to the 1995 DFFOs, submitted Phase I RI and Phase II RI and FS reports, which were approved by Ohio EPA, DERR in 1999, 2003, and 2007, respectively. The RI/FS activities identified the nature and extent of contamination in surface and subsurface soils; ground water; surface water and sediments for the volatile

and semi-volatile organic compounds, pesticides, PCBs, and metals; and as necessary, developed alternatives to address the contamination. The investigation also provided a description of Site geology, topography, hydrogeology and other Site characteristics.

Geology at the Site, including OU3, is complex. The subsurface geology consists of a mixture of non-native fill material (including large amounts of Solvay[1] material within the former waste lakes/soup ponds), glacial tills, alluvial deposits, and shale bedrock. Ground water is present across the Site at varying depths. Ground water quality is poor and in the majority of areas yield is very poor, which limits the ability for its use for potable purposes. For these reasons, it was determined that ground water did not need to be evaluated for risk to human health, with the exception of direct contact by future construction workers. However, ground water was evaluated as a potential contributor of contamination to both the Grand River and Lake Erie.

No ground water supply wells are located within the immediate vicinity of the Site and the area is served by public water from Lake Erie. A ground water divide, located north of Fairport Nursery Road (within a portion of OU3), as well as the Grand River and Lake Erie, complicate ground water flow direction and contaminant transport across the Site. One jurisdictional wetland has been identified on the Site and is located within Operable Unit 21 (OU21).

During the majority of the investigation, the Site was zoned industrial, which matched its historical use. In 2003, the Lake County Board of Commissioners and Lakeview Bluffs, LLC received a $3 million grant from the State of Ohio to perform a voluntary interim action for Operable Unit 15 (OU15), which would upgrade the end use of OU15 from industrial to a mixture of commercial, recreational and residential[2]. In 2006, they received a second $3 million grant from the State of Ohio for Operable Unit 2 (OU2) and Operable Unit 6 (OU6) to upgrade the end uses of those OUs to a combination of recreational and residential. The majority of the OUs at the Site, including OU3, have been re-zoned to accommodate these end uses. OU3 is bordered by OU6 and OU10 to the west, OU18 to the south, a CEI fly ash disposal facility to the east, and Lake Erie to the north.

2.3 Summary of Site Risks

As part of the RI/FS, a baseline human health and ecological risk assessments (BHHRA and BERA) were conducted, and approved by Ohio EPA on September 5, 2007, to evaluate current and potential future risks to human and ecological receptors as the result of exposure to contaminants present at OU3. The results demonstrated that existing contaminants in environmental media pose or potentially pose unacceptable risks and/or hazards to human and/or ecological receptors sufficient to trigger the need for remedial actions. Additional information on the primary COCs can be found in **Appendix B**.

---

[1] Solvay material is composed of waste material from the soda ash process and contains calcium carbonate, magnesium carbonate and calcium chloride.

[2] Since OUs 2, 3 and 15 were zoned industrial, formerly contained industrial manufacturing facilities, and the property owner had no plans to use the property for anything other than industrial purposes, Ohio EPA would have only been able to require that the property be remediated to industrial standards.

2.3.1 Risks to Human Health

The risk assessment for human health is an estimate of the likelihood of potential health problems occurring if no remedial actions were taken at a site. To estimate baseline risk, a four-step process is undertaken.

Step 1. Data Collection and Evaluation (of Contamination): The concentrations of contaminants at the site as well as any past scientific studies on the effects these contaminants have had on people are reviewed. Comparisons of site-specific concentrations of COCs and concentrations reported in past studies help determine which contaminants are most likely to pose the greatest threat to human health.

Step 2. Exposure Assessment: The different ways that people might be exposed to the COCs, the concentrations that people might be exposed to, and the potential frequency and duration of exposure are evaluated. A reasonable maximum exposure scenario is calculated, which portrays the highest level of human exposure that could reasonably be expected to occur.

Step 3. Toxicity Assessment (of Potential Health Dangers): The information from Step 2 is combined with data on the toxicity of each COC to assess potential health risks. Two types of risk are considered: excess lifetime cancer risk (ELCR) and non-cancer risk. The likelihood of any kind of cancer resulting from a site is expressed as a probability of 1 in 100,000, or $1x10^{-5}$. In other words, for every 100,000 people that could be exposed, one extra case of cancer may occur as a result of exposure to site COCs. For non-cancer health effects, a hazard index (HI) or hazard quotient (HQ) is calculated (quotient refers to the effects of an individual COC, whereas index refers to the combined effects of all of the COCs). The key concept here is that a "threshold level" (measured as an HQ or HI of 1) exists below which non-cancer health effects are not expected to occur to exposed populations or individuals.

Step 4. Risk Characterization: A determination is made as to whether site risks are substantial enough to cause potential health problems for people at or near a site. The potential risks from the individual pathways (*e.g.,* inhalation, direct contact, ingestion, etc.), and individual chemicals as appropriate, are added together to determine the total cumulative risk to human health.

Human health risk assessments for OU3 and the Grand River/Lake Erie were prepared to evaluate potential impacts to human health posed by COCs in soils, sediments, ground water, surface water, air, and fish for the following exposure pathways:

Soils:

Ingestion
Dermal Contact
Particulate Emissions to Outdoor Air

Volatile Emissions to Indoor Air
Volatile Emissions to Outdoor Air

Ground Water:

Source of Contaminants to Grand River and Lake Erie
Volatile Emissions to Indoor Air

Grand River Surface Water, Sediment and Fish:

Ingestion of Fish
Ingestion of Surface Water
Ingestion of Sediment
Dermal Contact with Surface Water
Dermal Contact with Sediment

Human health exposure to contaminants in ground water via ingestion was not determined, due to inability for ground water within the Site, including OU3, to be used for potable purposes, due to low quality and yield. If Site-specific data were not available or were insufficient to modify standard default values, then the standard defaults provided in U.S. EPA guidance were used.

Carcinogenic (cancer) and non-carcinogenic (non-cancer) risks were evaluated for the following receptors: child and adult resident, child and adult recreational user, recreational trespasser, construction/excavation worker and commercial/industrial worker. Results of the risk assessment indicated that only the child resident carcinogenic risk level, calculated to be 3×10^{-5}, exceeded the Site cumulative risk goal of 1×10^{-5}. Child resident non-carcinogenic threshold level (HQ) was below the Site risk goal of 1, as were the carcinogenic and non-carcinogenic risk and threshold levels for all the other receptors evaluated. The elevated child resident carcinogenic risk level indicates that remedial action is necessary for OU3.

2.3.2 Risks to Ecological Receptors

During the Phase II RI, Ohio EPA determined that a BERA was necessary for OU3, in order to evaluate potential risks posed to ecological receptors by OU-related COCs. Although 17 COCs were carried through the BERA, it was determined that minimal ecological risk is posed by contaminants within OU3. These risks were due to aluminum, chromium and vanadium in surface soils (0-4' below ground surface). Elevated risk to receptors is reported as an HQ. Unacceptable HQs are those which are in excess of 1. HQs for American woodcock, meadow vole, and short-tailed shrew ranged between 1.49 to 1.94, which are slightly elevated when compared to the HQ limit of 1. However, it is likely that these risk levels will be reduced once redevelopment begins within OU3.

3.0 REMEDIAL ACTION OBJECTIVES

A FS, to define and analyze appropriate remedial alternatives, was completed with Ohio EPA oversight and was approved in September 2007.

As part of the RI/FS process, RAOs were developed in accordance with Section 300.430 of the NCP, pursuant to the federal Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), 42 U.S.C. §9601 et seq., as amended, and U.S. EPA guidance (*i.e.*, RI/FS Guidance (EPA/540/G-89/004, and others). The RAOs are goals that a remedy should achieve in order to ensure protection of human health and the environment.

The RAOs for OU3 include those listed in **Table 2, Remedial Action Objectives**:

TABLE 2 REMEDIAL ACTION OBJECTIVES	
Ground Water	
Human Health Risk	Prevent ingestion/direct contact of ground water across OU3 containing carcinogens in excess of a total excess lifetime cancer risk (for all contaminants) greater than $1x10^{-5}$.
Human Health Risk	Prevent ingestion/direct contact of ground water across OU3 containing non-carcinogens in excess of a HQ or HI greater than 1.
Human Health Risk	Prevent inhalation in future structures of carcinogens (including carbon tetrachloride) in vapors emanating from ground water in excess of a $1x10^{-5}$ excess lifetime cancer risk.
Soil	
Human Health Risk	Prevent ingestion/direct contact with soil located across OU3, below the applicable minimum POC, containing carcinogens (including volatile and semi-volatile chemicals, pesticide, PCBs and metals) in excess of a total excess lifetime cancer risk greater than $1x10^{-5}$.
Human Health Risk	Prevent ingestion/direct contact with soil located across OU3, below the applicable minimum points of compliance, containing non-carcinogens (including volatile and semi-volatile chemicals, pesticide, PCBs and metals) in excess of a HQ or HI greater than 1.
Human Health Risk	Prevent inhalation in future OU3 structures of carcinogens (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h) anthracene, and indeno(1,2,3-cd)pyrene) in vapors emanating from soil in excess of a $1x10^{-5}$ excess lifetime cancer risk.

In the process of scoping and conducting the RI, generic preliminary remediation goals (PRGs) were established. These PRGs were converted to OU3-specific remediation goals (RGs) following completion of the RI and 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 "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 $1x10^{-5}$ (*i.e.*, 1 in 100,000) excess lifetime cancer risk and a HQ or HI of 1, and were

established using the default exposure parameters provided by U.S. EPA or OU3-specific information. This TDC can be found at http://www.epa.ohio.gov/portals/30/rules/riskgoal.pdf.

The contaminants of concern and the RGs, now termed final remediation levels (RLs), for OU3 are shown in **Table 3, Contaminants of Concern / Remediation Levels**.

TABLE 3 CONTAMINANTS OF CONCERN (COCs) / REMEDIATION LEVELS (RLs)		
Medium	**COC**	**RL (mg/kg)**
Soils: Human Direct Contact*	Aluminum	73000
	Manganese	2710
	Vanadium	704
	Benzo(a)anthracene	9.16
	Benzo(a)pyrene	0.916
	Benzo(b)fluoranthene	9.16
	Dibenz(a,h)anthracene	0.916
	Indeno(1,2,3-cd)pyrene	9.16

*Only human direct contact with soils exceeded acceptable residential risk-based standards.

4.0 SUMMARY OF REMEDIAL ALTERNATIVES

A total of three (3) remedial alternatives were considered in the FS, as identified in **Table 4, Summary of OU3 Remedial Alternatives**. A brief description of the major features of each of the remedial alternatives follows. More detailed information about these alternatives can be found in the FS report.

TABLE 4 SUMMARY OF OU3 REMEDIAL ALTERNATIVES		
Media	**Alternative**	**Description of Remedial Alternative**
Soil		
	S1 ALT OU3-A	No action
	S2 ALT OU3-B	EC limiting property use to industrial with a 2' minimum POC, placing limitations on building construction and location; prohibiting construction of buildings within 150' buffer zone around OU10; and prohibiting excavation unless performed under an RMP.
	S3 ALT OU3-C	EC permitting residential and recreational use of portions of the OU with 4' minimum POC in residential areas and 2' minimum POC in recreational areas, placing limitations on building construction and location; prohibiting construction of buildings within 150' buffer zone around OU10; and prohibiting excavation unless performed under an RMP.

Media	Alternative	Description of Remedial Alternative
Soil		
	S4 ALT OU3-D	Active remediation through excavation and/or covering contaminated area with clean soils to establish a 4' minimum POC. EC permitting residential use with a 4' minimum POC, placing limitations on building construction and location; prohibiting construction of buildings within 150' buffer zone around OU10; and prohibiting excavation unless performed under an RMP.
Ground Water		
	G1	No Action
	G2	EC prohibiting use of ground water for potable and non-potable purposes, with the exception of environmental investigation and remediation.

4.1 No Action Alternatives (S1 and G1)

The "no action alternatives" for soil and ground water have been included in a single section for efficiency. The NCP requires evaluation of a no action alternative to establish a baseline for the comparison of other remedial alternatives. Under this alternative, no remedial activities or monitoring are conducted at OU3 to prevent exposure to contaminated media.

4.2 Soil Alternatives

Alternative S2: ALT OU3-B

This alternative would rely on the establishment of an EC, which includes:

- Prohibiting residential land use and the construction of buildings in a buffer zone within 150 feet of the slurry wall installed on OU10 in accordance with the proposed remedy for OU10;
- Prohibiting residential development of OU3 in the absence of additional remedial activities and restrict the land use to industrial;
- Limiting building construction to slab-on-grade structures within OU3, with no basements or crawl spaces permitted;
- Establishing a 2' minimum POC across OU3; and
- Prohibiting excavation by construction workers below the 2' minimum POC, unless the excavation is performed in accordance with an Ohio EPA-approved RMP. This RMP would address health and safety precautions to be taken by workers excavating below the POCs, as well as how to manage potentially contaminated soils, materials, and ground water.

Alternative S3: ALT OU3-C

This alternative would rely on the establishment of an EC, which includes:

- Prohibiting residential land use and the construction of buildings in a buffer zone within 150' of the slurry wall installed on OU10 in accordance with the proposed remedy for OU10;
- Limiting building construction to slab-on-grade structures within OU3, with no basements or crawl spaces permitted;
- Prohibiting residential development of OU3 in the defined area where residential direct-contact risk goals are exceeded (area will be restricted to recreational use only);
- Establishing a 4' minimum POC in residential areas and a minimum 2' POC in recreational areas; and
- Prohibiting excavation by construction workers unless the excavation is performed in accordance with an Ohio EPA-approved RMP. This RMP would address health and safety precautions to be taken by workers excavating below the POCs, as well as how to manage potentially contaminated soils, materials, and ground water.

Alternative S4: ALT OU3-D

This alternative would require active remediation of OU3, in order to meet residential land use standards. The remediation would use one or both of the components listed below to achieve the required 4' minimum residential POC:

Component D-1: Placement of a minimum of 2' of clean soil cover over the location posing unacceptable risk (since the sample exceeding risk goals was collected at the 2'-3' depth interval), thus achieving a 4' minimum POC for the residential land use scenario.

Component D-2[3]: Excavation of 0-4' or more of impacted soils, placement of up to 4' of clean soil backfill, as needed to meet the residential risk goal and achieve a 4' minimum POC. Excavated soils would be disposed off-site at a licensed solid waste facility, in accordance with applicable statutes and regulations.

Confirmation sampling would be performed following completion of remedial activities to (1) ensure that the appropriate POC is met within the remedial area, and (2) confirm that the soils remaining on OU3 meet risk-based remediation goals established for the OU.

[3] This component was identified as component D-3 in the preferred plan. The original component D-2 was eliminated based on discussions with the Painesville PRP Group.

This alternative would also rely on an EC, which includes:

- Prohibiting residential land use and the construction of buildings in a buffer zone within 150 feet of the slurry wall installed on OU10 in accordance with the proposed remedy for OU10;
- Limiting building construction to slab-on-grade structures within OU3, with no basements or crawl spaces permitted;
- Establishing a 4' minimum POC across OU3; and
- Prohibiting excavation by construction workers unless the excavation is performed in accordance with an Ohio EPA-approved RMP. This RMP would address health and safety precautions to be taken by workers excavating below the POCs, as well as how to manage potentially contaminated soils, materials, and ground water.

4.3 Ground Water Alternative G2: ALT OU3-B, ALT OU3-C, and ALT OU3-D

The ground water RAOs would be satisfied by the establishment of an EC, which includes:

- Prohibiting the extraction of ground water for potable and non-potable use, with the exception of environmental investigation, remediation and monitoring.

4.4 Cost Estimates and Time to Achieve RAOs

Alternative S1/G1 – ALT OU3-A

This baseline alternative has no associated costs, since no remedial activities, including the placement of use restrictions, would be performed. RAOs are not achieved under this alternative.

Alternative S2/G2 – ALT OU3-B

The estimates of cost and time to achieve RAOs for the EC/RMP industrial use alternative are as follows:

Estimated Capital Cost	$ 30,900
Estimated Annual Reporting Cost	$ 3,100
Estimated Present Worth Cost	$ 92,000
Estimated Construction Time	N/A
Estimated Time to Achieve RAOs	60 days

Alternative S3/G2 – ALT OU3-C

The estimates of cost and time to achieve RAOs for the EC/RMP residential/recreational use alternative are as follows:

Estimated Capital Cost	$ 30,900
Estimated Annual Reporting Cost	$ 3,100
Estimated Present Worth Cost	$ 92,000
Estimated Construction Time	N/A
Estimated Time to Achieve RAOs	60 days

Alternative S4/G2 – ALT OU3-D

The estimates of cost and time to achieve RAOs for the EC/RMP residential use alternative are as follows:

Estimated Capital Cost	$ 107,000 - $286,000
Estimated Annual Reporting Cost	$ 6,300
Estimated Present Worth Cost	$ 231,000 - $410,000
Estimated Construction Time	4 months
Estimated Time to Achieve RAOs	6 months

5.0 COMPARISON AND EVALUATION OF ALTERNATIVES

5.1 Evaluation Criteria

Ohio EPA considers eight (8) criteria, as outlined in the NCP, to evaluate the various remedial alternatives individually and compare them with each other in order to select a remedy. A more detailed analysis of the remedial alternatives can be found in the FS report. The eight (8) evaluation criteria, including the threshold, balancing and modifying criteria are shown below in **Table 5, Remedial Alternative Evaluation Criteria**.

TABLE 5 REMEDIAL ALTERNATIVE EVALUATION CRITERIA
Threshold Criteria (2)
Overall Protection of Public Health and the Environment - determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, treatment, etc.
Compliance with Applicable or Relevant and Appropriate Requirements (ARARs) - 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.

Balancing Criteria (5)
Long-Term Effectiveness and Permanence – evaluates the ability of an alternative to maintain protection of human health and the environment over time.
Reduction of Toxicity, Mobility, or Volume of Contaminants Through Treatment – evaluates the amount of contamination present, the ability of the contamination to move in the environment, and the use of treatment to reduce harmful effects of the principal contaminants.
Short-Term Effectiveness – evaluates the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation.
Implementability – evaluates the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.
Cost – includes estimated capital and annual operation and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.
Modifying Criterion (1)
Community Acceptance – considers whether the local community agrees with Ohio EPA's analyses and preferred alternative. Comments received on the Preferred Plan are an important indicator of community acceptance.

