UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF INDIANA

UNITED STATES OF AMERICA and STATE OF INDIANA, Plaintiffs, v. ATLANTIC RICHFIELD COMPANY and E. I. DU PONT DE NEMOURS AND COMPANY, Defendants.	:	Civil Action No. 2:14-cv-312

CONSENT DECREE RELATING TO
RESPONSE ACTIONS AND RESPONSE COSTS
IN ZONES 1 AND 3 OF OPERABLE UNIT 1
OF THE USS LEAD SITE

TABLE OF CONTENTS

I. BACKGROUND

A. The United States of America ("United States"), on behalf of the Administrator of the United States Environmental Protection Agency ("EPA"), and the State of Indiana (the "State"), on behalf of the Indiana Department of Environmental Management ("IDEM"), filed a complaint in this matter pursuant to Sections 106 and 107 of the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA"), 42 U.S.C. §§ 9606, 9607.

B. The United States and the State in their complaint seek, *inter alia*: (1) reimbursement of costs incurred and to be incurred by EPA, the U.S. Department of Justice ("DOJ"), and the State for response actions within certain zones—identified as Zone 1 and Zone 3—of Operable Unit 1 ("OU1") of the U.S. Smelter and Lead Refinery, Inc. Superfund Site ("Site") in East Chicago, Indiana, together with accrued interest; and (2) performance of certain response actions by the Atlantic Richfield Company ("ARC") and E. I. du Pont de Nemours and Company ("DuPont") (collectively "Settling Defendants") within Zone 1 and Zone 3 of OU1 of the Site consistent with the National Contingency Plan, 40 C.F.R. Part 300 (as amended) ("NCP").

C. In accordance with the NCP and Section 121(f)(1)(F) of CERCLA, 42 U.S.C. § 9621(f)(1)(F), EPA notified the State of negotiations with potentially responsible parties ("PRPs") regarding the implementation of the remedial design and remedial action for Zone 1 and Zone 3 of OU1 of the Site and the State has participated in such negotiations and elected to be a party to this Consent Decree. All of the response costs that the State incurred at the Site before the Effective Date of this Consent Decree were paid by EPA through the Superfund Management Assistance Fund.

D. In accordance with Section 122(j)(1) of CERCLA, 42 U.S.C. § 9622(j)(1), EPA notified the Department of the Interior on June 26, 2014, of negotiations with Settling Defendants regarding the release of hazardous substances that may have resulted in injury to natural resources under federal trusteeship and encouraged the trustee to participate in the negotiations of this Consent Decree.

E. This Consent Decree is not intended to modify or supersede any terms or agreements set out in the Grand Calumet River/Indiana Harbor Canal Consent Decree entered on February 1, 2005, in *United States, et al. v. Atlantic Richfield Company, Inc., et al.*, No. 2:04-CV-00348-RL-APR (N.D. Ind.).

F. Settling Defendants do not admit any liability to Plaintiffs arising out of the transactions or occurrences alleged in the complaint nor do they acknowledge that the release or threatened release of hazardous substances at or from the Site constitutes an imminent and substantial endangerment to the public health or welfare or the environment.

G. Pursuant to Section 105 of CERCLA, 42 U.S.C. § 9605, EPA placed the Site on the National Priorities List ("NPL"), set forth at 40 C.F.R. Part 300, Appendix B, by publication in the Federal Register on April 8, 2009, 74 Fed. Reg. 16,126–34.

H. In response to a release or a substantial threat of a release of hazardous substances at or from OU1 of the Site, EPA commenced, in June 2009, a Remedial Investigation and Feasibility Study ("RI/FS") of OU1 of the Site pursuant to 40 C.F.R. § 300.430.

I. EPA completed a Remedial Investigation ("RI") Report and a Feasibility Study ("FS") Report of OU1 in June 2012.

J. Pursuant to Section 117 of CERCLA, 42 U.S.C. § 9617, EPA published notice of the completion of the FS for OU1 and of the proposed plan for remedial action for OU1 on July 12, 2012, in a major local newspaper of general circulation. EPA provided an opportunity for written and oral comments from the public on the proposed plan for remedial action. A copy of the transcript of the public meeting is available to the public as part of the administrative record upon which the Director of the Superfund Division, EPA Region 5, based the selection of the response action for OU1.

K. The decision by EPA on the remedial action to be implemented at OU1 of the Site is embodied in a final Record of Decision ("ROD"), executed on November 30, 2012, on which the State has given its concurrence. The ROD includes a responsiveness summary to the public comments. Notice of the final plan was published in accordance with Section 117(b) of CERCLA, 42 U.S.C. § 9617(b).

L. The Site consists of two Operable Units: OU1 and OU2, both defined below. The Parties agree that the remedy for OU2 will be addressed separately at a later time.

M. OU1 consists of surface and subsurface soil within the geographic boundaries identified in the definition of OU1. OU1 does not include groundwater. The Parties agree that the remedy for groundwater associated with the Site will be addressed separately at a later time.

N. EPA has determined that the remedial design and remedial action for OU1 should be conducted in at least two phases to expedite the response. The first phase will consist of remedial design and remedial action to address lead and arsenic contamination in Zone 1 and Zone 3 of OU1. Zone 1 and Zone 3 (sometimes collectively referred to as "Z1&3") are defined below. All remaining elements of the remedial design and remedial action for OU1 will be implemented in a later phase or phases at a later time.

O. Under this Consent Decree, Settling Defendants will: (i) implement response actions consisting of the Transportation and Disposal Work in Z1&3, except for Transportation and Disposal Work at certain properties within Z1&3 defined below as "Z1&3 Excluded Non-Residential Properties" and "Z1&3 Excluded Residential Properties"; (ii) pay all Z1&3 Future Response Costs and all State Z1&3 Future Response Costs not inconsistent with the NCP; and (iii) pay EPA for projected response costs, plus a premium, at the Z1&3 Excluded Non-Residential Properties and Z1&3 Excluded Residential Properties unless Settling Defendants are entitled to, and do, opt out of payment for one or both of these in exchange for not securing a covenant not to sue and not receiving contribution protection on the Z1&3 Excluded Non-Residential Properties and/or the Z1&3 Excluded Residential Properties, as applicable.

P. EPA will implement Z1&3 Remedial Design and all response actions in Z1&3 except for the Z1&3 Transportation and Disposal Work at all but the Z1&3 Excluded Properties.

Q. Based on the information presently available to EPA and the State, EPA and the State believe that the Z1&3 Transportation and Disposal Work at all but the Z1&3 Excluded Properties ("SDs' Z1&3 T&D Work") will be properly and promptly conducted by Settling Defendants if conducted in accordance with the requirements of this Consent Decree and its appendices.

R. Actions and/or costs related to remedy review and additional response actions, as described in Section 121 of CERCLA, 42 U.S.C. § 9621(c), for Z1&3 are not included in Settling Defendants' obligations under this Consent Decree. Settling Defendants' potential liability for such actions and/or costs is specifically reserved in Paragraph 74.m of this Decree.

S. Solely for the purposes of Section 113(j) of CERCLA, 42 U.S.C. § 9613(j), the remedy set forth in the ROD and the SDs' Z1&3 T&D Work shall constitute a response action taken or ordered by the President for which judicial review shall be limited to the administrative record.

T. The Parties recognize, and the Court by entering this Consent Decree finds, that this Consent Decree has been negotiated by the Parties in good faith and implementation of this Consent Decree will expedite the cleanup of the Site and will avoid prolonged and complicated litigation between the Parties, and that this Consent Decree is fair, reasonable, and in the public interest.

NOW, THEREFORE, it is hereby Ordered, Adjudged, and Decreed:

II. JURISDICTION

1. This Court has jurisdiction over the subject matter of this action pursuant to 28 U.S.C. §§ 1331 and 1345, and 42 U.S.C. §§ 9606, 9607, and 9613(b). This Court also has personal jurisdiction over Settling Defendants. Solely for the purposes of this Consent Decree and the underlying complaint, Settling Defendants waive all objections and defenses that they may have to jurisdiction of the Court or to venue in this District. Settling Defendants shall not challenge the terms of this Consent Decree or this Court's jurisdiction to enter and enforce this Consent Decree.

III. PARTIES BOUND

2. This Consent Decree applies to and is binding upon the United States and the State and upon Settling Defendants and their successors and assigns. Any change in ownership or corporate status of a Settling Defendant, including, but not limited to, any transfer of assets or real or personal property, shall in no way alter such Settling Defendant's responsibilities under this Consent Decree.

3. Settling Defendants shall provide a copy of this Consent Decree to each contractor hired to perform the SDs' Z1&3 T&D Work required by this Consent Decree and to each person representing Settling Defendants with respect to the Site or the SDs' Z1&3 T&D Work, and shall condition all contracts entered into hereunder upon performance of the SDs' Z1&3 T&D Work in conformity with the terms of this Consent Decree. Settling Defendants or their contractors shall provide written notice of the Consent Decree to all subcontractors hired to perform any portion of the SDs' Z1&3 T&D Work required by this Consent Decree. Settling Defendants shall nonetheless be responsible for ensuring that their contractors and subcontractors perform the SDs' Z1&3 T&D Work in accordance with the terms of this Consent Decree. With regard to the SDs' Z1&3 T&D Work undertaken pursuant to this Consent Decree, each contractor and subcontractor shall be deemed to be in a contractual relationship with Settling Defendants within the meaning of Section 107(b)(3) of CERCLA, 42 U.S.C. § 9607(b)(3).

IV. DEFINITIONS

4. Unless otherwise expressly provided in this Consent Decree, terms used in this Consent Decree that are defined in CERCLA or in regulations promulgated under CERCLA shall have the meaning assigned to them in CERCLA or in such regulations. Whenever terms listed below are used in this Consent Decree or in the appendices attached hereto and incorporated hereunder, the following definitions shall apply solely for purposes of this Consent Decree:

a. "ARC" shall mean Atlantic Richfield Company.

b. "CERCLA" shall mean the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, 42 U.S.C. §§ 9601-9675.

c. "Consent Decree" or "Decree" shall mean this Consent Decree and all appendices attached hereto (listed in Section XXV). In the event of conflict between this Consent Decree and any appendix, this Consent Decree shall control.

d. The term "day" shall mean a calendar day unless expressly stated to be a working day. The term "working day" shall mean a day other than a Saturday, Sunday, or federal holiday. In computing any period of time under this Consent Decree, where the last day would fall on a Saturday, Sunday, or federal holiday, the period shall run until the close of business of the next working day.

e. "Disposal," for purposes of this Consent Decree only, shall mean the lawful placement of Waste Material generated by response actions undertaken at Zone 1 or Zone 3 onto land which is permitted to receive the Waste Material.

f. "DOJ" shall mean the United States Department of Justice and its successor departments, agencies, or instrumentalities.

g. "DuPont" shall mean the E. I. du Pont de Nemours and Company.

h. "Effective Date" shall be the date upon which this Consent Decree is entered by the Court as recorded on the Court docket, or, if the Court instead issues an order approving the Consent Decree, the date such order is recorded on the Court docket.

i. "EPA" shall mean the United States Environmental Protection Agency and its successor departments, agencies, or instrumentalities.

j. "EPA Hazardous Substance Superfund" shall mean the Hazardous Substance Superfund established by the Internal Revenue Code, 26 U.S.C. § 9507.

k. "IDEM" shall mean the Indiana Department of Environmental Management and any successor departments or agencies of the State.

l. "Institutional Controls" or "ICs" shall mean Proprietary Controls and state or local laws, regulations, ordinances, zoning restrictions, or other governmental controls or notices that: (a) limit land, water, and/or resource use to minimize the potential for human exposure to Waste Material at or in connection with the Site; (b) limit land, water, and/or resource use to implement, ensure non-interference with, or ensure the protectiveness of the Remedial Action; and/or (c) provide information intended to modify or guide human behavior at or in connection with the Site or any property located within the Site.

m. "Interest" shall mean interest at the rate specified for interest on investments of the EPA Hazardous Substance Superfund established by 26 U.S.C. § 9507, compounded annually on October 1 of each year, in accordance with 42 U.S.C. § 9607(a). The applicable rate of interest shall be the rate in effect at the time the interest accrues. The rate of interest is subject to change on October 1 of each year.

n. "National Contingency Plan" or "NCP" shall mean the National Oil and Hazardous Substances Pollution Contingency Plan promulgated pursuant to Section 105 of CERCLA, 42 U.S.C. § 9605, codified at 40 C.F.R. Part 300, and any amendments thereto.

o. "OU1" shall mean the surface and subsurface soil of the area located inside the red highlighted boundaries on Appendix A. OU1 is generally bounded on the north by East Chicago Avenue; on the east by Parrish Avenue; and the south by East 151st Street/149th Place on the south; and on the west by the Indiana harbor Canal.

p. "OU1 Remedial Action Work Plan" shall mean the document developed and issued by EPA, and any modifications thereto, regarding Remedial Action in OU1. The OU1 Remedial Action Work Plan shall include, but not be limited to, implementation of Z1&3 Remedial Action except for the SDs' Z1&3 T&D Work. The OU1 Remedial Action Work Plan shall not include the SDs' Z1&3 T&D Work Plan.

q. "OU1 Remedial Design Work Plan" shall mean the document developed and issued by EPA, and any modifications thereto, regarding implementation of Remedial Design in OU1. The OU1 Remedial Design Work Plan shall include, but not be limited to, Z1&3 Remedial Design.

r. "OU2" shall mean groundwater associated with the Site as well as the surface soil, subsurface soil, and sediments located inside the blue highlighted boundaries on Appendix A. The area within the blue highlighted boundaries on Appendix A consists of approximately 79 acres, is commonly known as 5300 Kennedy Avenue, and is generally bounded on the north by the Indiana Harbor Belt Railroad; on the east by Kennedy Avenue; on the south and west by the Grand Calumet River; and on the northwest by the Indiana Harbor Canal.

s. "Proprietary Controls" shall mean easements or covenants running with the land that (a) limit land, water, or resource use or provide access rights and (b) are created pursuant to common law or statutory law by an instrument that is recorded by the owner in the appropriate land records office.

t. "Paragraph" shall mean a portion of this Consent Decree identified by an Arabic numeral and shall also mean any Subparagraphs thereof, identified by lower case letters and, in some cases, also Arabic numbers in parenthesis.

u. "Parties" shall mean the United States, the State of Indiana, and Settling Defendants.

v. "Past Response Costs" shall mean all costs, including but not limited to, direct and indirect costs, that the United States paid at or in connection with the Site through August 31, 2013, plus Interest on all such costs that has accrued pursuant to 42 U.S.C. § 9607(a) through such date.

w. "Performance Standards" shall mean the cleanup standards and other measures of achievement of the goals of the Remedial Action set forth in the ROD, the Z1&3 SOW attached to this Consent Decree as Appendix B, and any modified standards established pursuant to this Consent Decree.

x. "Remaining, Outstanding Z1&3 Future Response Costs" shall have the meaning set forth in Paragraph 41.b.

y. "Remedial Action" shall mean all activities performed to implement the ROD, including implementation of Institutional Controls, until the Performance Standards are met, and excluding performance of Remedial Design and the activities required under Section XXII (Retention of Records).

z. "Remedial Design" shall mean those activities to be undertaken to develop the final plans and specifications for Remedial Action.

aa. "Remedial Design Property Diagrams" shall have the meaning set forth in Section III.D.1.d of the Z1&3 SOW.

bb. "Plaintiffs" shall mean the United States and the State of Indiana.

cc. "RCRA" shall mean the Solid Waste Disposal Act, as amended, 42 U.S.C. §§ 6901-6992 (also known as the Resource Conservation and Recovery Act).

dd. "Record of Decision" or "ROD" shall mean the EPA Record of Decision relating to OU1 of the Site signed on November 30, 2012, by the Director of the Superfund Division, EPA Region 5, and all attachments thereto. The ROD is attached as Appendix C.

ee. "SDs' Z1&3 T&D Supervising Contractor" or "Settling Defendants' Z1&3 T&D Supervising Contractor" shall mean the principal contractor retained by Settling Defendants to supervise and direct the implementation of the SDs' Z1&3 T&D Work under this Consent Decree.

ff. "SDs' Z1 T&D Work" or "Settling Defendants' Z1 T&D Work" shall mean the T&D Work required of Settling Defendants in Zone 1 under this Consent Decree. Because Settling Defendants are not required to perform T&D Work at the Z1&3 Excluded

Properties, the "SDs' Z1 T&D Work" does not include T&D Work associated with response actions at Z1&3 Excluded Properties that are located in Zone 1.

gg. "SDs' Z3 T&D Work" or "Settling Defendants' Z3 T&D Work" shall mean the T&D Work required of Settling Defendants in Zone 3 under this Consent Decree. Because Settling Defendants are not required to perform T&D Work at the Z1&3 Excluded Properties, the "SDs' Z3 T&D Work" does not include T&D Work associated with response actions at Z1&3 Excluded Properties that are located in Zone 3.

hh. "SDs' Z1&3 T&D Work" or "Settling Defendants' Z1&3 T&D Work" shall mean SDs' Z1 T&D Work and SDs' Z3 T&D Work; it does not include the T&D Work associated with response actions at the Z1&3 Excluded Properties.

ii. "SDs' Z1&3 T&D Work Plan" or "Settling Defendants' Z1&3 T&D Work Plan" shall mean the document developed pursuant to Paragraph 10 and approved by EPA, and any modifications thereto.

jj. "Section" shall mean a portion of this Consent Decree identified by a Roman numeral.

kk. "Settling Defendants" shall mean Atlantic Richfield Company and E. I. du Pont de Nemours and Company.

ll. "Site" shall mean the U.S. Smelter and Lead Refinery, Inc. Superfund Site, located in the City of East Chicago, Lake County, Indiana, and depicted generally on the map attached as Appendix A. The Site includes both OU1 and OU2.

mm. "State Z1&3 Future Response Costs" shall mean all costs, on and after the Effective Date, including but not limited to direct and indirect costs, that the State incurs in reviewing or developing plans or reports or other documents or items for implementing response actions in Z1 and/or Z3, reviewing or developing plans, reports, or other deliverables submitted by Settling Defendants pursuant to this Consent Decree, overseeing implementation of the SDs' Z1&3 T&D Work, or otherwise implementing, overseeing, or enforcing this Consent Decree. These costs include, but are not limited to, payroll costs, contractor costs, travel costs, laboratory costs, Indiana Office of Attorney General costs, costs incurred pursuant to Section XII (Emergency Response) and Section XXVI (Community Involvement), and the costs of obtaining access and Institutional Controls (including but not limited to, the cost of attorney time and any monies paid to secure access and/or to secure, implement, monitor, maintain, or enforce Institutional Controls including, but not limited to, the amount of just compensation). Z1&3 Future Response Costs do not include any costs incurred pursuant to Section 121(c) of CERCLA, 42 U.S.C. § 9621(c) (sometimes referred to in paraphrase as "5-year remedy reviews"), relating to Z1&3, OU1, or the Site.

nn. "Transfer" shall mean to sell, assign, convey, lease, mortgage, or grant a security interest in, or where used as a noun, a sale, assignment, conveyance, or other disposition of any interest by operation of law or otherwise.

oo. "Transportation," for purposes of this Consent Decree only, shall mean the lawful transfer or conveyance of Waste Material generated by response actions undertaken in Zone 1 or Zone 3 from the time such Waste Material is picked up within Z1 and/or Z3 to the time it is disposed of. "Transportation" includes all transfers or conveyances of such Waste

Material, including but not limited to, temporary transfers or conveyances to transfer stations and/or treatment facilities and/or storage facilities prior to final Disposal.

pp. "Transportation and Disposal" or "T&D" shall mean the collective activities of Transportation and Disposal.

qq. "T&D Work" shall mean all activities and obligations required to undertake, perform, and complete Transportation and Disposal.

rr. "United States" shall mean the United States of America and each department, agency, and instrumentality of the United States, including EPA.

ss. "USS Lead Z1&3 Special Account" shall mean the special account, within the EPA Hazardous Substance Superfund, to be established for Zone 1 and Zone 3 of OU1 of the Site by EPA pursuant to Section 122(b)(3) of CERCLA, 42 U.S.C. § 9622(b)(3). This Special Account is associated with Site/Spill ID Number 05 3J.

tt. "Waste Material" shall mean (1) any "hazardous substance" under Section 101(14) of CERCLA, 42 U.S.C. § 9601(14), or under Indiana Code 13-11-2-98; (2) any pollutant or contaminant under Section 101(33) of CERCLA, 42 U.S.C. § 9601(33), or under Indiana Code 13-11-2-42; (3) any "solid waste" under Section 1004(27) of RCRA, 42 U.S.C.§ 6903(27), or under Indiana Code 13-11-2-205; and (4) any "hazardous material" under Indiana Code 13-11-2-96; and (5) any "hazardous waste" under Indiana Code 13-11-2-99(c).

uu. "Z1" or "Zone 1" shall mean the surface and subsurface soil found in an area located inside the yellow highlighted boundaries on Appendix D and labeled as "Zone 1." Zone 1 is generally bordered: (1) on the north by the northern boundary of the Carrie Gosch Elementary School and a line extending eastward from that boundary to the eastern edge of a north/south utility right of way that runs parallel to McCook Avenue north of East 149th Place; (2) on the east by: (i) the eastern-most edge of a north/south utility right of way that runs parallel to McCook Avenue until East 149th Place, and (ii) McCook Avenue between East 149th Place and 151st Street; (3) on the south by East 151st Street; and (4) on the west by the Indiana Harbor Canal.

vv. "Z2" or "Zone 2" shall mean the surface and subsurface soil found in an area located inside the yellow highlighted boundaries on Appendix D and labeled as "Zone 2." Zone 2 is generally bordered: (1) on the north by Chicago Avenue; (2) on the east, by the eastern edge of the railroad right of way that runs principally north and south and is labeled on Appendix D as "Elgin Joliet and Eastern Rlwy"; (3) on the south by East 151st Street; and (4) on the west by: (i) the Indiana Harbor Canal between Chicago Avenue and the northern boundary of the Carrie Gosch Elementary School; (ii) the eastern-most edge of a north/south utility right of way that runs parallel to McCook Avenue until East 149th Place, and (iii) McCook Avenue between East 149th Place and 151st Street.

ww. "Z3" or "Zone 3" shall mean the surface and subsurface soil found in an area located inside the yellow highlighted boundaries on Appendix D and labeled as "Zone 3." Zone 3 is generally bordered: (1) on the north by Chicago Avenue; (2) on the east by Parrish Avenue; (3) on the south by the northern edge of the railroad right of way located generally to the south of East 149th Place and labeled on Appendix D as "Elgin Joliet and Eastern Rlwy"; and (4) on the west by the eastern edge of the railroad right of way that runs principally north and

south and is labeled on Appendix D as "Elgin Joliet and Eastern Rlwy." The triangular plot of land bounded by several railroad spurs in the southeastern portion of the area labeled Zone 3 on Appendix D is a part of Zone 3.

xx. "Z1&3 Available Funds" shall mean the funds available in the USS Lead Z1&3 Special Account together with any other funds available to EPA to spend on the Z1 Work or the Z3 Work that originated from the USS Lead Z1&3 Special Account. Z1&3 Available Funds does not include any money within the EPA Hazardous Substance Superfund apart from the money within the USS Lead Z1&3 Special Account.

yy. "Z1&3 Excluded Properties" shall mean the Z1&3 Excluded Non-Residential Properties and the Z1&3 Excluded Residential Properties.

zz. "Z1&3 Excluded Non-Residential Properties" shall mean the final list of non-residential properties within Zones 1 and 3 identified by EPA pursuant to Paragraph 43.b of this Consent Decree.

aaa. "Z1&3 Excluded Residential Properties" shall mean the final list of residential properties within Zones 1 and 3 identified by EPA pursuant to Paragraph 43.b of this Consent Decree.

bbb. "Z1&3 Future Response Costs" shall mean all costs, including but not limited to direct and indirect costs, that the United States incurs in implementing response actions in Z1 and/or Z3, including but not limited to reviewing or developing its own plans or reports for implementing response actions in Z1 and/or Z3, reviewing or developing plans, reports, or other deliverables submitted by Settling Defendants pursuant to this Consent Decree, overseeing implementation of the SDs' Z1&3 T&D Work or otherwise implementing, overseeing, or enforcing this Consent Decree. These costs include, but are not limited to, payroll costs, contractor costs, travel costs, laboratory costs, Army Corps of Engineer Costs, Department of Justice costs, costs incurred pursuant to Section XII (Emergency Response), Paragraph 32 (Funding for Z1&3 Work Takeover), Paragraph 43 (Cashout of Z1&3 Excluded Properties or Opt-Out) and Section XXVI (Community Involvement), and the costs of obtaining access and Institutional Controls (including but not limited to, the cost of attorney time and any monies paid to secure access and/or to secure, implement, monitor, maintain, or enforce Institutional Controls including, but not limited to, the amount of just compensation). Z1&3 Future Response Costs also include all Z1&3 Interim Response Costs, but do not include Past Response Costs or any costs incurred pursuant to Section 121(c) of CERCLA, 42 U.S.C. § 9621(c) (sometimes referred to in paraphrase as "5-year remedy reviews"), relating to Z1&3, OU1, or the Site.

ccc. "Z1&3 Interim Response Costs" shall mean all costs, including but not limited to direct and indirect costs: (1) paid by the United States in connection with Zone 1 and/or Zone 3 between September 1, 2013, and the Effective Date; or (2) incurred in Zone 1 and/or Zone 3 prior to the Effective Date but paid after that date.

ddd. "Z1 Remedial Action" shall mean all activities performed in Zone 1 to implement the ROD, including implementation of Institutional Controls, until the Performance Standards are met in Zone 1, and excluding performance of the Zone 1 Remedial Design and the activities required under Section XXII (Retention of Records). Z1 Remedial Action includes response actions, including T&D Work, at the Z1&3 Excluded Properties located within Zone 1.

eee. "Z3 Remedial Action" shall mean all activities performed in Zone 3 to implement the ROD, including implementation of Institutional Controls, until the Performance Standards are met in Zone 3, and excluding performance of the Zone 3 Remedial Design and the activities required under Section XXII (Retention of Records). Z3 Remedial Action includes response actions, including T&D Work, at the Z1&3 Excluded Properties located within Zone 3.

fff. "Z1&3 Remedial Action" shall mean the Z1 Remedial Action and the Z3 Remedial Action. Z1&3 Remedial Action includes all response actions, including T&D Work, at the Z1&3 Excluded Properties.

ggg. "Z1 Remedial Design" shall mean those activities to be undertaken by EPA to develop the final plans and specifications for Z1 Remedial Action.

hhh. "Z3 Remedial Design" shall mean those activities to be undertaken by EPA to develop the final plans and specifications for Z3 Remedial Action.

iii. "Z1&3 Remedial Design" shall mean the Z1 Remedial Design and the Z3 Remedial Design.

jjj. "Z1&3 Statement of Work" or "Z1&3 SOW" shall mean the statement of work for implementation of response actions in Zones 1 and 3 as set forth in Appendix B to this Consent Decree, and any modifications made in accordance with this Consent Decree.

kkk. "Z1&3 Temporary Container Accumulation Areas" shall mean locations within the boundaries of Z1 and/or Z3 used for the temporary placement of containers that will hold Waste Material prior to the Transportation of the Waste Material outside the boundaries of Z1 and/or Z3.

lll. "Z1 Work" or "Zone 1 Work" shall mean the Z1 Remedial Design and Z1 Remedial Action. Settling Defendants will perform SDs' Z1 T&D Work and EPA will perform the remainder of the Z1 Work.

mmm. "Z3 Work" or "Zone 3 Work" shall mean the Z3 Remedial Design and Z3 Remedial Action. Settling Defendants will perform the SDs' Z3 T&D Work and EPA will perform the remainder of the Z3 Work.

nnn. "Z1&3 Work" or "Zones 1 and 3 Work" or "Zone 1 and Zone 3 Work" shall mean the Z1Work, the Z3 Work, and all activities and obligations (in addition to SDs' Z1&3 T&D Work) that Settling Defendants are required to perform under this Consent Decree, except for the activities required under Section XXII (Retention of Records). Z1&3 Work does not include any activities or obligations done or incurred pursuant to Section 121(c) of CERCLA, 42 U.S.C. § 9621(c) (sometimes referred to in paraphrase as "5-year remedy reviews").

V. GENERAL PROVISIONS

5. Objectives of the Parties. The objectives of the Parties in entering into this Consent Decree are to protect public health or welfare or the environment by the design and implementation of response actions in Zone 1 and Zone 3 of OU1 of the Site; to have Settling Defendants finance and perform SDs' Z1&3 T&D Work and pay the response costs of the United States and the State associated with Zone 1 and Zone 3 of OU1 of the Site; and to resolve

the claims of the United States and the State against Settling Defendants as provided in this Consent Decree.

6. Commitments by Settling Defendants.

a. Settling Defendants shall finance and perform the SDs' Z1&3 T&D Work in accordance with this Consent Decree, the ROD, the Z1&3 SOW, and the SDs' Z1&3 T&D Work Plan to be developed by Settling Defendants and approved by EPA pursuant to this Consent Decree. Settling Defendants shall pay the United States for Z1&3 Future Response Costs and the State for State Z1&3 Future Response Costs as provided in this Consent Decree.

b. The obligations of Settling Defendants to finance and perform the SDs' Z1&3 T&D Work and to pay the Z1&3 Future Response Costs and the State Z1&3 Future Response Costs are joint and several. In the event of the insolvency of either Settling Defendant or the failure by either Settling Defendant to comply with any requirement of this Consent Decree, the other Settling Defendant shall complete all such requirements.

7. Compliance With Applicable Law. All activities undertaken by Settling Defendants pursuant to this Consent Decree shall be performed in accordance with the requirements of all applicable federal and state laws and regulations. Settling Defendants must also comply with all applicable or relevant and appropriate requirements of all federal and state environmental laws as set forth in the ROD and the Z1&3 SOW. The activities conducted pursuant to this Consent Decree, if approved by EPA, shall be deemed to be consistent with the NCP.

8. Permits.

a. As provided in Section 121(e) of CERCLA, 42 U.S.C. § 9621(e), and Section 300.400(e) of the NCP, no permit shall be required for any portion of the SDs' Z1&3 T&D Work conducted entirely on-site (i.e., within the areal extent of contamination or in very close proximity to the contamination and necessary for implementation of the SDs' Z1&3 T&D Work). Where any portion of the SDs' Z1&3 T&D Work that is not on-site requires a federal, state, or local permit or approval, Settling Defendants shall submit timely and complete applications and take all other actions necessary to obtain all such permits or approvals.

b. Settling Defendants may seek relief under the provisions of Section XV (Force Majeure) for any delay in the performance of the SDs' Z1&3 T&D Work resulting from a failure to obtain, or a delay in obtaining, any permit or approval referenced in Subparagraph 8.a and required for the SDs' Z1& 3 T&D Work, provided that they have submitted timely and complete applications and taken all other actions necessary to obtain all such permits or approvals.

c. This Consent Decree is not, and shall not be construed to be, a permit issued pursuant to any federal, state, or local statute, regulation, or ordinance.

VI. PERFORMANCE OF SDs' Z1&3 T&D WORK BY SETTLING DEFENDANTS

9. Selection of SDs' Z1&3 T&D Supervising Contractor.

a. All aspects of the SDs' Z1&3 T&D Work to be performed by Settling Defendants pursuant to Sections VI (Performance of SDs' Z1&3 T&D Work by Settling Defendants) and XII (Emergency Response) shall be under the direction and supervision of the SD's Z1&3 T&D Supervising Contractor, the selection of which shall be subject to disapproval by EPA. Within 30 days after receipt from EPA of a draft of the OU1 Remedial Action Work Plan, Settling Defendants shall notify EPA in writing of the name, title, and qualifications of any contractor proposed to be the SDs' Z1&3 T&D Supervising Contractor. With respect to any contractor proposed to be the SDs' Z1&3 T&D Supervising Contractor, Settling Defendant shall demonstrate that the proposed contractor has a quality assurance system that complies with ANSI/ASQC E4-1994, "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs" (American National Standard, January 5, 1995), by submitting a copy of the proposed contractor's Quality Management Plan ("QMP"). The QMP should be prepared in accordance with "EPA Requirements for Quality Management Plans (QA/R-2)" (EPA/240/B-01/002, March 2001, reissued May 2006) or equivalent documentation as determined by EPA. EPA will issue either a notice of disapproval or an authorization to proceed regarding hiring of the proposed SDs' Z1&3 T&D Supervising Contractor. If at any time thereafter, Settling Defendants propose to change an SDs' Z1&3 T&D Supervising Contractor, Settling Defendants shall give such notice to EPA and must obtain an authorization to proceed from EPA before the new SDs' Z1&3 T&D Supervising Contractor performs, directs, or supervises any SDs' Z1&3 T&D Work under this Consent Decree.

b. If EPA disapproves a proposed SDs' Z1&3 T&D Supervising Contractor, EPA will notify Settling Defendants in writing. Settling Defendants shall submit to EPA a list of contractors, including the qualifications of each contractor, that would be acceptable to them within 30 days after receipt of EPA's disapproval of the contractor previously proposed. EPA will provide written notice of the names of any contractor(s) that it disapproves and an authorization to proceed with respect to any of the other contractors. Settling Defendants may select any contractor from that list that is not disapproved and shall notify EPA of the name of the contractor selected within 21 days after EPA's authorization to proceed.

c. If EPA fails to provide written notice of its authorization to proceed or disapproval as provided in this Paragraph and this failure prevents Settling Defendants from meeting one or more deadlines in a plan approved by EPA pursuant to this Consent Decree, Settling Defendant may seek relief under Section XV (Force Majeure).

10. SDs' Z1&3 Transportation and Disposal Work.

a. Within 30 days after receipt from EPA of a draft of the OU1 Remedial Action Work Plan, Settling Defendants shall submit to EPA and the State an SDs' Z1&3 T&D Work Plan. The SDs' Z1&3 T&D Work Plan shall provide for the Transportation of Waste Material out of Zone 1 and/or Zone 3 (except for Waste Material at Z1&3 Excluded Properties) and the Disposal of such Waste Material at a licensed Subtitle C or Subtitle D landfill, as

applicable, in accordance with this Consent Decree, the ROD, and the Z1&3 Statement of Work attached as Appendix B. Upon its approval by EPA, the SDs' Z1&3 T&D Work Plan shall be incorporated into and enforceable under this Consent Decree. As part of the SDs' Z1&3 T&D Work Plan, Settling Defendants shall submit to EPA and the State a Health and Safety Plan for field activities required by the SDs' Z1&3 T&D Work Plan that conforms to the applicable Occupational Safety and Health Administration and EPA requirements including, but not limited to, 29 C.F.R. § 1910.120. The Health and Safety Plan shall include a Traffic and Accident Management Plan and a Contingency Plan.

b. Upon approval of the SDs' Z1&3 T&D Work Plan by EPA, after a reasonable opportunity for review and comment by the State, and upon issuance of the final OU1 Remedial Action Work Plan by EPA, Settling Defendants shall implement the activities required under the SDs' Z1&3 T&D Work Plan consistent with the time frames set forth in the approved Plan. Settling Defendants shall submit to EPA and the State all reports and other deliverables required under the approved SDs' Z1&3 T&D Work Plan in accordance with the approved schedule for review and approval pursuant to Section VIII (EPA Approval of Plans, Reports, and Other Deliverables). Unless otherwise directed by EPA, Settling Defendants shall not commence the SDs' Z1&3 T&D Work prior to EPA's issuance of the final OU1 Remedial Action Work Plan. Settling Defendants are not required to perform Transportation and Disposal Work at the Z1&3 Excluded Properties.

11. Settling Defendants shall continue to implement the SDs' Z1&3 T&D Work Plan until: (i) in Zone 1, EPA issues a Certification of Completion of SDs' Z1 T&D Work pursuant to Subparagraph 34.b (Certification of Completion of SDs' Z1 T&D Work); and (ii) in Zone 3, EPA issues a Certification of Completion of SDs' Z3 T&D Work pursuant to Subparagraph 34.d (Certification of Completion of SDs' Z3 T&D Work).

12. Modification of Z1&3 SOW or Related Work Plans.

a. If EPA determines that it is necessary to modify, with respect to the performance of T&D activities, the SDs' Z1&3 T&D Work specified in the Z1&3 SOW and/or in the SDs' Z1&3 T&D Work Plan developed pursuant to the Z1&3 SOW to achieve and maintain the Performance Standards, to carry out and maintain the effectiveness of the remedy set forth in the ROD, or to protect human health or the environment, and such modification is consistent with the scope of the remedy set forth in the ROD, then EPA may issue such modification in writing and shall notify Settling Defendants of such modification. If Settling Defendants object to the modification they may, within 30 days after EPA's notification, seek dispute resolution under Paragraph 58 (Record Review).

b. The Z1&3 SOW and/or the SDs' Z1&3 T&D Work Plan shall be modified: (1) in accordance with the modification issued by EPA; or (2) if Settling Defendants invoke dispute resolution, in accordance with the final resolution of the dispute. The modification shall be incorporated into and enforceable under this Consent Decree, and Settling Defendants shall implement all SDs' Z1&3 T&D Work required by such modification.

c. Nothing in this Paragraph shall be construed to limit EPA's authority to require performance of further response actions as otherwise provided in this Consent Decree.

13. Nothing in this Consent Decree, the Z1&3 SOW, or the SDs' Z1&3 T&D Work Plan constitutes a warranty or representation of any kind by Plaintiffs that compliance with the work requirements set forth in the Z1&3 SOW and in SDs' Z1&3 T&D Work Plan will achieve the Performance Standards in Zone 1 or Zone 3.

14. Off-Site Shipment of Waste Material.

a. Settling Defendants may ship Waste Material from the Site to an off-site facility only if they verify, prior to any shipment, that the off-site facility is operating in compliance with the requirements of Section 121(d)(3) of CERCLA, 42 U.S.C. § 9621(d)(3), and 40 C.F.R. § 300.440, by obtaining a determination from EPA that the proposed receiving facility is operating in compliance with 42 U.S.C. § 9621(d)(3) and 40 C.F.R. § 300.440.

b. Settling Defendants may ship Waste Material from the Site to an out-of-state waste management facility only if, prior to any shipment, they provide written notice to the appropriate state environmental official in the receiving facility's state and to the EPA Project Coordinator. This notice requirement shall not apply to any off-site shipments when the total quantity of all such shipments will not exceed ten cubic yards. The written notice shall include the following information, if available: (1) the name and location of the receiving facility; (2) the type and quantity of Waste Material to be shipped; (3) the schedule for the shipment; and (4) the method of transportation. Settling Defendants also shall notify the state environmental official referenced above and the EPA Project Coordinator of any major changes in the shipment plan, such as a decision to ship the Waste Material to a different out-of-state facility. Settling Defendant shall provide the written notice before the Waste Material is shipped.

VII. REPORTING REQUIREMENTS AND CONSULTATION OPPORTUNITIES

15. Monthly Progress Reports. In addition to any other requirement of this Consent Decree, Settling Defendants shall submit to EPA and to the State one copy of a written monthly progress report that: (a) describes the SDs' Z1&3 T&D actions that have been taken during the previous month, including a summary of the type and quantity of Waste Material shipped and the name and location of the receiving facility(ies); (b) identifies all plans and other deliverables, if any, required by this Consent Decree that were completed and submitted during the previous month; (c) includes information regarding unresolved delays encountered or anticipated that may affect the future schedule for implementation of the SDs' Z1&3 T&D Work, and a description of efforts made to mitigate those delays or anticipated delays; and (d) includes any modifications to the SDs' Z1&3 T&D Work Plan or other schedules, if any, that Settling Defendants have proposed to EPA or that have been approved by EPA. Settling Defendants shall submit these progress reports to EPA and the State by the tenth day of every month following EPA's approval of the SDs' Z1&3 T&D Work Plan until EPA issues a Certification of Completion of the SDs' Z3 T&D Work pursuant to Paragraph 34.d; provided, however, Settling Defendants shall not be required to submit a monthly progress report for any month in which no activity under the SDs' Z1&3 T&D Work Plan occurs. The monthly progress reports required by this Paragraph may be

submitted electronically unless EPA requests otherwise. If requested by EPA or the State, Settling Defendants shall also provide briefings to EPA and the State to discuss the progress of the SDs' Z1&3 T&D Work. Such briefings may occur telephonically if agreed by EPA and Settling Defendants.

16. Settling Defendants shall notify EPA of any change in the schedule described in the monthly progress report for the performance of any of the SDs' Z1&3 T&D activity, including, but not limited to, implementation of the SDs' Z1&3 T&D Work Plan, no later than seven days prior to the performance of the activity.

17. Release Reporting. Upon the occurrence of any event during performance of the SDs' Z1&3 T&D Work that Settling Defendants are required to report pursuant to Section 103 of CERCLA, 42 U.S.C. § 9603, or Section 304 of the Emergency Planning and Community Right-to-know Act ("EPCRA"), 42 U.S.C. § 11004, Settling Defendants shall within 24 hours of the onset of such event orally notify the EPA Project Coordinator or the Alternate EPA Project Coordinator (in the event of the unavailability of the EPA Project Coordinator), or, in the event that neither the EPA Project Coordinator nor Alternate EPA Project Coordinator is available, the Emergency Response Section, Region 5, United States Environmental Protection Agency at 312 353-2318. These reporting requirements are in addition to the reporting required by CERCLA Section 103 or EPCRA Section 304.

18. Within 20 days after the onset of such an event, Settling Defendants shall furnish to EPA and the State a written report, signed by Settling Defendants' Project Coordinator, setting forth the events that occurred and the measures taken, and to be taken, in response thereto. Within 30 days after the conclusion of such an event, Settling Defendants shall submit a report setting forth all actions taken in response thereto.

19. Submission and Certification of Deliverables. Settling Defendants shall submit one hard copy of all plans, reports, data, and other deliverables required by the Z1&3 SOW, the SDs' Z1&3 T&D Work Plan, or any other approved plans to EPA and the State in accordance with the schedules set forth in the Z1&3 SOW and such plans. At the same time, Settling Defendants shall submit an additional copy to EPA and the State in electronic form.

20. All deliverables submitted by Settling Defendants to EPA and the State that purport to document Settling Defendants' compliance with the terms of this Consent Decree shall be signed by an authorized representative of Settling Defendants.

21. Consultation and Meeting Opportunities. To facilitate the implementation of the Z1&3 Remedial Design and the Z1&3 Remedial Action, EPA shall invite the State's Project Coordinator, Settling Defendants' Project Coordinator, the SDs' Z1&3 T&D Supervising Contractor, and any other representative(s) of Settling Defendants that EPA may so decide to invite to participate in periodic (generally weekly) conference calls between EPA, its contractor, and any other appropriate participants to the call to discuss the status, progress, and/or other relevant matters regarding the Z1&3 Remedial Design and the Z1&3 Remedial Action. EPA also shall provide to Settling Defendants' Project Coordinator an abridged version of the monthly progress reports that EPA's contractor prepares during the Z1 Work and the Z3 Work.

These reports shall be abridged to redact Confidential Business Information, Personal Identifying Information, trade secrets, unique solutions, and any other material protected from disclosure under the Freedom of Information Act.

VIII. EPA APPROVAL OF PLANS, REPORTS, AND OTHER DELIVERABLES

22. Initial Submissions.

a. After review of any plan, report, or other deliverable that is required to be submitted for approval pursuant to this Consent Decree, EPA shall: (1) approve, in whole or in part, the submission; (2) approve the submission upon specified conditions; (3) disapprove, in whole or in part, the submission; or (4) any combination of the foregoing.

b. EPA also may modify the initial submission to cure deficiencies in the submission if: (1) EPA determines that disapproving the submission and awaiting a resubmission would cause substantial disruption to the Z1 Work and/or the Z3 Work; or (2) previous submission(s) have been disapproved due to material defects and the deficiencies in the initial submission under consideration indicate a bad faith lack of effort to submit an acceptable plan, report, or deliverable.

23. Resubmissions. Upon receipt of a notice of disapproval under Paragraph 22.a.(3) or (4), or if required by a notice of approval upon specified conditions under Paragraph 22.a.(2), Settling Defendants shall, within 14 days or such longer time as specified by EPA in such notice, correct the deficiencies and resubmit the plan, report, or other deliverable for approval. After review of the resubmitted plan, report, or other deliverable, EPA may: (a) approve, in whole or in part, the resubmission; (b) approve the resubmission upon specified conditions; (c) modify the resubmission; (d) disapprove, in whole or in part, the resubmission, requiring Settling Defendants to correct the deficiencies; or (e) any combination of the foregoing.

24. Material Defects. If an initially submitted or resubmitted plan, report, or other deliverable contains a material defect, and the plan, report, or other deliverable is disapproved or modified by EPA under Paragraph 22.b.(2) or 23 due to such material defect, then the material defect shall constitute a lack of compliance for purposes of Paragraph 61. The provisions of Section XVI (Dispute Resolution) and Section XVII (Stipulated Penalties) shall govern the accrual and payment of any stipulated penalties regarding Settling Defendants' submissions under this Section.

25. Implementation. Upon approval, approval upon conditions, or modification by EPA under Paragraph 22 (Initial Submissions) or Paragraph 23 (Resubmissions) of any plan, report, or other deliverable, or any portion thereof: (a) such plan, report, or other deliverable, or portion thereof, shall be incorporated into and enforceable under this Consent Decree; and (b) Settling Defendants shall take any action required by such plan, report, or other deliverable, or portion thereof, subject only to their right to invoke the Dispute Resolution procedures set forth in Section XVI (Dispute Resolution) with respect to the modifications or conditions made by EPA. The implementation of any non-deficient portion of a plan, report, or other deliverable submitted or resubmitted under Paragraph 22 or 23 shall not relieve Settling Defendant of any liability for stipulated penalties under Section XVII (Stipulated Penalties).

IX. PROJECT COORDINATORS

26. Within 20 days after lodging this Consent Decree, Settling Defendants, the State, and EPA will notify each other, in writing, of the name, address, and telephone number of their respective designated Project Coordinators and Alternate Project Coordinators. If a Project Coordinator or Alternate Project Coordinator initially designated is changed, the identity of the successor will be given to the other Parties at least five working days before the change occurs, unless impracticable, but in no event later than the actual day the change is made. Settling Defendants' Project Coordinator shall be subject to disapproval by EPA and shall have the technical expertise sufficient to adequately oversee all aspects of the SDs' Z1&3 T&D Work. Settling Defendants' Project Coordinator shall not be an attorney for either Settling Defendant in this matter. He or she may assign other representatives, including other contractors, to serve as a Site representative for oversight of performance of daily operations during remedial activities.

27. Plaintiffs may designate other representatives, including, but not limited to, EPA and State employees and federal and State contractors and consultants, to observe and monitor the progress of any activity undertaken pursuant to this Consent Decree. EPA's Project Coordinator and Alternate Project Coordinator shall have the authority lawfully vested in a Remedial Project Manager ("RPM") and an On-Scene Coordinator ("OSC") by the NCP, 40 C.F.R. Part 300. EPA's Project Coordinator or Alternate Project Coordinator shall have authority, consistent with the NCP, to halt any of the SDs' Z1&3 T&D Work required by this Consent Decree and to take any necessary response action when he or she determines that conditions at the Site constitute an emergency situation or may present an immediate threat to public health or welfare or the environment due to release or threatened release of Waste Material.

28. EPA's Project Coordinator, the State's Project Coordinator, and Settling Defendants' Project Coordinator will meet, at a minimum, on a monthly basis. Such meetings may occur telephonically by agreement of the Project Coordinators.

X. PERFORMANCE GUARANTEE

29. In order to ensure the full and final completion of Z1&3 Work, Settling Defendants shall establish and maintain a performance guarantee, initially in the amount of $21 million (hereinafter "Estimated Cost of the Z1&3 Work") for the benefit of EPA. The performance guarantee, which must be satisfactory in form and substance to EPA, shall be in the form of one or more of the following mechanisms:

a. A surety bond unconditionally guaranteeing payment and/or performance of the Z1&3 Work that is issued by a surety company among those listed as acceptable sureties on federal bonds as set forth in Circular 570 of the U.S. Department of the Treasury;

b. One or more irrevocable letters of credit, payable to or at the direction of EPA, that is issued by one or more financial institution(s) (1) that has the authority to issue

letters of credit and (2) whose letter-of-credit operations are regulated and examined by a federal or state agency;

c. A trust fund established for the benefit of EPA that is administered by a trustee (1) that has the authority to act as a trustee and (2) whose trust operations are regulated and examined by a federal or state agency; or

d. A policy of insurance that (1) provides EPA with acceptable rights as a beneficiary thereof; and (2) is issued by an insurance carrier (i) that is eligible to issue insurance policies in the applicable jurisdiction(s) and (ii) whose insurance operations are regulated and examined by a federal or state agency.

30. Settling Defendants have selected, and EPA has found satisfactory, as an initial performance guarantee, a Surety Bond pursuant to Paragraph 29.a, in the form attached hereto as Appendix E. Within ten days after the Effective Date, Settling Defendants shall execute or otherwise finalize all instruments or other documents required in order to make the selected performance guarantee(s) legally binding in a form substantially identical to the documents attached hereto as Appendix E, and such performance guarantee(s) shall thereupon be fully effective. Within 30 days after the Effective Date, Settling Defendants shall submit copies of all executed and/or otherwise finalized instruments or other documents required in order to make the selected performance guarantee(s) legally binding to the EPA Regional Financial Management Officer in accordance with Section XXIII (Notices and Submissions), with a copy to the United States, EPA, and the State as specified in Section XXIII.

31. In the event that EPA determines at any time that a performance guarantee provided by any Settling Defendant pursuant to this Section is inadequate or otherwise no longer satisfies the requirements set forth in this Section, whether due to an increase in the estimated cost of completing the Z1&3 Work or for any other reason, or in the event that any Settling Defendant becomes aware of information indicating that a performance guarantee provided pursuant to this Section is inadequate or otherwise no longer satisfies the requirements set forth in this Section, whether due to an increase in the estimated cost of completing the Z1&3 Work or for any other reason, Settling Defendants, within 30 days after receipt of notice of EPA's determination or, as the case may be, within 30 days after any Settling Defendant becoming aware of such information, shall obtain and present to EPA for approval a proposal for a revised or alternative form of performance guarantee listed in Paragraph 29 that satisfies all requirements set forth in this Section X; provided, however, that if any Settling Defendant cannot obtain such revised or alternative form of performance guarantee within such 30-day period, and provided further that the Settling Defendant shall have commenced to obtain such revised or alternative form of performance guarantee within such 30-day period, and thereafter diligently proceeds to obtain the same, EPA shall extend such period for such time as is reasonably necessary for the Settling Defendant in the exercise of due diligence to obtain such revised or alternative form of performance guarantee, such additional period not to exceed 60 days. On day 30, Settling Defendant shall provide to EPA a status report on its efforts to obtain the revised or alternative form of guarantee. In seeking approval for a revised or alternative form of performance guarantee, Settling Defendants shall follow the procedures set forth in Paragraph 33.b(2). Settling Defendants' inability to post a performance guarantee for completion of the Z1&3 Work

shall in no way excuse performance of any other requirements of this Consent Decree, including, without limitation, the obligation of Settling Defendant to complete the SDs' Z1&3 T&D Work in strict accordance with the terms of this Consent Decree.

32. Funding for Z1&3 Work Takeover. The commencement by EPA of an SDs' Z1&3 T&D Work Takeover pursuant to Paragraph 75 and/or the failure by Settling Defendants to timely pay any costs due under Section XIII (Payments for Z1&3 Future Response Costs and State's Z1&3 Future Response Costs) shall trigger EPA's right to receive the benefit of any performance guarantee(s) provided pursuant to Paragraphs 29.a, 29.b, 29.c, or 29.d, subject to Settling Defendants' right to invoke the dispute resolution procedures set forth in Section XVI (Dispute Resolution). At such time as EPA commences an SDs' Z1&3 T&D Work Takeover and/or Settling Defendants fail to timely pay any costs due, EPA shall have immediate access to resources guaranteed under any such performance guarantee(s), whether in cash or in kind, as needed to continue and complete the SDs' Z1&3 T&D Work assumed by EPA under the SDs' Z1&3 T&D Work Takeover and/or as needed to continue and complete the Z1 Work and/or the Z3 Work. Upon the commencement of an SDs' Z1&3 T&D Work Takeover and/or the failure by Settling Defendants to timely pay any costs due, if for any reason EPA is unable to promptly secure the resources guaranteed under any such performance guarantee(s), whether in cash or in kind, necessary to continue and complete the SDs' Z1&3 T&D Work assumed by EPA under the SDs' Z1&3 T&D Work Takeover and/or to obtain any payment due under Section XIII, Settling Defendants shall immediately upon written demand from EPA deposit into a special account within the EPA Hazardous Substance Superfund or such other account as EPA may specify, in immediately available funds and without setoff, counterclaim, or condition of any kind, a cash amount up to but not exceeding the estimated cost of completing the remainder of the Z1&3 Work as of such date, as determined by EPA. In addition, if at any time EPA is notified by the issuer of a performance guarantee that such issuer intends to cancel the performance guarantee mechanism it has issued, then, unless Settling Defendants provide a substitute performance guarantee mechanism in accordance with this Section X no later than 30 days prior to the impending cancellation date, EPA shall be entitled (as of and after the date that is 30 days prior to the impending cancellation) to draw fully on the funds guaranteed under the then-existing performance guarantee. All of EPA's costs associated with an SDs' Z1&3 T&D Work Takeover and all Z1&3 Future Response Costs and all State Z1&3 Future Response Costs not reimbursed under this Paragraph shall be reimbursed under Section XIII (Payments for Z1&3 Future Response Costs and State's Z1&3 Future Response Costs).

33. Modification of Amount and/or Form of Performance Guarantee.

a. Reduction of Amount of Performance Guarantee.

(1) If, pursuant to Paragraph 39.b.(4), Settling Defendants elect to pay more than the $5 million due under Paragraph 39.b.(2), Settling Defendants may, without first seeking EPA's approval, reduce the amount of the performance guarantee by the additional amount above $5 million that they have elected to pay. Such reduction shall be made only after payment is made pursuant to Section XIII.

(2) After Settling Defendants make the $7.5 million payment required by Paragraph 39.b.(3) (or such larger sum as they may elect to pay pursuant to Paragraph 39.b.(4)), Settling Defendants may, without first seeking EPA's approval, reduce the amount of the performance guarantee by the total amount of the payment.

(3) Thereafter, if Settling Defendants believe that the estimated cost of completing the Z1&3 Work has diminished below the outstanding amount of the performance guarantee, Settling Defendants may, on the anniversary of their payment under Paragraph 39.b.(3) (whether it is the required $7.5 million or some larger amount), or at any other time agreed to by the Parties, petition EPA in writing to request a reduction in the amount of the performance guarantee provided pursuant to this Section so that the amount of the performance guarantee is equal to the estimated cost of completing the Z1&3 Work. Settling Defendants shall submit a written proposal for such reduction to EPA that shall specify, at a minimum, the estimated cost of completing the Z1&3 Work and the basis upon which such cost was calculated. In seeking approval for a reduction in the amount of the performance guarantee, Settling Defendants shall follow the procedures set forth in Paragraph 33.b.(2) for requesting a revised or alternative form of performance guarantee, except as specifically provided in this Paragraph 33.a. If EPA decides to accept Settling Defendants' proposal for a reduction in the amount of the performance guarantee, either to the amount set forth in Settling Defendants' written proposal or to some other amount as selected by EPA, EPA will notify Settling Defendants of such decision in writing. Upon EPA's acceptance of a reduction in the amount of the performance guarantee, the Estimated Cost of the Z1&3 Work shall be deemed to be the estimated cost of completing the Z1&3 Work set forth in EPA's written decision. After receiving EPA's written decision, Settling Defendants may reduce the amount of the performance guarantee in accordance with and to the extent permitted by such written acceptance and shall submit copies of all executed and/or otherwise finalized instruments or other documents required in order to make the selected performance guarantee(s) legally binding in accordance with Paragraph 33.b.(2). In the event of a dispute, Settling Defendants may reduce the amount of the performance guarantee required hereunder only in accordance with a final administrative or judicial decision resolving such dispute pursuant to Section XVI (Dispute Resolution). No change to the form or terms of any performance guarantee provided under this Section, other than a reduction in amount, is authorized except as provided in Paragraphs 31 or 33.b.

b. Change of Form of Performance Guarantee.

(1) If, after the Effective Date, Settling Defendants desire to change the form or terms of any performance guarantee(s) provided pursuant to this Section, Settling Defendants may, on any anniversary of the Effective Date, or at any other time agreed to by the Parties, petition EPA in writing to request a change in the form or terms of the performance guarantee provided hereunder. The submission of such proposed revised or alternative performance guarantee shall be as provided in Paragraph 33.b.(2). Any decision made by EPA on a petition submitted under this Paragraph shall be made in EPA's sole and unreviewable discretion, and such decision shall not be subject to

challenge by Settling Defendants pursuant to the dispute resolution provisions of this Consent Decree or in any other forum.

(2) Settling Defendants shall submit a written proposal for a revised or alternative performance guarantee to EPA that shall specify, at a minimum, the estimated cost of completing the Z1&3 Work, the basis upon which such cost was calculated, and the proposed revised performance guarantee, including all proposed instruments or other documents required in order to make the proposed performance guarantee legally binding. The proposed revised or alternative performance guarantee must satisfy all requirements set forth or incorporated by reference in this Section. Settling Defendants shall submit such proposed revised or alternative performance guarantee to the EPA Regional Financial Management Officer in accordance with Section XXIII (Notices and Submissions). EPA will notify Settling Defendants in writing of its decision to accept or reject a revised or alternative performance guarantee submitted pursuant to this Paragraph. Within ten days after receiving a written decision approving the proposed revised or alternative performance guarantee, Settling Defendants shall execute and/or otherwise finalize all instruments or other documents required in order to make the selected performance guarantee(s) legally binding in a form substantially identical to the documents submitted to EPA as part of the proposal, and such performance guarantee(s) shall thereupon be fully effective. Settling Defendants shall submit copies of all executed and/or otherwise finalized instruments or other documents required in order to make the selected performance guarantee(s) legally binding to the EPA Regional Financial Management Officer within 30 days after receiving a written decision approving the proposed revised or alternative performance guarantee in accordance with Section XXIII (Notices and Submissions), with a copy to the United States, EPA, and the State as specified in Section XXIII.

c. Release of Performance Guarantee. Settling Defendant shall not release, cancel, or discontinue any performance guarantee provided pursuant to this Section except as provided in this Paragraph. If Settling Defendants receive written notice from EPA in accordance with Paragraph 35 that the Z1&3 Work has been fully and finally completed in accordance with the terms of this Consent Decree, or if EPA otherwise so notifies Settling Defendants in writing, Settling Defendant may thereafter release, cancel, or discontinue the performance guarantee(s) provided pursuant to this Section. In the event of a dispute, Settling Defendants may release, cancel, or discontinue the performance guarantee(s) required hereunder only in accordance with a final administrative or judicial decision resolving such dispute pursuant to Section XVI (Dispute Resolution).

XI. CERTIFICATIONS OF COMPLETION

34. Completion of SDs' Z1 T&D Work and SDs' Z3 T&D Work.

a. SDs' Z1 T&D Work. Within 30 days after Settling Defendants have submitted their Final SDs' Z1 T&D Work Report, as identified in the Z1&3 SOW, Settling Defendants shall schedule and conduct a pre-certification meeting to be attended by Settling Defendants, EPA, and the State. If, after the pre-certification meeting, Settling Defendants still

believe that the SDs' Z1 T&D Work has been completed, they shall submit a written report requesting certification to EPA for approval, pursuant to Section VIII (EPA Approval of Plans, Reports, and Other Deliverables), with a copy to the State, within 30 days after the meeting. In the report requesting certification, Settling Defendants' Project Coordinator shall state that the SDs' Z1 T&D Work has been completed in full satisfaction of the requirements of this Consent Decree. The report shall contain the following statement, signed by a responsible corporate official of a Settling Defendant or Settling Defendants' Project Coordinator:

> I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

If, after the pre-certification meeting and receipt and review of the written report requesting certification, EPA determines, after reasonable opportunity for review and comment by the State, that the SDs' Z1 T&D Work, or any portion thereof, has not been completed in accordance with this Consent Decree, EPA will notify Settling Defendants in writing of the activities that must be undertaken by Settling Defendants pursuant to this Consent Decree to complete the SDs' Z1 T&D Work. EPA will set forth in the notice a schedule for performance of such activities consistent with the Consent Decree and the Z1&3 SOW or require Settling Defendants to submit a schedule to EPA for approval pursuant to Section VIII (EPA Approval of Plans, Reports, and Other Deliverables). Settling Defendants shall perform all activities described in the notice in accordance with the specifications and schedule established pursuant to this Paragraph, subject to their right to invoke the dispute resolution procedures set forth in Section XVI (Dispute Resolution).

b. Certification of Completion of the SDs' Z1 T&D Work. If, based on the initial meeting, the final SDs' Z1 T&D Work report, and/or the report requesting Certification of Completion of the SDs' Z1 T&D Work, EPA concludes, after a reasonable opportunity for review and comment by the State, that Settling Defendants have completed the SDs' Z1 T&D Work, EPA will so certify in writing to Settling Defendants. This certification shall constitute the Certification of Completion of the SDs' Z1 T&D Work for purposes of this Consent Decree. Certification of Completion of the SDs' Z1 T&D Work shall not affect Settling Defendants' remaining obligations under this Consent Decree. Nothing in this Paragraph or this Consent Decree shall require Defendants to perform Transportation and Disposal Work on Z1 Excluded Properties.

c. SDs' Z3 T&D Work. The Parties shall comply with the provisions of Paragraph 34.a except that each reference to "Z1" in Paragraph 34.a shall, for purposes of this Paragraph 34.c, be "Z3."

d. Certification of Completion of the SDs' Z3 T&D Work. The Parties shall comply with the provisions of Paragraph 34.b except that each reference to "Z1" in Paragraph 34.b shall, for purposes of this Paragraph 34.d, be "Z3."

35. Completion of Z1&3 Work Except for Response Actions at the Z1&3 Excluded Properties.

a. Within 180 days after EPA concludes that all phases of the Z1&3 Work have been fully performed, except for response actions at the Z1&3 Excluded Properties and the payment of all amounts due under Paragraphs 41 through 43, EPA shall schedule and conduct a pre-certification meeting to be attended by EPA, the State, and Settling Defendants. The meeting shall address issues related to the Z1&3 Excluded Properties, whether all contractor invoices for the Z1 Work and the Z3 Work have been received, whether all invoices issued by the State pursuant to Paragraph 44 have been paid, and any other matters that the Parties may wish to raise. Unless EPA concludes after the meeting that all Z1&3 Work, except for response actions at the Z1&3 Excluded Properties and the payment of any amounts due under Paragraphs 41 through 43, is not complete, EPA shall prepare and issue: (i) the accounting and bill under Paragraph 41; (ii) a bill under Paragraph 43.d.(1) for the cashout of the Z1&3 Excluded Non-Residential Properties; and (iii) a bill under Paragraph 43.e.(1) for the cashout of the Z1&3 Excluded Residential Properties. Settling Defendants thereafter shall pay the amount due under Paragraph 41 in accordance with the provisions of Paragraph 41 and shall either pay or opt-out of the payments sought under Paragraphs 43.d and 43.e in accordance with the provisions of those subparagraphs.

b. If EPA concludes after the meeting with Settling Defendants that all Z1&3 Work, except for response actions at the Z1&3 Excluded Properties and the payment of any amounts due under Paragraphs 41 through 43, is not complete, EPA will notify Settling Defendants of the additional activities that must be undertaken to complete the Z1&3 Work (except for the response actions at the Z1&3 Excluded Properties). To the extent that any of these activities require Settling Defendants to perform Z1&3 T&D Work, Settling Defendants shall perform all activities described in the notice in accordance with the specification and schedules established therein, subject to their right to invoke the dispute resolution procedures set forth in Section XVI (Dispute Resolution).

c. If, after receipt of all payments due under Paragraphs 41 and 43, EPA concludes, after a reasonable opportunity for review and comment by the State, that all of Settling Defendants' obligations under this Consent Decree have been satisfied except for any payments due under Paragraphs 42 and 44 and any activities under Section XXII (Retention of Records), EPA shall issue a Certification of Completion of the Z1&3 Work Except for Response Actions at the Z1&3 Excluded Properties. Settling Defendants' obligations, if any, to pay Z1&3 Future Response Costs pursuant to Paragraph 42 or State Z1&3 Future Response Costs pursuant to Paragraph 44 shall not terminate upon EPA's issuance of a Certification of Completion of the Z1&3 Work Except for Response Actions at the Z1&3 Excluded Properties.

XII. EMERGENCY RESPONSE

36. If any action or occurrence during the performance of the SDs' Z1&3 T&D Work causes or threatens a release of Waste Material from the Site that constitutes an emergency situation or may present an immediate threat to public health or welfare or the environment, Settling Defendants shall, subject to Paragraph 37, immediately take all appropriate action to prevent, abate, or minimize such release or threat of release, and shall immediately notify EPA's Project Coordinator, or, if the Project Coordinator is unavailable, EPA's Alternate Project Coordinator. If neither of these persons is available, Settling Defendants shall notify the EPA Emergency Response Section, Region 5, at (312) 353-2318. Settling Defendants shall take such actions in consultation with EPA's Project Coordinator or other available authorized EPA officer and in accordance with all applicable provisions of the Health and Safety Plans, the Contingency Plans, and any other applicable plans or documents developed pursuant to the Z1&3 SOW. In the event that Settling Defendants fail to take appropriate response action as required by this Section, and EPA or, as appropriate, the State takes such action instead, Settling Defendants shall reimburse EPA and the State all costs of the response action under Section XIII (Payments for Z1&3 Future Response Costs and State's Z1&3 Future Response Costs).

37. Subject to Section XVIII (Covenants by Plaintiff), nothing in the preceding Paragraph or in this Consent Decree shall be deemed to limit any authority of the United States or the State (a) to take all appropriate action to protect human health and the environment or to prevent, abate, respond to, or minimize an actual or threatened release of Waste Material on, at, or from the Site, or (b) to direct or order such action, or seek an order from the Court, to protect human health and the environment or to prevent, abate, respond to, or minimize an actual or threatened release of Waste Material on, at, or from the Site.

XIII. PAYMENTS FOR Z1&3 FUTURE RESPONSE COSTS AND STATE'S Z1&3 FUTURE RESPONSE COSTS

38. Payments by Settling Defendants for Z1&3 Future Response Costs. Settling Defendants shall pay to EPA all Z1&3 Future Response Costs not inconsistent with the NCP. Each payment made by Settling Defendants pursuant to Paragraphs 39 through 43 shall be deposited by EPA in the USS Lead Z1&3 Special Account, which is associated with Site/Spill ID Number 05 3J.

39. Fixed Prepayments of Certain Z1&3 Future Response Costs.

a. Deposit Information and Payment Instructions. Settling Defendants shall make all payments required by Paragraph 39 in accordance with the payment instructions set forth in Paragraph 45.a.

b. Fixed Prepayments of Certain Z1&3 Future Response Costs. Settling Defendants shall pay to EPA the following amounts at the following times as prepayments of Z1&3 Future Response Costs:

(1) Settling Defendants shall pay $1,000,000 by no later than 14 days after the Effective Date of this Consent Decree; and

(2) Settling Defendants shall pay $5,000,000 by no later than 14 days after Settling Defendants receive, by certified mail, notice from EPA that EPA has completed the final Z1&3 Remedial Design Work Plan; and

(3) Settling Defendants shall pay $7,500,000 by:

1. 21 days after Settling Defendants receive notice, by certified mail, from EPA that either: (i) the Z1 Work (excluding any activities related to the Z1&3 Excluded Properties located in Zone 1) has been substantially completed; or (ii) the preparation of individual Remedial Design Property Diagrams for some properties within Zone 3 has commenced; or

2. Such other date as EPA and the Settling Defendants may agree upon in writing.

(4) To the extent that Settling Defendants wish to increase the amount of the prepayment that they make under Paragraphs 39.b.(2) and/or (3), Settling Defendants shall be entitled to do so; provided however, that they first must notify the Department of Justice and EPA of the amount they intend to pay so that appropriate payment instructions under Paragraph 45.a can be developed.

c. Settling Defendants shall not be deemed to have violated the deadlines in Paragraph 39.b if Settling Defendants do not receive the payment instructions described in Paragraph 45.a at least five business days before payment is due. If, for any of the required payments, Settling Defendants do not receive the payment instructions at least five business days before the payment is due, Settling Defendants shall make the required payment no later than five business days after receipt of the payment instructions.