Evaluation Criteria 1 and 2 are threshold criteria required for acceptance of an alternative. Any acceptable remedy must comply with both of these criteria. Evaluation Criteria 3 through 7 are the balancing criteria used to select the best remedial alternative(s) identified in the Preferred Plan. Evaluation Criteria 8, community acceptance, is evaluated through public comment on the alternatives received during the comment period.

5.2 Analysis of Evaluation Criteria

This section examines how each of the evaluation criteria is applied to each of the remedial alternatives listed in **Section 4.0, Summary of Remedial Alternatives** and compares how the alternatives achieve the evaluation criteria.

Overall Protection of Human Health and the Environment

Evaluation of the overall protectiveness of the alternatives focuses on whether each alternative achieves adequate protection of human health and the environment and identifies how site risks posed through each pathway being addressed are eliminated, reduced or controlled by the alternative. This evaluation also includes consideration of whether the alternative poses any unacceptable short-term or cross-media impacts.

Soil Alternatives: Alternative S1 does not attempt to restrict contact with contaminated soils and therefore is not protective of human health and the environment. Alternatives S2 and S3 provide protection through implementation of an EC only. Alternative S4 provides protection through active remediation of contaminated soils and the implementation of an EC.
Ground Water Alternatives: Ground Water Alternative G1 does not attempt to restrict ground water use and therefore is not protective of human health and the environment. Alternative G2 is proposed for use with all of the soil alternatives. The restriction of ground water use through an EC is protective of human health.

Compliance with ARARs

Soil Alternatives: Alternative S1 does not comply with ARARs because it does not address current or future risks to human health and the environment. Alternatives S2 and S3 meet this criterion as long as the EC is established in compliance with Ohio Revised Code (ORC) §§ 5301.80 through 5301.92 and remains in place. Alternative S4 meets this criterion because it remediates OU3 to residential standards and establishes an EC.
Ground Water Alternatives: Alternative G1 does not comply with ARARs because it does not address current or future risks to human health and the environment. Alternative G2 complies with the ARARs identified for OU3. Under the alternative, use of ground water would be restricted for potable and non-potable use, with the exception of environmental investigations, through an EC. The EC would be established in compliance with ORC §§ 5301.80 through 5301.92.

Because the "no action alternatives" do not meet the two threshold criteria (overall protection of human health and the environment, and compliance with ARARs), they were eliminated from consideration under the remaining criteria.

Long-Term Effectiveness and Permanence

Soil Alternatives: Alternatives S2 and S3 meets the requirements of long-term effectiveness and permanence due to the EC and RMP which would be established for OU3, but they do not directly address contaminated soils. Alternative S4 fully meets the criterion of long-term effectiveness and permanence since it involves actively remediating contaminated soils through removal and/or covering to meet the applicable minimum 4' POC and establishes an EC and RMP.
Ground Water Alternatives: Alternative G2 meets the long-term effectiveness and permanence criteria by restricting ground water usage across OU3. Under the alternative, use of ground water would be restricted for potable and non-potable use, with the exception of environmental investigations, through an EC. In addition, ground water yield and quality across the Site are low, limiting use for potable purposes and further solidifying the permanence of this alternative.

Reduction of Toxicity, Mobility or Volume by Treatment

Soil Alternatives: None of the alternatives result in a reduction of toxicity, mobility or volume through treatment. Alternative S4 is the only alternative which involves active

remediation; however, it would result in contaminated soils being removed from OU3 or covered in place. Treatment would not be performed.
Ground Water Alternatives: Alternative G2 does not result in a reduction of toxicity, mobility or volume by treatment, since it relies strictly on an EC to restrict ground water use.

Short-Term Effectiveness

Soil Alternatives: Alternatives S2 and S3 are equivalent in short-term effectiveness. Alternatives S2 and S3 would become effective immediately upon filing of the EC. Neither of these alternatives impact the community, OU3 workers or the environment. Alternative S4 is an active remedy, which would take one to four months to complete. Alternative S4 poses a slight risk to the community due to increased traffic, but does not pose an increased risk due to exposure. Potential storm water impacts must be managed.
Ground Water Alternatives: Alternative G2 would become effective immediately upon recording the EC.

Implementability

Soil Alternatives: Alternatives S2 and S3 are easily implemented, since both involve execution of an EC, but no physical remediation. Alternative S4 is the most difficult to implement, since it involves the excavation and/or covering of contaminated soils within OU3, in addition to execution of an EC.
Ground Water Alternatives: Minimal obstacles also exist for implementation of Alternative G2. The owner is in agreement with placing an EC on OU3, and has already done so on other OUs within the Site.

Cost

Soil and Ground Water Alternatives: The estimated present worth cost (2015 value) for each remedial alternative, including implementation of Alternative G2 and operation and maintenance is as follows:

Alternative	Description	Estimated Cost (2015)
S1/G1	No Action Alternative	$0
S2/G2	Industrial Alternative	$92,000
S3/G2	Residential/Recreational Alternative	$92,000
S4/G2	Residential Alternative	$231,000-$410,000

Community Acceptance

Ohio EPA received comments from interested parties at the public meeting held on July 31, 2008, at the Painesville Township Hall and during the public comment period, which ran between June 26, 2008 and August 8, 2008. Those comments and Ohio EPA's responses are included in **Section 8.0, Responsiveness Summary**, of this Decision

Document. A copy of the OU3 public hearing transcript is located in **Appendix C** of this document.

5.3 Summary of Evaluation Criteria

A summary of the evaluation of the OU3 remedial alternatives is included in **Table 6, Evaluation of OU3 Remedial Alternatives**.

TABLE 6 EVALUATION OF OU3 REMEDIAL ALTERNATIVES

Remedial Alternatives	Threshold Criteria		Balancing Criteria					Modifying Criteria
	1. Protects Human Health & Environment	2. Compliance with ARARs	3. Long Term Effectiveness	4. Reduces T, M and/or V by Treatment	5. Short Term Effectiveness	6. Implementable	7. Costs	8. Community Acceptance
Soil								
S1 (ALT OU3-A) "No Action"	□	□	□	□	□	□	□	□
S2 (ALT OU3-B)	■	■	◘	□	■	■	■	■
S3 (ALT OU3-C)	■	■	◘	□	■	■	■	■
S4 (ALT OU3-D)	■	■	■	□	■	■	■	■
Ground Water								
G1	□	□	□	□	□	□	□	□
G2	■	■	■	□	■	■	■	■

■ = Fully Meets Criteria ◘ = Partially Meets Criteria □ = Does Not Meet Criteria

6.0 OHIO EPA'S SELECTED ALTERNATIVE

Ohio EPA's selected remedial alternative for OU3 is a combination of Soil Alternative S4 (ALT OU3-D), and Ground Water Alternative G2.

Based on information presently available, it is Ohio EPA's current judgment that the selected remedial alternative best satisfies the criteria defined in **Table 6, Evaluation of OU3 Remedial Alternatives**. The elements of the selected remedial alternative are as follows:

- **Remediation of SB-3A1-25**

  Soils in the area around location SB-3A1-25 (see **Figure 3, Area of Contamination that Currently Exceeds Risk**) would be remediated to achieve

residential risk based standards and a minimum 4' POC. This minimum POC would be obtained through performance of one or both of the following:

Component D-1

A minimum of 2' of clean soil would be placed over the contaminated area in order to reach the required minimum 4' POC (only 2' would be needed, since the contamination is located at least 2' below the current ground surface).

Component D-2

Contaminated soils would be excavated and up to 4' of clean soils would be placed in the area in order to meet the minimum 4' POC. These soils would be disposed off-site in accordance with applicable State and Federal statutes and regulations.

Performance Standard

The performance standard is met when documentation is submitted that soils within the 4' minimum POC of OU3, including those in the vicinity of SB-3A1-25, do not exceed the following OU3-specific RLs:

Medium	COC	RL (mg/kg)
Soils: Human Direct Contact	Aluminum	73000
	Manganese	2710
	Vanadium	704
	Benzo(a)anthracene	9.16
	Benzo(a)pyrene	0.916
	Benzo(b)fluoranthene	9.16
	Dibenz(a,h)anthracene	0.916
	Indeno(1,2,3-cd)pyrene	9.16

- **Establishment of an EC**

The EC would:

(1) Prohibit residential land use and the construction of buildings in a buffer zone within 150' of the slurry wall installed on OU10 (One Acre Site) in accordance with the recommended remedy for OU10;

(2) Prohibit the construction of sub-grade habitable structures (i.e., basements and/or crawl spaces) within OU3;

(3) Prohibit the extraction of ground water for potable and non-potable use, with the exception of environmental investigation, monitoring and treatment;

(4) Establish a 4' minimum POC across OU3; and

(5) Prohibit excavation by construction workers unless the excavation is performed in accordance with an Ohio EPA-approved RMP. This RMP would address health and safety precautions to be taken by workers excavating below the POCs, as well as how to manage potentially contaminated soils, materials, and ground water.

Performance Standards:

- The performance standard is met when documentation is provided to Ohio EPA demonstrating that the EC, including the restrictions identified in Section 6.0, has been recorded in the Lake County Recorder's Office.

- The performance standard is met when the restrictions identified in the EC are continually enforced, such that the RAOs (see Section 3.0) for the various media are met, until such institutional controls are no longer necessary.

- The performance standard is met when the property owner submits annual reports describing compliance with the EC.

7.0 Documentation of Significant Changes

Following the issuance of the Preferred Plan for OU3, significantly elevated levels of contaminants were found in ground water within OU18, located immediately south of OU3. In order to ensure that contaminants from OU18 were not impacting OU3, additional ground water investigations were conducted by the Painesville PRP Group. Based on those investigations, the boundary between OU3 and OU18 was relocated to provide an additional buffer between contamination in OU18 and OU3. The new position is approximately 100' north of the original OU3/OU18 boundary (see **Figure 4, Revised Operable Unit 3 Boundary Map**).

The new boundary bisects SB-3A1-25, which requires remediation under the selected remedy. Contamination in the vicinity of SB-3A1-25, which is located within OU3, north of the new boundary, will be remediated as specified in this Decision Document. The current property owner, Tierra Solutions, Inc., may or may not choose to remediate the contaminated portion of SB-3A1-25 located within OU18, south of the new boundary, during implementation of the OU3 remedy.

Three components for potential remediation of soils in the SB-3A1-25 area were included in the Preferred Plan. The Painesville PRP Group indicated during an August 3, 2015 discussion with Ohio EPA that the original component D-2, which provided the option of beneficial re-use of contaminated soils within non-residential portions of OU3, will not be utilized. Therefore, Ohio EPA has removed that component from the OU3 Decision Document. The remediation of OU3 will be performed using one or both of the remaining components, as specified in future Ohio EPA-approved RD/RA documents

and outlined in **Section 6.0, Ohio EPA's Selected Alternative**. The decision will be determined, in part, by restrictions posed by Dominion East Ohio, since the northern boundary of the high-pressure gas main right-of-way bisects location SB-3A1-25.

Ohio EPA has also determined that it would be more appropriate to maintain the applicable minimum POC across OU3 through an EC, rather than through an Operation and Maintenance (O&M) Agreement, as was proposed in the OU3 Preferred Plan. Under the EC, the property owner would be required to submit an annual report describing compliance with the EC, including the 4' minimum POC. Excavation below the 4' minimum POC would be prohibited unless performed in accordance with an Ohio EPA-approved RMP, in order to protect workers and ensure appropriate management of contaminated soils, materials and ground water.

8.0 Responsiveness Summary

On July 31, 2008, Ohio EPA presented the Preferred Plan for OU3 and OU15 at a public information session and hearing at the Painesville Township Hall. Oral and written comments were accepted at this meeting and during the comment period which ran from June 26, 2008 through August 8, 2008.

One technical and two non-technical comments regarding the OU3 Preferred Plan were received during the public comment period. The comments and Ohio EPA's responses are provided below:

Comment #1

This was not a legal public hearing, because: information about OU3 and OU15 in the Local Public Document Rooms (LPDRs, in Morley Library and Fairport Library) was not kept up to date, and the required thirty day notice was not given.

Ohio EPA Response:

The OU3 and OU15 hearing was public noticed and carried out in accordance with Ohio's rules and regulations.

Copies of the OU3 and OU15 Preferred Plan documents were provided directly to staff in both Morley Library and Fairport Library by Ohio EPA prior to issuance of the public notice.

As required, Ohio EPA published a public notice at least 30 days prior to the public hearing. On June 30, 2008, a public notice appeared in The News Herald, which is the largest local newspaper of general circulation in the Painesville, Ohio area. This public notice announced the July 31, 2008 public information session and hearing and provided a brief Site history and summary of the preferred plans for both OU3 and OU15. The notice also was published in Ohio EPA's Weekly Review.
In addition, two weeks before the public hearing, Ohio EPA's Public Interest Center issued a news release and citizen advisory to interested parties.

Comment #2

It is not proper to consider OU3, which surrounds OU10 on three sides apart from OU10, for two reasons:

1 – The millions of pounds of Persistent, Bio accumulative and Toxic (PBT) chemical waste that Diamond Shamrock reported burying in OU10 is being ignored. It may pass through OU3 on its way down gradient to Lake Erie, where it would create hazards.

2 – OU10 has increased groundwater flow through OU3 (and OU6), making the ground in OU3 and OU6 less stable. The known instability of this ground has increased the chance of a rapid release of large volumes of PBT waste into Lake Erie. That could be disastrous!

Ohio EPA's Response:

OU3 does not surround OU10 on three sides. Prior to issuance of the OU3 Preferred Plan, boundary maps were revised to eliminate a narrow piece of property between the OU10 landfill and Lake Erie, which was erroneously included as part of OU3. The updated boundary map was included in the OU3 Preferred Plan (see **Figure 2, Operable Unit 3 Location Map**).

While it is true that the landfill within OU10 contains contaminants which are considered to be persistent, bioaccumulative and toxic, those contaminants are contained within the landfill slurry walls and are currently being addressed by the Painesville PRP Group and Ohio EPA.

The current OU10 property owner, Tierra Solutions, Inc., has recently performed additional investigations which have documented that contamination has been contained by the slurry wall surrounding the OU10 landfill and that the OU10 ground water extraction system, which maintains an inward hydraulic gradient, is working. **Figure 5, Operable Unit 10 Ground Water Contour Map** of the Decision Document presents the current ground water contours for OU10, which indicate contamination is not migrating from OU10 onto OU3 and OU6. In addition, the stability of OU3 and OU6 are not impacted by OU10.

Based on the information presented in the above bullet points, it is appropriate to evaluate OU3 separately from OU10.

Comment #3

"Will the Ohio EPA be held accountable for any and all health concerns that may occur if the plan is approved? "

Ohio EPA Response:

Upon completion of remediation under a future Remedial Design/Remedial Action (RD/RA) Order, OU3 will meet residential and commercial/recreational standards and will be protective of human health and the environment. Compliance with these risk-based standards will rely, in part, on an Environmental Covenant (EC) to restrict land and ground water use, as well as maintain minimum points of compliance (POCs) across OU3. The EC will contain an annual reporting requirement to ensure that the minimum applicable POCs are maintained.

All written comments received during the public comment period are available for review at Ohio EPA's Northeast District Office, located at 2110 East Aurora Road, Twinsburg, Ohio, and at the Site's public document repositories, located at the Morley Public Library (184 Phelps St., Painesville, Ohio) and the Fairport Harbor Public Library (335 Vine St., Fairport Harbor, Ohio). A stenographic record of the public hearing portion of the meeting is located in **Appendix C, Operable Units 3 and 15 Public Hearing Transcript**.

FIGURE 1
Diamond Shamrock Location Map

DIAMOND SHAMROCK PAINESVILLE WORKS SITE – LAKE COUNTY, OHIO

(Map modified from Bing Maps, www.bing.com, 2014)