40. Additional Prepayments of Certain Z1&3 Future Response Costs Based on Projected Shortfalls to Complete the Z1 Work or the Z3 Work.

a. Payment Instructions. Settling Defendants shall make all payments required by Paragraph 40 in accordance with the payment instructions set forth in Paragraph 45.b.

b. Definitions. For purposes of this Paragraph 40, the following definitions shall apply:

(1) "Z1 Cost Completion Projection" shall mean the sum of any direct costs already incurred as of the date of the Projection but not paid for with Z1&3 Available Funds (*e.g.*, EPA's intramural costs such as payroll costs) plus EPA's projection of the direct costs EPA expects to incur, as of the date of the Projection, to complete the Z1 Work; and

(2) "Z3 Cost Completion Projection" shall mean the sum of any direct costs already incurred as of the date of the Projection but not paid for with Z1&3 Available Funds (*e.g.*, EPA's intramural costs such as payroll costs) plus EPA's projection of the direct costs EPA expects to incur, as of the date of the Projection, to complete the Z3 Work.

c. Notification of Projected Shortfall and Payment Amount.

(1) Z1 Work. If, during the course of the Z1 Work, the Z1&3 Available Funds fall below $2,000,000, EPA will notify Settling Defendants and include in the notification a Z1 Cost Completion Projection, the amount of Z1&3 Available Funds, and a bill for payment that shall be calculated using the following equation:

Payment = (Z1 Cost Completion Projection – Z1&3 Available Funds) + $1,000,000

(2) Z3 Work. If, during the course of the Z3 Work, the Z1&3 Available Funds fall below $2,000,000, EPA will notify Settling Defendants and include in that notification a Z3 Cost Completion Projection, the amount of Z1&3 Available Funds, and a bill for payment that shall be calculated using the following equation:

Payment = (Z3 Cost Completion Projection – Z1&3 Available Funds) + $1,000,000

d. Payments by Settling Defendants. By no later than 21 days after receiving a notice, by certified mail, from EPA pursuant to either Paragraph 40.c.(1) or Paragraph 40.c.(2), Settling Defendants shall pay the bill included in the notice. Settling Defendants shall not contest any bill sent under this Paragraph 40 at the time it is sent. Instead, at the time EPA sends the bill under Paragraph 41, Settling Defendants, in accordance with the requirements and limitations of Paragraph 46, may object to Z1&3 Future Response Costs that were paid through funds provided under this Paragraph 40.

e. Nothing in this Paragraph 40 shall limit EPA's ability to demand a payment under either Paragraph 40.c.(1) or Paragraph 40.c.(2) more than one time.

f. In its unreviewable discretion, EPA may elect to demand a payment under either Paragraph 40.c.(1) or Paragraph 40.c.(2) that is calculated using less than $1,000,000 as the value added at the end of the payment equation.

41. Z1&3 Future Response Cost Payment with Accounting Statement.

a. Payment Instructions. Settling Defendants shall make all payments required by Paragraph 41 in accordance with the payment instructions set forth in Paragraph 45.b.

b. After EPA has concluded that all phases of the Z1&3 Work, except for response actions at the Z1&3 Excluded Properties and the payment of any amounts under Paragraphs 41, 42, 43, and/or 44, is complete, EPA will prepare an accounting of Z1&3 Future Response Costs that will include an Itemized Cost Summary of all Z1&3 Future Response Costs, including direct and indirect costs, that EPA has incurred. In the accounting, EPA will credit Settling Defendants for all payments received under Paragraphs 39 and 40, not including Interest on those payments. EPA will send a bill, by certified mail, to Settling Defendants for the remaining, outstanding Z1&3 Future Response Costs, including Interest on indirect costs ("Remaining, Outstanding Z1&3 Future Response Costs"). Settling Defendants shall pay the bill within 60 days after receipt except as otherwise provided in Paragraph 46.

42. Periodic Billing for any Future Response Costs Not Previously Billed.

a. Payment Instructions. Settling Defendants shall make all payments required by Paragraph 42 in accordance with the payment instructions set forth in Paragraph 45.b.

b. After receipt of the payment in Paragraph 41, EPA will send to Settling Defendants, on a periodic basis if and as necessary, a bill requiring payment that includes an Itemized Cost Summary of all Z1&3 Future Response Costs (which includes direct and indirect costs incurred by EPA, its contractors, and DOJ) which shall show, *inter alia*, all Z1&3 Future Response Costs that EPA has not included in any previous bill and that are owed. Settling Defendants shall pay the bill within 60 days after receipt except as otherwise provided in Paragraph 46.

43. Cashout of Z1&3 Excluded Properties or Opt-Out.

a. Payment Instructions. Settling Defendants shall make all payments required by Paragraph 43 in accordance with the payment instructions set forth in Paragraph 45.b.

b. Z1&3 Excluded Residential Properties and Z1&3 Excluded Non-Residential Properties. At such time as EPA concludes, after consultation with the State, that it will be unable to timely obtain consent from one or more property owners within Zone 1 and/or Zone 3 to sample and/or to remediate its/their properties, EPA shall prepare a preliminary list of all unsampled and/or unremediated residential properties and a preliminary list of all unsampled and/or unremediated non-residential properties Upon preparation of the preliminary lists, EPA will provide them to the State and Settling Defendants. Thereafter, EPA and Settling Defendants, with a reasonable opportunity for comment by the State, will informally discuss the lists. At such time as EPA so decides, EPA will notify Settling Defendants, in writing, with a copy to the State, that informal discussions have ceased. EPA will then provide to Settling Defendants, with a copy to the State, a final list of the residential properties that are unsampled and/or unremediated ("Z1&3 Excluded Residential Properties") and a final list of the non-residential properties that are unsampled and/or unremediated ("Z1&3 Excluded Non-Residential Properties").

c. Settling Defendants' T&D Costs. By no later than 10 days after receipt of the final lists of Z1&3 Excluded Residential Properties and the Z1&3 Excluded Non-Residential Properties, Settling Defendants shall provide EPA with the following: the total of SDs' T&D costs for residential properties in Zone 1; the total of SDs' T&D costs for residential properties in Zone 3; the SDs' average T&D cost per cubic yard for residential properties remediated in Zone 1; the SDs' average T&D cost per cubic yard for residential properties remediated in Zone 3; and the SDs' T&D cost per cubic yard for non-residential properties remediated (broken down by property address, if possible).

d. Payment or Opt-out for Z1&3 Excluded Non-Residential Properties.

(1) EPA shall send a bill, by certified mail, to Settling Defendants to cash out their liabilities for the Z1&3 Excluded Non-Residential Properties. The bill shall equal the sum of the individual cash-out payments for each Z1&3 Excluded Non-Residential Property. The individual cash-out payments for each Z1&3 Excluded Non-Residential Property shall be calculated using the following formula:

> Individual Cash-Out Payment = EPA's Cost Estimate for that Particular Z1&3 Excluded Non-Residential Property x 2
>
> Where: "EPA's Cost Estimate for that Particular Z1&3 Excluded Non-Residential Property" shall equal the estimate of the direct and indirect costs (including T&D costs) that EPA expects to incur, based on all relevant information, for the specific non-residential property in question.

Defendants shall pay the bill within 60 days after receipt except as provided in Paragraph 43.d.(2).

(2) Opting-Out of the Payment for Z1&3 Excluded Non-Residential Properties. If the bill sent pursuant to Paragraph 43.d.(1) is greater than $1 million,

Settling Defendants shall have the option not to make the payment. By no later than 30 days after receipt of the bill, Settling Defendants shall notify EPA in writing about whether they are exercising this option. If Settling Defendants notify EPA that they are opting-out of the payment, the United States' and the State's covenants provided to Settling Defendants in Paragraph 73 of this Consent Decree shall no longer be in effect with respect to, and the "matters addressed" as defined by Paragraph 84 of this Consent Decree shall no longer include, response actions or response costs related to the Z1&3 Excluded Non-Residential Properties. If the bill is $1 million or less, or if, within 30 days after receipt of the bill, Settling Defendants do not elect to opt-out of paying a bill that is greater than $1 million, Settling Defendants shall pay the bill within 60 days after receipt and the United States' and the State's covenants provided in Paragraph 73 of this Consent Decree and the full "matters addressed" as defined by Paragraph 84 of this Consent Decree shall continue in effect. Settling Defendants shall not be entitled to object to a bill sent pursuant to Paragraph 43.d.(1) under the terms of Paragraph 46; their only remedy shall be to opt-out of the payment. Nothing in this Paragraph 43.d, however, shall preclude EPA and Settling Defendants from engaging in informal discussions either before or for 30 days after EPA issues a bill under Paragraph 43.d.(1) for the purpose of discussing any matter related to the bill. In its sole discretion, and not subject to review under Section XVI, EPA may elect, based on such discussions, to modify the bill and re-issue it (if it already has been sent). If EPA re-issues a bill, the deadlines under this Paragraph 43.d shall commence upon the date of the receipt of the re-issued bill.

e. Payment or Opt-out for Z1&3 Excluded Residential Properties.

(1) EPA shall send a bill, by certified mail, to Settling Defendants to cash out their liabilities for the Z1&3 Excluded Residential Properties. The bill shall be calculated using the following formula:

Bill = Zone 1 Cash-Out + Zone 3 Cash-Out

Where:

Zone 1 Cash-Out = Average Residential Property Cleanup Cost in Zone 1 x Number of residential properties that are Excluded Properties in Zone 1 x 2

Where: "Average Residential Property Cleanup Cost in Zone 1" = EPA's average direct and indirect costs per residential property remediated in Zone 1 + [(Total of SDs' T&D costs for residential properties in Zone 1 divided by Number of residential properties remediated in Zone 1) x 1.6].

Zone 3 Cash-Out = [the same formula as set forth for the Zone 1 Payment except that each reference to "Zone 1" or "Z1" shall be deleted and "Zone 3" or "Z3" shall be substituted]

Defendants shall pay the bill within 60 days after receipt except as provided in Paragraph 43.e.(2).

(2) Opting-Out of the Payment for Z1&3 Excluded Residential Properties. If the bill sent pursuant to Paragraph 43.e.(1) is greater than $2 million, Settling Defendants shall have the option not to make the payment. By no later than 30 days after receipt of the bill, Settling Defendants shall notify EPA in writing about whether they are exercising this option. If Settling Defendants notify EPA that they are opting-out of the payment, the United States' and the State's covenants provided to Settling Defendants in Paragraph 73 of this Consent Decree shall no longer be in effect with respect to, and the "matters addressed" as defined by Paragraph 84 of this Consent Decree shall no longer include, response actions or response costs related to the Z1&3 Excluded Residential Properties. If the bill is $2 million or less, or if, within 30 days after receipt of the bill, Settling Defendants do not elect to opt-out of paying a bill that is greater than $2 million, Settling Defendants shall pay the bill within 60 days after receipt and the United States' and the State's covenants provided to Settling Defendants in Paragraph 73 of this Consent Decree and the full "matters addressed" as defined by Paragraph 84 of this Consent Decree shall continue in effect. Settling Defendants shall not be entitled to object to a bill sent pursuant to Paragraph 43.e.(1) under the terms of Paragraph 46; their only remedy shall be to opt-out of the payment. Nothing in this Paragraph 43.e, however, shall preclude EPA and Settling Defendants from engaging in informal discussions either before or for 30 days after EPA issues a bill under Paragraph 43.e.(1) for the purpose of discussing any matter related to the bill. In its sole discretion, and not subject to review under Section XVI, EPA may elect, based on such discussions, to modify the bill and re-issue it (if it already has been sent). If EPA re-issues a bill, the deadlines under this Paragraph 43.e shall commence upon the date of the receipt of the re-issued bill.

44. Payment by Settling Defendants to State. Settling Defendants shall pay to the State all State Z1&3 Future Response Costs not inconsistent with the NCP. On a periodic basis, IDEM will send Settling Defendants an invoice requiring payment that includes a cost summary. Settling Defendants shall make all payments with 60 days of the date of the invoice except as otherwise provided in Paragraph 46. The check and a transmittal letter shall reference the name and address of the party making payment, the invoice number, the Site name, the Civil Action Number, and the IDEM Site Identification Number (USS Lead #7500081 (SZ029)) and shall be sent to:

Indiana Department of Environmental Management
100 N. Senate Avenue, Mail Code 50-10C
Indianapolis, IN 46204-2251

Attention: Cashier

Any payment received by IDEM after 12:30 pm Eastern Time will be credited on the next business day. A copy of the transmittal letter shall be sent to IDEM's Project Manager in accordance with Section XXIII (Notices and Submissions).

45. Payment Instructions for Payments by Settling Defendants to the United States.

a. Instructions for Z1&3 Future Response Costs Prepayments under Paragraph 39. All payments required under Paragraph 39 shall be made at https://www.pay.gov to the U.S. Department of Justice account, in accordance with instructions provided to Settling Defendants by the Financial Litigation Unit ("FLU") of the United States Attorney's Office for the Northern District of Indiana. The payment instructions provided by the Financial Litigation Unit shall include a Consolidated Debt Collection System ("CDCS") number, which shall be used to identify all payments required to be made in accordance with this Consent Decree. The FLU shall provide the payment instructions to:

Sally D. Prosser
DuPont Corporate Remediation Group
Chestnut Run Plaza 715-202
974 Centre Road
Wilmington, DE 19805
303.999.2874
Sally.Prosser@dupont.com

on behalf of Settling Defendants. Settling Defendants may change the individual to receive payment instructions on their behalf by providing a written notice of such change to the Financial Litigation Unit, United States Attorneys Office, 5400 Federal Plaza, Suite 1500, Hammond, IN 46320, and to the representatives of the United States set forth in Section XXIII (Notices and Submissions). When making payments under this Subparagraph 45.a, Settling Defendants shall also comply with Paragraph 45.c. EPA shall deposit all payments made pursuant to the instructions in this Paragraph 45.a to the USS Lead Z1&3 Special Account, which is associated with Site/Spill ID Number 05 3J.

b. Instructions for All Payments Except Those Under Paragraph 39 and Except for Stipulated Penalties. Except for payments made pursuant to Paragraph 39 and for stipulated penalty payments, all other payments required to be made under this Consent Decree shall be made by Fedwire EFT to:

Federal Reserve Bank of New York
ABA = 021030004
Account = 68010727
SWIFT address = FRNYUS33
33 Liberty Street
New York NY 10045
Field Tag 4200 of the Fedwire message should read "D 68010727 Environmental Protection Agency"

When making payments under this Subparagraph 45.b, Settling Defendants shall also comply with Subparagraph 45.c. EPA shall deposit all payments made pursuant to the instructions in this Paragraph 45.b to the USS Lead Z1&3 Special Account, which is associated with Site/Spill ID Number 05 3J.

c. All payments made under Paragraphs 45.a or 45.b shall reference the CDCS Number, Site/Spill ID Number 05 3J, USS Lead Z1&3 Special Account, and DOJ Case Number 90-11-3-10884/1. At the time of any payment required to be made in accordance with Paragraphs 45.a or 45.b, Settling Defendants shall send notice that payment has been made to the United States and to EPA, in accordance with Section XXIII (Notices and Submissions), and to the EPA Cincinnati Finance Office by email at cinwd_acctsreceivable@epa.gov or by mail at 26 W. Martin Luther King Drive, Cincinnati, Ohio 45268. Such notice shall also reference the CDCS Number, Site/Spill ID Number 05 3J, USS Lead Z1&3 Special Account, and DOJ Case Number 90-11-3-10884/1.

d. Instructions for Stipulated Penalty Payments. All payments for stipulated penalties under this Consent Decree shall be made by Fedwire EFT to:

Federal Reserve Bank of New York
ABA = 021030004
Account = 68010727
SWIFT address = FRNYUS33
33 Liberty Street
New York NY 10045
Field Tag 4200 of the Fedwire message should read "D 68010727 Environmental Protection Agency"

All payments under this Paragraph 45.d shall reference the CDCS Number, Site/Spill ID Number 05 3J, and DOJ Case Number 90-11-3-10884/1.

46. Objecting to Payments

a. Basis for Objections

(1) Except for payments required pursuant to Paragraph 43.d or 43.e, Settling Defendants may contest Z1&3 Future Response Costs that are direct costs and State Z1&3 Future Response Costs that are direct costs if Settling Defendants determine that EPA or the State, as applicable, has made a mathematical error or included a cost item that is not within the definition of Z1&3 Future Response Costs or State Z1&3 Future Response Costs, as applicable, or if they believe EPA or the State, as applicable, incurred excess costs as a direct result of an EPA or State action, as applicable, that was inconsistent with a specific provision or provisions of the NCP.

(2) Except for payments required pursuant to Paragraph 43.d or 43.e, Settling Defendants may contest Z1&3 Future Response Costs that are indirect costs or

any State Z1&3 Future Response Costs that are indirect costs only if Settling Defendants determine that EPA or the State, as applicable, has made a mathematical error. Settling Defendants shall not contest the methodology that EPA or the State uses to determine its/their indirect cost rate or the value of EPA's or the State's indirect rate(s) for the applicable years. The only basis for an objection to indirect costs is a mathematical error.

(3) Settling Defendants may not contest a bill for payment under Paragraph 43.d.(1) or 43.e.(1). Settling Defendants' only remedy shall be to opt-out of the payment under the terms of Paragraph 43.d.(2) or 43.e.(2).

b. Timing and Manner of Objection

(1) Timing. Except for payments required under Paragraphs 42–44, Settling Defendants shall make any objection only within 60 days after receipt of the accounting under Paragraph 41.b. For payments required under Paragraphs 42–44, Settling Defendants shall make any objection within 60 days after receipt of the bill.

(2) Manner. Any objection must be sent to the United States and the State (if contesting a state cost) in accordance with Section XXIII (Notices and Submissions). Any objection under Paragraph 46.a.(1) or (2) shall specifically identify the contested Z1&3 Future Response Cost and/or contested State Z1&3 Future Response Costs and the basis for objection. Any objection under Paragraph 46.a.(3) shall specifically identify the contested issue(s), the basis(es) for the objection, and the amount of the costs, if any, not contested.

c. Establishment of Escrow Account for Contested Costs and Payment of Uncontested Costs

(1) In the event of an objection, Settling Defendants shall establish, in a duly chartered bank or trust company, an interest-bearing escrow account that is insured by the Federal Deposit Insurance Corporation ("FDIC"), and remit to that escrow account funds equivalent to the amount of the contested Z1&3 Future Response Costs ("Escrowed Funds") and/or the contested State Z1&3 Future Response Costs ("State Escrowed Funds"). Settling Defendants shall send to the United States and the State, as applicable and as provided in Section XXIII (Notices and Submissions), a copy of the correspondence that establishes and funds the escrow account, including, but not limited to, information containing the identity of the bank and bank account under which the escrow account is established as well as a bank statement showing the initial balance of the escrow account.

(2) Simultaneously with the establishment of the escrow account, Settling Defendants shall pay: (i) with respect to a bill sent under Paragraph 41.b, the Remaining, Outstanding Z1&3 Future Response Costs minus the Escrowed Funds; (ii) with respect to a bill sent under Paragraphs 42 or 43, the uncontested Z1&3 Future Response Costs; and (iii) with respect to a bill sent under Paragraph 44, the uncontested

State Z1&3 Future Response Costs. Settling Defendants shall send to the United States and the State, as applicable and as provided in Section XXIII (Notices and Submissions), a transmittal letter identifying the payments made under this Paragraph 46.c.(2).

d. Dispute Resolution. Simultaneously with establishment of the escrow account, Settling Defendants shall initiate the Dispute Resolution procedures in Section XVI (Dispute Resolution). If the United States and/or the State, as applicable, prevails in the dispute, Settling Defendants shall pay the sums due (with accrued interest in the escrow account) to the United States and/or the State, as applicable, within five days after the resolution of the dispute. If Settling Defendants prevail concerning any aspect of the contested costs, Settling Defendants shall pay that portion of the costs (plus associated accrued interest in the escrow account) for which they did not prevail to the United States and/or the State, as applicable, within five days after the resolution of the dispute. Settling Defendants shall be disbursed any balance of the escrow account. The dispute resolution procedures set forth in this Paragraph in conjunction with the procedures set forth in Section XVI (Dispute Resolution) shall be the exclusive mechanisms for resolving disputes regarding Settling Defendants' obligation to reimburse the United States for its Z1&3 Future Response Costs and the State for the State's Z1&3 Future Response Costs.

e. Payment Instructions. All payments to the United States under this Paragraph shall be made in accordance with the payment instructions in Paragraph 45.b. All payments to the State under this Paragraph shall be made in accordance with the payment instructions in Paragraph 44.

47. Interest. In the event that any payment for Z1&3 Future Response Costs and/or State Z1&3 Future Response Costs required under this Section is not made by the date required, Settling Defendants shall pay Interest on the unpaid balance. The Interest on the prepayments of the Z1&3 Future Response Costs due under Paragraph 39 shall begin to accrue on the due dates of those payments. The Interest on all other payments due under this Section shall begin to accrue on the date of the bill. The Interest shall accrue through the date of Settling Defendants' payment. Payments of Interest made under this Paragraph shall be in addition to such other remedies or sanctions available to Plaintiffs by virtue of Settling Defendants' failure to make timely payments under this Section including, but not limited to, payment of stipulated penalties pursuant to Paragraph 62.

XIV. INDEMNIFICATION AND INSURANCE

48. Settling Defendants' Indemnification of the United States and the State.

a. The United States and the State do not assume any liability by entering into this Consent Decree or by virtue of any designation of Settling Defendants as EPA's authorized representative under Section 104(e) of CERCLA, 42 U.S.C. § 9604(e). Settling Defendants shall indemnify, save and hold harmless the United States, the State, and their officials, agents, employees, contractors, subcontractors, or representatives for or from any and all claims or causes of action arising from, or on account of, negligent or other wrongful acts or

omissions of Settling Defendants, their officers, directors, employees, agents, contractors, subcontractors, and any persons acting on their behalf or under their control, in carrying out activities pursuant to this Consent Decree, including, but not limited to, any claims arising from any designation of Settling Defendants as EPA's authorized representatives under Section 104(e) of CERCLA. Further, Settling Defendants agree to pay the United States and the State all costs they incur including, but not limited to, attorneys' fees and other expenses of litigation and settlement arising from, or on account of, claims made against the United States or the State based on negligent or other wrongful acts or omissions of Settling Defendants, their officers, directors, employees, agents, contractors, subcontractors, and any persons acting on their behalf or under their control, in carrying out activities pursuant to this Consent Decree. Neither the United States nor the State shall be held out as a party to any contract entered into by or on behalf of Settling Defendants in carrying out activities pursuant to this Consent Decree. Neither Settling Defendants nor any such contractor shall be considered an agent of the United States or the State.

b. The United States and the State shall give Settling Defendants notice of any claim for which the United States or the State plans to seek indemnification pursuant to this Paragraph 48, and shall consult with Settling Defendants prior to settling such claim.

49. Settling Defendants covenant not to sue and agree not to assert any claims or causes of action against the United States and the State for damages or reimbursement or for set-off of any payments made or to be made to the United States or the State, arising from or on account of any contract, agreement, or arrangement between any one or more of Settling Defendants and any person for performance of any SDs' Z1&3 T&D Work, including, but not limited to, claims on account of construction delays. In addition, Settling Defendants shall indemnify and hold harmless the United States and the State with respect to any and all claims for damages or reimbursement arising from or on account of any contract, agreement, or arrangement between any one or more of Settling Defendants and any person for performance of any SDs' Z1&3 T&D Work, including, but not limited to, claims on account of construction delays.

50. No later than 15 days before commencing any on-site SDs' Z1&3 T&D Work, Settling Defendants shall secure, and shall maintain until the first anniversary after issuance of EPA's Certification of Completion of the SDs' Z3 T&D Work pursuant to Paragraph 34.d of Section XI (Certifications of Completion), commercial general liability insurance with limits of $1 million, for any one occurrence, and automobile liability insurance with limits of $1 million, combined single limit, naming the United States and the State as additional insureds with respect to all liability arising out of the activities performed by or on behalf of Settling Defendants pursuant to this Consent Decree. In addition, for the duration of this Consent Decree, Settling Defendants shall satisfy, or shall ensure that their contractors or subcontractors satisfy, all applicable laws and regulations regarding the provision of worker's compensation insurance for all persons performing the SDs' Z1&3 T&D Work on behalf of Settling Defendants in furtherance of this Consent Decree. Prior to commencement of the SDs' Z1&3 T&D Work under this Consent Decree, Settling Defendants shall provide to EPA and the State certificates of such insurance and a copy of each insurance policy. Settling Defendants shall resubmit such certificates and copies of policies each year on the anniversary of the Effective Date. If Settling

Defendants demonstrate by evidence satisfactory to EPA and the State that any contractor or subcontractor maintains insurance equivalent to that described above, or insurance covering the same risks but in a lesser amount, then, with respect to that contractor or subcontractor, Settling Defendants need provide only that portion of the insurance described above that is not maintained by the contractor or subcontractor.

XV. FORCE MAJEURE

51. "Force majeure," for purposes of this Consent Decree, is defined as any event arising from causes beyond the control of Settling Defendants, of any entity controlled by Settling Defendants, or of Settling Defendants' contractors that delays or prevents the performance of any obligation under this Consent Decree despite Settling Defendants' best efforts to fulfill the obligation. The requirement that Settling Defendants exercise "best efforts to fulfill the obligation" includes using best efforts to anticipate any potential force majeure and best efforts to address the effects of any potential force majeure (a) as it is occurring and (b) following the potential force majeure such that the delay and any adverse effects of the delay are minimized to the greatest extent possible. "Force majeure" does not include financial inability to complete the SDs' Z1&3 T&D Work or to pay Z1&3 Future Response Costs or to pay the State Z1&3 Future Response Costs or a failure to achieve the Performance Standards in Zone 1 and/or Zone 3.

52. If any event occurs or has occurred that may delay the performance of any obligation under this Consent Decree for which Settling Defendants intend or may intend to assert a claim of force majeure, Settling Defendants shall notify EPA's Project Coordinator and the State's Project Coordinator, orally or, in the absence of EPA's Project Coordinator, EPA's Alternate Project Coordinator or, in the event both of EPA's designated representatives are unavailable, the Director of the Superfund Division, EPA Region 5, within 72 hours of when Settling Defendants first knew that the event might cause a delay. Within 7 days thereafter, Settling Defendants shall provide in writing to EPA and the State an explanation and description of the reasons for the delay; the anticipated duration of the delay; all actions taken or to be taken to prevent or minimize the delay; a schedule for implementation of any measures to be taken to prevent or mitigate the delay or the effect of the delay; Settling Defendants' rationale for attributing such delay to a force majeure; and a statement as to whether, in the opinion of Settling Defendants, such event may cause or contribute to an endangerment to public health or welfare, or the environment. Settling Defendants shall include with any notice all available documentation supporting its claim that the delay was attributable to a force majeure. Settling Defendants shall be deemed to know of any circumstance of which Settling Defendants, any entity controlled by Settling Defendants, or Settling Defendants' contractors knew or should have known. Failure to comply with the above requirements regarding an event shall preclude Settling Defendants from asserting any claim of force majeure regarding that event, provided, however, that if EPA, despite the late notice, is able to assess to its satisfaction whether the event is a force majeure under Paragraph 51 and whether Settling Defendant has exercised its best efforts under Paragraph 51, EPA may, in its unreviewable discretion, excuse in writing Settling Defendants' failure to submit timely notices under this Paragraph.

53. If EPA, after a reasonable opportunity for review and comment by the State, agrees that the delay or anticipated delay is attributable to a force majeure, the time for performance of the obligations under this Consent Decree that are affected by the force majeure will be extended by EPA, after a reasonable opportunity for review and comment by the State, for such time as is necessary to complete those obligations. An extension of the time for performance of the obligations affected by the force majeure shall not, of itself, extend the time for performance of any other obligation. If EPA, after a reasonable opportunity for review and comment by the State, does not agree that the delay or anticipated delay has been or will be caused by a force majeure, EPA will notify Settling Defendants in writing of its decision. If EPA, after a reasonable opportunity for review and comment by the State, agrees that the delay is attributable to a force majeure, EPA will notify Settling Defendants in writing of the length of the extension, if any, for performance of the obligations affected by the force majeure.

54. If Settling Defendants elect to invoke the dispute resolution procedures set forth in Section XVI (Dispute Resolution), it shall do so no later than 15 days after receipt of EPA's notice. In any such proceeding, Settling Defendants shall have the burden of demonstrating by a preponderance of the evidence that the delay or anticipated delay has been or will be caused by a force majeure, that the duration of the delay or the extension sought was or will be warranted under the circumstances, that best efforts were exercised to avoid and mitigate the effects of the delay, and that Settling Defendants complied with the requirements of Paragraphs 51 and 52. If Settling Defendants carry this burden, the delay at issue shall be deemed not to be a violation by Settling Defendants of the affected obligation of this Consent Decree identified to EPA and the Court.

XVI. DISPUTE RESOLUTION

55. Unless otherwise expressly provided for in this Consent Decree, the dispute resolution procedures of this Section shall be the exclusive mechanism to resolve disputes regarding this Consent Decree. However, the procedures set forth in this Section shall not apply to actions by the United States or the State to enforce obligations of Settling Defendants that have not been disputed in accordance with this Section.

56. Any dispute regarding this Consent Decree shall in the first instance be the subject of informal negotiations between the parties to the dispute. The period for informal negotiations shall not exceed 20 days from the time the dispute arises, unless it is modified by written agreement of the parties to the dispute. The dispute shall be considered to have arisen when one party sends the other parties a written Notice of Dispute.

57. Statements of Position.

a. In the event that the parties cannot resolve a dispute by informal negotiations under the preceding Paragraph, then the position advanced by EPA shall be considered binding unless, within 30 days after the conclusion of the informal negotiation period, Settling Defendants invoke the formal dispute resolution procedures of this Section by serving on the United States and the State a written Statement of Position on the matter in dispute, including, but not limited to, any factual data, analysis, or opinion supporting that position and

any supporting documentation relied upon by Settling Defendants. The Statement of Position shall specify Settling Defendants' position as to whether formal dispute resolution should proceed under Paragraph 58 (Record Review) or Paragraph 59.

b. Within 30 days after receipt of Settling Defendants' Statement of Position, EPA will serve on Settling Defendant its Statement of Position, including, but not limited to, any factual data, analysis, or opinion supporting that position and all supporting documentation relied upon by EPA. EPA's Statement of Position shall include a statement as to whether formal dispute resolution should proceed under Paragraph 58 (Record Review) or Paragraph 59. Within 14 days after receipt of EPA's Statement of Position, Settling Defendants may submit a Reply.

c. If there is disagreement between EPA and Settling Defendants as to whether dispute resolution should proceed under Paragraph 58 (Record Review) or Paragraph 59, the parties to the dispute shall follow the procedures set forth in the paragraph determined by EPA to be applicable. However, if Settling Defendants ultimately appeal to the Court to resolve the dispute, the Court shall determine which paragraph is applicable in accordance with the standards of applicability set forth in Paragraphs 58 and 59.

58. Record Review. Formal dispute resolution for disputes pertaining to the selection or adequacy of any response action and all other disputes that are accorded review on the administrative record under applicable principles of administrative law shall be conducted pursuant to the procedures set forth in this Paragraph. For purposes of this Paragraph, the adequacy of any response action includes, without limitation, the adequacy or appropriateness of plans, procedures to implement plans, or any other items requiring approval or developed by EPA under this Consent Decree, and the adequacy of the performance of response actions taken pursuant to this Consent Decree. Nothing in this Consent Decree shall be construed to allow any dispute by Settling Defendants regarding the validity of the ROD's provisions.

a. An administrative record of the dispute shall be maintained by EPA and shall contain all statements of position, including supporting documentation, submitted pursuant to this Section. Where appropriate, EPA may allow submission of supplemental statements of position by the parties to the dispute.

b. The Director of the Superfund Division, EPA Region 5, will issue a final administrative decision resolving the dispute based on the administrative record described in Paragraph 58.a. This decision shall be binding upon Settling Defendant, subject only to the right to seek judicial review pursuant to Paragraphs 58.c and 58.d.

c. Any administrative decision made by EPA pursuant to Paragraph 58.b shall be reviewable by this Court, provided that a motion for judicial review of the decision is filed by Settling Defendants with the Court and served on all Parties within ten days after receipt of EPA's decision. The motion shall include a description of the matter in dispute, the efforts made by the parties to resolve it, the relief requested, and the schedule, if any, within which the dispute must be resolved to ensure orderly implementation of this Consent Decree. The United States may file a response to Settling Defendants' motion.

d. In proceedings on any dispute governed by this Paragraph, Settling Defendants shall have the burden of demonstrating that the decision of the Superfund Division Director is arbitrary and capricious or otherwise not in accordance with law. Judicial review of EPA's decision shall be on the administrative record compiled pursuant to Paragraph 58.a.

59. Formal dispute resolution for disputes that neither pertain to the selection or adequacy of any response action nor are otherwise accorded review on the administrative record under applicable principles of administrative law, shall be governed by this Paragraph.

a. Following receipt of Settling Defendants' Statement of Position submitted pursuant to Paragraph 57, the Director of the Superfund Division, EPA Region 5, will issue a final decision resolving the dispute. The Superfund Division Director's decision shall be binding on Settling Defendants unless, within ten days after receipt of the decision, Settling Defendants file with the Court and serve on the parties a motion for judicial review of the decision setting forth the matter in dispute, the efforts made by the parties to resolve it, the relief requested, and the schedule, if any, within which the dispute must be resolved to ensure orderly implementation of the Consent Decree. The United States may file a response to Settling Defendants' motion.

b. Notwithstanding Paragraph S (CERCLA Section 113(j) Record Review of ROD and Work) of Section I (Background), judicial review of any dispute governed by this Paragraph shall be governed by applicable principles of law.

60. The invocation of formal dispute resolution procedures under this Section shall not extend, postpone, or affect in any way any obligation of Settling Defendants under this Consent Decree, not directly in dispute, unless EPA or the Court agrees otherwise. Stipulated penalties with respect to the disputed matter shall continue to accrue but payment shall be stayed pending resolution of the dispute as provided in Paragraph 68. Notwithstanding the stay of payment, stipulated penalties shall accrue from the first day of noncompliance with any applicable provision of this Consent Decree. In the event that Settling Defendants do not prevail on the disputed issue, stipulated penalties shall be assessed and paid as provided in Section XVII (Stipulated Penalties).

XVII. STIPULATED PENALTIES

61. Settling Defendants shall be liable for stipulated penalties in the amounts set forth in Paragraphs 62 and 63 to the United States for failure to comply with the requirements of this Consent Decree specified below, unless excused under Section XV (Force Majeure). "Compliance" by Settling Defendants shall include completion of all payments and activities required under this Consent Decree, or any plan, report, or other deliverable approved under this Consent Decree, in accordance with all applicable requirements of law, this Consent Decree, the Z1&3 SOW, and any plans, reports, or other deliverables approved under this Consent Decree and within the specified time schedules established by and approved under this Consent Decree.

62. Stipulated Penalty Amounts – Z1&3 Work (Including Payments and Excluding Plans, Reports, and Other Deliverables).

a. The following stipulated penalties shall accrue per day for failure to timely make any payment required in Section XIII (Payments for Z1&3 Future Response Costs and State Z1&3 Future Response Costs):

Penalty Per Day	Period of Noncompliance
$ 2,500	1st through 14th day
$ 5,000	15th through 30th day
$ 10,000	31st day and beyond

b. The following stipulated penalties shall accrue per violation per day for any noncompliance identified in Paragraph 62.c:

Penalty Per Violation Per Day	Period of Noncompliance
$ 2,000	1st through 14th day
$ 5,000	15th through 30th day
$ 7,500	31st day and beyond

c. Compliance Milestones.

(1) Failure to implement the approved SDs' Z1&3 T&D Work Plan in accordance with the term of the Work Plan.

(2) Failure to comply with each of the requirements for Off-Site Waste Material Shipments set forth in Paragraph 14 of this Consent Decree.

63. Stipulated Penalty Amounts – Plans, Reports, and other Deliverables and Other Requirements. The following stipulated penalties shall accrue per violation per day for failure to submit timely or adequate reports or other plans or deliverables or to satisfy any other requirement of the Consent Decree:

Penalty Per Violation Per Day	Period of Noncompliance
$ 1,500	1st through 14th day
$ 3,000	15th through 30th day
$ 5,000	31st day and beyond

64. In the event that EPA assumes performance of a portion or all of the SDs' Z1&3 T&D Work pursuant to Paragraph 75 (Work Takeover), Settling Defendants shall be liable for a stipulated penalty in the amount of $3 million. Stipulated penalties under this Paragraph are in

addition to the remedies available under Paragraphs 32 (Funding for Work Takeover) and 75 (Work Takeover).

65. All penalties shall begin to accrue on the day after the complete performance is due or the day a violation occurs, and shall continue to accrue through the final day of the correction of the noncompliance or completion of the activity. However, stipulated penalties shall not accrue: (a) with respect to a deficient submission under Section VIII (EPA Approval of Plans, Reports, and Other Deliverables), during the period, if any, beginning on the 31st day after EPA's receipt of such submission until the date that EPA notifies Settling Defendant of any deficiency; (b) with respect to a decision by the Director of the Superfund Division, EPA Region 5, under Paragraph 58.b or 59.a of Section XVI (Dispute Resolution), during the period, if any, beginning on the 21st day after the date that Settling Defendants' reply to EPA's Statement of Position is received until the date that the Director issues a final decision regarding such dispute; or (c) with respect to judicial review by this Court of any dispute under Section XVI (Dispute Resolution), during the period, if any, beginning on the 31st day after the Court's receipt of the final submission regarding the dispute until the date that the Court issues a final decision regarding such dispute. Nothing in this Consent Decree shall prevent the simultaneous accrual of separate penalties for separate violations of this Consent Decree.

66. Following EPA's determination that Settling Defendants have failed to comply with a requirement of this Consent Decree, EPA may give Settling Defendants written notification of the same and describe the noncompliance. EPA may send Settling Defendants a written demand for the payment of the penalties. However, penalties shall accrue as provided in the preceding Paragraph regardless of whether the EPA has notified Settling Defendants of a violation.

67. All penalties accruing under this Section shall be due and payable to the United States within 30 days after Settling Defendants' receipt from EPA of a demand for payment of the penalties, unless Settling Defendants invoke the Dispute Resolution procedures under Section XVI (Dispute Resolution) within the 30-day period. All payments to the United States under this Section shall indicate that the payment is for stipulated penalties and shall be made in accordance with Paragraph 45.d (Instructions for Stipulated Penalty Payments).

68. Penalties shall continue to accrue as provided in Paragraph 65 during any dispute resolution period, but need not be paid until the following:

a. If the dispute is resolved by agreement of the Parties or by a decision of EPA that is not appealed to this Court, accrued penalties determined to be owed shall be paid to EPA within 15 days after the agreement or the receipt of EPA's decision or order;

b. If the dispute is appealed to this Court and the United States prevails in whole or in part, Settling Defendants shall pay all accrued penalties determined by the Court to be owed to EPA within 60 days after receipt of the Court's decision or order, except as provided in Paragraph 68.c;

c. If the District Court's decision is appealed by any Party, Settling Defendants shall pay all accrued penalties determined by the District Court to be owed to the United States into an interest-bearing escrow account, established at a duly chartered bank or trust company that is insured by the FDIC, within 60 days after receipt of the Court's decision or order. Penalties shall be paid into this account as they continue to accrue, at least every 60 days. Within 15 days after receipt of the final appellate court decision, the escrow agent shall pay the balance of the account to EPA or to Settling Defendants to the extent that they prevail.

69. If Settling Defendants fail to pay stipulated penalties when due, Settling Defendants shall pay Interest on the unpaid stipulated penalties as follows: (a) if Settling Defendants have timely invoked dispute resolution such that the obligation to pay stipulated penalties has been stayed pending the outcome of dispute resolution, Interest shall accrue from the date stipulated penalties are due pursuant to Paragraph 68 until the date of payment; and (b) if Settling Defendants fail to timely invoke dispute resolution, Interest shall accrue from the date of demand under Paragraph 67 until the date of payment. If Settling Defendants fail to pay stipulated penalties and Interest when due, the United States may institute proceedings to collect the penalties and Interest.

70. The payment of penalties and Interest, if any, shall not alter in any way Settling Defendants' obligation to complete the performance of the SDs' Z1&3 T&D Work or to pay Z1&3 Future Response Costs or to pay State Z1&3 Future Response Costs required under this Consent Decree.

71. Nothing in this Consent Decree shall be construed as prohibiting, altering, or in any way limiting the ability of the United States or the State to seek any other remedies or sanctions available by virtue of Settling Defendants' violation of this Consent Decree or of the statutes and regulations upon which it is based, including, but not limited to, penalties pursuant to Section 122(*l*) of CERCLA, 42 U.S.C. § 9622(*l*), provided, however, that the United States shall not seek civil penalties pursuant to Section 122(*l*) of CERCLA for any violation for which a stipulated penalty is provided in this Consent Decree, except in the case of a willful violation of this Consent Decree.

72. Notwithstanding any other provision of this Section, the United States may, in its unreviewable discretion, waive any portion of stipulated penalties that have accrued pursuant to this Consent Decree.

XVIII. COVENANTS BY PLAINTIFFS

73. Covenants for Settling Defendants by the United States and the State.

a. By the United States. In consideration of the actions that will be performed and the payments that will be made by Settling Defendants under this Consent Decree, and except as specifically provided in Paragraph 43.d.(2) (Opting-Out of the Payment for Z1&3 Excluded Non-Residential Properties), Paragraph 43.e.(2) (Opting-Out of the Payment for Z1&3 Excluded Residential Properties), and Paragraph 74 (Reservations of Rights), the United States covenants not to sue or to take administrative action against Settling Defendants

pursuant to Sections 106 and 107(a) of CERCLA for the Z1&3 Work and the Z1&3 Future Response Costs. These covenants shall take effect upon the receipt by EPA of the payment required by Paragraph 39.b.(1) (Fixed Prepayment of Certain Z1&3 Future Response Costs) and any Interest or stipulated penalties due thereon under Paragraph 47 or Section XVII (Stipulated Penalties). These covenants are conditioned upon the complete and satisfactory performance by Settling Defendants of their obligations under this Consent Decree, including but not limited to payment of all Z1&3 Future Response Costs pursuant to Section XIII. These covenants not to sue extend only to Settling Defendants and do not extend to any other person.

b. By the State. In consideration of the actions that will be performed and the payments that will be made by Settling Defendants under this Consent Decree, and except as specifically provided in Paragraph 43.d.(2) (Opting-Out of the Payment for Z1&3 Excluded Non-Residential Properties), Paragraph 43.e.(2) (Opting-Out of the Payment for Z1&3 Excluded Residential Properties), and Paragraph 74 (Reservations of Rights), the State covenants not to sue or to take administrative action against Settling Defendants pursuant to Indiana Code 13-25-4 for the Z1&3 Work and the State Z1&3 Future Response Costs. These covenants shall take effect upon the Date of Entry and are conditioned upon the complete and satisfactory performance by Settling Defendants of their obligations under this Consent Decree, including but not limited to payment of all State Z1&3 Future Response Costs pursuant to Paragraph 44. These covenants extend only to Settling Defendants and do not extend to any other person.

74. Reservations of Rights. The covenants not to sue set forth in Paragraph 73 do not pertain to any matters other than those expressly specified in Paragraph 73. The United States and the State reserve, and this Consent Decree is without prejudice to, all rights against Settling Defendants with respect to all matters not expressly included within Plaintiffs' covenants. Notwithstanding any other provision of this Consent Decree, the United States and the State reserve all rights against Settling Defendants with respect to:

a. liability for failure by Settling Defendants to meet a requirement of this Consent Decree;

b. liability arising from the past, present, or future disposal, release, or threat of release of Waste Material outside of Zone 1 and/or Zone 3 of OU1 of the Site;

c. liability based on the ownership of properties within Zone 1 and/or Zone 3 of OU1 of the Site by Settling Defendants when such ownership commences after signature of this Consent Decree by Settling Defendants;

d. liability based on the operation of properties within Zone 1 and/or Zone 3 of OU1 of the Site by Settling Defendants when such operation commences after signature of this Consent Decree by Settling Defendants and does not arise solely from Settling Defendants' performance of the SDs' Z1&3 T&D Work;

e. liability based on Settling Defendants' transportation, treatment, storage, or disposal, or the arrangement for the transportation, treatment, storage, or disposal of Waste Material at or in connection with Zone 1 and/or Zone 3 of OU1 of the Site, other than as

provided in the ROD, the SDs' Z1&3 T&D Work Plan, or otherwise ordered by EPA, after signature of this Consent Decree by Settling Defendants;

f. liability for damages for injury to, destruction of, or loss of natural resources, and for the costs of any natural resource damage assessments;

g. criminal liability;

h. liability for violations of federal or state law that occur during or after implementation of the SDs' Z1&3 T&D Work;

i. liability, prior to achievement of the Performance Standards, for additional response actions that EPA determines are necessary to achieve and maintain Performance Standards or to carry out and maintain the effectiveness of the remedy set forth in the ROD, but that cannot be required pursuant to Paragraph 12 (Modification of Z1&3 SOW or Related Work Plans);

j. liability for Zone 2, additional operable units at the Site, or the final response action;

k. liability for costs that the United States and State will incur regarding the Site but that are not within the definition of Z1&3 Future Response Costs or State Z1&3 Future Response Costs, respectively;

l. liability for Past Response Costs;

m. liability for response actions and/or response costs undertaken and/or incurred pursuant to Section 121(c) of CERCLA, 42 U.S.C. § 9621(c) relating to Z1 and/or Z3 and/or OU1 and/or the Site;

n. if Settling Defendants are entitled to, and do, opt out of the payment requested in Paragraph 43.d.(1), liability for response actions and/or response costs related to the Z1&3 Excluded Non-Residential Properties; and

o. if Settling Defendants are entitled to, and do, opt out of the payment requested in Paragraph 43.e.(1), liability for response actions and/or response costs related to the Z1&3 Excluded Residential Properties.

75. Work Takeover.

a. In the event that EPA determines that Settling Defendants have (1) ceased implementation of any portion of the SDs' Z1&3 T&D Work, or (2) are seriously or repeatedly deficient or late in their performance of the SDs' Z1&3 T&D Work, or (3) are implementing the SDs' Z1&3 T&D Work in a manner that may cause an endangerment to human health or the environment, EPA may issue a written notice ("Work Takeover Notice") to Settling Defendants. Any Work Takeover Notice issued by EPA will specify the grounds upon which such notice was

issued and will provide Settling Defendants a period of ten days within which to remedy the circumstance giving rise to EPA's issuance of such notice.

b. If, after expiration of the ten-day notice period specified in Paragraph 75.a, Settling Defendants have not remedied to EPA's satisfaction the circumstances giving rise to EPA's issuance of the relevant Work Takeover Notice, EPA may at any time thereafter assume the performance of all or any portion(s) of the SDs' Z1&3 T&D Work as EPA deems necessary ("Work Takeover"). EPA will notify Settling Defendants in writing (which writing may be electronic) if EPA determines that implementation of a Work Takeover is warranted under this Paragraph 75.b. Funding of Work Takeover costs is addressed in Paragraph 32.

c. Settling Defendants may invoke the procedures set forth in Paragraph 58 (Record Review) to dispute EPA's implementation of a Work Takeover under Paragraph 75.b. However, notwithstanding Settling Defendants' invocation of such dispute resolution procedures, and during the pendency of any such dispute, EPA may in its sole discretion commence and continue a Work Takeover under Paragraph 75.b. until the earlier of (1) the date that Settling Defendants remedy, to EPA's satisfaction, the circumstances giving rise to EPA's issuance of the relevant Work Takeover Notice, or (2) the date that a final decision is rendered in accordance with Paragraph 58 (Record Review) requiring EPA to terminate such Work Takeover.

76. Notwithstanding any other provision of this Consent Decree, the United States and the State retain all authority and reserve all rights to take any and all response actions authorized by law.

XIX. COVENANTS BY SETTLING DEFENDANTS

77. Covenants Not to Sue by Settling Defendants. Subject to the reservations in Paragraph 79, Settling Defendants covenant not to sue and agree not to assert any claims or causes of action against the United States or the State with respect to the Z1&3 Work, the Z1&3 Future Response Costs, and the State Z1&3 Future Response Costs, including, but not limited to:

a. any direct or indirect claim for reimbursement from the EPA Hazardous Substance Superfund (established pursuant to the Internal Revenue Code, 26 U.S.C. § 9507) through CERCLA Sections 106(b)(2), 107, 111, 112 or 113, or any other provision of law, or any direct or indirect claim for reimbursement from the Indiana Hazardous Substances Fund, Indiana Code 13-25-4, *et seq.*;

b. any claims under CERCLA Sections 107 or 113, RCRA Section 7002(a), 42 U.S.C. § 6972(a), or state law regarding the Z1&3 Work, the Z1&3 Future Response Costs, the State Z1&3 Future Response Costs, and this Consent Decree; or

c. any claims arising out of response actions, including any claim under the United States Constitution, the State Constitution, the Tucker Act, 28 U.S.C. §1491, the Equal Access to Justice Act, 28 U.S.C. § 2412, as amended, or at common law, relating to the Z1&3 Work, the Z1&3 Future Response Costs, and the State Z1&3 Future Response Costs.

78. Except as provided in Paragraph 81 (Claims Against De Micromis Parties) and Paragraph 87 (Res Judicata and Other Defenses), the covenants in this Section shall not apply if the United States or the State brings a cause of action or issues an order pursuant to any of the reservations in Section XVIII (Covenants by Plaintiffs), other than in Paragraphs 74.a (liability for failure to meet a requirement of the Consent Decree), 74.g (criminal liability), and 74.h (liability for violations of federal/state law during or after implementation of the SDs' Z1&3 T&D Work), but only to the extent that Settling Defendants' claims arise from the same response action, response costs, or damages that the United States or the State is seeking pursuant to the applicable reservation.

79. Settling Defendants reserve, and this Consent Decree is without prejudice to, claims against the United States, subject to the provisions of Chapter 171 of Title 28 of the United States Code, and brought pursuant to any statute other than CERCLA or RCRA and for which the waiver of sovereign immunity is found in a statute other than CERCLA or RCRA, for money damages for injury or loss of property or personal injury or death caused by the negligent or wrongful act or omission of any employee of the United States, as that term is defined in 28 U.S.C. § 2671, while acting within the scope of his or her office or employment under circumstances where the United States, if a private person, would be liable to the claimant in accordance with the law of the place where the act or omission occurred. However, the foregoing shall not include any claim based on EPA's selection of response actions, or the oversight or approval of Settling Defendants' plan, reports, or other deliverable or activities.

80. Nothing in this Consent Decree shall be deemed to constitute preauthorization of a claim within the meaning of Section 111 of CERCLA, 42 U.S.C. § 9611, or 40 C.F.R. § 300.700(d).

81. Claims Against De Micromis Parties. Settling Defendants agree not to assert any claims and to waive all claims or causes of action (including but not limited to claims or causes of action under Sections 107(a) and 113 of CERCLA) that they may have for all matters relating to the Site against any person where the person's liability to Settling Defendants with respect to the Site is based solely on having arranged for disposal or treatment, or for transport for disposal or treatment, of hazardous substances at the Site, or having accepted for transport for disposal or treatment of hazardous substances at the Site, if all or part of the disposal, treatment, or transport occurred before April 1, 2001, and the total amount of material containing hazardous substances contributed by such person to the Site was less than 110 gallons of liquid materials or 200 pounds of solid materials.

82. The waiver in Paragraph 81 (Claims Against De Micromis Parties) shall not apply with respect to any defense, claim, or cause of action that a Settling Defendant may have against any person meeting the criteria in Paragraph 81 if such person asserts a claim or cause of action relating to the Site against such Settling Defendant. This waiver also shall not apply to any claim or cause of action against any person meeting the criteria in Paragraph 81 if EPA determines:

a. that such person has failed to comply with any EPA requests for information or administrative subpoenas issued pursuant to Section 104(e) or 122(e) of

CERCLA, 42 U.S.C. § 9604(e) or 9622(e), or Section 3007 of RCRA, 42 U.S.C. § 6927, or has impeded or is impeding, through action or inaction, the performance of a response action or natural resource restoration with respect to the Site, or has been convicted of a criminal violation for the conduct to which this waiver would apply and that conviction has not been vitiated on appeal or otherwise; or

b. that the materials containing hazardous substances contributed to the Site by such person have contributed significantly, or could contribute significantly, either individually or in the aggregate, to the cost of response action or Natural Resource restoration at the Site.

XX. EFFECT OF SETTLEMENT; CONTRIBUTION

83. Except as provided in Paragraph 81 (Claims Against De Micromis Parties), nothing in this Consent Decree shall be construed to create any rights in, or grant any cause of action to, any person not a Party to this Consent Decree. Except as provided in Paragraph 81 (Claims Against De Micromis Parties), each of the Parties expressly reserves any and all rights (including, but not limited to, pursuant to Section 113 of CERCLA, 42 U.S.C. § 9613), defenses, claims, demands, and causes of action that each Party may have with respect to any matter, transaction, or occurrence relating in any way to the Site against any person not a Party hereto. Nothing in this Consent Decree diminishes the right of the United States, pursuant to Section 113(f)(2) and (3) of CERCLA, 42 U.S.C.§ 9613(f)(2)–(3), to pursue any such persons to obtain additional response costs or response action and to enter into settlements that give rise to contribution protection pursuant to Section 113(f)(2).

84. The Parties agree, and by entering this Consent Decree this Court finds, that this Consent Decree constitutes a judicially approved settlement for purposes of Section 113(f)(2) of CERCLA, 42 U.S.C. § 9613(f), and that each Settling Defendant is entitled, as of the Effective Date, to protection from contribution actions or claims as provided by Section 113(f)(2) of CERCLA, under Indiana Code 13-25-4-27(b), or as may be otherwise provided by law, for "matters addressed" in this Consent Decree. The "matters addressed" in this Consent Decree are the Z1&3 Work, the Z1&3 Future Response Costs, and the State Z1&3 Future Response Costs; provided however, that if Settling Defendants are entitled to, and do, opt out of the payment requested in Paragraph 43.d (Payment or Opt-out for Z1&3 Excluded Non-Residential Properties) and/or Paragraph 43.e (Payment or Opt-out for Z1&3 Excluded Residential Properties), liability for response actions and/or response costs related to the Z1&3 Excluded Non-Residential Properties and/or the Z1&3 Excluded Residential Properties, as applicable, shall not be included in the "matters addressed" in this Consent Decree.

85. Each Settling Defendant shall, with respect to any suit or claim brought by it for matters related to this Consent Decree, notify the United States and the State in writing no later than 60 days prior to the initiation of such suit or claim.

86. Each Settling Defendant shall, with respect to any suit or claim brought against it for matters related to this Consent Decree, notify in writing the United States and the State within ten days after service of the complaint on such Settling Defendant. In addition, each

Settling Defendant shall notify the United States and the State within ten days after service or receipt of any Motion for Summary Judgment and within ten days after receipt of any order from a court setting a case for trial.

87. Res Judicata and Other Defenses. In any subsequent administrative or judicial proceeding initiated by the United States or the State for injunctive relief, recovery of response costs, or other appropriate relief relating to the Site, Settling Defendant shall not assert, and may not maintain, any defense or claim based upon the principles of waiver, res judicata, collateral estoppel, issue preclusion, claim-splitting, or other defenses based upon any contention that the claims raised by the United States or the State in the subsequent proceeding were or should have been brought in the instant case; provided, however, that nothing in this Paragraph affects the enforceability of the covenants not to sue set forth in Section XVIII (Covenants by Plaintiff).

XXI. ACCESS TO INFORMATION

88. Settling Defendants shall provide to EPA and the State, upon request, copies of all records, reports, documents, and other information (including records, reports, documents, and other information in electronic form) (hereinafter referred to as "Records") within their possession or control or that of their contractors or agents relating to activities at the Site or to the implementation of this Consent Decree, including, but not limited to, sampling, analysis, chain of custody records, manifests, trucking logs, receipts, reports, sample traffic routing, correspondence, or other documents or information regarding the Z1&3 Work. Settling Defendants shall also make available to EPA and the State, for purposes of investigation, information gathering, or testimony, their employees, agents, or representatives with knowledge of relevant facts concerning the performance of the Z1&3 Work.

89. Business Confidential and Privileged Documents.

a. Settling Defendants may assert business confidentiality claims covering part or all of the Records submitted to Plaintiffs under this Consent Decree to the extent permitted by and in accordance with Section 104(e)(7) of CERCLA, 42 U.S.C. § 9604(e)(7), and 40 C.F.R. § 2.203(b). Records determined to be confidential by EPA will be afforded the protection specified in 40 C.F.R. Part 2, Subpart B. If no claim of confidentiality accompanies Records when they are submitted to EPA and the State, or if EPA has notified Settling Defendants that the Records are not confidential under the standards of Section 104(e)(7) of CERCLA or 40 C.F.R. Part 2, Subpart B, the public may be given access to such Records without further notice to Settling Defendants.

b. Settling Defendants may assert that certain Records are privileged under the attorney-client privilege or any other privilege recognized by federal law. If Settling Defendants assert such a privilege in lieu of providing Records, they shall provide Plaintiffs with the following: (1) the title of the Record; (2) the date of the Record; (3) the name, title, affiliation (e.g., company or firm), and address of the author of the Record; (4) the name and title of each addressee and recipient; (5) a description of the contents of the Record; and (6) the privilege asserted by Settling Defendants. If a claim of privilege applies only to a portion of a Record, the Record shall be provided to the United States and State in redacted form to mask the

privileged portion only. Settling Defendants shall retain all Records that they claim to be privileged until the United States and the State have had a reasonable opportunity to dispute the privilege claim and any such dispute has been resolved in the Settling Defendants' favor.

c. No Records created or generated pursuant to the requirements of this Consent Decree shall be withheld from the United States or the State on the grounds that they are privileged or confidential.

90. No claim of confidentiality or privilege shall be made with respect to any data, including, but not limited to, all sampling, analytical, monitoring, hydrogeologic, scientific, chemical, or engineering data, or any other documents or information evidencing conditions at or around the Site.

XXII. RETENTION OF RECORDS

91. Until ten years after Settling Defendants' receipt of EPA's issuance of its Certification of Completion of the Z1&3 Work Except for Response Actions at the Z1&3 Excluded Properties, each Settling Defendant shall preserve and retain all non-identical copies of Records (including Records in electronic form) now in its possession or control or that come into its possession or control that relate in any manner to its liability under CERCLA with respect to the Site. Each Settling Defendant must also retain, and instruct its contractors and agents to preserve, for the same period of time specified above all non-identical copies of the last draft or final version of any Records (including Records in electronic form) now in its possession or control or that come into its possession or control that relate in any manner to the performance of the Z1&3 Work, provided, however, that each Settling Defendant (and its contractors and agents) must retain, in addition, copies of all data generated during the performance of the Z1&3 Work and not contained in the aforementioned Records required to be retained. Each of the above record retention requirements shall apply regardless of any corporate retention policy to the contrary.

92. At the conclusion of this record retention period, Settling Defendants shall notify the United States and the State at least 90 days prior to the destruction of any such Records, and, upon request by the United States or the State, Settling Defendants shall deliver any such Records to EPA or the State. Settling Defendants may assert that certain Records are privileged under the attorney-client privilege or any other privilege recognized by federal law. If Settling Defendants assert such a privilege, they shall provide Plaintiffs with the following: (a) the title of the Record; (b) the date of the Record; (c) the name, title, affiliation (e.g., company or firm), and address of the author of the Record; (d) the name and title of each addressee and recipient; (e) a description of the subject of the Record; and (f) the privilege asserted by Settling Defendants. If a claim of privilege applies only to a portion of a Record, the Record shall be provided to the United States and the State in redacted form to mask the privileged portion only. Settling Defendants shall retain all Records that they claim to be privileged until the United States and the State has had a reasonable opportunity to dispute the privilege claim and any such dispute has been resolved in the Settling Defendants' favor. However, no Records created or generated pursuant to the requirements of this Consent Decree shall be withheld on the grounds that they are privileged or confidential.

93. Each Settling Defendant certifies individually that, to the best of its knowledge and belief, after thorough inquiry, it has not altered, mutilated, discarded, destroyed, or otherwise disposed of any Records (other than identical copies) relating to its potential liability regarding the Site since the earlier of notification of potential liability by the United States or the State or the filing of suit against it regarding the Site and that it has fully complied with any and all EPA and State requests for information pursuant to Sections 104(e) and 122(e) of CERCLA, 42 U.S.C. §§ 9604(e) and 9622(e), and Section 3007 of RCRA, 42 U.S.C. § 6927.

XXIII. NOTICES AND SUBMISSIONS

94. Whenever, under the terms of this Consent Decree, written notice is required to be given or a report or other document is required to be sent by one Party to another, it shall be directed to the individuals at the addresses specified below, unless those individuals or their successors give notice of a change to the other Parties in writing. All notices and submissions shall be considered effective upon receipt, unless otherwise provided. Written notice as specified in this Section shall constitute complete satisfaction of any written notice requirement of the Consent Decree with respect to the United States, EPA, the State and Settling Defendants, respectively. Notices required to be sent to EPA, and not to the United States, under the terms of this Consent Decree should not be sent to the U.S. Department of Justice.

As to the United States:

Chief, Environmental Enforcement Section
Environment and Natural Resources Division
U.S. Department of Justice
P.O. Box 7611
Washington, D.C. 20044-7611
Re: DJ # 90-11-3-10884/1

As to EPA:

Richard C. Karl
Director, Superfund Division
United States Environmental Protection Agency
Region 5
77 W. Jackson Blvd. (SR-6J)
Chicago, IL 60604-3590

Michael Berkoff
EPA Project Coordinator
United States Environmental Protection Agency
Region 5
77 W. Jackson Blvd. (SR-6J)
Chicago, IL 60604-3590
berkoff.michael@epa.gov

Steven Kaiser
Office of Regional Counsel
United States Environmental Protection Agency
Region 5
77 West Jackson Blvd.
Chicago, IL 60604
312 353-3804
kaiser.steven@epa.gov

As to the Regional Financial Management Officer:

Chief, Program Accounting and Analysis Section
United States Environmental Protection Agency
Region 5, MF-10J
77 West Jackson Blvd.
Chicago, IL 60604-3590

As to the State:

Tim Junk
Indiana Office of the Attorney General
302 W. Washington St.
IGCS – 5th Floor
Indianapolis, IN 46204

Lisa McCoy
Deputy Commissioner of Office of Legal Counsel
Indiana Dep't of Environmental Management
100 North Senate Ave.
IGCN – 13th Floor
Indianapolis, IN 46204

Doug Petroff
Project Manager, Federal Programs
Indiana Dep't of Environmental Management
100 North Senate Ave.
IGCN – 11th Floor
Indianapolis, IN 46204

As to Settling Defendant ARC:

Chris Greco
Deputy Portfolio Manager
Remediation Management
Atlantic Richfield Company
150 West Warrenville Road
Mail Code MC 200-1E

Naperville, IL 60563
chris.greco@bp.com

and

Douglas S. Reinhart
Counsel to Atlantic Richfield Company
150 W. Warrenville Road
Mail Code 200-1W
Naperville, IL 60563
douglas.reinhart@bp.com

and

Michael H. Elam
Barnes & Thornburg LLP
One North Wacker Drive
Suite 4400
Chicago, IL 60606
michael.elam@btlaw.com

As to Settling Defendant DuPont:

Sathya Yalvigi
Project Director
Corporate Remediation Group
974 Centre Road
Chestnut Run Plaza 715-218
Wilmington, DE 19805
302-999-2764 (Office)
484-678-8984(Cell)
Sathya.v.Yalvigi@dupont.com

Bernard J. Reilly
DuPont Company
Legal D-7082A
1007 Market Street
Wilmington DE 19898
Phone: 302-774-5445
bernard.j.reilly@dupont.com

David L. Rieser
Much Shelist, P.C.
191 North Wacker Drive, Suite 1800
Chicago, IL 60606
Phone: 312-521-2717
DRieser@muchshelist.com

XXIV. RETENTION OF JURISDICTION

95. This Court retains jurisdiction over both the subject matter of this Consent Decree and Settling Defendants for the duration of the performance of the terms and provisions of this Consent Decree for the purpose of enabling any of the Parties to apply to the Court at any time for such further order, direction, and relief as may be necessary or appropriate for the construction or modification of this Consent Decree, or to effectuate or enforce compliance with its terms, or to resolve disputes in accordance with Section XVI (Dispute Resolution).

XXV. APPENDICES

96. The following appendices are attached to and incorporated into this Consent Decree:

"Appendix A" is a map depicting the geographic boundaries of OU1 and OU2 of the Site
"Appendix B" is the Z1&3 Statement of Work
"Appendix C" is the Record of Decision
"Appendix D" is a map depicting the geographic boundaries of Zones 1, 2, and 3 of OU1 of the Site
"Appendix E" is the form of the Performance Guarantee described in Section X.

XXVI. COMMUNITY INVOLVEMENT

97. If requested by EPA or the State, Settling Defendants shall participate in community involvement activities pursuant to the community involvement plan to be developed by EPA. EPA will determine the appropriate role for Settling Defendants under the Plan. Settling Defendants shall also cooperate with EPA and the State in providing information regarding the Z1&3 Work to the public. As requested by EPA or the State, Settling Defendants shall participate in the preparation of such information for dissemination to the public and in public meetings that may be held or sponsored by EPA or the State to explain activities at or relating to the Site. Costs incurred by the United States and the State under this Section, including the costs of any technical assistance grant under Section 117(e) of CERCLA, 42 U.S.C. § 9617(e), shall be considered Z1&3 Future Response Costs and State Z1&3 Future Response Costs that Settling Defendants shall pay pursuant to Section XIII (Payments for Z1&3 Future Response Costs and State's Z1&3 Future Response Costs).

XXVII. MODIFICATION

98. Except as provided in Paragraph 12 (Modification of Z1&3 SOW or Related Work Plans), material modifications to this Consent Decree, including the Z1&3 SOW, shall be in writing, signed by the United States and Settling Defendants, and shall be effective upon approval by the Court. Except as provided in Paragraph 12, non-material modifications to this Consent Decree, including the Z1&3 SOW, shall be in writing and shall be effective when signed by duly authorized representatives of the United States and Settling Defendants. All modification to the Consent Decree, other than the Z1&3 SOW, also shall be signed by the State, or a duly authorized representative of the State, as appropriate. A modification to the Z1&3 SOW shall be considered material if it fundamentally alters the basic features of the selected remedy within the meaning of 40 C.F.R. § 300.435(c)(2)(ii). Before providing its approval to any modification to the Z1&3 SOW, the United States will provide the State with a reasonable opportunity to review and comment on the proposed modification.

99. Nothing in this Consent Decree shall be deemed to alter the Court's power to enforce, supervise, or approve modifications to this Consent Decree.

XXVIII. LODGING AND OPPORTUNITY FOR PUBLIC COMMENT

100. This Consent Decree shall be lodged with the Court for a period of not less than 30 days for public notice and comment in accordance with Section 122(d)(2) of CERCLA, 42 U.S.C. § 9622(d)(2), and 28 C.F.R. § 50.7. The United States reserves the right to withdraw or withhold its consent if the comments regarding the Consent Decree disclose facts or considerations that indicate that the Consent Decree is inappropriate, improper, or inadequate. Settling Defendants consent to the entry of this Consent Decree without further notice.

101. If for any reason the Court should decline to approve this Consent Decree in the form presented, this agreement is voidable at the sole discretion of any Party and the terms of the agreement may not be used as evidence in any litigation between the Parties.

XXIX. SIGNATORIES/SERVICE

102. Each undersigned representative of a Settling Defendant to this Consent Decree, the Assistant Commissioner of the Office of Land Quality for IDEM, the Chief Counsel for Litigation for the Office of the Indiana Attorney General, and the Assistant Attorney General for the Environment and Natural Resources Division of the Department of Justice certify that he or she is fully authorized to enter into the terms and conditions of this Consent Decree and to execute and legally bind such Party to this document.

103. Each Settling Defendant agrees not to oppose entry of this Consent Decree by this Court or to challenge any provision of this Consent Decree unless the United States has notified Settling Defendants in writing that it no longer supports entry of the Consent Decree.

104. Each Settling Defendant shall identify, on the attached signature page, the name, address, and telephone number of an agent who is authorized to accept service of process by mail on behalf of that Party with respect to all matters arising under or relating to this Consent Decree. Settling Defendants agree to accept service in that manner and to waive the formal service requirements set forth in Rule 4 of the Federal Rules of Civil Procedure and any applicable local rules of this Court, including, but not limited to, service of a summons. Settling Defendants need not file an answer to the complaint in this action unless or until the Court expressly declines to enter this Consent Decree.