FIGURE 2
Operable Unit 3 Location Map

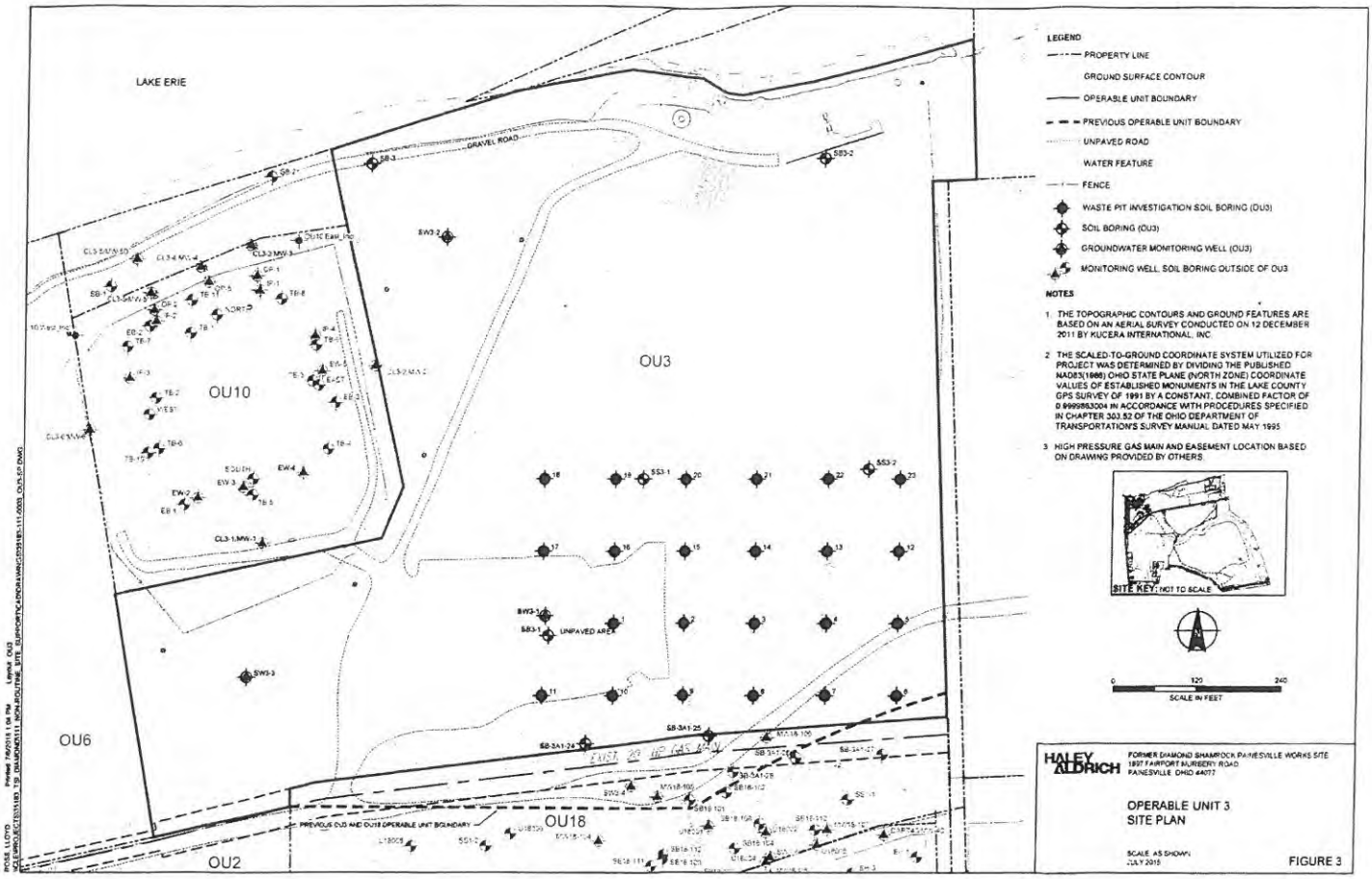
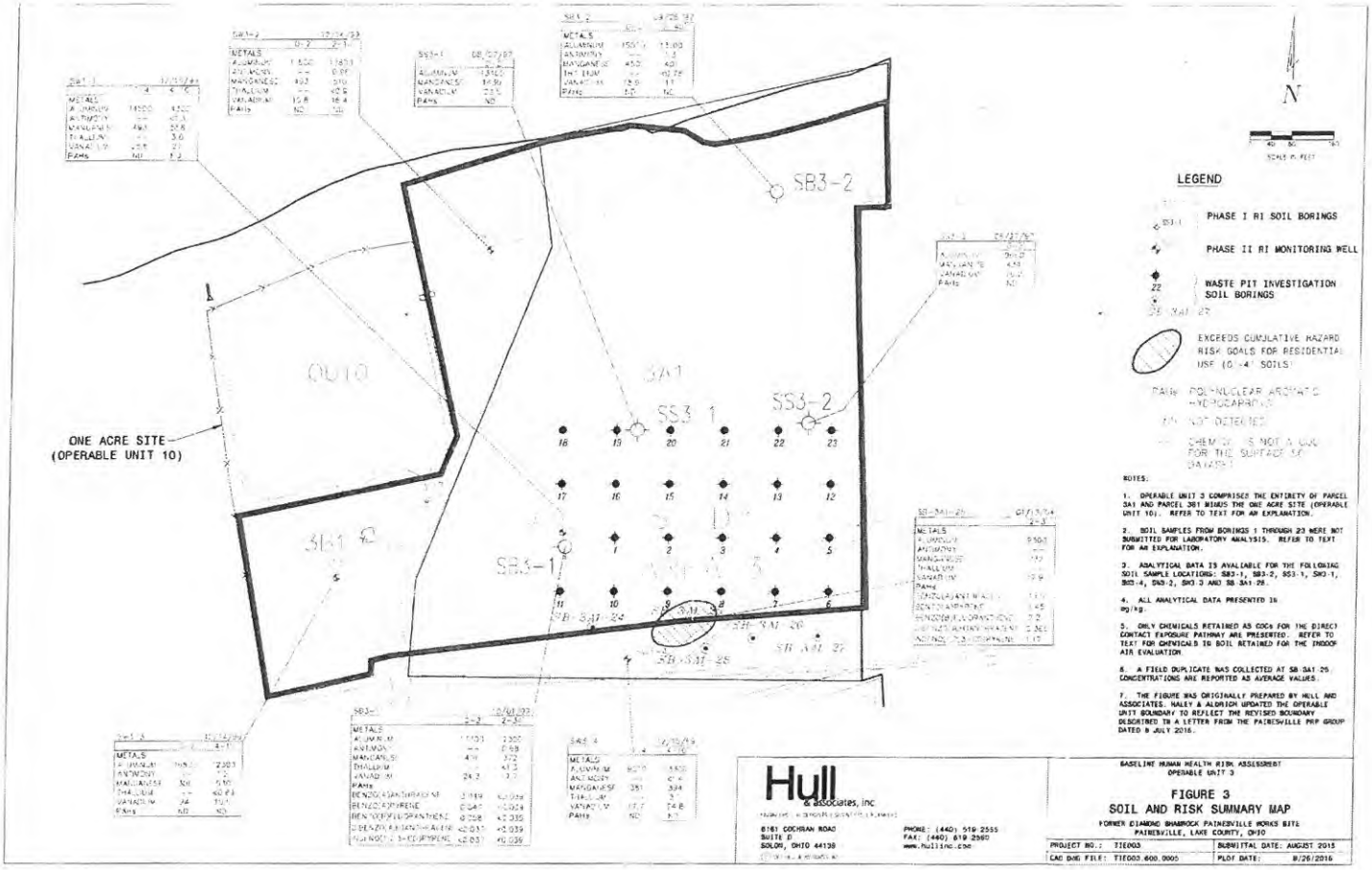

LAKE ERIE
GRAVEL ROAD
OU3
OU10
OU6
OU18
OU2
UNPAVED AREA
PREVIOUS OU3 AND OU18 OPERABLE UNIT BOUNDARY
LEGEND
PROPERTY LINE
GROUND SURFACE CONTOUR
OPERABLE UNIT BOUNDARY
PREVIOUS OPERABLE UNIT BOUNDARY
UNPAVED ROAD
WATER FEATURE
FENCE
WASTE PIT INVESTIGATION SOIL BORING (OU3)
SOIL BORING (OU3)
GROUNDWATER MONITORING WELL (OU3)
MONITORING WELL, SOIL BORING OUTSIDE OF OU3
NOTES
1. THE TOPOGRAPHIC CONTOURS AND GROUND FEATURES ARE BASED ON AN AERIAL SURVEY CONDUCTED ON 12 DECEMBER 2011 BY KUCERA INTERNATIONAL, INC.
2. THE SCALED-TO-GROUND COORDINATE SYSTEM UTILIZED FOR PROJECT WAS DETERMINED BY DIVIDING THE PUBLISHED NAD83(1986) OHIO STATE PLANE (NORTH ZONE) COORDINATE VALUES OF ESTABLISHED MONUMENTS IN THE LAKE COUNTY GPS SURVEY OF 1991 BY A CONSTANT, COMBINED FACTOR OF 0.9999953204 IN ACCORDANCE WITH PROCEDURES SPECIFIED IN CHAPTER 303.52 OF THE OHIO DEPARTMENT OF TRANSPORTATION'S SURVEY MANUAL DATED MAY 1995
3. HIGH PRESSURE GAS MAIN AND EASEMENT LOCATION BASED ON DRAWING PROVIDED BY OTHERS.
SITE KEY: NOT TO SCALE
0
120
240
SCALE IN FEET
HALEY & ALDRICH
FORMER DIAMOND SHAMROCK PAINESVILLE WORKS SITE
1897 FAIRPORT NURSERY ROAD
PAINESVILLE, OHIO 44077
OPERABLE UNIT 3
SITE PLAN
SCALE: AS SHOWN
JULY 2015
FIGURE 3

FIGURE 3
Area of Contamination that Currently Exceeds Risk



NOTES:

1. OPERABLE UNIT 3 COMPRISES THE ENTIRETY OF PARCEL 3A1 AND PARCEL 3B1 MINUS THE ONE ACRE SITE (OPERABLE UNIT 10). REFER TO TEXT FOR AN EXPLANATION.
2. SOIL SAMPLES FROM BORINGS 1 THROUGH 23 WERE NOT SUBMITTED FOR LABORATORY ANALYSIS. REFER TO TEXT FOR AN EXPLANATION.
3. ANALYTICAL DATA IS AVAILABLE FOR THE FOLLOWING SOIL SAMPLE LOCATIONS: SB3-1, SB3-2, SS3-1, SW3-1, SW3-4, SW3-2, SW3 3 AND SB 3A1-25.
4. ALL ANALYTICAL DATA PRESENTED IN mg/kg.
5. ONLY CHEMICALS RETAINED AS COCs FOR THE DIRECT CONTACT EXPOSURE PATHWAY ARE PRESENTED. REFER TO TEXT FOR CHEMICALS TO BE RETAINED FOR THE INDOOR AIR EVALUATION.
6. A FIELD DUPLICATE WAS COLLECTED AT SB 3A1 25. CONCENTRATIONS ARE REPORTED AS AVERAGE VALUES.
7. THE FIGURE WAS ORIGINALLY PREPARED BY HULL AND ASSOCIATES. HALEY & ALDRICH UPDATED THE OPERABLE UNIT BOUNDARY TO REFLECT THE REVISED BOUNDARY DESCRIBED IN A LETTER FROM THE PAINESVILLE PRP GROUP DATED 8 JULY 2016.

Hull & associates, inc
6161 COCHRAN ROAD
SUITE D
SOLON, OHIO 44139
PHONE: (440) 519 2555
FAX: (440) 519 2560
www.hullinc.com

BASELINE HUMAN HEALTH RISK ASSESSMENT
OPERABLE UNIT 3

FIGURE 3
SOIL AND RISK SUMMARY MAP

FORMER DIAMOND SHAMROCK PAINESVILLE WORKS SITE
PAINESVILLE, LAKE COUNTY, OHIO

PROJECT NO.: 116003	SUBMITTAL DATE: AUGUST 2015
CAD DWG FILE: 116003.600.0005	PLOT DATE: 8/26/2016

FIGURE 4
Revised Operable Unit 3 Boundary Map

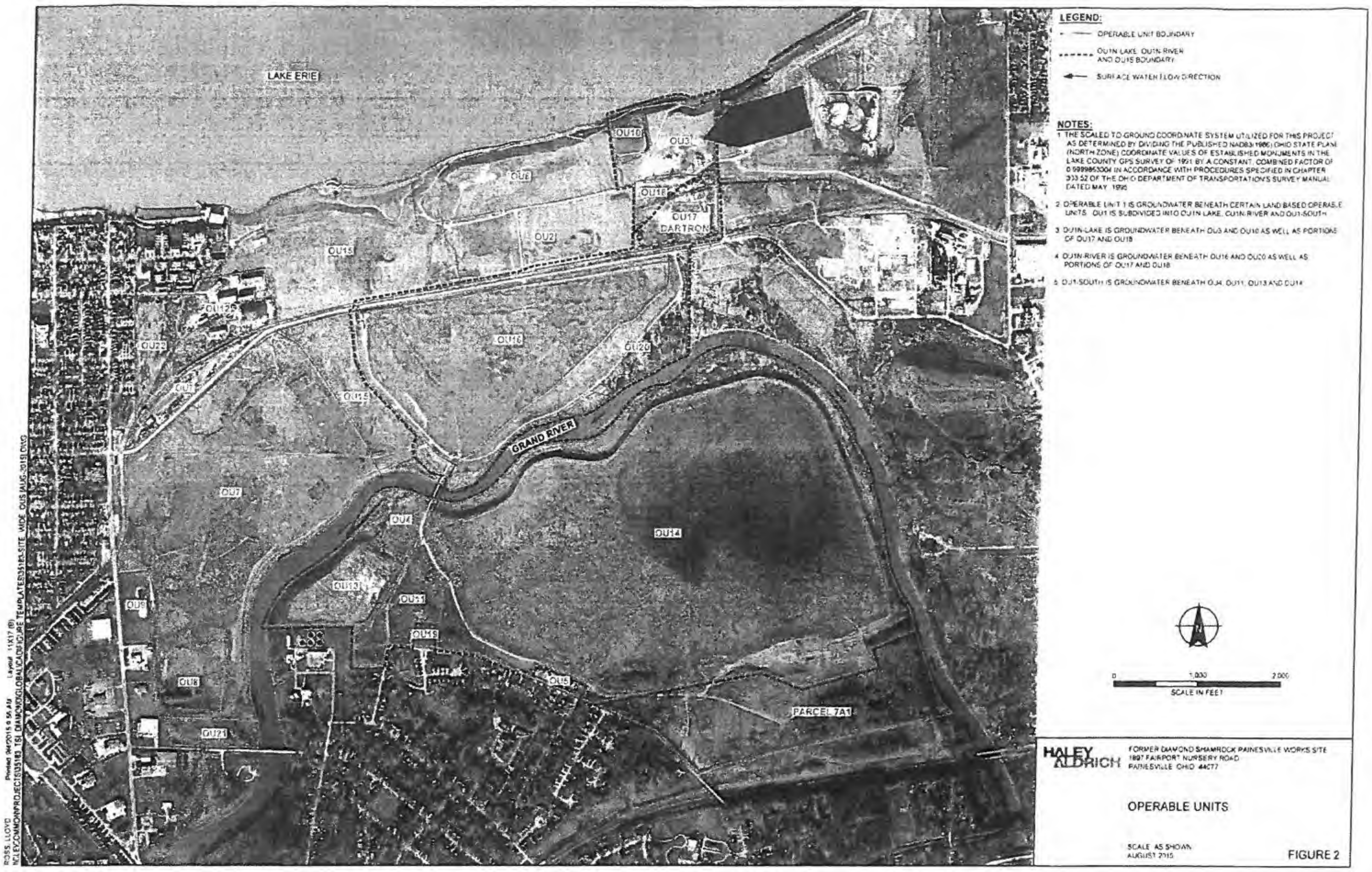
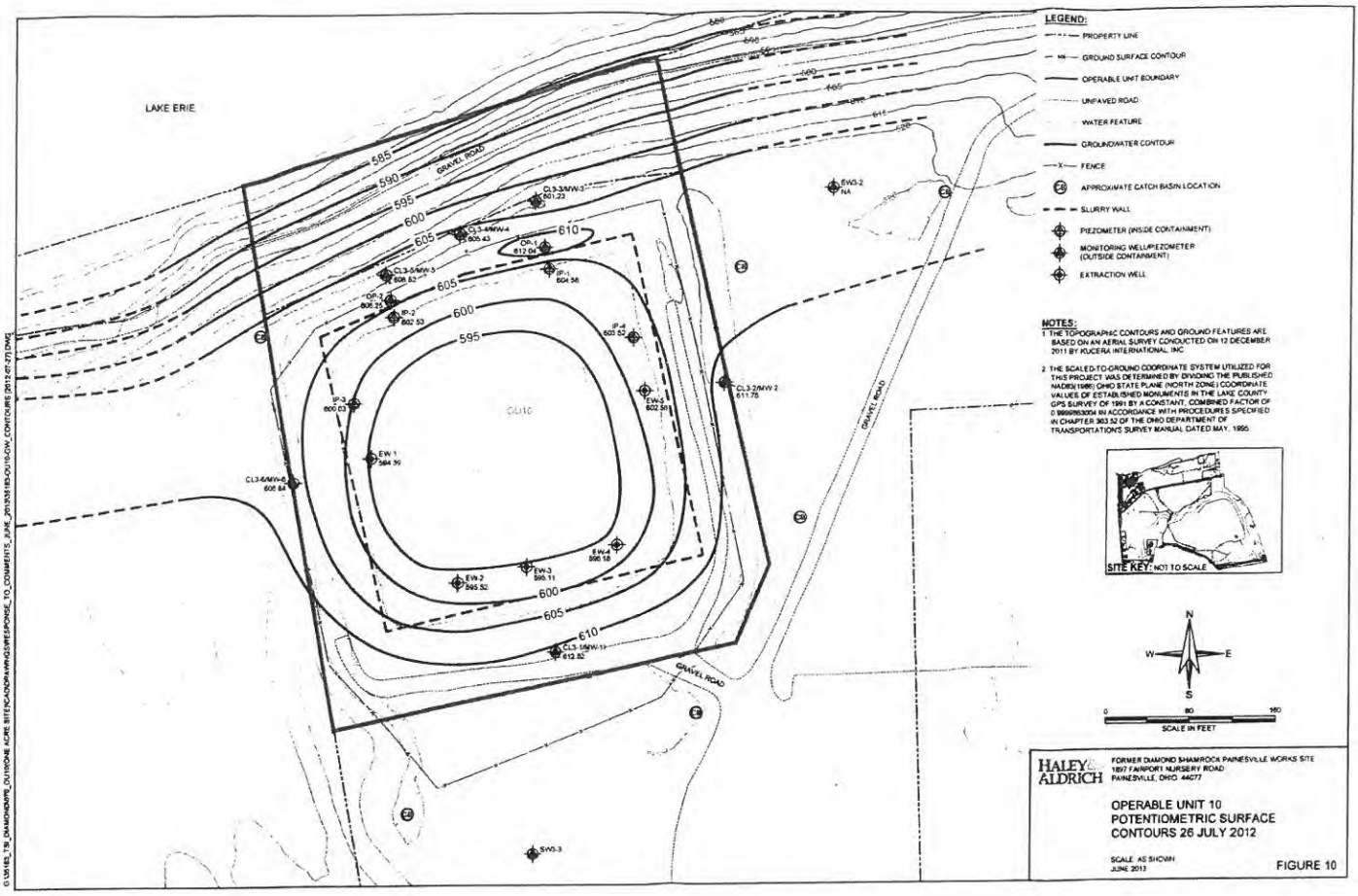

LAKE ERIE
OU10
OU3
OU2
OU18
OU17 DARTRON
OU2
OU15
OU12
OU16
OU22
OU20
OU1
OU15
GRAND RIVER
OU7
OU4
OU14
OU13
OU11
OU9
OU19
OU8
OU5
OU21
PARCEL 7A1
LEGEND:
OPERABLE UNIT BOUNDARY
OU1N LAKE, OU1N RIVER AND OU15 BOUNDARY
SURFACE WATER FLOW DIRECTION
NOTES:
1. THE SCALED TO-GROUND COORDINATE SYSTEM UTILIZED FOR THIS PROJECT AS DETERMINED BY DIVIDING THE PUBLISHED NAD83 (1986) OHIO STATE PLANE (NORTH ZONE) COORDINATE VALUES OF ESTABLISHED MONUMENTS IN THE LAKE COUNTY GPS SURVEY OF 1991 BY A CONSTANT, COMBINED FACTOR OF 0.999985300 IN ACCORDANCE WITH PROCEDURES SPECIFIED IN CHAPTER 333.52 OF THE OHIO DEPARTMENT OF TRANSPORTATION'S SURVEY MANUAL DATED MAY, 1996
2. OPERABLE UNIT 1 IS GROUNDWATER BENEATH CERTAIN LAND BASED OPERABLE UNITS. OU1 IS SUBDIVIDED INTO OU1N-LAKE, OU1N-RIVER AND OU1-SOUTH
3. OU1N-LAKE IS GROUNDWATER BENEATH OU3 AND OU10 AS WELL AS PORTIONS OF OU17 AND OU18
4. OU1N-RIVER IS GROUNDWATER BENEATH OU16 AND OU20 AS WELL AS PORTIONS OF OU17 AND OU18
5. OU1-SOUTH IS GROUNDWATER BENEATH OU4, OU11, OU13 AND OU14
0
1,000
2,000
SCALE IN FEET
HALEY ALDRICH
FORMER DIAMOND SHAMROCK PAINESVILLE WORKS SITE
1997 FAIRPORT NURSERY ROAD
PAINESVILLE, OHIO 44077
OPERABLE UNITS
SCALE: AS SHOWN
AUGUST 2015
FIGURE 2