XXX. FINAL JUDGMENT

105. This Consent Decree and its appendices constitute the final, complete, and exclusive agreement and understanding among the Parties regarding the settlement embodied in the Consent Decree. The Parties acknowledge that there are no representations, agreements, or understandings relating to the settlement other than those expressly contained in this Consent Decree.

106. Upon entry of this Consent Decree by the Court, this Consent Decree shall constitute a final judgment between and among the United States, the State, and Settling Defendants. The Court enters this judgment as a final judgment under Fed. R. Civ. P. 54 and 58.

SO ORDERED THIS _____ DAY OF _____, 2014.

_____
United States District Judge

THE UNDERSIGNED PARTY enters into this Consent Decree with Atlantic Richfield Company and E. I. du Pont de Nemours and Company in the matter of *United States and the State of Indiana v. Atlantic Richfield Co., et al.* (N.D. Ind.) relating to the USS Lead Superfund Site in East Chicago, IN, subject to public notice and comment.

FOR THE UNITED STATES OF AMERICA

s/ Sam Hirsch
SAM HIRSCH
Acting Assistant Attorney General
Environment and Natural Resources Division
U.S. Department of Justice
Washington, DC 20530

s/ Annette M. Lang
ANNETTE M. LANG
Senior Counsel
Environmental Enforcement Section
Environment and Natural Resources Division
U.S. Department of Justice
P.O. Box 7611
Washington, DC 20044-7611
Phone: 202 514-4213
Fax: 202 616-6584
annette.lang@usdoj.gov

DAVID CAPP
United States Attorney
Northern District of Indiana

s/ Wayne T. Ault
WAYNE T. AULT
Assistant United States Attorney
5400 Federal Plaza
Suite 1500
Hammond, IN 46320
Phone: 219 937-5500
Fax: 219 937-5547
wayne.ault@usdoj.gov

THE UNDERSIGNED PARTY enters into this Consent Decree with Atlantic Richfield Company and E. I. du Pont de Nemours and Company in the matter of *United States and the State of Indiana v. Atlantic Richfield Co., et al.* (N.D. Ind.) relating to the USS Lead Superfund Site in East Chicago, IN, subject to public notice and comment.

FOR THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

s/ Richard C. Karl***
RICHARD C. KARL
Director, Superfund Division
U.S. Environmental Protection Agency
Region 5
77 W. Jackson Blvd.
Chicago, IL 60604

s/ Steven P. Kaiser***
STEVEN P. KAISER
Associate Regional Counsel
U.S. Environmental Protection Agency
Region 5
77 W. Jackson Blvd.
Chicago, IL 60604

*** Signed with permission.

THE UNDERSIGNED PARTY enters into this Consent Decree with Atlantic Richfield Company and E. I. du Pont de Nemours and Company in the matter of *United States and the State of Indiana v. Atlantic Richfield Co., et al.* (N.D. Ind.) relating to the USS Lead Superfund Site in East Chicago, IN.

FOR THE STATE OF INDIANA

s/ Peggy Dorsey, Deputy Assistant Commissioner, for***
BRUCE H PALIN
Assistant Commissioner
Office of Land Quality
Indiana Department of Environmental Management
100 N. Senate Ave. (IGCN-1101, MC 66-30)
Indianapolis, IN 46204-2251

s/ Patricia Orloff-Erdmann***
PATRICIA ORLOFF-ERDMANN
Chief Counsel of Litigation
Office of Indiana Attorney General
302 W. Washington St. (IGCS Fifth Floor)
Indianapolis, IN 46204

*** Signed with permission.

THE UNDERSIGNED PARTY enters into this Consent Decree with Atlantic Richfield Company and E. I. du Pont de Nemours and Company in the matter of *United States and the State of Indiana v. Atlantic Richfield Co., et al.* (N.D. Ind.) relating to the USS Lead Superfund Site in East Chicago, IN.

FOR ALTANTIC RICHFIELD COMPANY

s/ Andrew Fiedler***
ANDREW FIEDLER
President, Atlantic Richfield Company
Helios Plaza-201 Helios Way
Houston, TX 77079

Agent Authorized to Accept Service on Behalf of Atlantic Richfield Company:

Name:	Douglas S. Reinhart
Title:	Counsel to Atlantic Richfield Company
Address:	150 W. Warrenville Road Mail Code 200-1W Naperville, IL 60563
Phone:	630 420-5457
Email:	douglas.reinhart@bp.com

*** Signed with permission.

THE UNDERSIGNED PARTY enters into this Consent Decree with Atlantic Richfield Company and E. I. du Pont de Nemours and Company in the matter of *United States and the State of Indiana v. Atlantic Richfield Co., et al.* (N.D. Ind.) relating to the USS Lead Superfund Site in East Chicago, IN.

FOR E. I. DU PONT DE NEMOURS AND COMPANY

s/ Sheryl A. Telford***
SHERYL A. TELFORD
Director-DuPont Corporate Remediation Group
E. I. du Pont de Nemours and Company
1007 Market St.
Wilmington, Delaware 19898

Agent Authorized to Accept Service on Behalf of E. I. du Pont de Nemours and Company:

Name: E. I. du Pont de Nemours and Company
Address: Room 8042 Du Pont Building
1007 Market St.
Wilmington, Delaware 19898

*** Signed with permission.

APPENDIX A

TO
CONSENT DECREE
BETWEEN THE UNITED STATES
AND THE STATE OF INDIANA
IN THE MATTER OF
UNITED STATES AND INDIANA V. ATLANTIC RICHFIELD CO., ET AL. (N.D IND.)

USS LEAD SUPERFUND SITE
EAST CHICAGO, INDIANA

OU-1 boundary

OU-2 boundary

Basemap source: Esri

US SMELTER & LEAD REFINERY
LAKE COUNTY, EAST CHICAGO, INDIANA

APPENDIX A

USS LEAD SITE

EPA REGION 5 RAC 2 | REVISION 0 | JULY 2014

SulTRAC

APPENDIX B

TO
CONSENT DECREE
BETWEEN THE UNITED STATES
AND THE STATE OF INDIANA
IN THE MATTER OF
UNITED STATES AND INDIANA V. ATLANTIC RICHFIELD CO., ET AL. (N.D IND.)

USS LEAD SUPERFUND SITE
EAST CHICAGO, INDIANA

USS LEAD SUPERFUND SITE EAST CHICAGO, INDIANA STATEMENT OF WORK FOR THE Z1&3 REMEDIAL DESIGN AND Z1&3 REMEDIAL ACTION USS LEAD SUPERFUND SITE, EAST CHICAGO, LAKE COUNTY, INDIANA

I. PURPOSE

The purpose of this Statement of Work is to set forth requirements for the partial implementation of the remedial action set forth in the Record of Decision (ROD), which was signed by the Director of the Superfund Division of the U.S. Environmental Protection Agency, Region 5, on November 30, 2012. The ROD addresses only soils and subsurface soils within Operable Unit 1 (OU1) of the U.S. Smelter and Lead Refinery, Inc. Superfund Site (Site). It does not address groundwater associated with OU1 or the Site (which will be included in OU2) or any other aspect of Operable Unit 2 (OU2).

For purposes of the partial implementation of the remedial action, the parties have divided OU1 into three zones: Zone 1 (Z1), Zone 2 (Z2), and Zone 3 (Z3). This Statement of Work applies to Zones 1 and 3 and shall be identified as the "Z1&3 SOW." The Consent Decree to which this Statement of Work is appended provides definitions of OU1, OU2, Z1, Z2, and Z3. All terms that are defined in Section IV of the Consent Decree shall have the same meaning in this Z1&3 SOW.

This Z1&3 SOW addresses Z1&3 Remedial Design and Z1&3 Remedial Action. EPA will implement all Z1&3 Remedial Design and all Z1&3 Remedial Action except for Transportation and Disposal Work that Settling Defendants shall do at all properties within Z1&3 except for Z1&3 Excluded Properties (as defined in the Consent Decree). At the Z1&3 Excluded Properties, EPA shall perform all response actions, including all Transportation and Disposal. The Z1&3 Transportation and Disposal Work that Settling Defendants shall perform at all but the Z1&3 Excluded Properties shall be termed the "SDs' Z1&3 T&D Work."

EPA will implement its activities consistent with the *National Contingency Plan*, the *Superfund Lead-Contaminated Residential Sites Handbook*, August 2003 ("*Lead Handbook*") (which is attached to this SOW as Attachment 1), and any other relevant EPA guidance documents for remedial design and remedial action undertaken by EPA.

Settling Defendants shall implement the SDs' Z1&3 T&D Work consistent with the ROD, this Z1&3 SOW, all plans approved by EPA pursuant to the Consent Decree and this Z1&3 SOW, and any additional guidance provided by EPA to implement the SDs' Z1&3 T&D Work.

II. DESCRIPTION OF THE Z1&3 REMEDIAL ACTION AND THE PERFORMANCE STANDARDS FOR THE Z1&3 REMEDIAL ACTION AND SD's Z1&3 T&D WORK

Performance standards for the Z1&3 Remedial Action include cleanup standards, standards of control, quality criteria, and other substantive requirements, criteria or limitations including all Applicable or Relevant and Appropriate Requirements (ARARs) set forth in the ROD, this Z1&3

SOW and/or the Consent Decree. Settling Defendants shall design and implement the SDs' Z1&3 T&D Work to meet those performance standards and specifications which relate to T&D Work.

A. Description of the Z1&3 Remedial Action within OU1

Soils throughout OU1 are contaminated with lead and arsenic at levels that pose a threat to human health by ingestion, inhalation and direct contact. The ROD requires the excavation and off-Site disposal of certain soils that contain lead or arsenic above the remedial action levels (RALs). The RALs at OU1 are 400 milligram per kilogram (mg/kg) for lead at residential properties, schools, parks and unrestricted public right of ways; 800 mg/kg for lead at industrial/commercial properties; and 26 mg/kg for arsenic at both residential and industrial/commercial properties.

EPA will identify and excavate soils that contain lead or arsenic in concentrations that exceed the RALs down to a maximum depth of twenty-four inches below ground surface (bgs). EPA will not excavate soils that contain lead or arsenic in concentrations that exceed the RALs located more than twenty-four inches bgs. If EPA identifies soils that contain lead or arsenic in concentrations that exceed the RALs but which are located more than twenty-four inches bgs, EPA will install a visual barrier such as landscape fabric or orange construction fencing twenty-four inches bgs. Backfill will be placed on the visual barrier to restore the area to the level that existed before EPA began Z1&3 Remedial Action. The top six inches of fill will consist of topsoil. EPA will seed or place sod over the topsoil, and water the seed or sod for a period of thirty days.

At properties within Z1 and Z3 where soils remain that contain lead or arsenic in concentrations that exceed the RALs, EPA will record appropriate deed restrictions to protect the visual barrier that separates clean backfill from impacted soil and to ensure that persons are not unknowingly exposed to contaminants that remain twenty-four inches bgs.

In the event that hazardous substances, pollutants, or contaminants remain at any property within Z1 or Z3, EPA will conduct a review of the Remedial Action every five years to ensure that the remedy remains protective of human health and the environment.

B. Performance Standards for the Z1&3 Remedial Action and SDs' Z1&3 T&D Work

1. Cleanup Standards: The cleanup standards for the Z1&3 Remedial Action are the RALs for lead and arsenic set forth in the ROD. For residential yards, the RAL for lead is 400 mg/kg. At schools, parks and unrestricted public right of ways, the RAL for lead is also 400 mg/kg. At industrial/commercial properties, the RAL for lead is 800 mg/kg. The RAL for arsenic is 26 mg/kg at both residential and commercial/industrial properties.

2. ARARs: EPA has identified the ARARs for the Z1&3 Remedial Action in Appendix B of the ROD, a copy of which is appended to the CD as Appendix C. As set forth in Section V of the Consent Decree, and provided for in

Section 121(e) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and Section 300.400(e) of the National Contingency Plan (NCP), permits will not be required for any portion of the remedial action conducted entirely on-site. This includes work that is conducted within the areal extent of contamination or in very close proximity to the contamination and is necessary for implementation of the work.

3. Treatment and Disposal: Soil that shows characteristics of being a hazardous waste under the Resource Conservation and Recovery Act (RCRA), based upon EPA sampling and analysis or, after initial sampling and analysis, process knowledge that a disposal facility accepts, can be disposed of at either a Subtitle C-compliant landfill or treated and disposed of at a Subtitle D-compliant landfill. To the extent that treatment is selected for soils that exhibit characteristics of hazardous waste, Settling Defendants shall utilize only an EPA-permitted, licensed, off-Site treatment facility and shall ensure that only EPA-approved treatment processes are utilized.

4. Soil Management: When transporting, arranging for the treatment of, holding at a transfer station, or in any way managing contaminated soil, Settling Defendants shall take all necessary measures to prevent contaminated soil from being redistributed to any area outside the container holding the soil. Such efforts may include but are not be limited to wetting soils to suppress dust; covering the containers holding the soil; maintaining covers previously applied to the containers; and using other such methods or procedures.

III. SCOPE OF Z1&3 REMEDIAL DESIGN AND Z1&3 REMEDIAL ACTION

A. Role of EPA

EPA will perform Z1&3 Remedial Design. The purpose of the Z1&3 Remedial Design will be to identify those soils that exceed the cleanup standards and therefore require excavation and to develop a diagram of each property that shows the horizontal and vertical extent of the excavation.

EPA will sample the soils of all properties within Z1 and Z3 that have not yet been sampled to identify yards that contain soils that exceed RALs and to determine the necessary depths of the excavations. EPA will employ the same sampling methodologies as those used during the Remedial Investigation (RI) field work and described in the RI.[1] EPA will collect and analyze soil samples from four different horizons (0–6", 6–12", 12–18", and 18–24" bgs). Samples will be collected from front yards, back yards, and quadrants of larger properties. The purpose of sampling soils from different soil horizons is to establish vertical contamination profiles.

[1] *Remedial Investigation Report, Final*, June 2012, at Section 3.0; *Lead Handbook* at Section 4.3.

Soils that contain lead or arsenic in concentrations above the RALs and which are located from the surface down to twenty-four inches below will be targeted for excavation and removal.

For each property that contains lead or arsenic in concentrations above the RALs at locations from the surface down to twenty-four inches bgs, EPA will develop a design document for the property which will consist of a diagram for that individual property. The diagram will identify the areas of excavation and the depth of the excavation areas. For each property that does not contain lead or arsenic in concentrations above the RALs at locations from the surface to twenty-four inches bgs, no design document will be created nor will EPA excavate or remove soils from such properties.

EPA will perform Z1&3 Remedial Action except for SDs' Z1&3 T&D Work. EPA will excavate contaminated soil and place it into roll-off boxes, trucks, or other appropriate containers located within the boundaries of Z1 and Z3. EPA will determine the types and sizes of the containers that are necessary and where such containers temporarily will be placed for the loading and holding of soils prior to Transportation out of Z1 and/or Z3. These locations will change as work progresses. These locations will be known as the "Z1&3 Temporary Container Accumulation Areas." EPA will be responsible for maintaining and securing the Z1&3 Temporary Container Accumulation Areas until the containers are picked up, at the request of EPA, by Settling Defendants.

For purposes of characterizing soils as either hazardous or non-hazardous, EPA will perform the Toxicity Characteristic Leachate Procedure (TCLP) on soil either during the time it is sampled in the Remedial Design phase or after the soil has been placed into containers in the Remedial Action phase. If, after time, process knowledge enables EPA to reliably determine the hazardous or non-hazardous nature of such soils without the use of the TCLP, and the disposal facility agrees with EPA's determinations, such knowledge may be used instead of TCLP characterization.

To the extent that EPA performs the TCLP on soil (or is able to rely on process knowledge) during the time it is sampled in the RD phase, then during the RA phase, EPA will segregate those soils that are characterized as hazardous into separate containers from those soils that are characterized as non-hazardous.

To the extent that EPA performs the TCLP on soil in containers (or is able to rely on process knowledge) during the RA phase (and not during the RD phase), EPA will segregate soils having concentrations of lead greater than 2000 mg/kg into separate containers from those soils having concentrations of less than 2000 mg/kg. EPA will characterize the soils in both the containers with lead greater than 2000 mg/kg and the containers with lead less than 2000 mg/kg, unless and until process knowledge is a sufficient basis for characterization. As appropriate, EPA may adjust the cutoff concentration based on TCLP data.

EPA will advise Settling Defendants of the hazardous or non-hazardous status of the contents of each container so that Settling Defendants may properly transport and dispose of the contents of the container. For purposes of waste manifesting, EPA will be considered the generator of the Waste Material. EPA will prepare and sign the appropriate and necessary paperwork for

shipping Waste Material, including waste manifests. EPA will provide these documents to Settling Defendants.

EPA will confer with Settling Defendants about any additional accumulation and/or staging procedures to promote efficient SD Z1&3 T&D Work.

EPA anticipates that it may not be able to secure access to some properties within Zone 1 and/or Zone 3 in time to do sampling and/or remediation simultaneously with other properties within Zones 1&3. Pursuant to the Consent Decree, EPA shall develop a list of all such properties and these properties shall be termed the "Z1&3 Excluded Properties." EPA shall be responsible for response actions at these Z1&3 Excluded Properties including, as necessary, T&D Work.

B. Role of Settling Defendants

Settling Defendants shall be responsible for the SDs' Z1&3 T&D Work. Settling Defendants shall transport and appropriately dispose of all Waste Material generated within Z1&3 during the Z1&3 Remedial Action except for any Waste Material that may result from later response actions at the Z1&3 Excluded Properties.

Settling Defendants shall appropriately dispose of all Waste Material at either a licensed, off-Site Subtitle D-compliant landfill or a licensed, off-Site, Subtitle-C compliant landfill, depending upon the characterization of the Waste Material.

Consistent with Section VI of the Consent Decree, Settling Defendants shall retain an SDs' Z1&3 T&D Supervising Contractor who will be responsible for the SDs' Z1&3 T&D Work, including but not limited to:

(1) Supplying roll-off boxes, trucks, or other appropriate containers ("Containers") to the Z1&3 Temporary Container Accumulation Areas;

(2) Picking up the Containers from the Z1&3 Temporary Container Accumulation Areas;

(3) Transporting the Containers out of Z1 and Z3;

(4) Transporting and Disposing of the Waste Material in the Containers as follows:

(i) Transporting the Containers holding contaminated soils to an EPA-permitted, licensed, off-Site treatment facility for treatment, and then transporting the treated soils to an appropriate EPA-permitted, licensed, off-Site disposal facility; or

(ii) Transporting Containers holding Waste Materials, including contaminated soils, directly to an appropriate EPA-permitted, licensed, off-Site disposal facility; and

(5) Electing, at its option, to utilize an EPA-approved, licensed, off-Site transfer station during any Transportation done under either (4)(i) or (4)(ii).

Settling Defendants shall require the SDs' Z1&3 T&D Supervising Contractor to follow the direction of EPA as to Tasks (1) and (2), including, but not limited to, following the direction of EPA with respect to the type and size of, as well as any other specifications regarding, the Containers needed to implement the Z1&3 Remedial Action, and the number, timing, and placement of the Containers within Z1 and/or Z3 for implementing the Z1&3 Remedial Action. In addition, Settling Defendants shall require the SDs' Z1&3 T&D Supervising Contractor to respond directly to EPA for requests to pick-up Containers. Settling Defendants shall require the SDs' Z1&3 T&D Supervising Contractor to pick up a Container or Containers as soon as practicable but no later than one business day after notification by EPA. EPA shall provide SDs' Z1&3 Supervising Contractor with the appropriate and necessary paperwork for shipping the Waste Material, including manifests, at the time of the pick-up of the Container(s). In the event that EPA fails to provide the necessary documentation at the time of the pick-up, EPA shall remain responsible for the Containers until such time as the Settling Defendants are provided with the necessary documentation and the Settling Defendants pick up the Containers.

Prior to performing SDs' Z1&3 T&D Work, Settling Defendants shall prepare and submit to EPA for approval an SDs' Z1&3 T&D Work Plan which shall include a Health and Safety Plan (HASP). The content of these plans is described below in Section III.D.1.b.vii, Section III.D.2, and Section IV.

C. Project Organization

EPA intends to conduct concurrently the Z1&3 Remedial Design and Z1&3 Remedial Action in order to accelerate the implementation of the Z1&3 Remedial Action. EPA has termed this approach a "rolling RD/RA." As a part of the rolling RD/RA, EPA expects to employ the same contractor for both the Z1&3 Remedial Design and Z1&3 Remedial Action. In addition to the utilization of a contractor to perform Z1&3 Remedial Design and the Z1&3 Remedial Action, EPA expects to retain the U.S. Army Corps of Engineers (Corps or Corps of Engineers) or another party to provide third party oversight of EPA's contractors. The Corps' oversight functions will include but not be limited to the review of the Z1&3 Remedial Design, observation of fieldwork, and the review of technical documents.

EPA expects to hold regular site progress meetings (generally weekly) with its contractor during the Z1&3 Remedial Design and the Z1&3 Remedial Action. Designated representatives of the Settling Defendants may participate in these meetings.

After the Effective Date of the Consent Decree and continuing until the Certification of the Completion of the Z1&3 Work, EPA periodically will provide, with respect to Z1&3 Work, the following documents to Settling Defendants: one-page Work Assignment forms; Statements of Work associated with Work Assignment forms (these will be either new Statements of Work or revisions or modifications to prior Statements of Work); and the narrative descriptions provided by EPA's contractor describing the Work Plans to implement the Statements of Work (these likewise will be either new narrative descriptions or revised/modified descriptions of prior

narrative descriptions). These documents will be redacted to exclude Confidential Business Information (CBI), Personal Identifying Information (PII), trade secrets, unique solutions, or any other material that is protected from disclosure pursuant to the Freedom of Information Act (FOIA).

On a monthly basis, EPA also will provide Settling Defendants with abridged Monthly Progress Reports prepared by EPA's contractor which shall be abridged to exclude CBI, PII, trade secrets, unique solutions, and any other material that is protected from disclosure pursuant to FOIA.

EPA will not provide Settling Defendants with drafts of any of the documents identified in the prior two Paragraphs. The documents identified in the prior two Paragraphs will be provided to Settling Defendants as a courtesy only. Other than talking informally with EPA's Project Coordinator about such documents, Settling Defendants shall not seek changes, additions, clarifications, modifications, deletions or withdrawals to any part or all of each of these documents through any process, procedure, dispute resolution, civil action, or in any other manner. If, in EPA's unreviewable discretion, Settling Defendants violate the terms of the preceding sentence, EPA may cease voluntarily providing the documents identified in the prior two paragraphs to Settling Defendants pursuant to this Z1&3 SOW and this decision shall not be subject to dispute resolution under the Consent Decree. However, nothing in these paragraphs diminishes any other rights SDs may have to seek this information, including rights under FOIA.

EPA periodically will provide Settling Defendants with invoices which shall exclude CBI, PII, trade secrets, unique solutions, and any other material that is protected from disclosure pursuant to FOIA.

D. Project Plans/Components

Development of the following plans and implementation of the following components will be necessary to perform the Z1&3 Remedial Design and Z1&3 Remedial Action.

Plan 1	OU1 Remedial Design Work Plan	EPA
Plan 2	OU1 Remedial Action Work Plan	EPA
Plan 3	OU1 Remedial Design Property Diagrams	EPA
Plan 4	SDs' Z1&3 T&D Work Plan	SDs
Component 1	Z1&3 Remedial Action/Construction	EPA
Component 2	SDs' Z1&3 T&D Work	SDs

1. Project Plans: EPA's

   a. OU1 Remedial Design Work Plan: EPA will prepare an OU1 Remedial Design Work Plan. The OU1 Remedial Design Work Plan will describe how EPA will implement the ROD and comply with the terms of this Consent Decree and Z1&3 SOW. The OU1 Remedial Design Work Plan will also specify the necessary procedures, inspections, and deliverables, and include a schedule with specific dates for completion of each required activity, and a list of key contractor personnel who will provide support to implement the Z1&3 Remedial Design. The OU1 Remedial Design Work Plan will include, but not be limited to, the following plans: Data Management Plan; Site Management Plan; Sampling and Analysis Plan (consisting of the Field Sampling Plan and Quality Assurance Project Plan); and Health and Safety Plan.

   b. Sub-Plans of OU1 Remedial Design Work Plan:

      i. The Data Management Plan (DMP) will set forth the procedures for storing, handling, accessing, and securing the data collected during the Z1&3 Remedial Design sampling.

      ii. The Site Management Plan (SMP) will describe how EPA will gain access, secure equipment and materials, and manage wastes generated during the Z1&3 Remedial Action. It also will contain contingency procedures and management responsibilities.

      iii. The Sampling and Analysis Plan (SAP) will be comprised of two parts: the Field Sampling Plan (FSP) and the Quality Assurance Project Plan (QAPP).

      iv. The FSP will describe the number, type, and locations of samples; the method of sample analysis; and collection and documentation procedures. The FSP will be consistent with 40 CFR 300.415(b)(4)(ii).

      v. The QAPP will be prepared in accordance with *EPA Requirements for QA Project Plans* (QA/R-5), Office of Environmental Information, EPA/240/B-01/003, March 2001. It will describe the procedures necessary to obtain accurate data during the Z1&3 Remedial Design phase. It will also describe the procedures necessary for confirming that EPA has properly removed contaminated soils during the Z1&3 Remedial Action phase.

         EPA will modify its QAPP if additional relevant information is received (*e.g.*, updates to analytical methodologies).

      vi. In addition to the QA/QC requirements set forth in the QAPP, the SAP also will contain standard operating procedures (SOPs) for the development of data quality objectives (DQOs), the collection of environmental samples, chain-of-custody documentation, field screening activities, ambient air monitoring, field equipment decontamination, and data validation.

vii. The HASP will establish minimum health and safety requirements and procedures for all environmental activities conducted within the Site. The HASP will specify employee training, protective equipment, medical surveillance requirements, standard operating procedures, and contain a contingency plan in accordance with 29 CFR 1910.120(l)(1) and (l)(2).

The HASP will address the following components: scope of plan; safety management; traffic management; accident management; personnel responsibilities; hazard assessment; communications; personnel exposure and air quality monitoring; personal protective equipment; training and medical surveillance; contamination reduction procedures; general work precautions; sanitary facilities; and fire control equipment.

EPA will prepare a HASP and Settling Defendants will prepare a HASP as part of their Z1&3 T&D Work Plan. *See* Section III.D.2.b below.

Each contractor retained by EPA or the Settling Defendants will supplement the information presented in the HASP, as necessary. Contractor-specific HASP(s) will consider not only the general information and minimum requirements contained in the HASP, but also specific information related to the particular work area and task(s) to be performed by the contractor.

c. OU1 Remedial Action Work Plan: EPA will develop the OU1 Remedial Action Work Plan. The OU1 Remedial Action Work Plan will specify the necessary procedures, inspections, and deliverables; contain a schedule with specific dates for completion of each required activity and deliverable; and contain a list of key contractor personnel who will provide support on the work assignment. EPA will conduct the Z1&3 Remedial Action in accordance with the OU1 Remedial Action Work Plan.

d. OU1 Remedial Design Property Diagrams: For properties that have soils that contain lead and/or arsenic above the RALs, EPA will prepare individual diagrams of each property. These diagrams will specify the extent, depth, and other information, as set forth in the OU1 Remedial Design Work Plan, necessary to undertake excavation of soils at the property. EPA will conduct the Z1&3 Remedial Action in accordance with the OU1 Remedial Design Property Diagrams.

2. Project Plans: Settling Defendants

a. SDs' Z1&3 T&D Work Plan: Settling Defendants shall develop an SDs' Z1&3 T&D Work Plan that shall describe how they will perform the SDs' Z1&Z3 T&D Work. The SDs' Z1&3 T&D Work Plan specifically shall include, but not be limited to, a detailed description of: (i) the types, sizes, and numbers of roll-off boxes, trucks, or other Containers that will be available for loading Waste

Materials into; (ii) the terms of the agreement that establishes EPA's ability to direct certain work of the SDs' Z1&3 T&D Supervising Contractor as described Section III.B of this Z1&3 SOW; (iii) the management of Waste Materials, including contaminated soils, so as to prevent Waste Materials, including contaminated soils, from being redistributed to any area outside a container holding the Waste Materials; (iv) the Transportation of the containers of Waste Materials out of Z1 and/or Z3; (v) the EPA-permitted, licensed, off-Site treatment facility(ies), if any, that will be used for the treatment of contaminated soil; (vi) the EPA-approved treatment process(es), if any, that will be used at such facility(ies); (vii) the EPA-approved, licensed, off-site transfer station(s), if any, that will be used for the temporary holding of Containers of Waste Materials prior to disposal at an appropriate disposal facility; and (viii) the EPA-permitted, licensed, off-Site disposal facilities that will be used for the disposal of the Waste Materials.

EPA will review the SDs' Z1&3 T&D Work Plan in accordance with Section VIII of the Consent Decree (EPA Approval of Plans, Reports, and Other Deliverables). EPA will confer with the Settling Defendants before either disapproving the plan or approving it with modifications.

b. Sub-Plans of the SDs' Z1&3 T&D Work Plan:

i. The SDs' Z1&3 T&D Work Plan shall include a Health and Safety Plan (HASP) which shall be consistent with the requirements of Section III.D.1.b.vii and Section IV of this Z1&3 SOW.

ii. The HASP will include a Traffic and Accident Management Plan and a Contingency Plan which shall be consistent with the requirements of Section IV of this Z1&3 SOW.

3. Project Components

a. Once EPA has approved the SDs' Z1&3 T&D Work Plan and issued the final OU1 Remedial Action Work Plan, Settling Defendants shall begin work in accordance with the procedures and schedule set forth in the approved plan. EPA and/or the Corps of Engineers may oversee all aspects of the SDs' Z1&3 T&D Work. Settling Defendants shall not be required to perform T&D Work in connection with the Z1&3 Excluded Properties.

b. Once the SDs' Z1 T&D Work has been completed, Settling Defendants shall prepare and submit to EPA an SDs' Z1 T&D Final Report. After receipt of the SDs' Z1 T&D Final Report and completion of the Z1 Remedial Action, EPA will complete the Z1 Remedial Action Final Report. The Z1 Remedial Action Final Report will include as-built drawings signed and stamped by a professional engineer and will contain the SDs' Z1 T&D Final Report.

c. Once the SDs' Z3 T&D Work has been completed, Settling Defendants shall prepare and submit to EPA an SDs' Z3 T&D Final Report. After receipt of the SDs' Z3 T&D Final Report and completion of the Z3 Remedial Action, EPA will complete the Z3 Remedial Action Final Report. The Z3 Remedial Action Final Report will include as-built drawings signed and stamped by a professional engineer and will contain the SDs' Z3 T&D Final Report.

IV. CONTENT OF SUPPORTING PLANS PREPARED BY SETTLING DEFENDANTS

HASP. Settling Defendants shall develop a HASP, which is designed to protect on-Site personnel and area residents from physical, chemical and all other hazards posed by the SDs' Z1&3 T&D Work. The safety plan shall develop the performance levels and criteria necessary to address the following areas: facility description; personnel; levels of protection; safe work practices and safe guards; medical surveillance; personal and environmental air monitoring; personal protective equipment; personal hygiene; decontamination - personal and equipment; site work zones; contaminant control; contingency and emergency planning; and logs, reports and recordkeeping. The HASP shall follow EPA guidance and all OSHA requirements as outlined in 29 CFR 1910 and 1926.

The HASP shall include the following sub-plans: Traffic and Accident Management Plan and a Contingency Plan.

The Traffic and Accident Management Plan shall describe procedures to be used to manage traffic and prevent accidents in and around the Z1&3 Temporary Container Accumulation Areas and the Site, as well as on public roadways between Z1 and/or Z3 and the treatment facility, if applicable, the transfer facility, if applicable, and the disposal facilities. The Plan shall contain, at a minimum, the following elements: responsibilities and authorities of all organizations and key personnel involved in traffic and accident management; qualifications of the key personnel to demonstrate they possess the training and experience necessary to fulfill their identified responsibilities; proposed routes for transporting materials from Z1 and/or Z3 to the treatment facility, if any, the transfer facility, if any, and the disposal facilities; and procedures to follow in the event of an accident during the transportation of materials in, around, and/or from the Site.

The Contingency Plan shall describe procedures to be used in the event of an accident or emergency in, around, and/or from the Z1&3 Temporary Container Accumulation Areas, the Site, and/or on public roadways between Z1 and/or Z3, the Site, and treatment facility, if any, the transfer facility, if any, and the disposal facilities. The Contingency Plan shall include, at a minimum, the following: the name of the person or entity responsible for responding in the event of an emergency incident; plans and date(s) for meeting(s) with the local community, including local, State and Federal agencies involved in the cleanup, as well as local emergency squads and hospitals; first aid medical information; Air Monitoring Plan (if applicable); and a Spill Prevention, Control, and Countermeasures (SPCC) Plan (if applicable), as specified in 40 CFR Part 109, describing measures to prevent and contingency plans for potential spills and discharges from materials handling and transportation.

V. SUMMARY OF MAJOR DELIVERABLES/SCHEDULE FOR SETTLING DEFENDANTS

A summary of the project schedule and reporting requirements for Settling Defendants is set forth below:

Submission	Due Date
1. SDs' Z1&3 T&D Work Plan	30 days after receipt from EPA of a draft of the OU1 Remedial Action Work Plan
2. Final SDs' Z1 T&D Report	30 days after completion of the SDs' Z1 T&D Work
3. Final SDs' Z3 T&D Report	30 days after completion of the SDs' Z3 T&D Work

ATTACHMENT 1
TO
APPENDIX B

TO
CONSENT DECREE
BETWEEN THE UNITED STATES
AND THE STATE OF INDIANA
IN THE MATTER OF
UNITED STATES AND INDIANA V. ATLANTIC RICHFIELD CO., ET AL. (N.D IND.)

USS LEAD SUPERFUND SITE
EAST CHICAGO, INDIANA

EPA United States Environmental Protection Agency | Office of Emergency and Remedial Response | OSWER 9285.7-50 August 2003

Superfund Lead-Contaminated Residential Sites Handbook

Final: August 2003

Prepared by the

Environmental Protection Agency
Lead Sites Workgroup (LSW)

NOTICE

This document has been reviewed in accordance with U.S. EPA policy and is approved for publication. Mention of trade names or commercial products does not constitute endorsement or recommendation.

DISCLAIMER

This document provides guidance to EPA Regions concerning how the Agency intends to exercise its discretion in implementing one aspect of the CERCLA remedy selection process. The guidance is designed to implement national policy on these issues.

Some of the statutory provisions described in this document contain legally binding requirements. However, this document does not substitute for those provisions or regulations, nor is it a regulation itself. Thus, it cannot impose legally-binding requirements on EPA, states, or the regulated community, and may not apply to a particular situation based upon the circumstances. Any decisions regarding a particular remedy selection will be made based on the statute and regulations, and EPA decision makers retain the discretion to adopt approaches on a case-by-case basis that differ from this guidance where appropriate.

Interested parties are free to raise questions and objections about the substance of this guidance and the appropriateness of the application of this guidance to a particular situation, and the Agency welcomes public input on this document at any time. EPA may change this guidance in the future.

CONTRIBUTING MEMBERS of Lead Sites Workgroup of U.S. Environmental Protection Agency

Shahid Mahmud, Co-Chair
U.S. EPA HQ
Bus: (703) 603-8789
E-mail: mahmud.shahid@epa.gov

Brad Bradley, Co-Chair
U.S. EPA Region 5
Bus: (312) 886-4742
E-mail: bradley.brad@epa.gov

Monica McEaddy
U.S. EPA HQ
Bus: (202) 603-0044
E-mail: mceaddy.monica@epa.gov

Rafael Casanova
U.S. EPA Region 6
Bus: (214) 665-7437
E-mail: casanova.rafael@epa.gov

Ron Morony
U.S. EPA HQ
Bus: (202) 260-0282
E-mail: morony.ronald@epa.gov

Mark Doolan
U.S. EPA Region 7
Bus: (913) 551-7169
E-mail: doolan.mark@epa.gov

Byron Mah
U.S. EPA Region 1
Bus: (617) 918-1249
E-mail: mah.byron@epa.gov

Sara Sparks
U.S. EPA Region 8
Bus: (406) 782-7415
E-mail: sparks.sara@epa.gov

Mark Maddaloni
U.S. EPA Region 2
Bus: (212) 637-3765
E-mail: maddaloni.mark@epa.gov

Shea Jones
U.S. EPA Region 9
Bus: (415) 972-3148
E-mail: jones.shea@epa.gov

Khai Dao
U.S. EPA Region 3
Bus: (215) 814-5467
E-mail: dao.khai@epa.gov

Sean Sheldrake
U.S. EPA Region 10
Bus: (206) 553-1220
E-mail: sheldrake.sean@epa.gov

Charlie Root
U.S. EPA Region 3
Bus: (215) 814-3193
E-mail: root.charlie@epa.gov

Steve Jones
ATSDR
Bus: (703) 603-8729
E-mail: jones.steve@epa.gov

Beth Walden
U.S. EPA Region 4
Bus: (404) 562-8814
E-mail: walden.beth@epa.gov

CONTENTS

LIST OF TABLES AND FIGURES

ACRONYMS

ARARs	Applicable or Relevant and Appropriate Requirements
ASTM	American Society for Testing and Materials
ASTSWMO	Association of State and Territorial Solid Waste Management Officials
ATSDR	Agency for Toxic Substances and Disease Registry
BMPs	Best Management Practices
BRAC	Base Realignment and Closure
CAGs	Community Advisory Groups
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CIC/CIS	Community Involvement Coordinator/ Specialist
DOD	Department of Defense
FOSL	Finding of Suitability to Lease
FOST`	Finding of Suitability to Transfer
FP-XRF	Field-Portable X-Ray Fluorescence
HUD	Department of Housing and Urban Development
IC	Institutional Control
LBP	Lead-Based Paint
IEUBK	Integrated Exposure Uptake Biokinetic Model for Lead in Children
LSCG	Lead Sites Consultation Group
MCL	Maximum Contaminant Level
NCP	National Contingency Plan
NLLAP	National Lead Laboratory Accreditation Program
NTCRA	Non-Time-Critical Removal Action
OSWER	EPA Office of Solid Waste and Emergency Response
PRG	Preliminary Remediation Goal
PRP	Potentially Responsible Party
RCRA	Resource Conservation and Recovery Act
SEP	Supplemental Environmental Project
TAG	Technical Assistance Grant
TCLP	Toxicity Characteristic Leaching Procedure
TCRA	Time-Critical Removal Action
TITLE X	Title X of the Housing and Community Development Act of 1992, 42 U.S.C. 4822
TRW	EPA Technical Review Workgroup
TSCA	Toxic Substances Control Act
UAO	Unilateral Administrative Order

1.0 INTRODUCTION

This Superfund Lead-Contaminated Residential Sites Handbook (subsequently called the Handbook) has been developed by the U.S. Environmental Protection Agency (EPA) to promote a nationally consistent decision-making process for assessing and managing risks associated with lead-contaminated residential sites across the country.

The primary audience for this risk management document is Superfund project managers working on the characterization and cleanup of lead-contaminated residential sites; however, Resource Conservation and Recovery Act (RCRA) project managers may also find it useful. This information was developed primarily for EPA staff, but may prove useful to others working on lead-contaminated residential sites, including states, other federal agencies, tribes, local governments, public interest groups, and private industry. While this Handbook is not intended to apply to lead-contaminated commercial or industrial properties, other non-residential areas, or sites with ecological risks, some of the concepts may be useful for such properties. Addressing lead-contaminated properties at federal facilities requires a different approach, and this Handbook provides a special section (Section 8) on addressing this universe of sites.

Generally, Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) response actions are undertaken to address a release or threat of release of a hazardous substance such as lead into the environment. Lead contamination found inside homes may be caused by deteriorating lead-based paint (LBP), plumbing, or other sources not resulting from a release into the environment, and therefore may be more appropriately addressed by authorities and programs other than CERCLA (see Appendix A and Section 6.6 of this Handbook). However, it may be appropriate to use CERCLA authorities to conduct sampling and site characterization activities to determine the source of the lead contamination and to differentiate between various site-related sources.

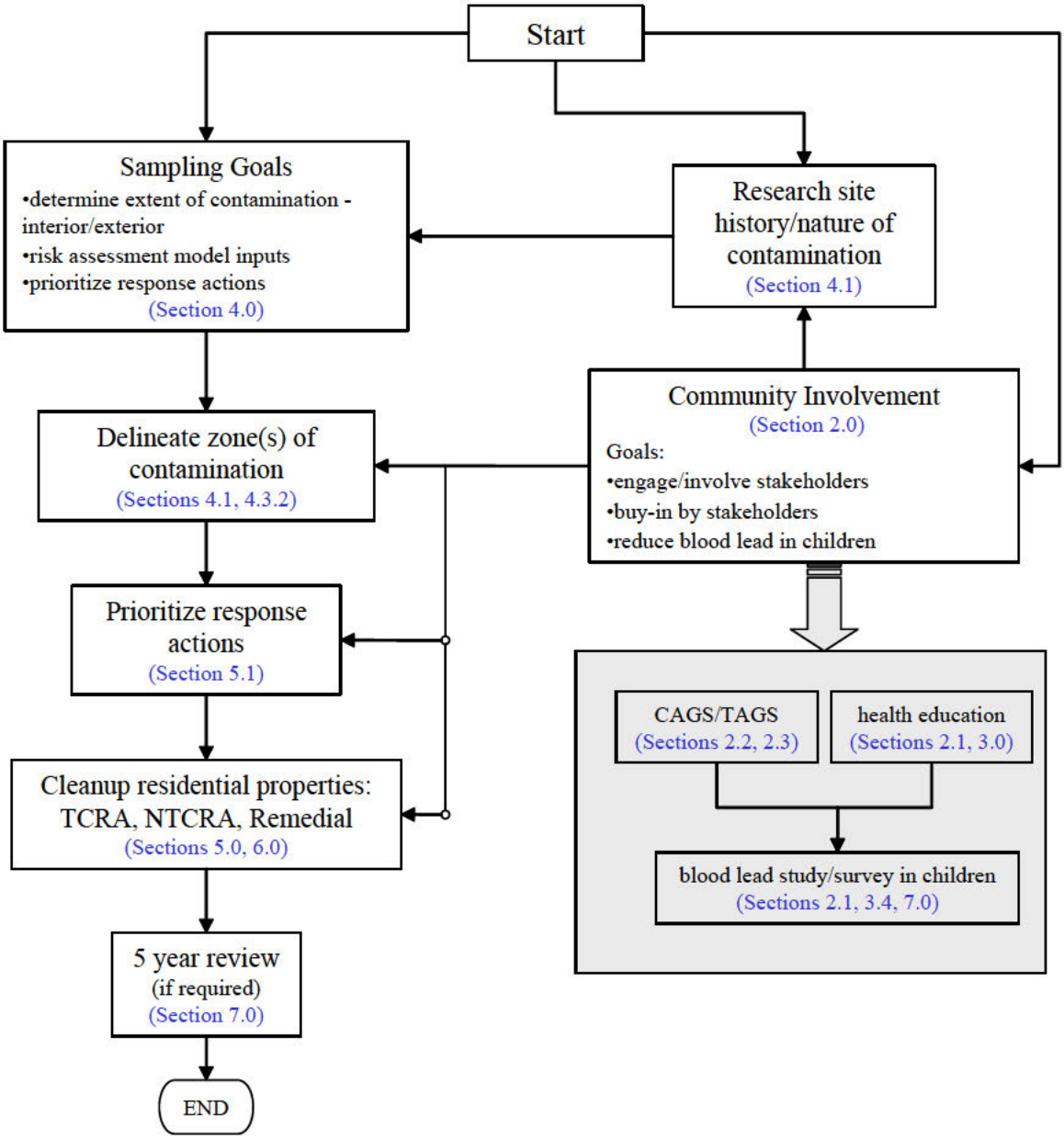
The Handbook lays out only the minimum considerations for addressing lead-contaminated residential sites and encourages users to refer to appropriate agency guidance and/or policy to conduct more stringent investigation and clean-up activities on a site-specific basis, if necessary. In addition, the site manager should determine the applicable and relevant or appropriate requirements (ARARs), including state laws and regulations, that apply to the site. It should also be noted that this Handbook does not, outside the federal facilities universe, apply to lead-contaminated residential sites addressed under Title X (HUD, 1992) procedures.

Lead site characterization and clean-up procedures are unique owing to the ubiquitous nature of lead exposures and the reliance on blood lead concentrations to describe lead exposure and toxicity. Lead

risks are characterized by predicting blood lead levels with computer models and guidance developed by EPA, which are available on the internet: http://www.epa.gov/superfund/programs/lead/products.htm. Major improvements in the removal of lead from gasoline, paint, and food packaging have significantly reduced the incidence of severe lead poisoning. The results of this progress mean that most environmental sources of lead exposure are more likely to cause subtle adverse health effects, primarily behavioral and learning impairments.

An overview to the clean-up process is provided as Figure 1-1. Section numbers are provided in the figure to help the reader locate information within this document.

Figure 1-1. An Overview to the Clean-up Process



1.1 BACKGROUND

Elevated blood lead concentrations in young children in the United States are still prevalent in many areas. Major sources of lead contamination historically included mining and milling sites, primary and secondary smelters, battery manufacturing and recycling facilities, pesticide formulators, pesticide use in orchards, and paint manufacturers (prior to 1978). Many of the source facilities are located near residential areas or have had residential areas develop around them. Fugitive emissions from the facilities have resulted in soil contamination in the yards of residences, which in turn can cause high blood lead levels in children.

Although numerous sites of this type exist, EPA has remediated, or overseen the remediation of, many of these sites and surrounding residences. Many different clean-up methods have been implemented with varying degrees of success. This document is based on the lessons learned from EPA's experience in remediating residential lead sites. It is intended to promote consistency in the characterization and cleanup of lead-contaminated residential sites, while retaining the flexibility needed to respond to different sites and communities to ensure success of the remedy and provide long-term protection of human health. The document also provides guidance on addressing lead sources and media that the Superfund does not usually remediate, such as LBP and lead plumbing. It is anticipated that this information will be periodically updated as we strive to improve our ability to respond to environmental lead hazards.

1.2 GENERAL DISCUSSION ON CERCLA'S APPLICABILITY TO LEAD SITES

This section provides a general discussion of the sections of CERCLA that address lead-contaminated sites. A description of Title X and EPA's Toxic Substances Control Act (TSCA) IV Lead Program is provided in Appendix A. The Title X discussion is provided for informational purposes and is primarily applicable to federal facilities. Section 4.2.5 also provides useful information for LBP and dust sampling.

1.2.1 Background

Historically, the CERCLA has been used as a tool to implement clean-up activities at a large number of sites across the country. CERCLA authorities have been used for cleanups ranging from the removal of drums of hazardous substances from long-abandoned sites, to major privately funded remedial actions at sites on the National Priorities List (NPL).

CERCLA may apply any time there is a release or threatened release of: (1) a hazardous substance into the environment, or (2) a pollutant or contaminant "which may present an imminent and substantial endangerment to the public health or welfare" (EPA, 2000a). The term "release" is defined broadly in the statute and includes discharging or leaking of substances into the environment. This also includes the abandonment of closed containers containing hazardous substances, pollutants, or contaminants.

The definition of hazardous substance is extremely broad, and is defined in CERCLA Section 101(14). A comprehensive list of these substances is provided in 40 CFR 302.4. In addition to general listings for “lead”, “lead and compounds”, and “lead compounds,” the regulation lists fourteen other subcategories of lead.

Additionally, CERCLA is not media-specific. Thus, it may address releases to air, surface water, groundwater, and soils. This multi-media aspect of CERCLA makes it possible to conduct environmental assessments and design clean-up projects that address site contaminants in a comprehensive way.

The Agency has pursued a number of CERCLA response actions involving lead-contaminated soil using the abatement authority under Section 106 (which also requires a showing of imminent and substantial endangerment). CERCLA covers almost every constituent found at mining and mineral processing (primary lead and other metals smelters) sites. Exceptions include petroleum (that is not mixed with a hazardous substance) and, in some cases, responses to releases of a naturally occurring substance in its unaltered form. It should be noted, however, that the latter exception does not include any of the releases typically dealt with at mining sites, such as acid mine drainage, waste rock, or any ore exposed to the elements by man.

1.2.2 Response Authorities

CERCLA's main strength is its response authorities. EPA can either use the Superfund to perform response (removal or remedial) activities (Section 104) or require private parties to perform such activities (Section 106). CERCLA gives EPA the flexibility to clean up sites based upon site-specific circumstances. EPA's clean-up decisions generally are based upon both risk assessment and consideration of ARARs. As long as the jurisdictional prerequisites have been met, CERCLA gives EPA the ability to perform virtually any clean-up activity necessary to protect public health and the environment.

There are potential limitations in CERCLA which may be relevant to lead-contaminated sites. For example, Section 104(a)(3) limits EPA’s ability to respond to releases within residential structures as follows:

> "Limitations on Response. The President (EPA) shall not provide for removal or remedial action under this section in response to a release or threat of release . . . from products which are part of the structure of , and result in exposure within, residential buildings or business or community structures . . . "

The above cited section of CERCLA generally limits EPA's authority to respond to LBP inside a structure or house as written in Section 6.6.1 of this Handbook. However as noted in Section 6.6.1 of the Handbook, EPA has the authority to conduct response actions addressing soils contaminated by a release of lead-contaminated paint chips from the exterior of homes to prevent recontamination of soils that have been remediated. In addition, Section 104(a)(4) provides an exception to the limitations in Section 104(a)(3).

CERCLA provides EPA with the authority to perform "removal" and "remedial" actions. Assessments generally are considered "removal" actions and evaluate contaminants of concern, exposure pathways, and potential receptors. The assessment process includes the review of available information, as well as sampling, to obtain other necessary information. The process is broad in its application and is a powerful tool in evaluating environmental risks posed by a site. Removal actions can be performed on mining and mineral processing (primary lead and other metals smelters) sites, and other sites with lead releases to the environment, of any size. Removal actions are subject to limits on time (12 months) and money ($2,000,000) under the statute; however, these limits are subject to exceptions.

Remedial actions are typically long-term responses performed at those sites placed on the NPL. Remedial actions also may be performed at non-NPL sites, through administrative orders on consent (AOCs) or consent decrees, if they are privately financed. Remedial actions are not subject to the time or dollar limitations imposed on removal actions, but require a more detailed and formal decision process.

1.2.3 Applicable or Relevant and Appropriate Requirements (ARARs)

Under Section 121(d) of CERCLA, remedial actions must comply with substantive provisions of federal environmental laws and more stringent, timely identified state environmental or facility siting laws. Removal actions should comply with ARARs to the extent practicable. "Applicable" requirements are those federal or state laws or regulations that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. "Relevant and appropriate" requirements are not "applicable," but address problems or situations similar enough to those at the CERCLA site that their use is well suited to the site.

State requirements are not considered ARARs unless they are identified in a timely manner and are more stringent than federal requirements. The recently published TSCA §403 Soil Hazard Rule, which establishes a soil-lead hazard of 400 ppm for bare soil in play areas and 1,200 ppm for bare soil in non-play areas of the yard, should not be treated as an ARAR. As recognized in the TSCA §403 Rule, lead contamination at levels equal to or exceeding the 400 ppm and 1,200 ppm standards may pose serious health risks based upon a site-specific evaluation and may warrant timely response actions. However, the soil-lead hazard levels under the TSCA §403 Rule should not be used to modify approaches to addressing brownfields, NPL sites, state Superfund sites, federal CERCLA removal actions and CERCLA non-NPL facilities.

EPA has published a manual outlining potential federal ARARs that may be requirements at Superfund sites. Published in two parts, the manual is entitled *CERCLA Compliance with Other Laws Manua*l, Part I, August 1988, and Part II, August 1989, and is available at EPA libraries (EPA, 1988).

1.3 DEFINITION AND PURPOSE

Residential properties are defined in the Handbook as any area with high accessibility to sensitive populations, and includes properties containing single- and multi-family dwellings, apartment complexes, vacant lots in residential areas, schools, day-care centers, community centers, playgrounds, parks, green ways, and any other areas where children may be exposed to site-related contaminated media (EPA, 1996a, 1997a, 1998a). This document defines sensitive populations as young children (those under 7 years of age, who are most vulnerable to lead poisoning) and pregnant women. Focus is put on children less than 7 years old because blood lead levels typically peak in this age range (EPA, 1986, 1990a; CDC, 1991). Unfortunately, this age range is also when children are most vulnerable to adverse cognitive effects of lead (Rodder, 1995). Pregnant women are included due to the effects of lead on the fetus (Gayer, 1990; Graziano et al., 1990; Carbone et al., 1998). Other EPA guidance (EPA, 1995a, 2001b) and local zoning regulations should also be consulted prior to determining which properties will be treated as residential.

Lead-contaminated residential sites are defined, for the purposes of this document, as sites where lead is the primary contaminant of concern in residential soils. Generally, lead-contaminated sites contain other metals of concern, such as cadmium and arsenic. This document, while addressing primarily lead contamination, may also be appropriate for use in the remediation of sites contaminated by other metals. In all cases, looking at the site history (type of lead site, depositional environment for the lead contamination, fill activities, previous epidemiological studies, etc.) is important in the use of the Handbook. Typically, the types of sites addressed by the Handbook are sites where the lead contamination has resulted primarily from primary or secondary lead smelting, battery cracking, or

mining and milling operations. Lead paint and dust, along with other sources of lead and other toxic metals, may also be present at these sites.

The Handbook is primarily based on a compilation of the Superfund program knowledge and experiences, as well as existing technical and scientific literature addressing lead-contaminated residential sites. The Handbook has undergone broad review by the Agency for Toxic Substances and Disease Registry (ATSDR), the Association of State and Territorial Solid Waste Management Officials (ASTSWMO), and national and regional EPA offices. Because the Handbook is written for use by CERCLA program staff, there are frequent references to guidance or other documents developed under the Superfund auspices. The Handbook does not supersede or modify any existing EPA guidance or policy. This guidance does not suggest that CERCLA authorities are to be applied at all lead-contaminated residential sites. Rather, these references are provided to the reader as resources to be considered in developing site characterization and clean-up strategies under whatever regulatory or non-regulatory approach is appropriate at a particular site. However, the NCP should be followed and other applicable guidance consulted when addressing lead-contaminated residential sites under CERCLA. The Handbook does not address ecological risks from lead and lead sites.

2.0 COMMUNITY INVOLVEMENT

The sustainability of a residential clean-up project in many ways is contingent upon support from affected residents, elected officials, local public health agencies, municipal and public works staff, state government personnel, and other stakeholders. Few sites impact more citizens of a community than large residential clean-up projects, with many projects exceeding a thousand homes and several thousand residents. If the residents recognize the risks posed to their community and feel involved in the decision-making process, they are more likely to accept the need for cleanup. House-to-house personal interaction with residents can be useful to learn their concerns (or lack of concerns) and can also be an effective part of educating the public regarding risks posed by the site. The project manager should issue bulletins and/or fact sheets to help keep the community informed of site activities and should consider establishing a toll free number for residents to contact her/him with questions about the site. Likewise, without the support of local governments, portions, if not all, of the selected remedy may be more difficult to implement. Many remedies rely in part on health education and institutional controls (ICs) as part of the actions taken to protect human health, both of which may rely on the active participation of local governments and health departments. The following sub-sections provide information on involving the community.

2.1 EDUCATION ACTIVITIES

This section discusses how to involve the local health departments and community in the education activities and the overall benefits and limitations of health education. Section 3 addresses health education activities in detail.

Several studies have shown that a significant short-term reduction in blood lead concentrations can be achieved through the education of the public on the dangers of lead exposure and on methods they can take to limit their exposure (Kimbrough et al., 1994; Hilts et al., 1998; Schultz et al., 1999). However, EPA does not consider health education, as the only action, to be an effective, permanent remedy for Superfund sites (Appendix B). Often, in-home education activities have been combined with regular house cleaning. One key to begin reduction of elevated blood lead concentrations in children is to initiate health education activities, and where appropriate, blood lead screening, as early as possible in the process. These activities should be started as soon as elevated blood lead levels or elevated soil levels are detected at a site. Education should be sustained throughout the project. If residual contamination, such as encapsulated wastes, LBP, or other such potential sources are left on site after completion of the remedy, then education activities should be sustained in perpetuity.

Generally, EPA does not directly conduct the majority of education activities. One of the responsibilities of the project manager is to educate the community on the risks of lead exposure and to coordinate with various health agencies in establishing lead education programs. These programs are often implemented by local health districts that, in turn, typically coordinate with schools and other community groups working with families and children. Initial tasks include educating the community regarding their lead exposure and associated health risks. Typically, a significant amount of effort will be required to explain the rationale and procedures of the EPA risk assessment method for lead, using the Integrated Exposure Uptake Biokinetic Model (IEUBK), and the need to collect data to estimate site-specific values for model parameters. It is advisable to obtain input on exposure parameters specific to the community (e.g., how often they frequent locations that are not residential). Community input into the risk assessment is not relevant to those parameters that require site-specific studies to generate empirical data (e.g., an animal feeding study to determine bioavailability). Often, local health officials will be unfamiliar with EPA's risk assessment process and will benefit from education along with the general public. The need for community education is heightened by the subtle nature of the low-dose adverse health effects of lead, which cannot be diagnosed in an individual because the scientific basis for cognitive impairments caused by low to moderate exposures relies on carefully controlled comparisons of large numbers of children exhibiting a range of blood lead levels (NRC, 1993; Needleman and Bellinger, 2001). Once the public and local health officials are made aware of the potential risks presented by the site, specific programs, discussed in detail in Section 3 (Health Education), can be implemented. Education and clean-up activities should be easier to implement, more effective, and more widely accepted by the community when the citizens understand the risks and believe that the community is at risk.

> Integrated Exposure Uptake Biokinetic Model (IEUBK) – Predicts blood-lead concentrations (PbBs) for an individual child, or group of similarly exposed children (6 months to 7 years old), who are exposed to lead in the environment. More information is available from the Technical Review Workgroup for Lead (TRW) web site: http://www.epa.gov/superfund/programs/lead/ieubk.htm

2.2 COMMUNITY ADVISORY GROUPS

Community Advisory Groups (CAGs) can be invaluable in assuring the success of the project (EPA, 1995b). A supporting and active CAG, comprised of a wide cross section of the community, has been demonstrated on several projects to greatly contribute to the success of meeting the remedial goal. Establishing an open dialogue with the CAG

> Community Advisory Group (CAG) – Members of the community make up a CAG, which serves as the focal point for the exchange of information among the local community, EPA, the state regulatory agency, and other pertinent federal agencies involved in cleanup of the Superfund site. Additional information is available online: http://www.epa.gov/superfund/tools/cag/index.htm

and understanding and addressing its concerns, leads to increased satisfaction in the community at the completion of the project. Concurrent with the establishment of health education activities, formation of citizens groups should be encouraged at the very onset of the project. Delay in forming the groups until significant progress has occurred may lead to mistrust by the community, as well as delay or loss of the valuable contributions they can make in assisting EPA.

Citizens groups should be representative of the community. Examples include residents, workers, and business owners from affected neighborhoods, as well as minority leaders, realtors, bankers or lending institution officers, school board members, health officials, elected officials, city public works staff, local environmental group members, and other groups in the community. Additionally, the project manager should coordinate with other federal and state agencies to attend citizen group meetings. Relevant agencies may include the ATSDR, HUD, and state health and environmental departments.

Citizens groups can create a feeling of ownership that facilitates the long-term success of the remedy. They can contribute significantly to education activities in numerous ways. A few examples of the successful programs and activities accomplished by citizens groups at sites include: general education and awareness of the segment of the community they individually represent; creating site-specific education material such as coloring/story books; hosting health fairs; creating health education programs for local school districts; establishing lead poisoning prevention merit badges for girl and boy scout organizations; developing instructional videos; and establishing pre- and post-natal education programs at local hospitals.

2.3 EPA'S TECHNICAL ASSISTANCE GRANT PROGRAM

EPA provides assistance grants to communities to help citizens understand site-related information. By regulation, EPA must inform communities about the availability of Technical Assistance Grants (TAGs) and assist them in applying for these grants (EPA, 1992). EPA also informs citizens about obtaining assistance through other programs such as the university-based Technical Outreach Services for Communities program and the Department of Defense's Technical Assistance for Public Participation (TAPP) program.

Under the TAG program, initial grants of up to $50,000 are available to qualified groups affected by a response action. Additional funding is available for unusually large or complex sites. A group applying for a TAG need not be incorporated as a non-profit organization at the time it submits its application, but must incorporate as a non-profit organization before EPA can award the grant.

The group must contribute 20 percent of the total project costs to be supported by the TAG grant. This requirement can be met in a number of ways, including with cash, donated supplies, and volunteered services. TAG groups must prepare a budget and work plan for using the funds. There may be only one TAG award per NPL site. If more than one group applies for the same TAG, they are encouraged to form a coalition to apply for the grant.

TAGs are used to hire a technical advisor, who is an independent expert who can review site-related documents, interpret them, and explain technical or health-related information to community members. A TAG advisor will often make site visits to gain a better understanding of the clean-up activities. A technical advisor can also help communicate the community's concerns to EPA. TAG funds may not be used to generate new data (e.g., to conduct additional sampling) or for lawsuits or other legal actions. For further information on TAGs, see the recently revised TAG regulation (EPA, 2000b), which is available from the EPA TAG web site.

2.4 INFORMATIONAL MEETINGS

As important as the health education activities and the establishment of citizens groups are, the project manager should consider holding frequent public meetings to inform the community of current and planned EPA activities and to collect feedback and concerns from citizens. If a CAG has been formed at the site, meetings with the group should be frequent and open to the general public. It is recommended that in the early phases of the project, information sessions should be held at least monthly. Once the community becomes aware of the site risks, current site activities, and becomes relatively involved in the process, the frequency of the meetings can be reduced. However, it is recommended that public informational meetings, separate from the citizens task force meetings, be conducted at least once every six months. This frequency can help ensure that the public stays informed of site progress and has an opportunity to provide meaningful input to the process.

In addition to the meetings pursuant to CERCLA (e.g., prior to release of the Record of Decision) meetings are helpful at the following points in the process: (1) before sampling is conducted, to explain the reason that lead contamination is suspected, how residents can reduce exposure as a safety precaution while awaiting sampling results, and the overall goals of the project (e.g., if the goal of the project is to reduce exposure by remediating only surface soils and therefore the sampling is designed to evaluate only surface soils, the issue of ICs for any contaminated soils remaining at depth should be discussed with the property owners early in the process); (2) after sampling is conducted, to explain results, reiterate how residents can reduce exposure (if results show elevated levels), explain plans and the schedule for conducting remediation, discuss plans for re-landscaping the property, and discuss what sort of ICs may be appropriate; and (3) after remediation is completed, to explain what was done, provide documentation

of the results of the remediation, discuss any problems with the landscaping, and discuss any applicable ICs.

2.5 COMMUNITY INVOLVEMENT SPECIALIST/COORDINATOR

When the site is large and cleanup is expected to last several years, consideration should be given to housing a full time community involvement specialist/coordinator (CIS/CIC) at the site. The roles of the CIS/CIC are (1) to coordinate community involvement activities, and (2) to be readily accessible to the public to provide information and answer questions concerning site activities. The CIS/CIC should be intimately familiar with all activities at the site, as well as the documented health risks, and should maintain an office with business hours convenient to the public. Additionally, the CIS/CIC can use information gained from their constant contact with the local community to brief project staff on issues important to the successful remediation of the site.

> Community Involvement Specialist/ Coordinator - is the primary point of contact for a community and a Community Advisory Group (CAG), if one was formed for the site. He or she answers questions and provides other assistance directly as well as sees that a CAG's concerns and other issues are transmitted to other Regional Office staff who can help.

3.0 HEALTH EDUCATION

Health education provides information to the public about the risks associated with exposure to contamination and, in turn, how to reduce the exposures. Health education may be considered one of many tools the project manager can use at lead-contaminated sites to reduce exposure to humans.

3.1 APPROPRIATE USES FOR HEALTH EDUCATION

Health education is an informational device and this type of instrument is largely unenforceable. Furthermore, health education has not been demonstrated to be effective over the longer term. Health education may be effective when combined with other measures as an overall remedy for a site. Health education is not a stand-alone remedy. EPA's policy is that health education is only appropriate as a supplemental component of the permanent, health protective remedy selected at a contaminated lead site.

For these reasons, EPA advocates that health education be layered or implemented in series with ICs and engineered remedies. Layering means using different types of ICs and engineered remedies at the same time to enhance the protectiveness of the remedy. Using ICs in series is the use of ICs at different points in the investigation and remediation process to ensure the short- and long-term protection of human health and the environment.

3.2 PLANNING FOR HEALTH EDUCATION

Generally, the specific goals of the health education program should be described in a site-specific decision document. A plan that clearly defines the goals and how they should be achieved is also more likely to succeed. Health education at large lead sites may have a performance period of several years and cost hundreds of thousands of dollars. For these large projects, a clearly defined health education program is even more important.

An early step in any health education planning process includes conducting a community profile and assessing the educational needs of the community. A comprehensive health education program for a typical large lead site would normally attempt to focus on reaching the general public, with special emphasis on schools and other groups involved with young children. Also, it is important to coordinate with city, county, and other local governmental entities. The most important target population, though, is parents, particularly young parents, and parents with a child whose blood lead tested high. Other means of targeted education may include those homes with children that have high dust lead concentrations or lead loadings, which have been shown to be highly predictive of homes where a child is likely to have an elevated blood lead level during the summer peak (EPA, 1996b; von Lindern and Spalinger, 2001).

The response plan should describe what actions and activities are necessary to reach the community-at-large and the targeted groups. It is very important to consider that there are costs associated with the development, implementation, and follow up of health education and that these factors should be thoroughly understood and estimated. Other key points to consider are that the responsibilities for conducting this work should be clear and agreements should be made in writing in the planning stages of site response process.

3.3 EVALUATION OF HEALTH EDUCATION ACTIVITIES

It is important to monitor the effectiveness of health education projects that have been implemented at lead-contaminated sites. Many sites may include health education activities as a major component of the remedy, especially in the early phases of the cleanup. Failure to establish the education part of the remedy may trigger reconsideration and imposition of additional requirements, or more extensive and costly clean-up efforts.

The project manager should monitor the organization(s) performing the educational activities for proper implementation of the health education program and assess the effectiveness of the program. Project managers should ensure that the objectives of the program are being met to protect children's health. If health education is included as part of the final remedy, it should be carefully scrutinized during the Five-Year Review process.

3.4 AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY (ATSDR) INVOLVEMENT

Health education is often implemented through grants from ATSDR to its partners in state health departments or directly through agreements with local health departments. When health education is specified as a major part of EPA's clean-up activities, strong consideration should be given to establishing an interagency agreement with ATSDR to assist in funding the required activities. ATSDR as a federal health agency is well positioned in terms of health education resources to administer such grants. ATSDR can provide expertise not only with the CAGs but also with public health assessments, health consultations, and health surveillance. An emphasis should be placed on developing the collaborative partnerships between EPA, ATSDR, and other federal, state, and local health departments for health education activities at contaminated lead sites.

Health education at lead sites is often accompanied with blood lead screening. Centers for Disease Control and Prevention (CDC) has issued guidelines for increasing intensity of health intervention activities based on blood lead test results (CDC, 1991). Increased collaboration among the involved

agencies is important to properly implement a health education/blood lead screening project. Additionally, ATSDR and many state and local health departments have ongoing lead screening and health education programs. Information from targeted screening is valuable for (1) targeting follow-up education to individual families with children identified with elevated blood lead levels; (2) determining the areal and demographic extent of the problem; and (3) effectively evaluating the impact of health education.

3.5 OUTREACH

EPA has had success in health education activities at several sites because the programs were tailored specifically for the site by the site team (i.e., project manager, toxicologist, on-scene coordinator, CIS/CIC, etc.). These programs have included significant amounts of outreach activities in the communities. The success of any health education program generally can be attributed to the amount of community outreach that is conducted at the site. As discussed in Section 2, the outreach can consist of a wide variety of activities. A few examples include the following: site specific coloring books distributed to the parents of young children, scouting merit badges on lead-poisoning prevention, school curriculums developed to inform student of the hazards of lead and good hygiene, health and environmental fairs conducted in the community, and blood lead testing events held at community celebrations. Consultation with local health officials and community groups can provide numerous ideas for outreach, which can be incorporated into specific programs to best meet the needs of the community. Typically, the local health officials should lead the outreach efforts. Funding should be provided by EPA when other funds, such as from ATSDR, are unavailable to support the outreach activities.