FIGURE 5
Operable Unit 10 Ground Water Contour Map


LAKE ERIE
GRAVEL ROAD
GRAVEL ROAD
GRAVEL ROAD
585
590
595
600
605
610
OU-10
EW-1
EW-2
EW-3
EW-4
EW-5
IP-1
IP-2
IP-3
IP-4
OP-1
OP-2
CL3-3/MW-3
CL3-4/MW-4
CL3-5/MW-5
CL3-6/MW-6
CL3-15/MW-15
CL3-2/MW-2
SW3-2
SW3-3
LEGEND:
PROPERTY LINE
GROUND SURFACE CONTOUR
OPERABLE UNIT BOUNDARY
UNPAVED ROAD
WATER FEATURE
GROUNDWATER CONTOUR
FENCE
APPROXIMATE CATCH BASIN LOCATION
SLURRY WALL
PIEZOMETER (INSIDE CONTAINMENT)
MONITORING WELL/PIEZOMETER (OUTSIDE CONTAINMENT)
EXTRACTION WELL
NOTES:
1 THE TOPOGRAPHIC CONTOURS AND GROUND FEATURES ARE BASED ON AN AERIAL SURVEY CONDUCTED ON 12 DECEMBER 2011 BY KUCERA INTERNATIONAL INC
2 THE SCALED-TO-GROUND COORDINATE SYSTEM UTILIZED FOR THIS PROJECT WAS DETERMINED BY DIVIDING THE PUBLISHED NAD83(1986) OHIO STATE PLANE (NORTH ZONE) COORDINATE VALUES OF ESTABLISHED MONUMENTS IN THE LAKE COUNTY GPS SURVEY OF 1991 BY A CONSTANT, COMBINED FACTOR OF 0.9999763004 IN ACCORDANCE WITH PROCEDURES SPECIFIED IN CHAPTER 303.32 OF THE OHIO DEPARTMENT OF TRANSPORTATION'S SURVEY MANUAL DATED MAY, 1995
SITE KEY: NOT TO SCALE
N
W
E
S
0
80
160
SCALE IN FEET
HALEY & ALDRICH
FORMER DIAMOND SHAMROCK PAINESVILLE WORKS SITE
1897 FAIRPORT NURSERY ROAD
PAINESVILLE, OHIO 44077
OPERABLE UNIT 10
POTENTIOMETRIC SURFACE
CONTOURS 26 JULY 2012
SCALE AS SHOWN
JUNE 2013
FIGURE 10

Appendix A Glossary of Terms

Applicable or Relevant and Appropriate Requirements (ARARs): Those rules that strictly apply to remedial activities at the site or those rules whose requirements would help achieve the remedial goals for the site.
Baseline Risk Assessment: An evaluation of the risks to humans and the environment posed by a site in the absence of any remedial action, which also determines the extent of cleanup needed to reduce potential risk levels to within acceptable ranges.
Carcinogen: A chemical that causes cancer.
CERCLA: Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended, 42 U.S.C. 9601 et seq. A federal law that regulates cleanup of hazardous substances sites under the U.S. EPA Superfund Program.
Contaminants of Concern (COCs): Chemicals identified at the site that are present in concentrations that may be harmful to human health or the environment.
Decision Document: A statement issued by the Ohio EPA giving the director's selected remedy for a site and the reasons for its selection.
Ecological Receptor: Animals or plant life exposed or potentially exposed to chemicals released from a site.
Environmental Covenant (EC): A servitude arising under an environmental response project that imposes activity and use limitations and that meets the requirements established in ORC Section 5301.82.
Exposure Pathway: Route by which a chemical is transported from the site to a human or ecological receptor.
Feasibility Study (FS): A study conducted to ensure that appropriate remedial alternatives are developed and evaluated such that relevant information concerning the remedial action options can be presented to a decision-maker and an appropriate remedy can be selected.
Hazardous Substance: A chemical that may cause harm to humans or the environment.
Hazardous Waste: A waste product listed or defined by RCRA that may cause harm to humans or the environment.
Human Receptor: A person/population exposed to chemicals released at a site.
Monitoring Well: A well installed to collect ground water samples for the purpose of physical, chemical, or biological analyses to determine the amounts, types, and distribution of contaminants in ground water beneath a site.
NCP: National Oil and Hazardous Substances Pollution Contingency Plan, codified at 40 C.F.R. Part 300 (1990), as amended. A framework for remediation of hazardous substance sites specified in CERCLA.
Operation and maintenance (O&M): Long-term measures taken at a site, after the initial remedial actions, to assure that a remedy remains protective of human health and the environment.
Performance Standard: Measures by which Ohio EPA determines if RAOs are being met.
Preferred Plan: The plan that evaluates the preferred remedial alternative chosen by Ohio EPA to remediate the site in a manner that best satisfies the evaluation criteria.

Present Worth Cost: Estimated current cost, or value, of the future remedial costs to be expended, typically discounted at the current market rate. Provides a solid basis for comparing costs of each of the remedial alternatives.
RCRA: Resource Conservation and Recovery Act of 1976, as amended, 42 U.S.C. 6901 et seq. A federal law that regulates the handling of hazardous wastes.
Remedial Action Objectives (RAO): Specific remedial goals for reducing risks posed by the site.
Remedial Investigation (RI): A study conducted to collect information necessary to adequately characterize the site for the purpose of developing and evaluating effective remedial alternatives.
Responsiveness Summary: A summary of all comments received concerning the Preferred Plan and Ohio EPA's response to the comments.
Risk-based Remedial Goal: Final cleanup levels identified in the Decision Document along with the RAOs and performance standards
Sediment: Topsoil, sand and minerals washed from the land into water, usually after rain or snow melt.
Water Quality Criteria: Chemical, physical and biological standards that define whether a body of surface water is unacceptably contaminated. These standards are intended to ensure that a body of water is safe for fishing, swimming and as a drinking water source. These standards can be found in OAC Chapter 3745-1.

Appendix B Primary Contaminants of Concern

A total of five (5) primary COCs have been identified that pose the greatest potential risk to human health and the environment at OU3. Additional details on each primary COC (from the Agency for Toxic Substances and Disease Registry (ATSDR Toxicological Profiles) are provided below.

Aluminum is the most abundant metal in the earth's crust. It is always found combined with other elements such as oxygen, silicon, and fluorine. Aluminum as the metal is obtained from aluminum-containing minerals. Small amounts of aluminum can be found dissolved in water. Aluminum is used for beverage cans, pots and pans, airplanes, siding and roofing, and foil. Aluminum is often mixed with small amounts of other metals to form aluminum alloys, which are stronger and harder. Individuals who breathe large amounts of aluminum dusts can have lung problems, such as coughing or abnormal chest X-rays. Some workers who breathe aluminum dusts or aluminum fumes have decreased performance in some tests that measure functions of the nervous system. Some people with kidney disease store a lot of aluminum in their bodies and sometimes develop bone or brain diseases which may be caused by the excess aluminum. The Department of Health and Human Services (DHHS) and the EPA have not evaluated the carcinogenic potential of aluminum in humans. Aluminum has not been shown to cause cancer in animals.
Manganese occurs naturally in many kinds of rocks and in its pure form is silver in color. Elemental manganese does occur by itself in nature, but is combined with substances such as oxygen, sulfur or chlorine. It is used in steel production and gasoline as an additive. Manganese is considered an essential nutrient, meaning that manganese must be included in small amounts in your diet in order for you to be healthy. Manganese is naturally found in grains, beans, nuts, and other foods, as well as in drinking water and nutritional supplements. Exposure to high levels of manganese, which is more common when performing certain occupational duties such as welding or working in a steel mill, can lead to changes to the nervous system, causing individuals to become slow and clumsy. High levels of manganese in the air have been related to lung irritation and reproductive problems. Manganese has been determined not to be a human carcinogen.
Polycyclic Aromatic Hydrocarbons (PAHs; including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene) are a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbag e, or other organic substances. Some PAHs are manufactured. PAHs are primarily found in coal tar, crude oil, creosote, and roofing tar, but a few are used in medicines or to make dyes, plastics, and pesticides. Animal studies have shown that PAHs can cause harmful effects on the skin, body fluids, and the immune system after both short and long term exposure. Some PAHs have caused lung, stomach and skin cancer in laboratory animals during inhalation, ingestion or direct contact. The U.S. Department of Health and Human Services has determined that some PAHs may reasonably be expected to be human carcinogens.

Vanadium is a compound that occurs in nature as a white-to-gray metal, and is often found as crystals. Pure vanadium has no smell. It usually combines with other elements such as oxygen, sodium, sulfur, or chloride. Vanadium and vanadium compounds can be found in the earth's crust and in rocks, some iron ores, and crude petroleum deposits. Vanadium is mostly combined with other metals to make special metal mixtures called alloys. Vanadium in the form of vanadium oxide is a component in special kinds of steel that is used for automobile parts, springs, and ball bearings. Most of the vanadium used in the United States is used to make steel. Vanadium oxide is a yellow-orange powder, dark-gray flakes, or yellow crystals. Vanadium is also mixed with iron to make important parts for aircraft engines. Small amounts of vanadium are used in making rubber, plastics, ceramics, and other chemicals. Excess levels of vanadium can affect the cardiovascular, gastrointestinal, renal, reproductive and respiratory systems. Exposure to vanadium does not appear to cause cancer.

APPENDIX C
Operable Units 3 and 5 Public Hearing Transcript

OHIO ENVIRONMENTAL PROTECTION AGENCY
PUBLIC HEARING

- -:
:
In Re: :
:
Draft Preferred Plans for :
Cleanup Operable Units 3 and 15 :
Diamond Shamrock Painesville Works :
:
- -:

Transcript of proceedings before the Ohio Environmental Protection Agency, taken at Painesville Town Hall, 55 Nye Road, Painesville, Ohio 44077, on Thursday, July 31, 2008, commencing at 6:30 p.m.

APPEARANCES:

Darla Peelle, Ohio EPA Public Involvement Coordinator

Teri Heer, Ohio EPA, Site Coordinator

MS. PEELLE: The purpose of this public hearing is to accept comments on the official record regarding two draft plans to clean up operable units 3 and 15 -- two of 24 operable units or parcels comprising of the 1,100-acre Diamond Shamrock property in Painesville, Ohio.

Operable Unit 3 is a 25-acre parcel on the northeast corner of the property and is adjacent to Lake Erie. Sampling throughout the parcel found high concentrations of polycyclic aromatic hydrocarbons, also known as PAHs, in one location. Ohio EPA's preferred cleanup plan calls for removing these contaminated soils, covering with clean soils to prevent direct contact and restricting future use of the portions of Operable Unit 3.

Operating Unit 15 is a 100-acre parcel located in the center the property and borders the Grand River and Lake Erie. An earlier cleanup removed soils contaminated with metals, volatile organic compounds and semi volatile organic compounds; however, two areas of contaminated soils remain. Ohio EPA's

preferred plan proposes to excavate contaminated soils, replace with clean soils and place restrictions on future use.

Written and oral comments received as a part of the official record are reviewed by Ohio EPA prior to a final action of the Director. To be included in the official record, written comments must be received by Ohio EPA by the close of business on August 8, 2008. Comments received after this date will not be considered as part of the official record for this hearing but may be reviewed as the opportunity arises.

Written comments can be filed with us this evening or submitted to Teri Heer, Site Coordinator, Ohio EPA's Northwest District office -- I'm sorry, Northeast -- 2110 East Aurora Road, Twinsburg, Ohio 44087 or by e-mail. This information also can be found in the agenda and in the presentation.

It is important for you to know that all comments, whether received this evening or provided in writing are given the same consideration.

I ask that all exhibits referred to in

your testimony be submitted to us this evening as part of the official record. This will help us ensure the accuracy of your testimony.

Questions and comments made at the public hearing will be responded to in a responsiveness summary. The Director, after taking into consideration the recommendations of the program staff and comments presented by the public, may issue or deny these plans. Once a final decision is made by the Director, the decision, along with the responsiveness summary, will be sent to the applicant, all persons who have submitted comments and all persons who have signed in for this evening's meeting.

Final actions of the Director are appealable to the Environmental Review Appeals commission also known as ERAC; the board is separate from Ohio EPA and reviews cases in accordance with Ohio's environmental laws and rules. Any ERAC decision is appealable to the Franklin County Court of Appeals. Any order of the Court of Appeals is appealable to the Supreme Court of Ohio.

This evening, each individual may

testify only once and speak for five minutes. Ohio EPA representatives cannot respond to comments or questions during the hearing; hearings afford citizens an opportunity to provide input. An Ohio EPA representative may ask clarifying questions of speakers to ensure that the record is as complete as possible.

If you have a question that was not asked or responded to during the information session, please ask it on the record and it will be addressed in writing in the responsiveness summary.

Because of the size of the attendance this evening, rather than fill out cards, I'm going to ask that if you wish to provide testimony, raise your hand. I will call upon you; when you are recognized, if you will stand toward the front of the room for the stenographer's benefit, state your name, spell it for the record and then proceed with your testimony.

Does anyone wish to provide testimony?

MR. BIMBER: I have a draft version of my comments. I wish to send you a final version later by e-mail.

MS. PEELLE: If you could state and spell your name, sir.

MR. BIMBER: Sure. I'm Russell M. Bimber.

MS. PEELLE: Spell your last name, Mr. Bimber.

MR. BIMBER: B-i-m-b-e-r.

MS. PEELLE: Thank you.

MR. BIMBER: A couple of pages from the back of my testimony, I have attached, on this draft version an e-mail I sent to a few people to try to encourage attendance here.

I was a research chemist for Diamond Alkali and successor companies, Diamond Shamrock, SDS Biotech, and Ricerca for 40 years starting in 1952. I now live at 156 Kendal Drive, Oberlin, Ohio -- that's Kendal in Oberlin. My e-mail address is randcbim@juno.com My phone number is (440) 774-6175.

First, I would like to inform you that they have copies of the DSCRT newsletters here. The official document room on the third-floor of Morley Public Library did not

have issues 11 and 12 of that newsletter and they did not even have a copy of the public notice of this meeting. And as I understand it, it is required that you provide the public notice, published in the local newspapers, 30 days in advance of any public meeting. I do not believe this was done. The public document room did not even have a copy of a July 18th news release, which I found with Mike Settles' name on it on the Ohio EPA web site, and it was dated, July 18th. If it was placed in any newspapers, it was probably some time on or after that date, so it would seem as though it is too early to be holding this meeting. But anyway, I expect we will proceed anyway.

If a legal notice was published, I should have received a mailed copy because I've repeatedly signed up to get any EPA notices concerning Diamond, and I have had significant involvement with the EPA's litigation of Diamond for more than a decade, this included the 1998 appeal of the Ohio EPA Director's Final Findings and Orders, DFFO, on the Painesville Works, that's Case Number EBR

43392, that stands for Environmental Board of Review, which was before renaming to the Environmental Review Appeals Commission, ERAC, which they now use.

EBR Number 433921, that appeal was dismissed as being too late because I waited for the Director's Final Findings and Orders to appear in the local public document room and I had to keep insisting to Teri that it be placed there, for a long time before I achieved the placement in the local public repositories. After that time, I think I should have been allowed time from that date, but I wasn't. I was too late. I mailed in testimony on Operable Unit 6 for a public hearing on July 7, 2005, which I could not attend and, even though I was not a member of the DSCRT, I've attended several of their meetings, even after moving at Oberlin. That's about 140 miles west -- excuse me 70, 140 round-trip.

The Diamond Shamrock Community Relations Team Newsletter 12, citing this meeting, was mailed to me postmarked July 11, afternoon. The DSCRT web site, at that time,

had been completely revised and updated by the time I got the newsletter. Now it includes newsletter 12, Summer of 2008. Newsletter 11, Fall of 2007, which I did not get, minutes of DSCRT meetings and other interesting information.

I checked the web site during the week ended June 28, and it had not been updated since November, 2006.

Today, I checked Ohio EPA's web site and found an EPA news release about this meeting, dated July 18. Isn't a 30-day notice still required for public meetings?

Second. I think it is not proper to consider Operable Unit 3, which surrounds Operable Unit 10 on three sides, apart from Operable Unit 10, because of the large amount of toxic waste buried in Operable Unit 10.

Over 3,000,000 pounds of hazardous chemicals, including more than 100,000 gallons of Persistent Bio-accumulative, and Toxic liquids in tanks of 10 to 18,000 gallons were buried in Operable Unit 10. The chlorinated solvents in these tanks are much denser than water, well above the Lake and so close, they

could get into Lake Erie very quickly, perhaps moving through Operable Units 3 or 6.

This process could be analogous to the horizontal flow of large wedge shaped pieces of earth, both east and west of Operable Unit 10 that were flushed into Lake Erie more than a decade ago when water from melting snow on the top of the bluff was temporarily dammed by ice frozen on the north face of the bluff then broke loose. This left a lot of fine clay on top of the ice on the lake hundreds of feet from shore and a temporary sandy gravel beach 10 to 25 feet wide, which a friend and I both walked on. It was a very long length of sandy gravel beach.

MS. PEELLE: You have one minute Mr. Bimber.

MR. BIMBER: Sure.

MS. PEELLE: Thank you.

You have one minute.

MR. BIMBER: Okay. All right.

I better skip on then. The last couple of pages I mention some references that could be useful to some of these other people here.

The important thing I wanted to say is

I believe it is still possible to recover about 100,000 gallons of hazardous chlorinated solvents from Operable Unit 10 simply by pumping out whatever liquids remain in about 10 large tanks. If this were done, it would make the other hazardous wastes there, which might otherwise not be likely to migrate, much safer.

The Persistent Bio-accumulative Toxic liquids in large tanks were impure chlorinated solvents; carbon tetrachloride, usually called Carbon Tet, hexachlorobenzene, known also as HCB, dissolved in Hexachlorobutadiene, HCBD. These and the chlorinated paraffins and chlorothalonil fungicide, which are major contaminants in this OP OU 10, are all known or suspected human carcinogens, in addition to damaging the liver and kidneys and showing other toxic properties.

The exact nature of these wastes was detailed extensively in a letter from John Licata of Diamond Shamrock to Ohio EPA in 1981 and then ODNR protested the existence of so many hazardous waste so close to the edge of the Lake in 1982 and that's what led to the

Woodward Kline study of 1986. These documents are all contained in Ohio EPA's Twinsburg headquarters. People who want to view these documents have to make an appointment to go there and see them.

Portions of some of this information that is most important, may be available, sort of hidden in these extensive documents, in the local public document rooms. But if you make an appointment to view certain records and can identify what record you want to see, Ohio EPA will dig them out and you can go there to view them and copy what you need.

Thank you.

MS. PEELLE: Thank you, Mr. Bimber.

Would someone else like to provide testimony?

My son-in-law us an auctioneer and I usually say going once, going twice. All right. If there are no further requests to present testimony we will end the hearing.

Remember that written comments will be accepted through the close of business on August 8, 2008. Again, these can be sent to

Teri Heer listed at the address on the agenda.

Thank you for participating in Ohio EPA's decision-making process. It was good to see all of you here this evening. The time is now 7:32 and this hearing is adjourned. Thank you.

(Hearing concluded.)

- - -

State of Ohio,)
) SS:
County of Cuyahoga.)

C E R T I F I C A T E

This certifies that the foregoing is a true and correct transcript of the proceedings had before the State of Ohio, Environmental Protection Agency, at the Painesville Township Hall, on Thursday, July 31, 2008, commencing at 6:30 p.m.

In Re:

Diamond Shamrock Draft Preferred Plans
To Clean up Operable Units 3 and 15

COURT REPORTER

FINCUN-MANCINI COURT REPORTERS
1801 East Ninth Street
Suite 1720
Cleveland, Ohio 44114
(216) 696-2272
(216) 696-2275 FAX

APPENDIX B

RD/RA SOW

Painesville PRP Group
c/o Glenn Springs Holdings, Inc.
5 Greenway Plaza, Suite 110
Houston, TX 77046
(713) 215-7622

July 11, 2018

Division of Emergency and Remedial Response
Ohio Environmental Protection Agency
Northeast District Office
2110 East Aurora Road
Twinsburg, Ohio 44087

Attention: Mr. Regan Williams

Subject: Remedial Design and Remedial Action (RD/RA) Work Plan for Operable Unit 3
Former Diamond Shamrock Painesville Works Site
Painesville, Ohio

Dear Mr. Williams:

Attached is the RD/RA Work Plan for Operable Unit 3 (OU3) of the Former Diamond Shamrock Painesville Works Site. The work plans were prepared by Haley & Aldrich consistent with the discussions at the scoping meeting held with Ohio EPA on March 7, 2018. The work plan is being submitted in anticipation of the signing of the director's final findings and orders for Remedial Design and Remedial Action at OU3. To accelerate the implementation of remedial actions at OU3, Glenn Springs is prepared to proceed with the proposed pre-design investigations upon receiving Ohio EPA's concurrence on the work plan.

If you have any questions or concerns, please contact Ms. Chris DeJarlais at (517) 625-4138.

Sincerely,

Rick Passmore
Site Coordinator

Enclosure (1)

cc: Mr. Lloyd Ross

ec: Mr. Sig Williams, Ohio EPA, regan.williams@epa.ohio.gov
Mr. Ronald Shadrach, Ohio EPA, ronald.shadrach@epa.ohio.gov
Ms. Chris DeJarlais, christina_dejarlais@oxy.com
Bob Princic, Ohio EPA, bob.princic@epa.ohio.gov
Rod Beals, Ohio EPA, rodney.Beals@epa.ohio.gov
Emily Patchen, Ohio EPA, emily.patchen@epa.ohio.gov
Clint White, Ohio EPA, clint.white@epa.ohio.gov
Michael O'Callaghan, SLK, mocallaghan@slk-law.com

HALEY ALDRICH

www.haleyaldrich.com

REMEDIAL DESIGN/REMEDIAL ACTION WORK PLAN
OPERABLE UNIT 3
FORMER DIAMOND SHAMROCK PAINESVILLE WORKS SITE
PAINESVILLE, OHIO

by Haley & Aldrich, Inc.
Cleveland, Ohio

for Glenn Springs Holdings, Inc.
Houston, Texas

File No. 129937
July 2018

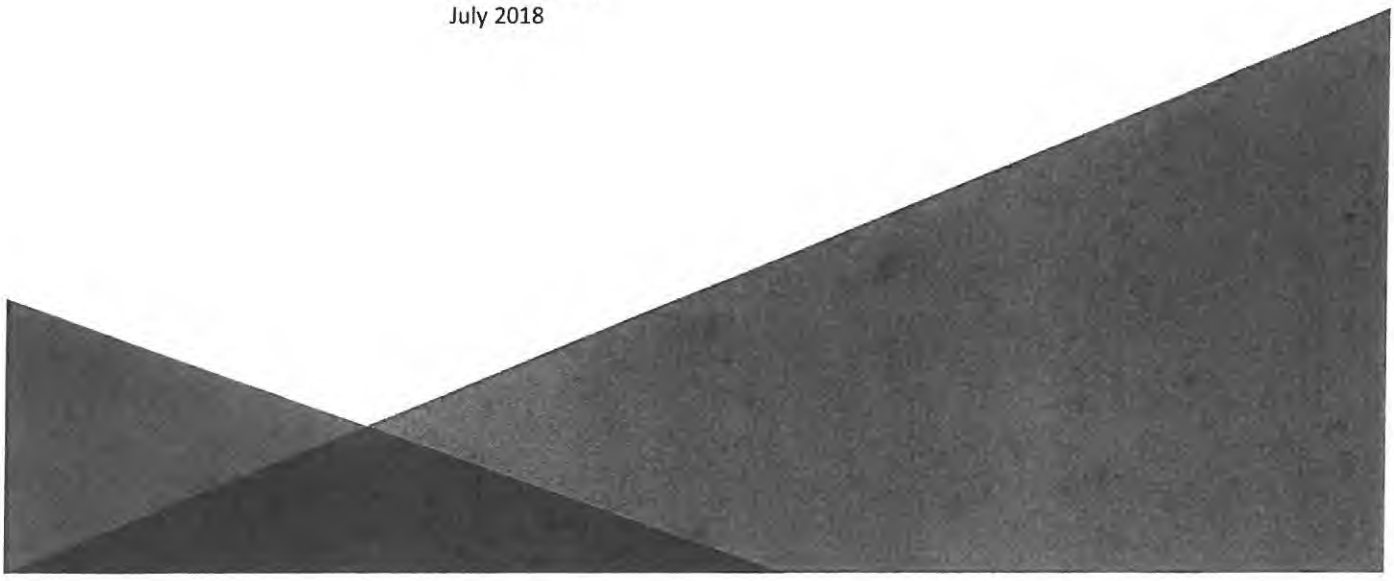


Table of Contents

Table of Contents

List of Tables

List of Figures

1. Introduction

On October 14, 2016, Ohio EPA's Division of Environmental Response and Revitalization issued proposed directors final findings and orders (DFFO) authorized under Chapters 3734 and 6111 of the Ohio Revised Code, requiring the commencement and completion of Remedial Design and Remedial Action (RD/RA) at Operable Unit 3 (OU3) of the former Diamond Shamrock Painesville Works Site (Site). While the Final Order negotiations are not complete, this RD/RA Work Plan is proposed to accelerate the field activities in anticipation of the final orders.

The Site is located at 1897 Fairport Nursery Road, Painesville Township, Lake County, Ohio (Figure 1). OU3 is in the northeast portion of the Site and is north of Fairport Nursery Road (Figure 2). OU3 is owned by Mariana Properties Inc., a wholly-owned subsidiary of Glenn Springs Holdings, Inc (Glenn Springs). The proposed DFFO sets forth the responsibilities of Occidental Chemical Corporation (OxyChem) and the Ohio EPA until the RD/RA is completed. Glenn Springs, an affiliate of OxyChem will manage the activities associated with the RD/RA for OU3.

The DFFO was proposed based on the presence of elevated concentrations of contaminants in shallow soil that exceed applicable standards, the need to formalize prohibitions (potable groundwater use and land use) and to formalize the subsurface soil management plan. This Remedial Design/Remedial Action Work Plan fulfills Task I and II of the requirements of the DFFO and associated Generic Scope of Work.

2. Background

2.1 PHYSICAL SETTING AND SITE HISTORY

OU3 is approximately 25-acres in size and is located on the northeastern portion of the Site, adjacent to Lake Erie. The Site is approximately 1,100 acres and is in northern Lake County, Ohio. The Site is bordered by industrial and vacant property to the east, residential and commercial/industrial properties to the west, Lake Erie to the north, and residential property to the south (Figure 1). The Grand River bisects the Site from east to west. The Site has been divided into 24 Operable Units (Figure 2).

The Site includes all known areas of manufacturing or other industrial use, areas of disposal, and other areas, that are or may be contaminated. Diamond Shamrock began shutting down the Site in 1972, and the last Site operations ceased in 1977. Portions of the Site were sold to other entities, which performed a variety of commercial and industrial activities within its boundaries.

On July 25, 1999, Ohio EPA approved the Remedial Investigation (RI) Report for Phase I activities at the Site. These activities included the collection and analysis of soil, groundwater, surface water and sediment samples across the Site. On September 22, 2003 the Phase II RI Report was approved by Ohio EPA. The Phase I and Phase II RI Reports identified public health and environmental risks at the Site resulting from contaminated groundwater, soil, surface water, and sediment. The RI Reports characterized the nature and extent of the contaminants released at the Site and the potential risks to human health and safety and the environment.

In September 2007, Ohio EPA approved the Feasibility Study (FS) Report for OU3, which presented an array of remedial alternatives to address required remedial actions within the OU. In June 2008, Ohio EPA notified the public of its Preferred Plan for remediation of OU3 and solicited public comments. The Preferred Plan summarizes the OU3 information presented in the Phase I and Phase II RI and FS Reports and identifies and explains Ohio EPA's preferred alternative for the remedial action at OU3.

On July 31, 2008, Ohio EPA held a public meeting and hearing on the Preferred Plan. The public comment period ended on August 8, 2008. On December 1, 2015, Ohio EPA issued a Decision Document, which selected the remedy for the Site and included responses to the public comments in the form of a responsiveness summary.

2.2 SUMMARY OF OPERABLE UNIT CONDITIONS

OU3 is located in the northeastern corner of the Site adjacent to Lake Erie. It is bordered to the west by OU10 and the former OU6; to the south by OU18 and the former OU2; and to the east by a Cleveland Electric Illuminating Company (CEI) fly ash disposal facility, which is located outside of the Site boundaries. OU3 consists of vacant land except for a "pocket park" on the northeast corner, which was recently developed for Site-related social events, and equipment and clean material storage for other Site-related remedial activities.

Access to the One Acre Landfill, a hazardous waste disposal facility operated by Diamond Shamrock and located in OU10, is through the western portion of OU3. The central and eastern portions of OU3 have been used for material storage, parking, and other activities associated with the Site.

Generally, the subsurface geology at OU3 consists of fill over glacial till before bedrock is encountered. No groundwater supply wells are located within the immediate vicinity of the Site and the area is served by public water from Lake Erie. A groundwater divide, located south of OU3 and Lake Erie, influence groundwater flow direction beneath OU3 to the north.

Due to the poor yield of groundwater at the Site, the Ohio EPA has concurred with the Painesville PRP Group that potable use groundwater exposure pathways do not apply to the Former Diamond Shamrock Painesville Works Site. It should also be noted that groundwater beneath the Site is not of sufficient quality for potable use. Specifically, highly productive zones exist within the bedrock below the Site, but these zones primarily yield non-potable brine. For these reasons, it was determined that groundwater did not need to be evaluated for risk to human health, with the exception of direct contact by future construction workers and as a potential for migration of contamination to both the Grand River and Lake Erie.

The Phase I and Phase II RI Reports identified public health and environmental risks at the Site resulting from contaminated groundwater, soil, surface water, and sediment. The RI Reports 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 OU3 Human Health Baseline Risk Assessment (April 2007) identified that the excess lifetime cancer risk exceeded the risk goal of 1E-05 for a child receptor for direct contact with surface soil. Constituents in groundwater beneath OU3 were determined not to pose unacceptable risk to construction workers or for potential migration to Lake Erie.

The Baseline Ecological Risk Assessment (BERA) was necessary for OU3 to evaluate potential risks posed to ecological receptors. Although 17 COCs were carried through the BERA, it was determined that minimal ecological risk is posed by contaminants within OU3. These risks were due to aluminum, chromium and vanadium in surface soils (0 to 4 feet below ground surface). Hazard Quotients (HQ) for three evaluated species ranged from 1.49 to 1.94, which are slightly elevated when compared to the HQ limit of 1. However, it was concluded that it is likely that these risk levels will be reduced once redevelopment begins within OU3. Therefore, no remedial investigation/remedial action is proposed for ecological receptors.

2.3 REMEDIAL ACTION OBJECTIVES AND REMEDIATION LEVELS

An FS to define and analyze appropriate remedial alternatives was completed with Ohio EPA oversight and was approved in September 2007. As part of the RI/FS process, Remedial Action Objectives (RAOs) were developed in accordance with the National Contingency Plan, pursuant to the federal Comprehensive Environmental Response, Compensation and Liability Act of 1980, and U.S. EPA guidance. The RAOs are goals that a remedy should achieve in order to ensure protection of human health and the environment.

Per the Decision Document, the RAOs for OU3 include those listed in Table 1 below.

Table 1. Remedial Action Objectives

Groundwater	
Human Health Risk	Prevent ingestion/direct contact of groundwater across OU3 containing carcinogens in excess of a total excess lifetime cancer risk (for all contaminants) greater than $1x10^{-5}$
Human Health Risk	Prevent ingestion/direct contact of groundwater across OU3 containing noncarcinogens in excess of a HQ or HI greater than 1.
Human Health Risk	Prevent inhalation in future structures of carcinogens (including carbon tetrachloride) in vapors emanating from ground water in excess of a 1×10^{-5} excess lifetime cancer risk.
Soil	
Human Health Risk	Prevent ingestion/direct contact with soil located across OU3, below the applicable minimum POC, containing carcinogens (including volatile and semi-volatile chemicals, pesticide, PCBs and metals) in excess of a total excess lifetime cancer risk greater than $1x10^{-5}$
Human Health Risk	Prevent ingestion/direct contact with soil located across OU3, below the applicable minimum points of compliance, containing non-carcinogens (including volatile and semi-volatile chemicals, pesticides, PCBs and metals) in excess of a HQ or HI greater than 1.

In the process of scoping and conducting the RI, generic preliminary remediation goals (PRGs) were established. These PRGs were converted to OU3-specific remediation goals (RGs) following completion of the RI/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. These goals are given as $1x10^{-5}$ (i.e., 1 in 100,000) excess lifetime cancer risk and a Hazard Quotient or Hazard Index of 1.

Per the Decision Document, the COCs and the RGs, now termed final remediation levels (RLs), for OU3 are shown in Table 2 below[1].

Table 2. Remediation Levels

Medium	COC	RL (mg/kg)
Soils: Human Direct Contact	Benzo(a)anthracene	9.16
	Benzo(a)pyrene	0.916
	Benzo(b)fluoranthene	9.16
	Dibenz(a,h)anthracene	0.916
	Indeno(1,2,3-cd)pyrene	9.16

[1] RLs were also presented for aluminum, manganese and vanadium as they were evaluated in the baseline risk assessment as constituents of potential concern. Aluminum, manganese and vanadium maximum detected concentrations in soil were less than the applicable standards and therefore do not warrant remediation.

2.4 SELECTED REMEDIAL ALTERNATIVE AND PERFORMANCE STANDARDS

The selected remedial alternative, as described in the Decision Document, consists of the following:

- Delineation and remediation of the SB-3A1-25 area of concern. Remediation will include excavation and off-site disposal, covering with clean soil in place, or a combination of these two options.
- Establishment of an environmental covenant which would:
  - Prohibit residential land use and the construction of buildings in a buffer zone within 150 feet of the slurry wall installed on OU10 (One Acre Site) in accordance with the recommended remedy for OU10;
  - Prohibit the construction of sub-grade habitable structures (i.e., basements and/or crawl spaces) within OU3;
  - Prohibit the extraction of groundwater for potable and non-potable use, with the exception of environmental investigation, monitoring and treatment;
  - Establish a 4-foot minimum point of compliance (POC) across OU3; and
  - Prohibit excavation by construction workers, unless the excavation is performed in accordance with an Ohio EPA-approved risk management plan (RMP). This RMP would address health and safety precautions to be taken by workers excavating below the POCs, as well as how to manage potentially contaminated soils, materials, and groundwater.

For the first listed component of the selected remedy (delineation and remediation of the SB-3A1-25 area of concern), the performance standard is met when documentation is submitted that soils within the 4-foot minimum POC of OU3, including those in the vicinity of SB-3A1-25, do not exceed the OU3-specific RLs listed in Table 2 above.

For the second listed component of the selected remedy (establishment of an environmental covenant), the performance standard is met when:

- Documentation is provided to Ohio EPA demonstrating that the environmental covenant, including the restrictions identified for the selected remedial alternative (listed above in this section) has been recorded in the Lake County Recorder's Office;
- The restrictions identified in the environmental covenant are continually enforced, such that the RAOs (listed in the previous section) for the various media are met, until such institutional controls are no longer necessary; and
- The property owner submits annual reports describing compliance with the environmental covenant.

3. General Requirements

3.1 SITE ACCESS

The Site is owned by and under the control of the respondents therefore, no third-party access agreement is required.

3.2 REGULATORY COMPLIANCE PLAN

Based on the anticipated size of the remedial action, permits are not anticipated to be required from federal, state, or local regulatory authorities to execute this Work Plan, including the pre-design study, remedial design, or remedial action.