4.0 SITE CHARACTERIZATION

EPA has reviewed various sampling designs historically employed at lead-contaminated residential sites and assessed the ability of these sampling designs to meet risk assessment needs and support the development of clean-up levels. Over a 20-year period, several large area lead sites (e.g., Bunker Hill, Shoshone County, Idaho; Joplin, Missouri; NL Industries/Taracorp-Granite City, Illinois; Tar Creek, Ottawa County, Oklahoma) have used a variety of sampling techniques to characterize residential properties. Additionally, many different approaches to applying selected clean-up levels have been taken. As stated, this document was developed to promote consistent procedures, criteria and goals in the investigation and clean-up activities at Superfund lead-contaminated residential sites. However, a level of flexibility is needed to best respond to different site conditions, communities, and uncertainties.

The overall goals of the sampling effort are to estimate an average soil lead concentration for risk assessment purposes and to provide information to determine the scope of any required clean-up actions. This information can also be used for public education and intervention. The sampling designs discussed in this section are intended to provide, within one sampling effort, the necessary data for all phases of a clean-up project so that residents are not inconvenienced by repeated sampling of the same property. Project managers should carefully choose the sampling points needed to estimate the average lead concentration in a cost-effective manner. Some uncertainty is acceptable to reduce the overall cost of sampling at large lead sites. The selection of sample locations within areas with potential for exposure has been the subject of recent articles which describe methods to manage decision uncertainty by balancing sampling and clean-up costs (Englund & Heravi, 1994; Crumbling et al., 2001). Table C-1 (Appendix C) lists contacts within the agency who can provide assistance in various aspects of sample planning and design, and also lists software that may be used for sample planning and decision support.

Section 4.0 discusses: (1) delineating the contamination zones; (2) residential property sampling locations; (3) sampling method; (4) sampling requirements for backfill material and excavated soil for off-site disposal.

4.1 CONTAMINANT ZONE DELINEATION

Historical information on site operations and use is crucial for the design of sampling plans that are intended to delineate contaminant zone(s), and for the interpretation of data generated from the sampling effort. In addition to gathering data on the nature of the source of contamination, information should be gathered to identify areas where soils may have been moved or where fill or topsoil may have been placed. Guidance on how to gather historical site data is available (EPA, 2001f, 2001g). Sites that have been contaminated primarily by airborne-derived lead, such as smelter areas, can initially be sampled in a

grid pattern. This will usually allow concentration contours to be defined across the community and to establish the extent of horizontal contamination for cleanup and costing purposes. If grid sampling is used for initial characterization to define the horizontal extent of contamination, follow-up sampling of each yard located within the identified clean-up zone should be used to characterize each individual property for clean-up requirements. For other sites where the variability is expected to be higher, such as mining sites with discrete individual tailings piles located throughout the area, delineating the contaminant zones by establishing concentration contours will be more uncertain and consideration should be given to sampling every home in the potentially affected area, moving laterally away from the source until clean areas of the community have been identified.

Delineating the zone of contamination generally amounts to distinguishing soil with "background" lead concentration from soil that has been impacted by site-related activities. There are basically two types of background: naturally occurring and anthropogenic (see insert for definitions) (EPA, 1989, 1995c, 2002). EPA guidance defines background for inorganics as *"…the concentration of inorganics found in soils or sediments surrounding a waste site, but which are not influenced by site activities or releases"* (EPA, 1995c). Natural background concentrations of lead vary widely with the local geology, and can be as high as 250 ppm or more in mining areas (SRC, 1999). Local background concentrations, which include natural and non-site-related anthropogenic sources (e.g., historic automobile emissions) can be substantially higher. Background samples should be collected from areas near the site that are not influenced by site contamination, but that have the same basic characteristics (e.g., soil type, land use).

Types of Background

naturally occurring: ambient concentrations of lead present in the environment that have not been influenced by humans

anthropogenic: lead concentrations that are present in the environment due to human-made, non-site sources (e.g., automobile exhaust)

Statistical approaches to delineating contaminant zones are useful for some sites. In these cases, the project manager should consult with a statistician to design an efficient sampling plan. The Agency is developing guidance on characterizing background chemicals in soil that includes statistical methods for delineating contaminated areas (EPA, 2001i). Geostatistics is widely recognized for offering graphical methods that are ideally suited for delineating contaminant zones (Gilbert and Simpson, 1983; Flatman and Yfantis, 1984; Journel, 1984; Englund and Heravi, 1994; Goovaerts, 1997). Geostatistics also provides powerful methods for detecting contaminated areas from background when sample locations have not been randomly selected (e.g., Quimby, 1986; Borgman and Quimby, 1996), for sampling plan design (e.g., Flatman and Yfantis, 1984; Borgman et al., 1996), and for aiding in the design of remedial

responses (e.g., Ryti, 1993). For smaller sites, rigorous statistical analyses may be unnecessary because site-related and non-site-related contamination clearly differ. For these sites, the sampling plan should focus on establishing a reliable representation of the extent (in two or three dimensions) of a contaminated area (EPA, 1989) .

4.2 RESIDENTIAL PROPERTIES

For the purposes of this document, a residential property includes properties that contain single and multi-family dwellings, apartment complexes, vacant lots in residential areas, schools, day-care centers, playgrounds, parks, and green ways (EPA, 1996a, 1997a). In all cases, historical site information (type of lead site, fill activities, previous epidemiological studies, etc.) is important in the application of this Handbook.

Rationale for collecting yard soil samples and water samples on a residential property is provided in Table 4-1. The collection of other types of media are important to determine overall risk, however CERCLA has limited authority to address these media (e.g., interior paint, dust, and potable water).

4.2.1 Sampling Access

Prior to conducting any sampling or clean-up activities at a residential property, access must be obtained from the property owner; access obtained from tenants or renters is not sufficient. It is essential to begin access procurement as early as possible in the remedial process to avoid potentially lengthy delays. It is recommended that access be obtained by going door-to-door. If residents are not home, a blank access agreement with instructions for signature and submission to EPA, along with relevant contact information should be left at the residence (but not in the mailbox). Examples of access agreements are presented in Appendix D, pages D-2 and D-3. If possible, access for remediation should be obtained at the same time access for sampling is sought. Examples of combined sampling/remediation access agreements are included on pages D-4 and D-5 of Appendix D. Combining sampling and clean-up access will avoid potentially lengthy delays. Additionally, access should be obtained for any interior dust sampling and/or cleaning that will be performed at the residence (Section 6.6.2). Sample access agreements for dust cleanup are presented in Appendix E.

Table 4-1.
Rationale for Sampling Residential Properties

Sample Location	Rationale for Sample Collection
Residential yard soils	Residential soil may present a direct exposure pathway to persons working, playing, or conducting other recreational activities on the property. Soil samples should be collected and quantitatively analyzed to estimate lead concentrations. Residential soils may also present an indirect exposure pathway via house dust exposure (see below).
Gravel driveways	Fine-grained driveway material may present a direct exposure pathway to persons working or engaged in recreational activities on driveways. Soil samples should be collected and quantitatively analyzed to estimate lead concentrations. Gravel driveways with elevated soil concentrations may also contribute to the transport of contaminants throughout the community.
Drip zones and soils below roof gutter downspouts	Rooftops may collect fine-grained sediments that contain high concentrations of lead. In yard areas where downspouts discharge during a storm event, the fine-grained material washed from a roof may accumulate and result in a localized increase in soil lead concentrations. Soil samples should be collected and quantitatively analyzed to estimate lead concentrations. Drip zone areas may also contain LBP influences and are important to characterize for health intervention purposes, as drip zones are often used as play areas.
Soils in play areas	Play area soils may present a direct exposure pathway to children under the age of seven. Soil samples should be collected and quantitatively analyzed to estimate lead concentrations.
Garden soils	Garden soils may present a direct exposure pathway to persons who actively maintain a garden. Soil samples should be collected and quantitatively analyzed to estimate lead concentrations.
Interior lead dust	Lead in household dust may be a significant contributor to elevated blood lead levels, especially in younger children. Dust samples should be collected and quantitatively analyzed to estimate lead concentrations. Lead-contaminated interior dust can be derived from multiple sources; dust mat samples and speciation can be used to identify lead sources.
Lead-based paint	Deteriorating LBP may contribute lead to household dust, which can be a significant source of lead exposure, particularly for young children. If elevated concentrations of lead are found in interior dust, samples of interior paint should be collected and quantitatively analyzed to estimate lead concentrations. Exterior LBP may contribute to the recontamination of remediated properties. Samples of exterior LBP should be collected and quantitatively analyzed to estimate lead concentrations.
First run and purged tap water	Groundwater and surface water near the site may contain elevated lead concentrations. Some residences located within the site may use local groundwater or nearby surface water as a source of drinking, cooking, bathing, or irrigation water. The water may represent a direct exposure or ingestion pathway. Samples of both water standing in the pipes (first run sample) and water discharged after the system has been flushed (purged sample) should be collected and quantitatively analyzed to estimate lead concentrations. These results can also be used to help determine if the drinking water is contaminated with site-related contamination (exceedance in purged), or to determine if there is lead in the home's plumbing (exceedance in first run), or both, which may be used for remediation or intervention purposes, respectively.
Crawl Spaces	Crawl space sampling is recommended if the crawl space is accessible to children or pets. At some sites (e.g., Bunker Hill) this has been found to be a significant pathway (IDHW, 2000; TerraGraphics, 2000). Even when spaces are too small for children, pets have been found to access these spaces and move significant amounts of fine dust containing elevated lead levels into the child's bedroom (e.g., where a pet may sleep on the child's bed at night). Information on concentrations of lead beneath the structure may be used to document the need to preclude access or take other remedial measures.
Other areas	During field work, other potential sources of lead contamination may be identified. If the sources appear to represent a potential exposure pathway to occupants of a residence, sampling may be recommended. Other areas should be evaluated on a case-by-case basis and could include sediment, surface water, or secondary play areas. If deemed appropriate, samples should be collected and quantitatively analyzed to estimate lead concentrations.

4.2.2 Residential Yards

It is recommended that when sampling residential lots with a total surface area less than 5,000 square feet (a typical urban lot size), five-point composite samples should, at a minimum, be collected from each of the following locations: the front yard, the back yard, and the side yard (if the size of the latter is substantial). The front, back, and side (if needed) yard composites should be equally spaced within the respective portion of the yard, and should be outside of the drip zone and away from influences of any other painted surfaces (Figures 4-1a and 4-1b). Composites should consist of aliquots collected from the same depth interval.

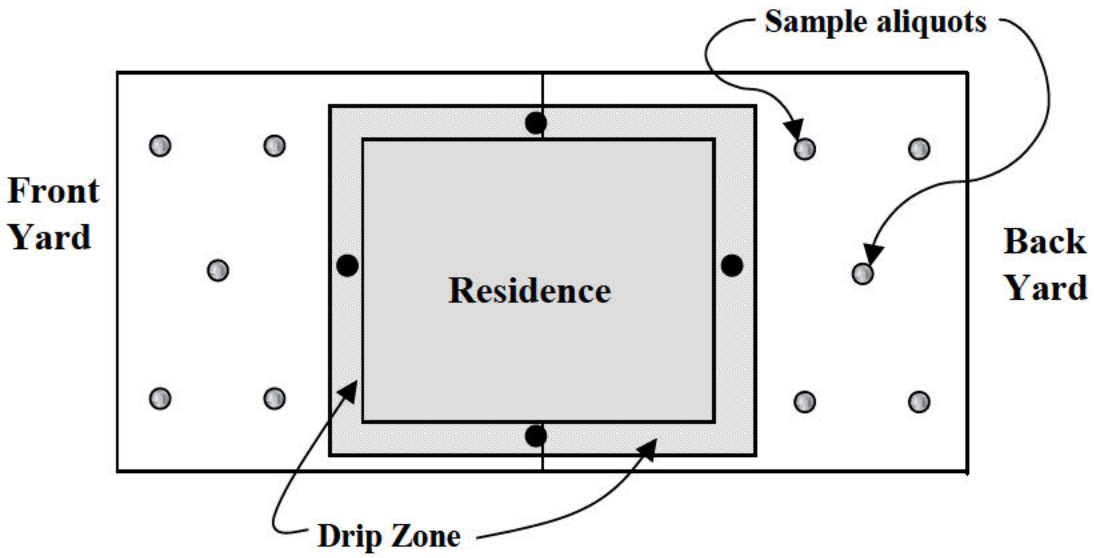


Figure 4-1a. Recommended minimum soil sampling in yards less than or equal to 5,000 square feet with small side yard. Five point composite samples should be collected from each of the front and back yards. Four point composites should be collected from the drip zone; each aliquot should generally be collected from the midpoint along each side of the residence. Aliquots for a single composite sample should be collected from the same depth interval. Soil samples should also be collected from distinct play areas and gardens if they are present, as well as unpaved driveways and minimal use areas such as areas under porches and crawl spaces. The locations of the aliquots should be equally spaced within the area of the yard the composite is collected from. The figure illustrates one possible arrangement of the sample aliquots. Please refer to Section 4.2.2 for further explanation.

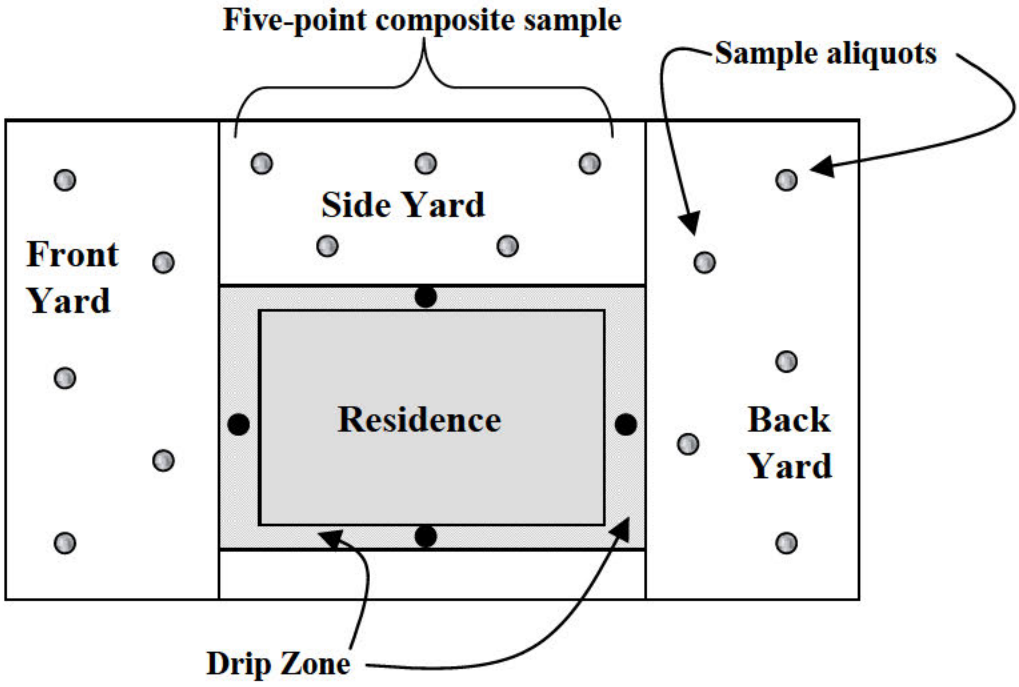


Figure 4-1b. Recommended minimum soil sampling in yards less than or equal to 5,000 square feet with substantial side yard. Five point composite samples should be collected from each of the front, back, and side yards, along with other areas as described in Figure 4-1a. The locations of the aliquots should be equally spaced within the area of the yard the composite is collected from. The figure illustrates one possible arrangement of the sample aliquots Aliquots for a single composite sample should be collected from the same depth interval. Please refer to Section 4.2.2 for further explanation.

For residential lots with a total surface area greater than 5,000 square feet, it is advisable that the property be divided into four quadrants of roughly equal surface area. The two quadrants in the front yard should encompass one half of the side yard; likewise for the two quadrants in the back yard. One five-point composite of aliquots collected at equal spacing and from the same depth interval should be obtained from each quadrant. Each aliquot should be collected away from influences of the drip zone and any other painted surfaces (Figure 4-2).

Properties over one acre in size should be divided into 1/4 acre sections. One five-point composite sample should be collected from each section. For large properties, consideration should be given to whether elevated concentrations trigger partial removal of soils or access restriction (see Section 6.5).

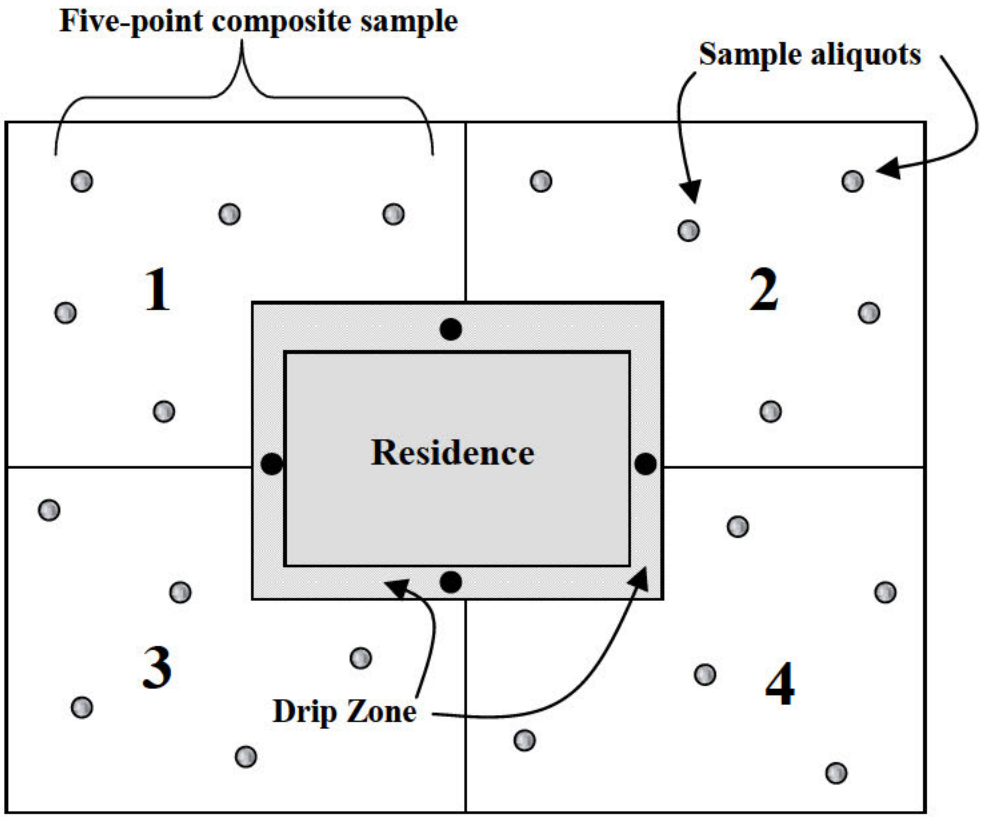


Figure 4-2. Recommended minimum soil sampling in yards greater than 5,000 square feet. Five point composite samples should be collected from each of the four quadrants as indicated above. The locations of the aliquots should be equally spaced within each of the quadrants. The figure illustrates one possible arrangement of the sample aliquots. Four point composites should be collected from the drip zone; each aliquot should generally be collected from the midpoint along each side of the residence. Aliquots for a single composite sample should be collected from the same depth interval. Additional samples should be collected from distinct play areas and gardens if they are present, as well as unpaved driveways and minimal use areas such as areas under porches and crawl spaces. Please refer to Section 4.2.2 for further explanation.

4.2.3 Drip Zones

Lead-contaminated soils are frequently found within the drip zone of houses. It is recommended that a four-point composite sample be collected from the drip zone of each residential property (Figures 4-1a, 4-1b, and 4-2). The composite sample (taken from any size lot) should consist of a minimum of four aliquots collected between 6 and 30 inches from the exterior walls of the house. Each aliquot should generally be collected from the midpoint of each side of the house. Collection of additional aliquots should be considered if other factors exist, such as bare spots, distinct differences in the house exterior, and areas where runoff collects. Rooftops may collect fine-grained sediments that contain high concentrations of lead. In yard areas where downspouts discharge during a storm event, the fine-grained material washed from a roof may accumulate and result in a localized increase in soil lead

concentrations. Samples of the soil from the downspout discharge area should also be sampled if present.

4.2.4 Play Areas, Gardens, and Driveways

Distinct play areas and gardens, if present, should generally be sampled separately as discrete areas of the yard. At some sites, collection of a right-of-way/easement composite may also be appropriate, such as residential areas with unpaved streets and alleys. Paved surfaces such as asphalt/concrete driveways, patios, alleys, and parking lots should, in most cases, not be sampled. Samples should also be collected in other locations depending upon the potential for exposure or recontamination, for example, under porches and crawl spaces and areas with incomplete barriers such as gravel driveways.

4.2.5 Potable Water, Lead-Based Paint and Interior Dust

Drinking water supply samples should be collected to determine if exposure to lead in drinking water is occurring. First-run and purged samples of potable water should be collected to differentiate site-related sources of lead from lead derived from plumbing that is located within the residence. CERCLA authority for remedial action may be limited with regard to lead derived from plumbing that is located within the residence.

Deteriorating LBP may contribute lead to household dust. If elevated concentrations of lead are found in interior dust, samples of interior paint should be collected. Exterior LBP may contribute to the recontamination of remediated properties (Section 6.7). Samples of exterior LBP should be collected and analyzed to estimate lead concentrations. Lead in household dust may be a significant contributor to elevated blood lead levels, especially in younger children. Lead-contaminated interior dust can be derived from multiple sources; dust mat samples and speciation can be used to identify lead sources. Dust samples should be collected and analyzed to estimate its potential contribution to lead exposure. Guidance on LBP and dust sampling is available from HUD (HUD, 1995).

4.2.6 Backfill and Waste Soil

Backfill soil should be sampled to ensure that uncontaminated material is being placed on the site. The list of analytes and the frequency of sampling should be based on site-specific factors including the location of the source for the backfill material relative to potential sources of contamination, the geology of the borrow area, and the heterogeneity of the material. For example, on the Bunker Hill Superfund Site, four-point composite samples were collected for each 200 yd^3 of soil (TerraGraphics, 1997a). Gravel for driveway backfill was also sampled every 200 yd^3 (TerraGraphics, 1997b). Samples of excavated soil should be analyzed by the toxicity characteristic leaching procedure (TCLP) method to

determine the appropriate method of disposal. The frequency required for TCLP sampling should be based on the heterogeneity of the lead and other contaminant(s), if any, on the site.

4.3 SAMPLING METHOD AND ANALYSIS

4.3.1 Sample Collection

Composite samples should consist of discrete aliquots of equal amounts of soil. The soil from each aliquot should be collected into one clean container, such as a stainless steel bowl or plastic bag, and thoroughly mixed. After mixing, the sample can then be analyzed by X-Ray Fluorescence (XRF) (see Section 4.3.4) or sent to the laboratory. Remaining sample volume can then be disposed in the general location from where it was collected, or archived, depending on the requirements of the project. In some cases, material other than grass and/or soil will be encountered at a sample location, e.g., wood chips and sand are often found in recreational areas of day-care and school playgrounds. Samples of the soil below the cover material should be collected.

The use of a dynamic sampling and analysis strategy should be considered (EPA, 2001d). A dynamic sampling and analysis strategy takes full advantage of the real-time that data field analytical methods provide, which can limit the sampling effort and minimize cost (EPA, 2001d). This document suggests the use of field portable X-Ray Fluorescence (FP-XRF) analysis.

4.3.2 Sample Depth

The following sampling design is based on the assumption that removal of surficial contaminated soils and placement of a cover of clean soil will be protective of human health and the environment (see Section 4.0). Furthermore, the sampling design outlined below is based on the assumption that a minimum of 12 inch soil cover is adequate.

Initial sampling for lead contamination in residential soils should be conducted to a depth of at least 18 inches, but does not need to exceed 24 inches to define the vertical extent of contamination for clean-up purposes. Composite samples should be collected at 6 inch depth intervals, i.e., 0–6 inches, 6–12 inches, 12–18 inches, and 18–24 inches. Additional sampling may be required at lead sites in cold weather regions when contamination is associated with coarse grained material. Stone-sized material, such as tailings and crushed battery casings, will, over time, migrate upward through the soil via freeze/thaw effects. At such sites, composite sampling should be conducted at 6 inch intervals to the approximate maximum frost depth for the region. In all cases, composites should consist of aliquots collected from the same depth interval.

In site-specific situations, deeper sampling may be conducted to determine the total vertical extent of contamination for groundwater issues or ICs, and to determine if complete removal of contaminated soil is possible. Depth sampling should be conducted until the vertical extent of contamination has been adequately defined, but does not need to be conducted on every property.

In addition to the composite samples collected to define the vertical extent of contamination, five-point composite surface soil samples should be collected from 0 to 1 inch for human health risk assessment purposes (EPA, 1989, 1996c). The samples should be collected using the procedure described in Section 4.3.1. These surface soil samples should be collected from every property within the identified zone of contamination; however, after collecting a statistically valid number of both 0–1" and 1–6" samples, the project manager may want to compare both sample horizons (e.g., paired-sample t-test; Wilcoxon Rank Sum test) (Gilbert, 1987; Snedecor and Cochran, 1989) to determine if the 0–1" depth can be eliminated (i.e., sample from 0–6"), to further decrease sampling costs. This may be particularly useful at mine waste sites where contamination often extends to depth or at sites where lead-contaminated soil has been used as fill material; in such cases, the lead concentration may increase with depth. Conversely, the 0–1" horizon may be far more contaminated than the 1–6" at smelter sites, making individual horizon sampling crucial to remedial decision-making.

Collection of samples from specified depth intervals serves two primary purposes: risk assessment and remedial decision-making. With respect to risk assessment, the top inch of soil best represents current exposure to contaminants (EPA, 1989, 1996c) and is the source of data used in the IEUBK model to represent exposure from soil. The various depth intervals are used in remedial decision-making to determine if a residential yard requires cleanup by evaluating if any of the horizons exceed the site-specific action level. The lower soil horizons represent possible future exposures, such as homeowner projects, children’s play areas, and other home activities that periodically go beneath the top inch of vegetation/soil (EPA, 1989). All soil horizons should be used for clean-up decision-making. The 6 inch depth intervals recommended in this document are based on the performance that may be reasonably expected of operators of small equipment working in relatively small spaces around homes. Specifically, a “bobcat” is most efficiently used for soil removal on a property if the soil is removed in 6 inch intervals, rather than in smaller increments, which would be far more difficult to achieve in a consistent or cost-effective manner. This approach has been developed to ensure a residential yard is cleaned up if it poses an immediate or long-term risk to human health in a manner that relates the sampling methodology closely to reasonable and cost-effective construction equipment performance.

A secondary goal of the sample collection effort is to facilitate the implementation of ICs for sites where contamination at depth is left in place.

4.3.3 Sample Preparation

Residential soil lead samples should represent the exposure potential of young children who are most vulnerable to adverse effects of exposure. Children inadvertently ingest lead in soil and dust that adheres to their hands (Succop et al., 1998). The smaller particles are more representative of this type of exposure (Duggan et al., 1985; Kissel et al., 1996; Mielke et al., 1997). Additionally, smaller particles are preferentially brought into the home. Sieving is conducted to better represent the soil fraction that is ingested by the typical child. Sieving has also been used in soil ingestion and bioavailability studies (Calabrese et al., 1996; Casteel et al., 1997; Stanek et al., 1999). Samples collected from all depth intervals should be sieved. Samples should not be ground prior to sieving, as this changes the physical structure of the soil and may bias the analytical results. To reduce sampling costs, it may be desirable to develop a correlation between sieved and unsieved data, to eliminate the need to sieve all samples. The correlation can be used to predict sieved results from unsieved samples. The EPA Technical Review Workgroup (TRW) and American Society for Testing and Materials (ASTM) have issued guidance on sieving (ASTM, 1998; EPA, 2000c). The EPA TRW guidance addresses appropriate sieve size (No. 60) and a method for predicting the concentration in the fine fraction using concentrations measured in unsieved samples.

Technical Review Workgroup (TRW) – The TRW is an interoffice workgroup that consists of key scientific experts from various EPA regions, labs, and headquarters that supports and promotes consistent application of the best science in the field of lead (Pb) risk assessment at contaminated sites nationwide.

The presence of paint chips in a soil sample can represent a large proportion of the total lead concentration that is measured. On this issue, the Handbook directs the reader to existing HUD guidance, which states “If paint chips are present in the soil, they should be included as part of the sample. However, there should be no special attempt to over-sample paint chips. The laboratory should be instructed to disaggregate (‘break up’) paint chips by forcing them through a sieve in the laboratory. Although paint chips should not be oversampled, they should not be excluded from the soil sample, since they are part of the soil matrix.” (HUD, 1995). The TRW website should be checked periodically for additional sampling guidance.

4.3.4 Sample Analysis

EPA’s experience in sample analyses at large residential contamination sites (with several thousand homes on a site) shows that both FP-XRF or fixed-site laboratory analyses (acid digestion/Inductively Coupled Spectroscopy) provide reliable information (EPA, 1996d, 1998b, 2001c, 2001d; Crumbling et al., 2001). The objective of using a FP-XRF is to predict Contract Laboratory Program (CLP) values with

less expensive real-time data. A sufficient amount of data should be collected to develop a site-specific relationship (i.e., correlation) between FP-XRF and CLP lab data.

The comparison should consider sample preparation (drying and sieving) and analytical methods. Typically, a large number of laboratory confirmation samples should be analyzed at the beginning of the project to estimate the correlation between the FP-XRF and the CLP results and the FP-XRF precision and accuracy. Additional confirmatory samples should then be analyzed at key decision points when the FP-XRF results are close to action levels or when the reliability of the FP-XRF unit is in question (EPA, 2001d). For example, initial sample analyses using an FP-XRF instrument could include 20 percent laboratory confirmatory samples to assess the accuracy and precision of the FP-XRF. Once the accuracy and precision of the FP-XRF results have been determined (and assuming they satisfy the requirements of the project), the number of laboratory confirmatory samples could be reduced (e.g., to 5 percent). Additional information on analyzing soil (and other media) in the field with FP-XRF is available on the EPA web site: http://www.epa.gov/superfund/programs/dfa/ (EPA, 2001e).

Proper calibration of the FP-XRF unit is important to obtaining reliable results (EPA, 1996d). Correlation between the FP-XRF and laboratory analyses is best achieved with small sample volume. Laboratory confirmatory samples should be collected in the specimen cup available from the FP-XRF manufacturer. The sample is first analyzed with the FP-XRF and then sent to the laboratory for wet chemistry analysis. Soil moisture can introduce error in FP-XRF results to varying degrees, depending on the instrument being used (EPA, 1996d). The correlation between the FP-XRF measurements on dried and undried samples should be estimated. The correlation analysis should then be used to establish a cutoff or ‘soil moisture ceiling’. The ‘soil moisture ceiling’ represents the maximum moisture content at which useful results (i.e., of sufficient precision and accuracy) can be obtained with the FP-XRF. Field portable instruments capable of measuring moisture content are available and should be used to compare sample moisture content to the ‘soil moisture ceiling’. Samples with moisture contents greater than the ‘soil moisture ceiling’ should be dried prior to analysis with the FP-XRF.

5.0 CLEAN-UP LEVEL SELECTION

Generally, the approach to human health risk assessment for lead differs from that of other metals and contaminants. Typically, risks from lead exposures are estimated from long-term exposures, although elevated blood lead concentrations also result from short-term exposures (CDC, 1991). EPA has developed the IEUBK model to predict blood lead (PbB) concentrations in children exposed to lead. The model considers several different media through which children can be exposed to lead.

EPA and the CDC have determined that childhood PbB concentrations at or above 10 micrograms of lead per deciliter of blood (: g Pb/dL) present risks to children's health (CDC, 1991). Accordingly, EPA seeks to limit the risk that children will have Pb concentrations above 10 : g Pb/dL. The IEUBK model predicts the geometric mean PbB for a child exposed to lead in various media (or a group of similarly exposed children). The model also calculates the probability that the child's PbB exceeds 10 : g Pb/dL (P_{10}). Preliminary remediation goals (PRGs) generally are determined with the model by adjusting the soil concentration term until the P_{10} is below 5%. Final clean-up level selection for Superfund sites generally is based on the IEUBK model results and the nine criteria analysis per the National Contingency Plan (NCP) (EPA, 1990b), which includes an analysis of ARARs. More information on the IEUBK model is available from the EPA TRW web site.

Typically at large lead sites, early actions taken to mitigate the identified site risks consist of time-critical removal actions (TCRAs), most often taken as an interim action. These actions are usually followed by long-term remedial actions. The following sections describe the different approaches that should be used for prioritizing response actions and selecting clean-up levels for both early (interim) and long-term (permanent) response actions.

5.1 PRIORITIZING RESPONSE ACTIONS

For early, interim actions, a tiered approach should be used for prioritizing clean-up actions. A tiered-response approach is recommended when sufficient resources are not available to fully address lead risks. The size and complexity of many lead sites often requires implementation of response actions over an extended period of time; therefore, it is often necessary to implement interim clean-up actions to manage short-term health risk concerns while response actions to address long-term risk are planned and implemented. Early removal actions at residential lead sites should contribute to the performance of the long-term permanent remedy.

The tiered approach is depicted in Figure 5-1. Figure 5-1 is a flowchart that provides a roadmap of the recommended clean-up process for lead-contaminated residential sites. An overview to the clean-up process is provided in Figure 1-1. The first page of Figure 5-1 provides a more detailed overview; the subsequent pages provide additional details of the process.