A below-ground high-pressure gas main is located immediately south of the OU3 boundary. Glenn Springs will coordinate with the utility company during execution of any work required within the gas line easement.

4. Pre-Design Studies Plan

Delineation of the SB-3A1-25 area of concern is necessary before remedial design/remedial action can proceed, as described below.

4.1 FIELD SAMPLING PLAN

Consistent with anticipated DFFO requirements, the objective of the field sampling plan is to address delineation at historical sampling location SB-3A1-25 (Figure 3). Laboratory analysis of a soil sample collected previously from this location indicates the presence of PAHs greater than the RLs at a depth of 2 to 3 feet.

The proposed scope of work includes collection of soil samples from a location (SB-3A1-25B) collected as close to SB-3A1-25 while still remaining in OU3, and three new locations (OU3-B101 through OU3-B103) (Figure 4, Table 3). Discrete soil samples will be collected from these four locations at depths of 0 to 2 feet and 2 to 4 feet below ground surface. The sampling intervals were selected to provide characterization for the residential point of compliance (0 to 4 feet) and to evaluate alternatives of excavation and cover. Soil samples will be submitted for analysis of PAHs in accordance with the Diamond Shamrock Painesville Works Site *Quality Assurance Project Plan* (QAPP) *for Remedial Design/Remedial Action and Supplemental Feasibility Study Sampling* (August 2007) and applicable addenda. In order to complete delineation efficiently and minimize the potential for additional mobilizations, soil samples will also be collected from the same depth intervals at seven additional locations, extracted, and put on hold. Field sampling procedures will be completed consistent with the Standard Operating Procedures in QAPP.

The approach described above will be executed in a dynamic manner that will depend upon field conditions. If observations indicate the potential or likely presence of soil contamination at locations initially put on hold, they may be submitted for laboratory analysis instead. Similarly, boring/sampling depths may be extended, or additional borings advanced beyond the horizontal limits of those currently proposed, based on such field observations. Such flexibility in sampling execution may limit the number of rounds of investigation planning, execution, data evaluation in support of achieving the proposed schedule and overall efficiency. Additional sampling or data collection will occur beyond that described herein if deemed necessary for the design. The Ohio EPA will be consulted prior to any reduction to the pre-design investigation.

Material from the borings will be visually inspected and screened in the field using a PID equipped with an 11.7 eV lamp consistent with the methods described in the QAPP, and stratigraphy and other relevant observations will be recorded. If unexpected, non-soil materials are encountered, a discrete sample of each material will be collected for laboratory analysis. Analyses for such materials may be expanded beyond PAHs subject to discussion with Ohio EPA.

Upon completion of sampling, borings will be backfilled in accordance with the methods described in the QAPP. A licensed surveyor will obtain ground surface elevations and boring locations based on the Site coordinate system. The samples will be submitted to Eurofins Lancaster Laboratories and the analytical results will be validated in accordance with the QAPP.

4.2 HEALTH AND SAFETY PLAN

The work to be conducted for OU3, per the field sampling plan, will be executed in accordance with the HASP (July 2011) developed for the Site, which is incorporated herein by reference.

4.3 QUALITY ASSURANCE PROJECT PLAN (QAPP)

The work to be conducted for OU3, per the field sampling plan, will be executed in accordance with the QAPP prepared for the Site. The QAPP and associated addenda are incorporated herein by reference.

5. Remedial Design Requirements

The remedial design procedures discussed below have been stipulated in accordance with the Generic Statement of Work (SOW) provided as Appendix B of the DFFO.

5.1 GENERAL REQUIREMENTS FOR PLANS AND SPECIFICATIONS

Construction plans, specifications and supporting plans to implement the remedial action will be prepared and submitted to Ohio EPA as defined in the Purpose and Description of the Remedial Action section of the Generic SOW, the Decision Document and/or the DFFO.

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

The plans and specifications will include the following:

- Discussion of the design strategy and design basis including:
  - Compliance with requirements of the Decision Document and the DFFO and all applicable regulatory requirements
  - Minimization of environmental and public health impacts
- Discussion of the technical factors of importance including:
  - Use of currently accepted environmental control measures and technologies
  - The constructability of the design
  - Use of currently accepted construction practices and techniques
- Description of the assumptions made and detailed justification for those assumptions;
- Discussion of possible sources of error and possible operation and maintenance problems;
- Tables listing equipment and specifications; and
- Appendices that may include the following:
  - Sample calculations (one example presented and clearly explained for significant or unique calculations);
  - Derivation of equations essential to understanding the report; and
  - Results of laboratory tests, field tests and any additional studies.

5.2 DESIGN PHASES

The selected remedy for OU3 consists of excavation and/or adding cover material (and an environmental covenant). Because the design and implementation of the remedy is not expected to be complex, and in the interest of efficiency and the proposed schedule, only two design phases are proposed (i.e., intermediate and prefinal design combined into final design).

5.2.1 Preliminary Design

A Preliminary Design, which reflects the design effort at approximately 30% completion, will be submitted to the Ohio EPA for review and comment. At this stage of the design process, existing conditions at the Site that may

influence the design and implementation of the selected RA will have been verified. The Preliminary Design will demonstrate that the basic technical requirements of the remedial action and any permits required have been addressed. The Preliminary Design will 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 will include the following elements, at a minimum, as applicable:

- Preliminary plans, drawings and sketches, including design calculations;
- Results of additional field sampling;
- Outline of design specifications;
- Expected long-term operation and monitoring requirements;
- Real estate and easement requirements;
- Preliminary construction schedule, including contracting strategy; and
- Revised cost estimate.

The supporting data and documentation necessary to define the functional aspects of the RA will be submitted with the Preliminary Design. The technical specifications will be outlined in a manner that anticipates the scope of the final specifications. Design calculations will be included with the Preliminary Design completed to the same degree as the design they support. Any revisions or amendments to the Preliminary Design required by the Ohio EPA will be incorporated into the subsequent design phase.

The Preliminary Design will also include the Pre-Design Studies Report for the activities described in Section 4. The Pre-Design Studies report will include a summary of objectives, technical approach/methodology, significant observations/findings, conclusions, and recommendations, with sample analysis results provided in tabular and graphic format.

5.2.2 Final Design

Comments, if any, from Ohio EPA on the Preliminary design will be incorporated into the Final Design. The Final Design will include the following:

- Design Plans and Specifications
- Construction Quality Assurance Plan
- Performance Standard Verification Plan
- Risk Management Plan (which includes any operation and maintenance requirements)
- Remedial Action Implementation Plan
- Estimated Cost of the Remedial Action
- Health and Safety Plan

The purpose and content of the above plans is described in the DFFO Generic SOW. As indicated in the Decision Document for OU3, Ohio EPA determined that it would be more appropriate to maintain the applicable minimum POCs across OU3 through an EC, rather than through an Operation and Maintenance (O&M) Plan. The environmental covenant will include a requirement to submit an annual report describing compliance with the environmental covenant, including POCs. Excavation below the applicable minimum POCs would be prohibited unless performed in accordance with an Ohio EPA-approved Risk Management Plan noted above.

Corrections or changes will be made based on Ohio EPA comments on the Final Design submittals. The revised Final Design will then be submitted in its 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 will be commensurate to what could be in a bid package to invite contractors to submit bids for the construction project.

5.3 ESTIMATED COST OF THE REMEDIAL ACTION

The cost estimate developed in the Feasibility Study will be refined to reflect the preliminary and detailed plans and specifications being developed for the RA. The cost estimate will include both capital and operation and maintenance costs for the entire project. The final estimate will be based on the revised final approved plans and specifications. It will include any comments by Ohio EPA during the preliminary design review, and reflect current prices for labor, material and equipment.

5.4 REMEDIAL ACTION IMPLEMENTATION PLAN

As mentioned above, a Remedial Action Implementation Plan (RAIP) will be prepared and submitted with the Final Design. The RAIP will help coordinate implementation of the various components of the RA. It will include a schedule for the RA that identifies timing for initiation and completion of all critical path tasks. The RAIP will specifically identify dates for completion of the project and major interim milestones in conformance with the approved RD/RA Work Plan schedule. The RAIP is a management tool, which will address the following topics:

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

5.5 COMMUNITY RELATIONS SUPPORT

The Site has a Community Relations Program in place through the Diamond Shamrock Community. Relations Team (DSCRT). Glenn Springs will cooperate and support the Ohio EPA and DSCRT in community relations efforts.

6. Remedial Action Construction Requirements

Following approval of the Final Design submittal by the Ohio EPA, the designed remedial action will be performed in accordance with the plans, specifications, Construction Quality Assurance Plan (CQAP), 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 will include the activities described below

6.1 PRECONSTRUCTION INSPECTION AND CONFERENCE

A preconstruction inspection and conference will be conducted with 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 CQAP to ensure that Site specific considerations are addressed. The CQAP will be submitted to 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; and
- 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 preconstruction inspection and conference will be held within 10 days of the award of the construction contract. The preconstruction inspection and conference will be documented by a designated person and minutes (Preconstruction Inspection and Conference Report) will be transmitted to all parties in attendance.

6.2 DESIGN CHANGES DURING CONSTRUCTION

During construction, unforeseen Site conditions, changes in estimated quantities of required construction materials and other problems associated with the project may develop. Such changing conditions may require either major or minor changes to the approved Final Design. Certain design changes will require approval of 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. Examples of 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;
- 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 DFFO, the Generic SOW, the Decision Document, the RD/RA Work Plan, and the approved Final Design;
- Those that result in a significant delay in the completion of the RA;
- Any other changes that alter or are outside of the scope or intent of the approved remedial design.

Ohio EPA will be notified of other changes made during construction through routine communications and monthly progress reports.

6.3 REMEDIAL ACTION CONSTRUCTION COMPLETION AND ACCEPTANCE

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

6.3.1 Final Construction Conference and Inspection

Based on the nature of the selected remedy, and to promote efficiency and meet the proposed schedule, the Prefinal Construction Conference and Prefinal Inspection will be combined into the Final Construction Conference and Inspection. It is anticipated that Ohio EPA will have made interim inspections during work execution.

Within seven days of making a preliminary determination that construction is complete, written notification (Notification of Preliminary Completion of Construction/Final Inspection) will be provided to Ohio EPA and a final construction conference will be held with the construction contractor(s) to discuss procedures and requirements for project completion and closeout. Participants will include the Project Manager for the Glenn Springs, the Site Coordinator for Ohio EPA, all contractors involved with construction of the remedial action and the remedial design agent (person(s) who 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 Risk Management Plan submission, if it has not been submitted already;
- Cleanup responsibilities;
- Demobilization activities;
- Security requirements for project transfer.

Following the final construction conference, a final inspection of the project will be conducted. The final inspection will be led by Ohio EPA with assistance from Glenn Springs, if requested. The 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 and approved Final Design. Any outstanding deficient or incomplete construction items should be identified and noted during the inspection.

If any work scope items remain deficient or incomplete, the inspection will be considered a prefinal inspection requiring another final inspection and report.

6.3.2 Construction Completion Report and Certification

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

- A brief description of any outstanding construction items from the final inspection and an indication that the items were satisfactorily resolved, if applicable;

- A synopsis of the work defined in the approved RD/RA Work Plan and the Final Design and certification that this work was performed;
- 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; and
- Certification that the constructed RA or component of the RA is operational and functional.

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

6.3.3 Community Relations Support

Support will be provided for Ohio EPA's community relations program and DSCRT during remedial action implementation as required.

7. Operation and Maintenance/Performance Monitoring

Performance monitoring and operation and maintenance procedures will be implemented as required by the approved Performance Standard Verification Plan and approved Risk Management Plan, once it is demonstrated that the RA components are operational and functional. The approved Risk Management Plan will be incorporated into the environmental covenant for OU3.

7.1 COMPLETION OF REMEDIAL ACTION REPORT

At the completion of the remedial action, a Completion of Remedial Action Report will be prepared and submitted to Ohio EPA. The RA will be considered complete when the goals, performance standards and cleanup standards for the RA as stated in the Decision Document, the DFFO, the Generic SOW, the RD/RA Work Plan and the approved Final Design (including changes approved during construction) have been met. The report will 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 will include, but not be limited to the following elements:

- Synopsis of the remedial action and certification of the design and construction;
- Listing of the cleanup and performance standards as established in the Decision Document and the DFFO, and any amendments to those standards with an explanation for adopting the amendments;
- Summary and explanation of any changes to the approved plans and specifications. An explanation of why the changes were necessary will be included and, where necessary, Ohio EPA approval of the changes will be documented;
- Summary of operation of treatment systems including monitoring data, indicating that the remedial action met or exceeded the performance standards or cleanup criteria; and
- Explanation of any monitoring and maintenance activities to be undertaken at the Site in the future.

8. Reporting Requirements

8.1 MONTHLY PROGRESS REPORTS DURING REMEDIAL DESIGN AND REMEDIAL ACTION CONSTRUCTION

Monthly progress reports will be provided to Ohio EPA during the design and construction phases of the remedial action and will contain the information listed below.

- A description of the work performed during the reporting period and estimate of the percentage of the RD/RA completed;
- Summaries of all findings and sampling during the reporting period;
- Summaries of all changes made in the RD/RA during the reporting period, indicating consultation with Ohio EPA and approval by Ohio EPA of those changes, when necessary;
- Summaries of all contacts with representatives of the local community, public interest groups or government agencies during the reporting period;
- 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;
- Summaries of actions taken and being taken to rectify problems;
- Summaries of actions taken to achieve and maintain cleanup standards and performance standards;
- Changes in personnel during the reporting period;
- Projected work for the next reporting period; and
- Inspection reports, sampling data, laboratory/ monitoring data, etc.

8.2 SUMMARY OF REPORTS AND SUBMITTALS

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

- RD/RA Work Plan
  - Health and Safety Plan (incorporated existing)
  - Regulatory Compliance Plan
  - Pre-Design Studies Plan (incorporated in RD/RA Work Plan)
    - Quality Assurance Project Plan (incorporated existing)
    - Field Sampling Plan (incorporated existing)
- Monthly Progress Reports During Remedial Design
- Preliminary Design Documents
  - Pre-Design Studies Report (to be included with Preliminary Design Documents)
- Final Design Documents
  - Construction Quality Assurance Plan
  - Remedial Action Implementation Plan
  - Performance Standard Verification Plan
  - Risk Management Plan
  - Health and Safety Plan (incorporated existing)
- Preconstruction Inspection and Conference Report
- Monthly Progress Reports During Remedial Action
- Notification of Preliminary Completion of Construction/Final Inspection

- Final Construction Inspection and Conference Report
- Final Risk Management Plan
- Construction Completion Report
- Progress Reports During O&M/Performance Monitoring
- Completion of Remedial Action Report

9. Anticipated Schedule

The following presents the anticipated schedule for completion of major remedial design and remedial action milestones for OU3. The schedule is predicated on the assumption that the remedy will consist of excavation and/or adding additional cover of soil impacted by PAHs.

RD/RA WORK PLAN (including Pre-Design Work Plan)	**Approximate Duration**
Ohio EPA review/comment	30 days
Final RD/RA Work Plan	15 - 30 days
Ohio EPA review/approval	30 days
PRE-DESIGN STUDIES IMPLEMENTATION	
Field implementation, including receipt of all laboratory analyses	60-days after approval of Pre-Design Work Plan
REMEDIAL DESIGN	
Preliminary Design with Pre-Design Studies Report	30 days after pre-design study data available
Ohio EPA review/comment	30 days
Final Design	15 - 30days
Ohio EPA review/approval	30 days
REMEDIAL ACTION CONSTRUCTION	
Preconstruction Conference/Inspection	15-30 days after final design approval
Remedial Action Implementation	30 days after Preconstruction Conference
Final Construction Conference/Inspection	30 days after Preconstruction Conference
Draft Construction Completion Report and Certification	45 days after Final Inspection
Ohio EPA review/comment	30 days
Final Construction Completion Report and Certification	15 – 30 days
Ohio EPA review/approval	30 days

Based on the above, it is anticipated that the Final Construction Completion Report and Certification can be approved between 315 to 465 days after submittal of this work plan.

TABLES

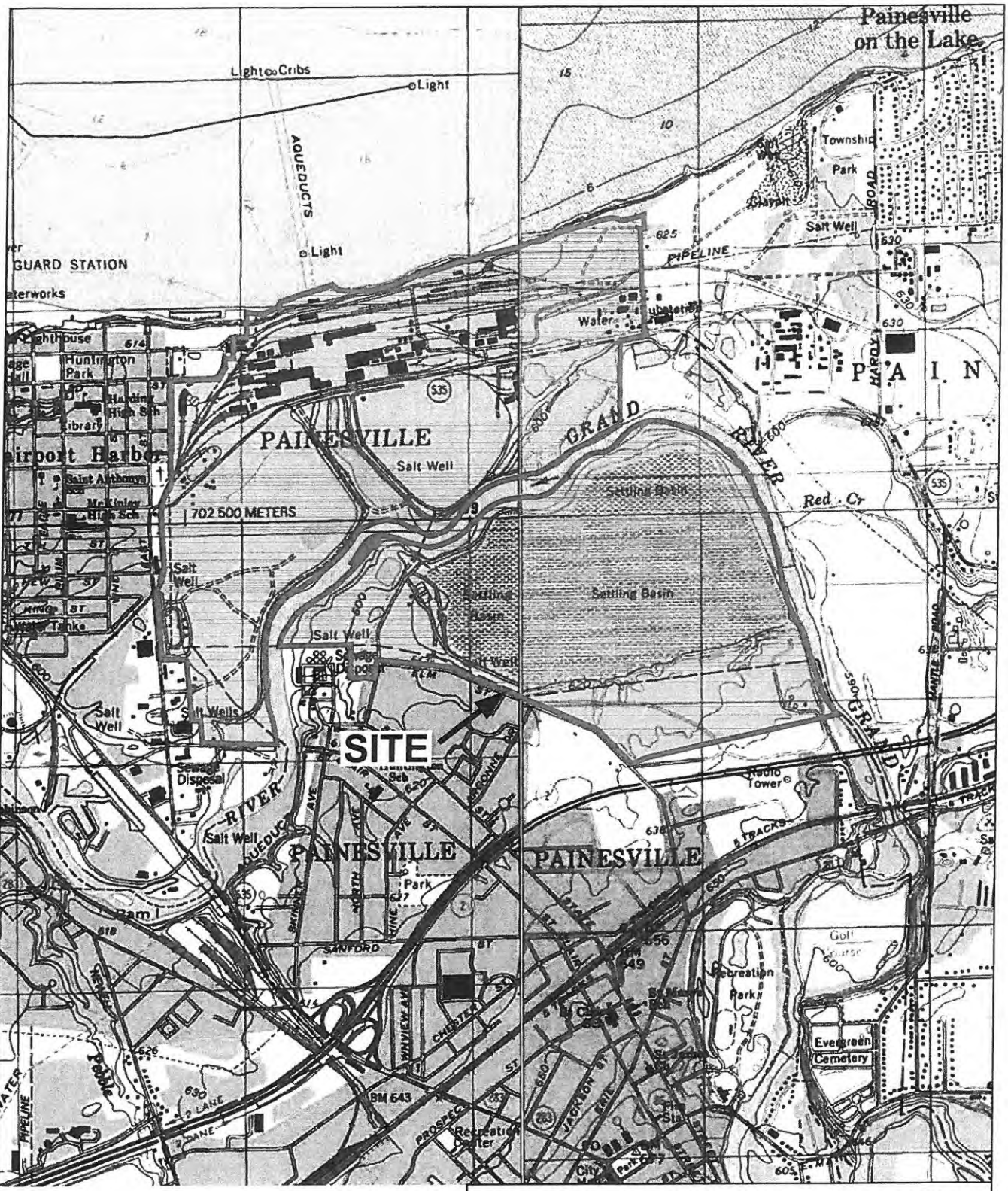
TABLE 3
PRE-DESIGN STUDIES SAMPLING AND ANALYSIS SUMMARY
OPERABLE UNIT 3
FORMER DIAMOND SHAMROCK PAINESVILLE WORKS SITE
PAINESVILLE, OHIO

Sample Location	Sample ID	Sample Depth	LABATORY ANALYSIS PAHs - 8270C	Notes
SOIL SAMPLES				
SB-3A1-25B	SB-3A1-25-MMDDYY-TIME	0 - 2 ft	1	
	SB-3A1-25-MMDDYY-TIME	2 - 4 ft	1	
OU3-B101	OU3-B101-MMDDYY-TIME	0 - 2 ft	1	
	OU3-B101-MMDDYY-TIME	2 - 4 ft	1	
OU3-B102	OU3-B102-MMDDYY-TIME	0 - 2 ft	1	
	OU3-B102-MMDDYY-TIME	2 - 4 ft	1	
OU3-B103	OU3-B103-MMDDYY-TIME	0 - 2 ft	1	
	OU3-B103-MMDDYY-TIME	2 - 4 ft	1	
OU3-B104	OU3-B104-MMDDYY-TIME	0 - 2 ft	1	Extract/Hold
	OU3-B104-MMDDYY-TIME	2 - 4 ft	1	Extract/Hold
OU3-B105	OU3-B105-MMDDYY-TIME	0 - 2 ft	1	Extract/Hold
	OU3-B105-MMDDYY-TIME	2 - 4 ft	1	Extract/Hold
OU3-B106	OU3-B106-MMDDYY-TIME	0 - 2 ft	1	Extract/Hold
	OU3-B106-MMDDYY-TIME	2 - 4 ft	1	Extract/Hold
OU3-B107	OU3-B107-MMDDYY-TIME	0 - 2 ft	1	Extract/Hold
	OU3-B107-MMDDYY-TIME	2 - 4 ft	1	Extract/Hold
OU3-B108	OU3-B108-MMDDYY-TIME	0 - 2 ft	1	Extract/Hold
	OU3-B108-MMDDYY-TIME	2 - 4 ft	1	Extract/Hold
OU3-B109	OU3-B109-MMDDYY-TIME	0 - 2 ft	1	Extract/Hold
	OU3-B109-MMDDYY-TIME	2 - 4 ft	1	Extract/Hold
OU3-B110	OU3-B110-MMDDYY-TIME	0 - 2 ft	1	Extract/Hold
	OU3-B110-MMDDYY-TIME	2 - 4 ft	1	Extract/Hold
		Subtotal Samples	**22**	
		Field Duplicate	2	
		Matrix Spike/Matrix Spike Duplicate	2	
		Equipment Blank	2	
		QA/QC TOTAL	**6**	
		SAMPLE TOTAL	**28**	

Notes:

1. Discrete soil samples will be collected from each of the different materials encountered (if any) within the sampling interval; otherwise soil collected from within the specified interval will be composited.
2. QA/QC samples are collected at a frequency of 5% (or 1 in 20 samples). Each QA/QC sample set consists of a field duplicate, MS/MSD and an equipment blank. In addition, a trip blank is required with VOC soil and groundwater
3. Standard laboratory turnaround time for sample analysis results is 14 days.
4. For PAHs, holding time for extraction is 14 days and for analysis is 40 days.

FIGURES



OHIO

QUADRANGLE LOCATION

1994 QUADS: MENTOR, OH, PAINESVILLE, OH, PERRY, OH

N

0 1,000 2,000

SCALE IN FEET

HALEY ALDRICH

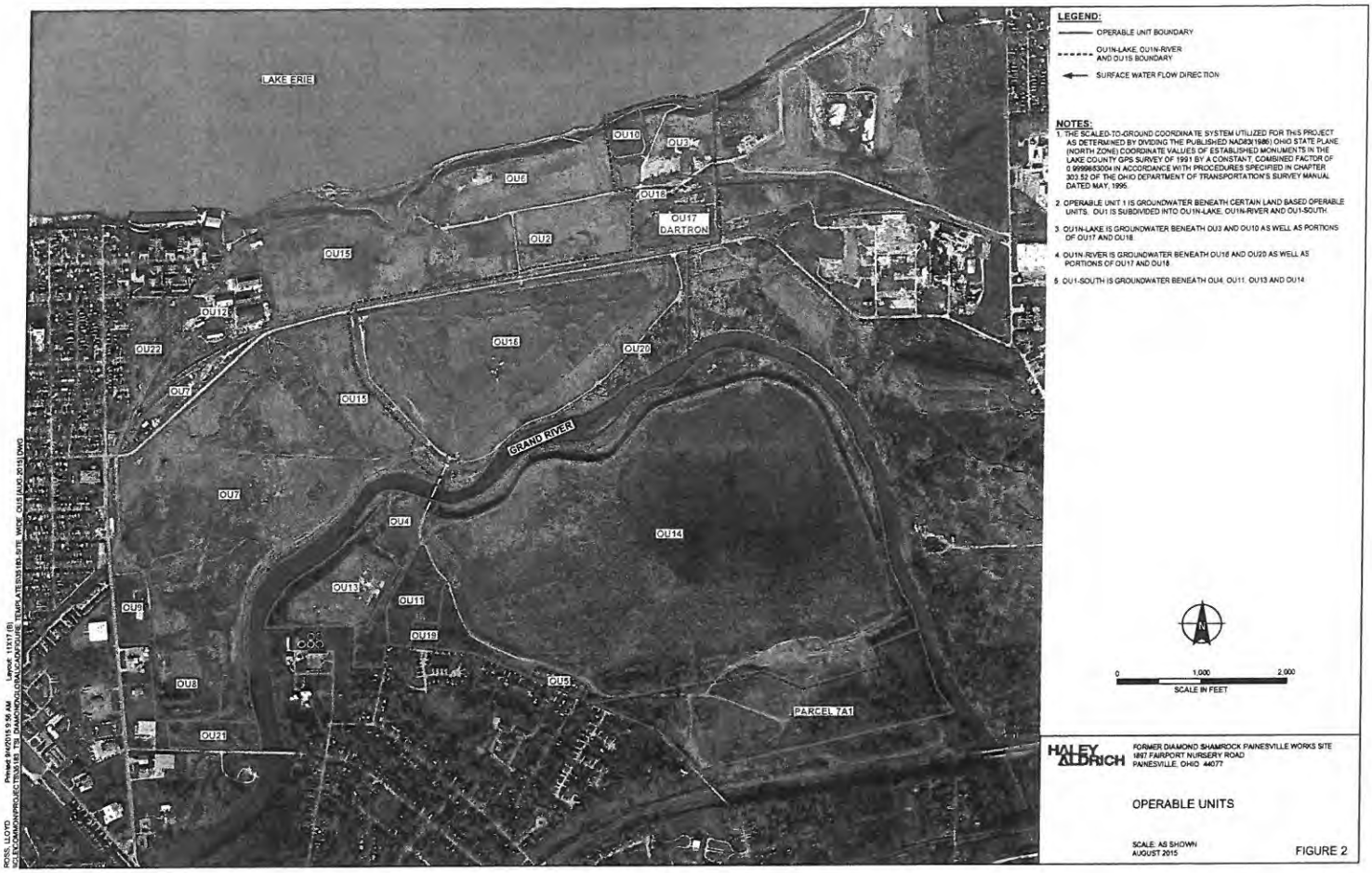
FORMER DIAMOND SHAMROCK PAINESVILLE WORKS SITE
1897 FAIRPORT NURSERY ROAD
PAINESVILLE, OHIO 44077

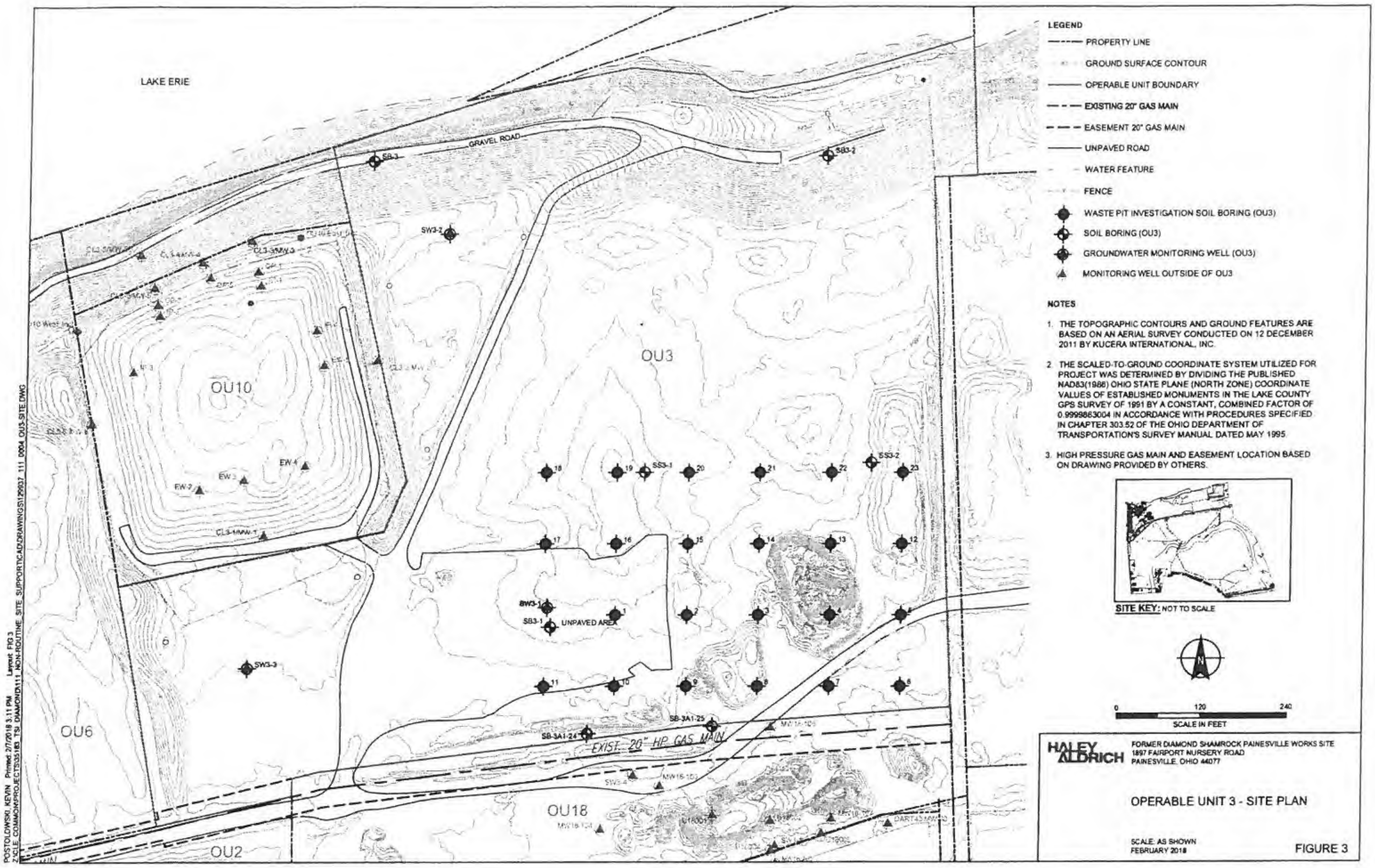
PROJECT LOCUS

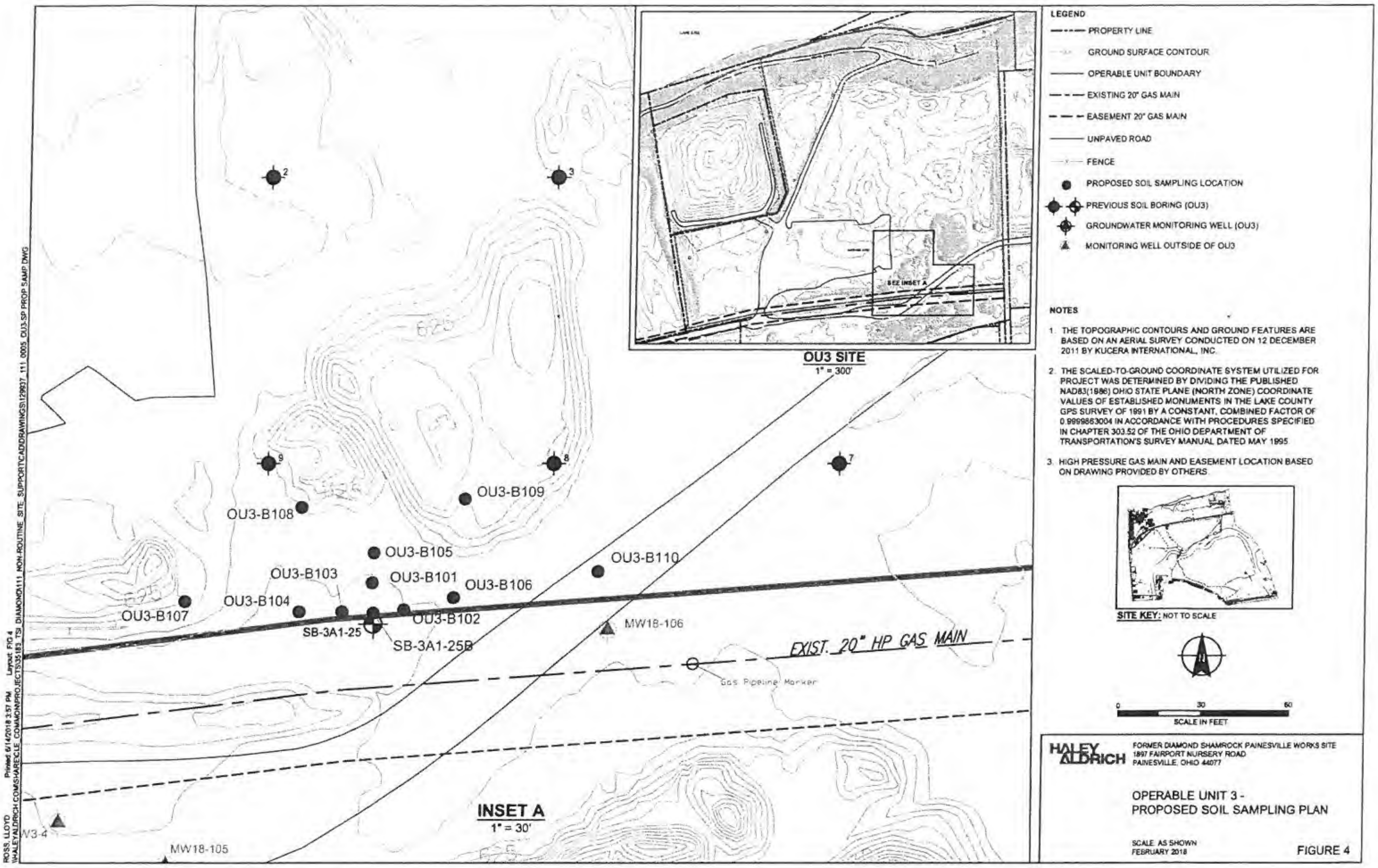
SCALE: AS SHOWN
AUGUST 2015

FIGURE 1

SANDY, DANIEL Printed: 2/19/2015 8:51 PM Layout: ALL
\\CLE\COMMON\PROJECTS\35183_TSI_DIAMOND\GLOBAL\CAD\FIGURE TEMPLATES\35183-LOCUS [2015].DWG


LAKE ERIE
OU10
OU3
OU8
OU18
OU17
DARTRON
OU2
OU15
OU12
OU22
OU16
OU20
OU7
OU13
GRAND RIVER
OU7
OU4
OU14
OU9
OU11
OU19
OU5
PARCEL A1
OU8
OU21
LEGEND:
OPERABLE UNIT BOUNDARY
OU1N-LAKE, OU1N-RIVER AND OU1S BOUNDARY
SURFACE WATER FLOW DIRECTION
NOTES:
1. THE SCALED-TO-GROUND COORDINATE SYSTEM UTILIZED FOR THIS PROJECT AS DETERMINED BY DIVIDING THE PUBLISHED NAD83(1986) OHIO STATE PLANE (NORTH ZONE) COORDINATE VALUES OF ESTABLISHED MONUMENTS IN THE LAKE COUNTY GPS SURVEY OF 1991 BY A CONSTANT, COMBINED FACTOR OF 0.999983004 IN ACCORDANCE WITH PROCEDURES SPECIFIED IN CHAPTER 303.52 OF THE OHIO DEPARTMENT OF TRANSPORTATION'S SURVEY MANUAL DATED MAY, 1996.
2. OPERABLE UNIT 1 IS GROUNDWATER BENEATH CERTAIN LAND BASED OPERABLE UNITS. OU1 IS SUBDIVIDED INTO OU1N-LAKE, OU1N-RIVER AND OU1-SOUTH.
3. OU1N-LAKE IS GROUNDWATER BENEATH OU3 AND OU10 AS WELL AS PORTIONS OF OU17 AND OU18.
4. OU1N-RIVER IS GROUNDWATER BENEATH OU16 AND OU20 AS WELL AS PORTIONS OF OU17 AND OU18.
5. OU1-SOUTH IS GROUNDWATER BENEATH OU4, OU11, OU13 AND OU14.
0
1,000
2,000
SCALE IN FEET
HALEY ALDRICH
FORMER DIAMOND SHAMROCK PAINESVILLE WORKS SITE
1807 FAIRPORT NURSERY ROAD
PAINESVILLE, OHIO 44077
OPERABLE UNITS
SCALE: AS SHOWN
AUGUST 2015
FIGURE 2
ROSS, LLOYD
Printed: 8/4/2015 9:55 AM
Layout: 11X17 (B)


LAKE ERIE
GRAVEL ROAD
OU10
OU3
OU6
OU18
OU2
UNPAVED AREA
EXIST. 20" HP GAS MAIN
SW3-2
SW3-3
SB3-1
SS3-1
SS3-2
SB3-2
SB-3A1-24
SB-3A1-25
LEGEND
PROPERTY LINE
GROUND SURFACE CONTOUR
OPERABLE UNIT BOUNDARY
EXISTING 20" GAS MAIN
EASEMENT 20" GAS MAIN
UNPAVED ROAD
WATER FEATURE
FENCE
WASTE PIT INVESTIGATION SOIL BORING (OU3)
SOIL BORING (OU3)
GROUNDWATER MONITORING WELL (OU3)
MONITORING WELL OUTSIDE OF OU3
NOTES
1. THE TOPOGRAPHIC CONTOURS AND GROUND FEATURES ARE BASED ON AN AERIAL SURVEY CONDUCTED ON 12 DECEMBER 2011 BY KUCERA INTERNATIONAL, INC.
2. THE SCALED-TO-GROUND COORDINATE SYSTEM UTILIZED FOR PROJECT WAS DETERMINED BY DIVIDING THE PUBLISHED NAD83(1986) OHIO STATE PLANE (NORTH ZONE) COORDINATE VALUES OF ESTABLISHED MONUMENTS IN THE LAKE COUNTY GPS SURVEY OF 1991 BY A CONSTANT, COMBINED FACTOR OF 0.9999863004 IN ACCORDANCE WITH PROCEDURES SPECIFIED IN CHAPTER 303.52 OF THE OHIO DEPARTMENT OF TRANSPORTATION'S SURVEY MANUAL DATED MAY 1995.
3. HIGH PRESSURE GAS MAIN AND EASEMENT LOCATION BASED ON DRAWING PROVIDED BY OTHERS.
SITE KEY: NOT TO SCALE
0
120
240
SCALE IN FEET
HALEY ALDRICH
FORMER DIAMOND SHAMROCK PAINESVILLE WORKS SITE
1897 FAIRPORT NURSERY ROAD
PAINESVILLE, OHIO 44077
OPERABLE UNIT 3 - SITE PLAN
SCALE: AS SHOWN
FEBRUARY 2018
FIGURE 3



LEGEND
PROPERTY LINE
GROUND SURFACE CONTOUR
OPERABLE UNIT BOUNDARY
EXISTING 20" GAS MAIN
EASEMENT 20" GAS MAIN
UNPAVED ROAD
FENCE
PROPOSED SOIL SAMPLING LOCATION
PREVIOUS SOIL BORING (OU3)
GROUNDWATER MONITORING WELL (OU3)
MONITORING WELL OUTSIDE OF OU3
NOTES
1. THE TOPOGRAPHIC CONTOURS AND GROUND FEATURES ARE BASED ON AN AERIAL SURVEY CONDUCTED ON 12 DECEMBER 2011 BY KUCERA INTERNATIONAL, INC.
2. THE SCALED-TO-GROUND COORDINATE SYSTEM UTILIZED FOR PROJECT WAS DETERMINED BY DIVIDING THE PUBLISHED NAD83(1986) OHIO STATE PLANE (NORTH ZONE) COORDINATE VALUES OF ESTABLISHED MONUMENTS IN THE LAKE COUNTY GPS SURVEY OF 1991 BY A CONSTANT, COMBINED FACTOR OF 0.9999863004 IN ACCORDANCE WITH PROCEDURES SPECIFIED IN CHAPTER 303.52 OF THE OHIO DEPARTMENT OF TRANSPORTATION'S SURVEY MANUAL DATED MAY 1995.
3. HIGH PRESSURE GAS MAIN AND EASEMENT LOCATION BASED ON DRAWING PROVIDED BY OTHERS.
OU3 SITE
1" = 300'
SITE KEY: NOT TO SCALE
0
30
60
SCALE IN FEET
OU3-B108
OU3-B109
OU3-B105
OU3-B103
OU3-B101
OU3-B106
OU3-B110
OU3-B104
OU3-B107
OU3-B102
SB-3A1-25
SB-3A1-25B
MW18-106
EXIST. 20" HP GAS MAIN
Gas Pipeline Marker
625
INSET A
1" = 30'
MW18-105
W3-4
HALEY ALDRICH
FORMER DIAMOND SHAMROCK PAINESVILLE WORKS SITE
1897 FAIRPORT NURSERY ROAD
PAINESVILLE, OHIO 44077
OPERABLE UNIT 3 -
PROPOSED SOIL SAMPLING PLAN
SCALE: AS SHOWN
FEBRUARY 2018
FIGURE 4

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

---

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.

Table of Contents

Table of Contents

Page

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, 22nd 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, 2nd 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)

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

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

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

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

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

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

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

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

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

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

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 9203.1-02I: 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

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)

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

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

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

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

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

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

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, InSitu 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

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

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

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

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

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

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

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

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)

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

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

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

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

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

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

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

Environmental Covenant Template

To be recorded with Deed Records - ORC § 317.08

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 1st 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

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.

IT IS SO AGREED:

[OWNER NAME]

_____
Signature of Owner

_____
Printed Name and Title

State of _____)
) ss:
County of _____)

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 _____)
) ss:
County of _____)

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

_____
Craig W. Butler, Director

State of Ohio)
) ss:
County of Franklin)

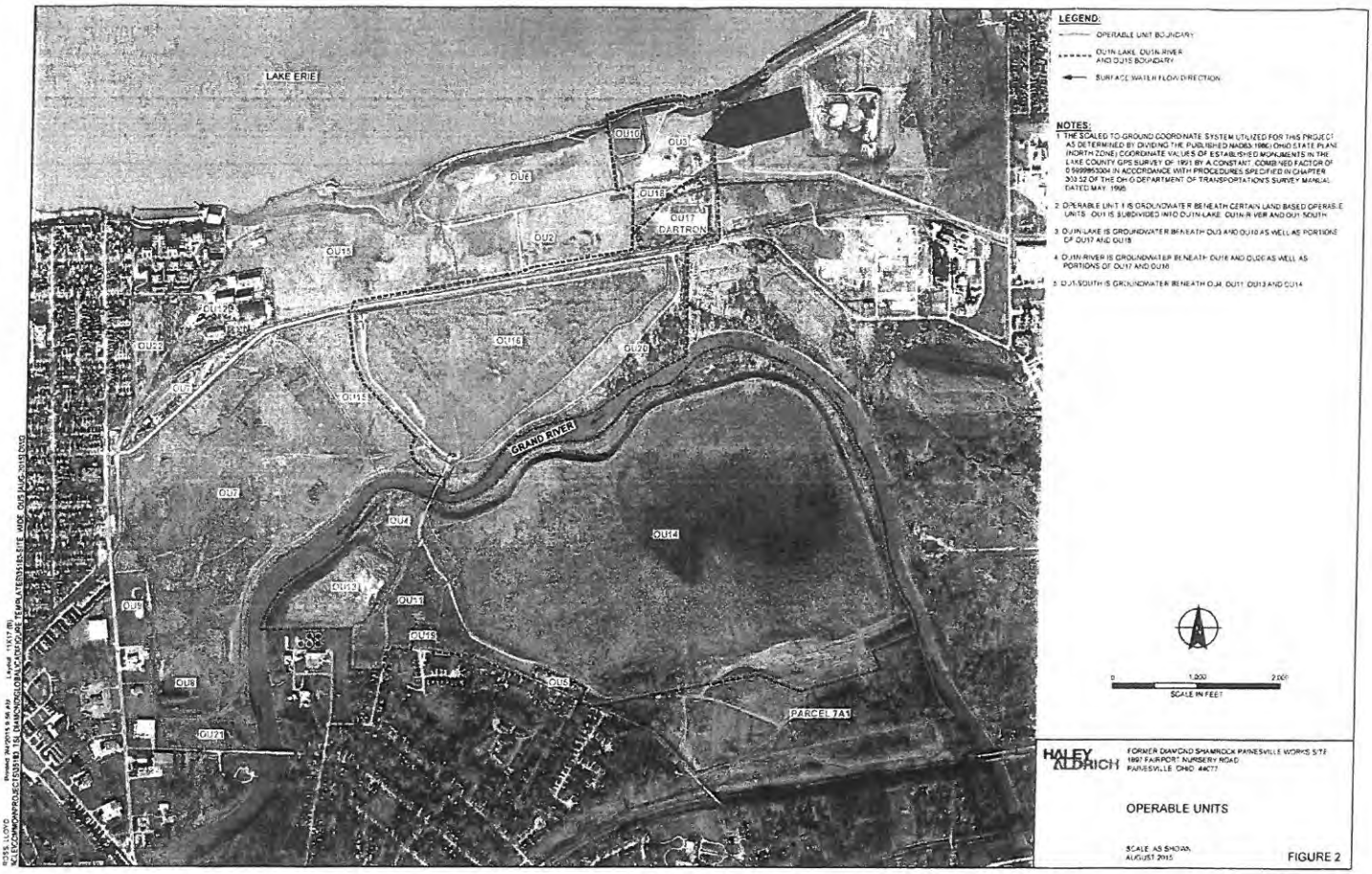
Before me, a notary public, in and for Franklin County, Ohio, personally appeared Craig W. Butler, the Director of Ohio EPA, who acknowledged to me that he did execute the foregoing instrument on behalf of Ohio EPA.

IN TESTIMONY WHEREOF, I have subscribed my name and affixed my official seal this _____ day of _____, 201__.

_____
Notary Public

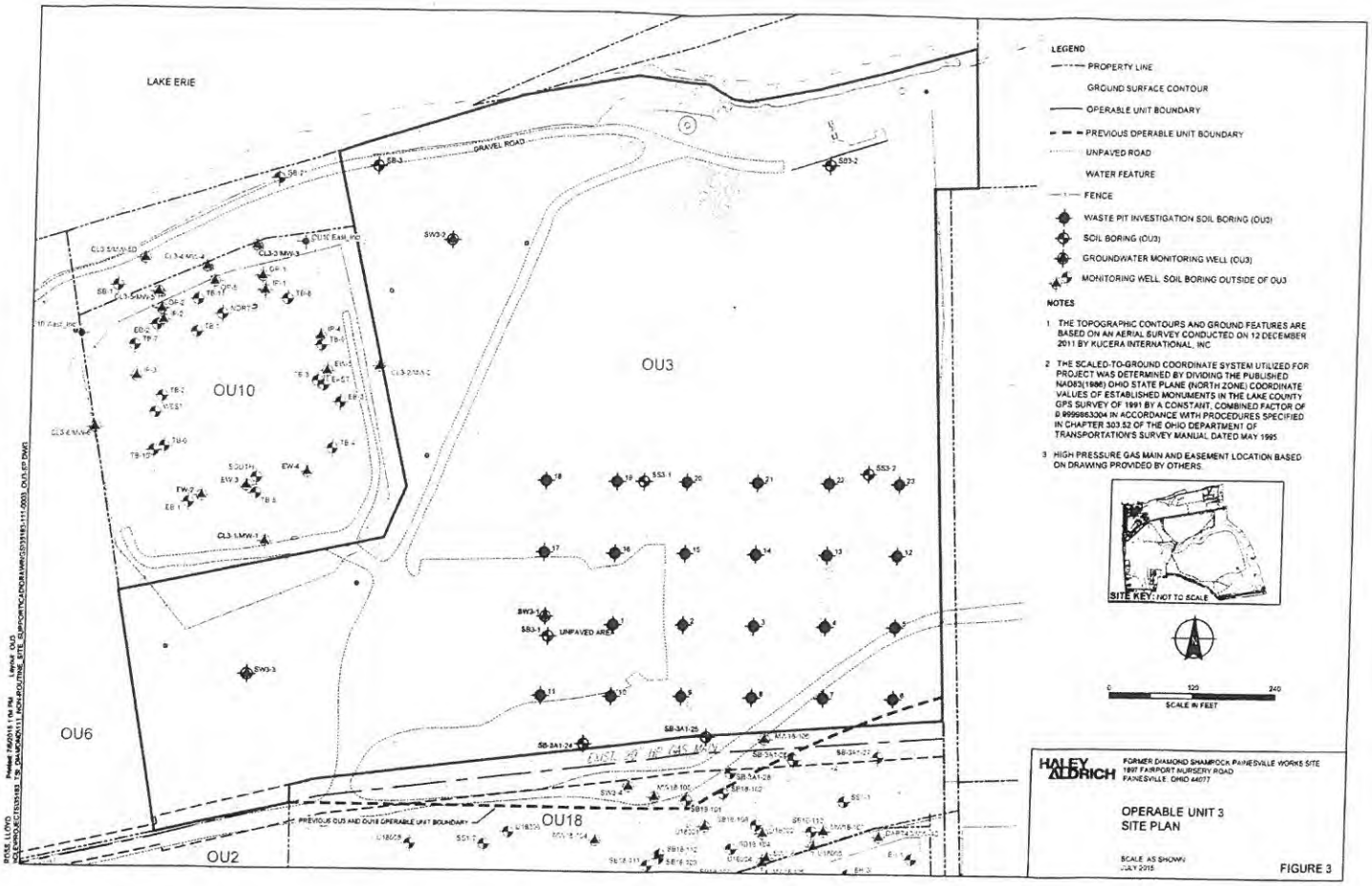
APPENDIX E

Site Map


LAKE ERIE
GRAND RIVER
PARCEL 7A1
OU1
OU2
OU3
OU4
OU5
OU6
OU7
OU8
OU9
OU10
OU11
OU12
OU13
OU14
OU15
OU16
OU17
DARTRON
OU18
OU19
OU20
OU21
OU22
OU23
LEGEND:
OPERABLE UNIT BOUNDARY
OU1N-LAKE, OU1N-RIVER AND OU1S BOUNDARY
SURFACE WATER FLOW DIRECTION
NOTES:
1. THE SCALED TO GROUND COORDINATE SYSTEM UTILIZED FOR THIS PROJECT AS DETERMINED BY DIVIDING THE PUBLISHED NAD83-1986 OHIO STATE PLANE (NORTH ZONE) COORDINATE VALUES OF ESTABLISHED MONUMENTS IN THE LAKE COUNTY GPS SURVEY OF 1993 BY A CONSTANT, COMBINED FACTOR OF 0.9999953304 IN ACCORDANCE WITH PROCEDURES SPECIFIED IN CHAPTER 3733.32 OF THE OHIO DEPARTMENT OF TRANSPORTATION'S SURVEY MANUAL DATED MAY, 1995.
2. OPERABLE UNIT 1 IS GROUNDWATER BENEATH CERTAIN LAND BASED OPERABLE UNITS. OU1 IS SUBDIVIDED INTO OU1N-LAKE, OU1N-RIVER AND OU1 SOUTH.
3. OU1N-LAKE IS GROUNDWATER BENEATH OU3 AND OU10 AS WELL AS PORTIONS OF OU17 AND OU18.
4. OU1N-RIVER IS GROUNDWATER BENEATH OU16 AND OU20 AS WELL AS PORTIONS OF OU17 AND OU18.
5. OU1-SOUTH IS GROUNDWATER BENEATH OU1, OU11, OU13 AND OU14.
0
1,000
2,000
SCALE IN FEET
HALEY ALDRICH
FORMER DIAMOND SHAMROCK PAINESVILLE WORKS SITE
1897 FAIRPORT NURSERY ROAD
PAINESVILLE, OHIO 44077
OPERABLE UNITS
SCALE AS SHOWN
AUGUST 2015
FIGURE 2

APPENDIX F

Chromite Ore Processing Residue Area


LAKE ERIE
GRAVEL ROAD
OU10
OU3
OU6
OU18
OU2
UNPAVED AREA
SOUTH
NORTH
PREVIOUS OU3 AND OU18 OPERABLE UNIT BOUNDARY
LEGEND
PROPERTY LINE
GROUND SURFACE CONTOUR
OPERABLE UNIT BOUNDARY
PREVIOUS OPERABLE UNIT BOUNDARY
UNPAVED ROAD
WATER FEATURE
FENCE
WASTE PIT INVESTIGATION SOIL BORING (OU3)
SOIL BORING (OU3)
GROUNDWATER MONITORING WELL (OU3)
MONITORING WELL SOIL BORING OUTSIDE OF OU3
NOTES
1 THE TOPOGRAPHIC CONTOURS AND GROUND FEATURES ARE BASED ON AN AERIAL SURVEY CONDUCTED ON 12 DECEMBER 2011 BY KUCERA INTERNATIONAL, INC
2 THE SCALED-TO-GROUND COORDINATE SYSTEM UTILIZED FOR PROJECT WAS DETERMINED BY DIVIDING THE PUBLISHED NAD83(1996) OHIO STATE PLANE (NORTH ZONE) COORDINATE VALUES OF ESTABLISHED MONUMENTS IN THE LAKE COUNTY GPS SURVEY OF 1991 BY A CONSTANT, COMBINED FACTOR OF 0.999983304 IN ACCORDANCE WITH PROCEDURES SPECIFIED IN CHAPTER 303.52 OF THE OHIO DEPARTMENT OF TRANSPORTATION'S SURVEY MANUAL DATED MAY 1995
3 HIGH PRESSURE GAS MAIN AND EASEMENT LOCATION BASED ON DRAWING PROVIDED BY OTHERS.
SITE KEY: NOT TO SCALE
0
120
240
SCALE IN FEET
HALEY ALDRICH
FORMER DIAMOND SHAMROCK PAINESVILLE WORKS SITE
1997 FAIRPORT NURSERY ROAD
PAINESVILLE, OHIO 44077
OPERABLE UNIT 3
SITE PLAN
SCALE AS SHOWN
JULY 2015
FIGURE 3