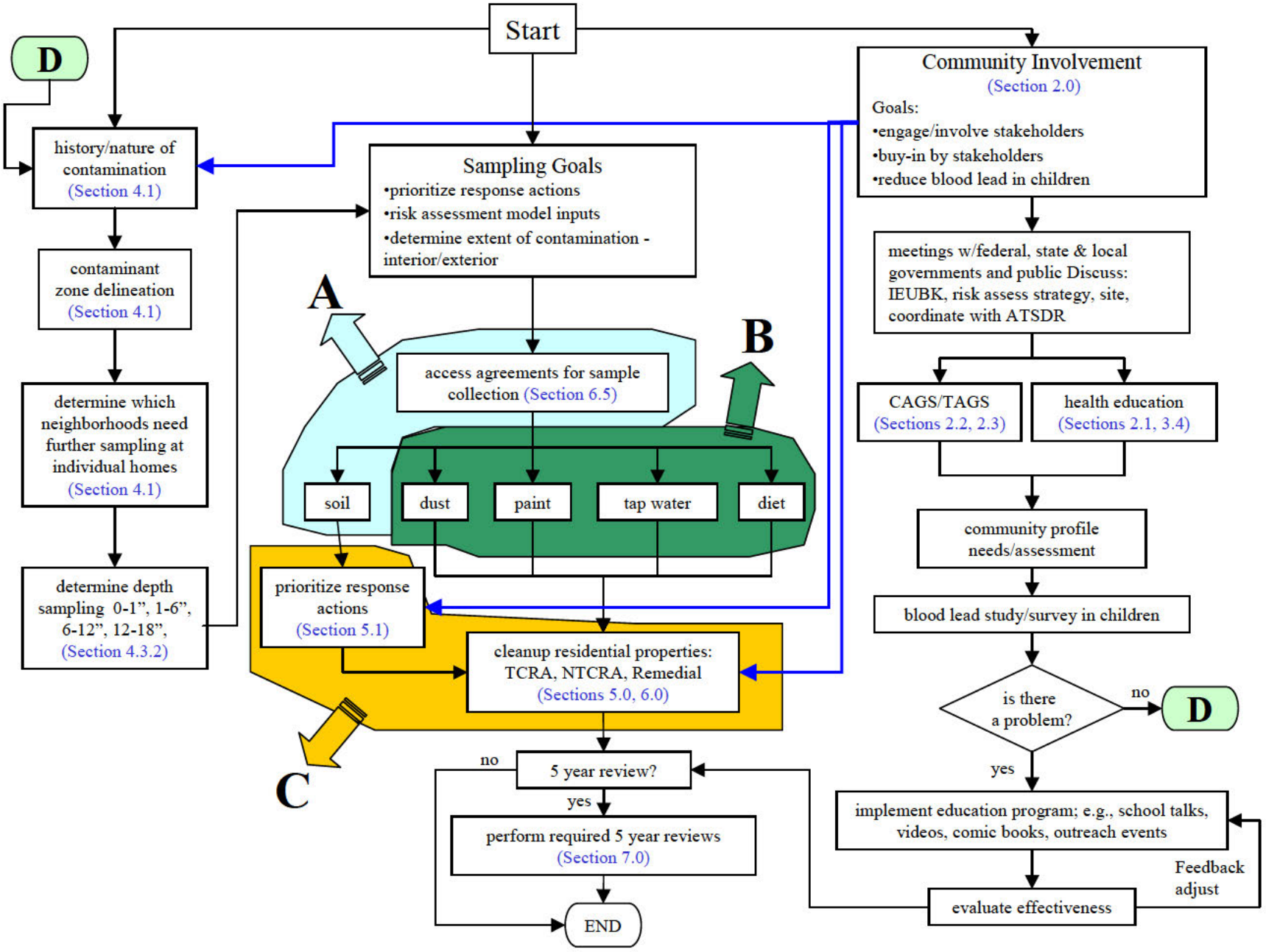


Figure 5-1. Recommended clean-up process for lead-contaminated residential sites. Refer to Figure 1-1 for an overview of the process. The shaded portions of the figure, labeled A-C, are expanded on the second through the fourth pages of the flowchart.

Figure 5-1. (continued)

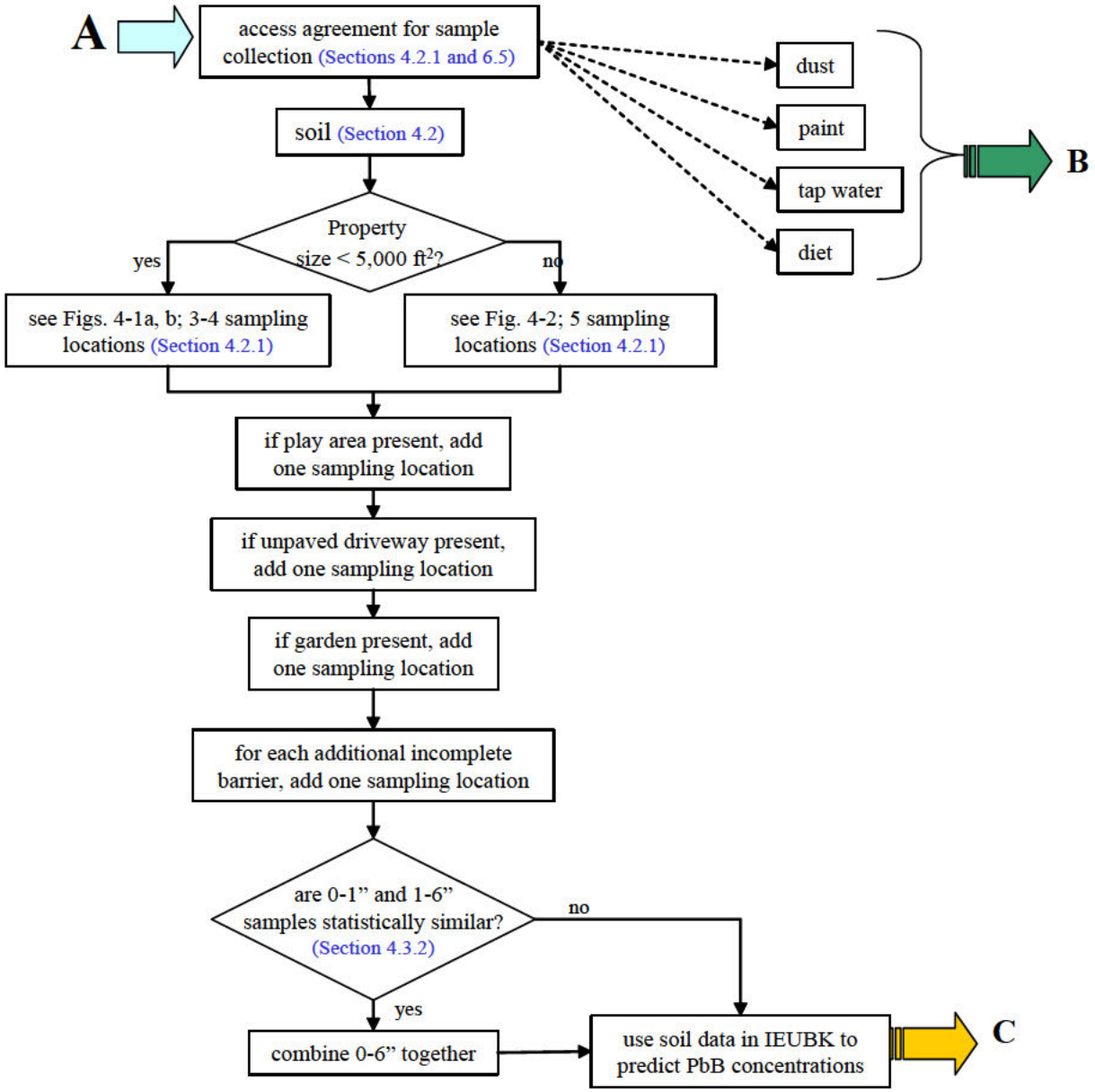


Figure 5-1. (continued)

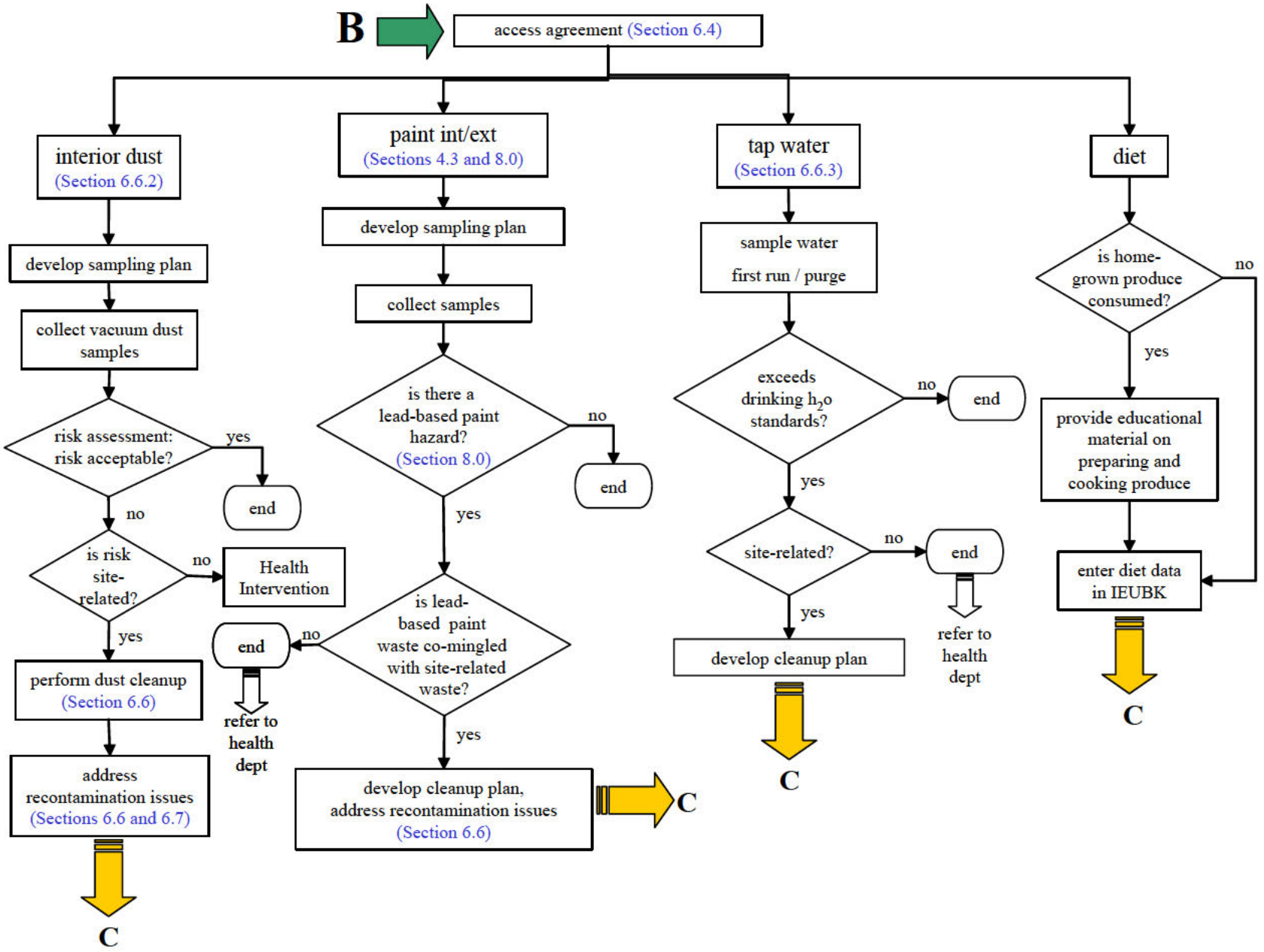
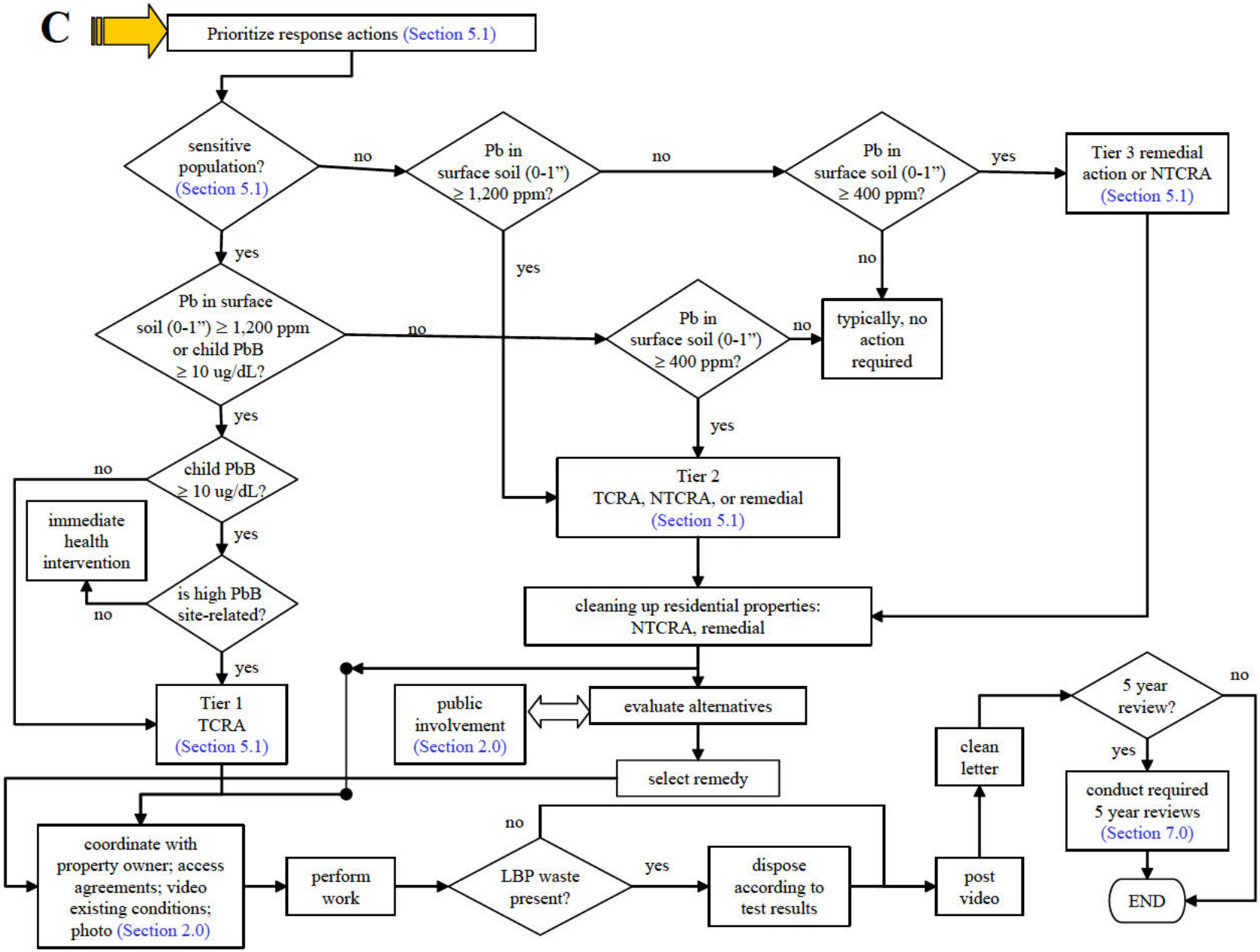


Figure 5-1. (continued)



The concentrations that are used to define tiers should not be confused with clean-up numbers, which are based on the PRG determined with the IEUBK model and an analysis that includes the nine criteria listed in the NCP (EPA, 1990b). The 1,200 ppm concentration is not an action level for TCRAs, but is intended to provide an alternative to running the IEUBK model if the project manager believes the site poses an urgent threat (EPA, 1997b, 1997c). Certainly, a TCRA could be justified above or below this concentration depending on the conditions at the site. The tiers, for the purposes of this guidance, are defined below (see also Figure 5-1). (Please note the Agency is considering developing new guidance for removal actions.)

- Tier 1 properties have both sensitive populations (children up to 7 years old or pregnant women) and soil concentrations in the surface soils (0–1" depth) at or above 1,200 ppm (EPA, 1997b, 1997c). Also, Tier 1 sites can be identified based upon a demonstration of children's blood lead levels at or above 10 µg/dL. Generally, TCRAs would be taken at Tier 1 properties.

- Tier 2 properties have either sensitive populations and soil lead concentrations in surface soils between 400 ppm and 1,200 ppm, or no sensitive populations and surface soil lead concentrations above 1,200 ppm, but not both. Tier 2 properties can be addressed through TCRAs, or non-time-critical removal actions (NTCRAs), or long-term remedial actions.

- Tier 3 properties have surface soil concentrations below 1,200 ppm, but above 400 ppm, and no sensitive populations present. Tier 3 sites would typically be addressed through long-term remedial actions or NTCRAs.

Tier 1 should be the highest priority for immediate action and Tier 3 should be the lowest priority for immediate action. Residential properties can move into a different tier if conditions change (e.g., small children or pregnant women move into a house). A typical residential lead site will contain a combination of properties that fit into different tiers. The project manager should use judgement to determine whether or not to perform a complete cleanup of contaminated residential properties (as defined in Section 1.3).

As discussed below, remedial actions for residential lead sites should use the IEUBK model. The IEUBK model should be used to assess risks posed by contaminated soils and to determine PRGs for soils at residential lead sites. In order to facilitate TCRAs, a demonstration of elevated blood lead levels or elevated soil-lead levels at or above 1,200 ppm will usually be sufficient. If elevated blood lead levels are the basis for concern, occupational contributions of lead, elevated lead levels in drinking water, lead from LBP, and lead dust in the homes of children or adults with elevated blood lead should be investigated first because these sources of lead can be significant (Appendix B). At this stage, consultation with Regional

risk assessors and public health officials (such as ATSDR) to better understand health impacts is encouraged.

The Agency plans on publishing a future lead removal directive which includes further information on site-tier approaches.

5.2 LONG-TERM REMEDIAL ACTION

The 1994 Office of Solid Waste and Emergency Response (OSWER) Directive 9355.4-12 states OSWER's risk reduction goal for residential lead sites: "... generally, OSWER will attempt to limit exposure to soil lead levels such that a typical (or hypothetical) child or group of similarly exposed children would have an estimated risk of no more than 5% exceeding the 10 ：g lead/dL blood lead level." (P_{10}<5%) (EPA, 1994b). It is important to note that this recommendation (i.e., P_{10}<5%) is meant to apply to a single residential property or another discrete exposure area, not on an area- or community-wide basis (i.e., 5 children out of every 100 actually exceed 10 ：g/dL). It is also important to note that selecting a soil lead concentration in this manner will not guarantee that a given child will not exceed a blood lead level of 10 ：g/dL. Many factors other than soil concentration cause variance in blood lead levels: pica behavior, or other sources of lead not included in the exposure unit, such as paint, diet, etc. (e.g., this could include soil at a camping site or other remote site frequented by the child).

The 1998 OSWER Directive 9200.4-27P ('Clarification') (EPA, 1998a) recommends that the IEUBK Model be used as the primary tool to generate risk-based soil clean-up levels at lead sites for current and future residential use (Appendix B). Additionally, the 1998 Clarification states that response actions can be taken using IEUBK predictions alone, and that blood lead studies, while providing useful information, should not be used for establishing long-term remedial or non-time-critical removal clean-up levels at lead sites. Regarding exposure units at residential lead sites, the 1998 Clarification states: "... it is recommended that risk assessments conducted at lead-contaminated residential sites use the individual residence as the primary exposure unit of concern" (EPA, 1998a; Appendix B). This document clarifies the definition of exposure unit provided in the 1998 Clarification. In addition to the individual residence, accessible site-related lead sources outside the residential setting should also be evaluated to understand how these other potential exposures contribute to the overall risk to children. When the evaluation indicates a significant contribution to risk, clean-up measures should be determined for those areas.

Empirical blood lead data occasionally deviates significantly from IEUBK Model predictions. This can be due to numerous factors, including the implementation of lead exposure-reduction and health education programs, and uncertainties in the exposure parameters of the Model as well as uncertainties in the blood lead data (Mushak, 1998). Regarding this issue, the 1998 Clarification states: "Where actual

blood lead data varies significantly from IEUBK Model predictions, the model parameters should not automatically be changed. In such a case, the issue should be raised to the TRW to further identify the source of those differences" (Appendix B). Basically, model inputs should be changed only when defensible, site-specific information that is specifically applicable to the parameters is collected. Moreover, these changes should also ensure that model outputs are protective of future residents. Examples of such information are dust lead concentration, drinking water concentration, bioavailability data (e.g., *in vivo* pig studies), and soil-to-dust ratio. The predictive capacity of the IEUBK Model depends upon the representativeness of the inputs. Section 4 discusses the collection of the data used to estimate some of these inputs.

In summary, there is no national clean-up standard for lead in residential soil on a Superfund site; however, there is a consistent process by which residential soil lead clean-up levels are selected. One step is to gather site-specific data as recommended in Section 4 of this Handbook and review other guidance on the use of the IEUBK Model (EPA, 1994b; TRW web site: http://www.epa.gov/superfund/programs/lead/ieubk.htm). Risk assessors (and other data users) should be consulted early to assist with data collection and planning (EPA, 2000d). Another step is to get assistance from the regional risk assessor(s) to run the IEUBK Model with applicable site-specific inputs. Running the model should allow the determination of a site-specific PRG that corresponds to a P_{10} for a typical child, or group of similarly exposed children, that is no more than 5%. Another step is to select a site-specific residential soil lead clean-up level that is based on the model-derived soil lead PRG and an analysis of the nine criteria consistent with the NCP (Superfund sites only) (EPA, 1990b). If the proposed clean-up level is outside of the range of 400 ppm to 1,200 ppm lead, then the draft decision document for the site is sent to the Lead Sites Consultation Group (LSCG) for review (EPA, 1997b).

Lead Sites Consultation Group (LSCG) – The Lead Sites Consultation Group (LSCG) was created in 1997 to promote national consistency in decision-making at lead sites across the country (EPA, 1997b). The main purpose of the group is to review key response decisions at lead sites. The LSCG is comprised of senior management representatives from the Waste Management Divisions in all 10 EPA regions along with senior representatives from the Office of Emergency and Remedial Response in EPA headquarters.

The LSCG is supported by EPA's Technical Review Workgroup for Lead (TRW) and the national Lead Sites Workgroup (LSW). According to Agency policy, there are three triggers that cause the review of lead-related proposed plans by the LSCG (EPA, 1997b):

1) Residential contaminated lead sites with proposed cleanup levels outside a 400 to 1,200 ppm soil-lead level;
2) Sites that envision actions to address non-soil lead-contaminated media;
3) Routine LSW deliberations that identify a unique or precedent setting site issue(s).

6.0 APPLICATION OF CLEAN-UP NUMBERS/REMEDIATION

The following section provides a detailed discussion of recommended minimum considerations to remediate residential soil and other sources of lead in residential settings. The guidelines stated below apply to early/interim actions and long-term remedial actions. However, due to statutory funding limitations that apply to time-critical removal actions, site-specific determinations regarding yard size limitations, and whether to clean up empty lots and other sources of lead (paint, dust, tap water), should be made by the project manager on a site-by-site basis.

6.1 MINIMUM EXCAVATION DEPTH/SOIL COVER THICKNESS

Based on Agency experience, it is strongly recommended that a minimum of twelve (12) inches of clean soil be used to establish an adequate barrier from contaminated soil in a residential yard for the protection of human health. Cover soil can either be placed after excavation as backfill or placed on top of the contaminated yard soil. The rationale for establishing a minimum cover thickness of 12 inches is that the top 12 inches of soil in a residential yard can be considered to be available for direct human contact. With the exception of gardening, the typical activities of children and adults in residential properties do not extend below a 12-inch depth. Thus, placement of a barrier of at least 12 inches of clean soil will generally prevent direct human contact and exposure to contaminated soil left at depth.

Removal of lead-contaminated soil to depths greater than 12 inches should be considered at sites in cold regions with non-soil lead-contamination sources, such as tailings and crushed battery casings, and whenever it is cost-effective. The additional response cost should be compared to future IC and monitoring costs associated with leaving the material in place. Full vertical removal of residential soil has many advantages, such as reducing or avoiding the costs of maintaining the soil cover, the placement of subsurface barriers/markers, and obtaining environmental easements. Full removal of contaminated soil also satisfies EPA’s preference for permanent remedies and normally allows the remediated yard to return to unrestricted use.

Twenty-four (24) inches of clean soil cover is generally considered to be adequate for gardening areas; however, site specific conditions that may require more soil cover (e.g., presence of burrowing animals) should be considered. A 24-inch barrier normally is necessary to prevent contact of contaminated soil at depth with plant roots, root vegetables, and clean soil that is mixed via deep rototilling. Raised garden beds may be built to obtain 24 inches of clean soil, and may be more cost effective than excavating to 24 inches in depth, e.g., excavate 12 inches of contaminated soil, then add 24 inches of soil to create a 12" raised bed.

6.2 SOIL CLEAN-UP OPTIONS

Currently, there are only two remedial actions that generally are considered to be protective, long-term (not interim) remedial actions at residential properties: (1) excavation of contaminated soil followed by the placement of a soil cover barrier and (2) placement of a soil cover barrier without any excavation of contaminated soils. Excavation followed by the placement of a soil cover is the preferred method and is strongly recommended at sites with relatively shallow contamination, such as many smelter sites. In most cases, excavation and placement of a soil cover should be performed whenever the specific conditions of a site do not preclude it. For example, it may not be feasible to fully excavate a very large site cost-effectively, therefore capping, also considered to be protective, may be more appropriate. The advantage of the preferred method is that it is a permanent remedy in terms of removal of lead from areas where children may be exposed.

Several treatment technologies are currently under development to reduce the bioavailability of soil lead, but have not yet been proven to be protective in the long-term. These include amending the soil with phosphorus or high iron biosolids composts. Preliminary results have shown phosphate treatment to reduce the bioavailability of lead in soil by as much as 50 percent. This would mean that soil with lead concentrations in the range between clean-up levels calculated with the pre- and post-treatment bioavailability values could be treated instead of removed (e.g., if the IEUBK model-derived clean-up number using the pre-treatment bioavailability were 400 ppm lead, and the calculated post-treatment clean-up level were 800 ppm lead, then the yards with lead concentrations between 400 ppm and 800 ppm could be treated rather than excavated or capped).

Over time, the efficacy of the phosphorous treatments appears to increase. This is consistent with what is predicted using thermodynamics. To date, the treatability studies have been monitored for 3–5 years. Additional monitoring will be necessary to assure the long-term stability of the observed reduction in bioavailability.

Some other existing technologies for soil remediation that are not currently considered acceptable for residential lead cleanups are rototilling, phytoremediation, and interim controls, such as mulching, seeding, and sodding (without prior removal of contaminated soil). Rototilling is not considered a permanent, protective remedy in that no lead removal occurs, and adequate mixing of soil is difficult, if not impossible, to achieve; additionally, rototilling may increase the volume of soil, which ultimately requires remediation. Mulch, sod, or other vegetative covers are generally not considered permanent, protective remedies in that no lead removal occurs, and there is no guarantee that grass, mulch, or other vegetative cover will be maintained in good condition over time.

Additionally, land use changes that may occur within a yard, such as starting a garden or putting in a swing set, are not precluded in any way by mulch, sod, or other vegetative cover. Lastly, phytoremediation is not currently an appropriate technology for residential lead cleanups due to several factors: (1) the lead concentrations at many residential sites are not within the optimal performance range for the plants; (2) the plants may concentrate lower level lead contamination and present an increased disposal cost if the plants fail the TCLP test, but the unremediated yard soil does not fail; (3) the length of time required for remediation; (4) the potential conflicts with local regulations pertaining to yard maintenance; and (5) the depth of remediation achieved may be inadequate.

6.3 INTERPRETING SAMPLING RESULTS

Based upon the results of the sampling efforts (Section 4.0), this section describes the implementation of two clean-up options: (1) excavation and backfill (and placement of a visible barrier if applicable); or (2) soil cover placement (and placement of a visible barrier if applicable). The options should be performed as described below (see also Figure 6-1). The goal should be to remove all contaminated soil or provide a minimum 12" clean soil barrier. The following describes the implementation of option 1:

- If the 0–1" horizon exceeds the clean-up level, a 6 or 12" excavation is recommended, depending on the 6–12" sample horizon results;
- If the 1–6" or 0–6" horizon exceeds the clean-up level, a 6 or 12" excavation is recommended, depending on the 6–12" sample horizon results;
- If the 6–12" horizon exceeds the clean-up level, a 12" excavation is recommended. A visual barrier is required if the 12–18" horizon exceeds the clean-up level;
- If the 0–1, 0–6 or 1–6" horizons exceed the clean-up level and the 6–12" horizon does not exceed the clean-up level, a 6" excavation is recommended; a visual barrier is not needed.

	Depth	Soil Concentration Exceed Action Level?							
	0-1”	Yes	Yes	Yes	Yes	No	No	No	No
	1-6” (or 0-6”)	Yes	Yes	No	No	No	Yes	No	Yes
Remedial Action Options	6-12”	Yes	No	Yes	No	No	No	Yes	Yes
Option 1: Excavation (& Backfill)	Depth of excavation	12”	6”	12”	6”	No action	6”	12”	12”
Option 2: Capping	Soil cover thickness	12”	12”	12”	12”	No action	12”	6”	12”

Figure 6-1. Interpreting Sampling Results. The figure suggests remedial actions based on the results of composite soil samples collected for each of the depth intervals shown. The figure includes two remedial action options: (1) excavation followed by backfilling, and (2) placement of a clean soil cover without removal of soil that exceeds the action level. To use the figure, find the column of the table that agrees with the soil sample results for your site, then read down the table to determine the depth of soil to remove (option 1: excavation remedies) or the thickness of the soil cover recommended (option 2: capping remedies). For example, the heavy border around the third column of the table corresponds to a situation where the average lead concentration in the 0–1" and 1–6" depth intervals exceed the action level, but the 6–12" interval does not. In this example, it is recommended to remove the top 6" of contaminated soil and replace it with clean soil, or to place a 12" clean soil cover (cap). The goal is to provide a minimum 12” barrier of clean soil when the underlying soil exceeds the action level. Please refer to Section 6.3 for further explanation.

The following describes the implementation of option 2:

- If the 0–1" horizon exceeds the clean-up level, a 12" soil cover and visual barrier should be used;
- If the 0–6" or 1–6" horizon exceeds the clean-up level, a 12" soil cover and visual barrier should be used;
- If the 6–12" horizon exceeds the clean-up level (but not the 0–1", 1–6", or 0–6" intervals), a 6" soil cover should be used;
- If only the 12–18" horizon exceeds the clean-up level, no capping is needed.

The decision to perform soil cleanup to depths greater than 12 inches should be considered on a site-by-site basis. Some advantages to full vertical soil cleanup are listed in Section 6.1. However, there are many sites where lead contamination is located at depth. Full vertical soil cleanup may not be cost-effective and/or feasible at such sites. The depth of excavation and soil cover thickness is an important factor to be considered during the analysis of the nine criteria per the NCP (for Superfund sites) (EPA, 1990b). Potential for freeze/thaw upward migration, groundwater contamination, and the cost, extent, and effectiveness of ICs are some of the factors to be considered in this analysis.

Sampling results obtained for residential lots may indicate that only a portion of the lot contains soil that exceeds the selected clean-up level. For properties less than 5,000 square feet, the spatial scale for the remedial decision should be one-half of the yard. For properties greater than 5,000 square feet, the property should be divided into four quadrants and a remedial decision should be made for each quadrant. It is usually protective to excavate only the portion(s) of the lot that exceed the clean-up level (Figures 6-2a and 6-2b). However, removal of the sod layer and resodding/reseeding the unexcavated portion(s) of the lot is strongly recommended to promote consistency in the vegetative cover of the yard for homeowner satisfaction. When interpreting sampling results for a property, the sampling results of surrounding properties should also be considered to lessen the probability of mislabeling the property as being below the clean-up level, when it is actually above, and to avoid “patchwork clean-up” patterns, which are prone to recontamination.

If the only portion of the yard that exceeds the selected clean-up level is the drip zone, the exterior paint should be checked for lead content. If the drip zone contamination does not appear to be paint-related, the drip zone should generally be cleaned up. If the drip zone contamination appears to be solely paint-related, EPA should promote the remediation of the exterior LBP by local health agencies, other local government agencies, state health agencies, and/or the homeowner. At a minimum, the resident should be notified and informed of the disclosure requirements (Appendix A). Consideration should be given to also notifying the relevant local government agencies and informing them about available remedies, such as HUD grants.

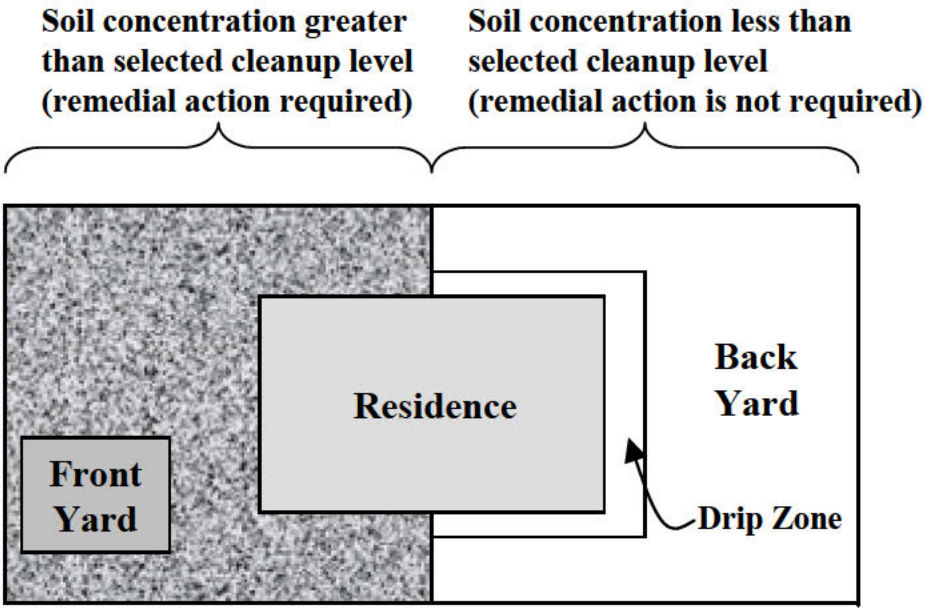


Figure 6-2a. Partial cleanup of residential lot less than or equal to 5,000 square feet in size. In this example, the lead concentration measured in the front yard exceeds the selected clean-up level while the concentration measured in the backyard does not. Cleanup may be limited to the front yard although it is recommended that the sod layer in the entire lot be removed to promote consistency in the vegetative cover on the property for homeowner satisfaction. The entire drip zone should be cleaned up if the average lead concentration exceeds the clean-up level. For example, in the above figure, the drip zone in the back yard (as well as the front yard) should be cleaned up if the average concentration in the drip zone exceeds the clean-up level. Please refer to Section 6.3 for further explanation.

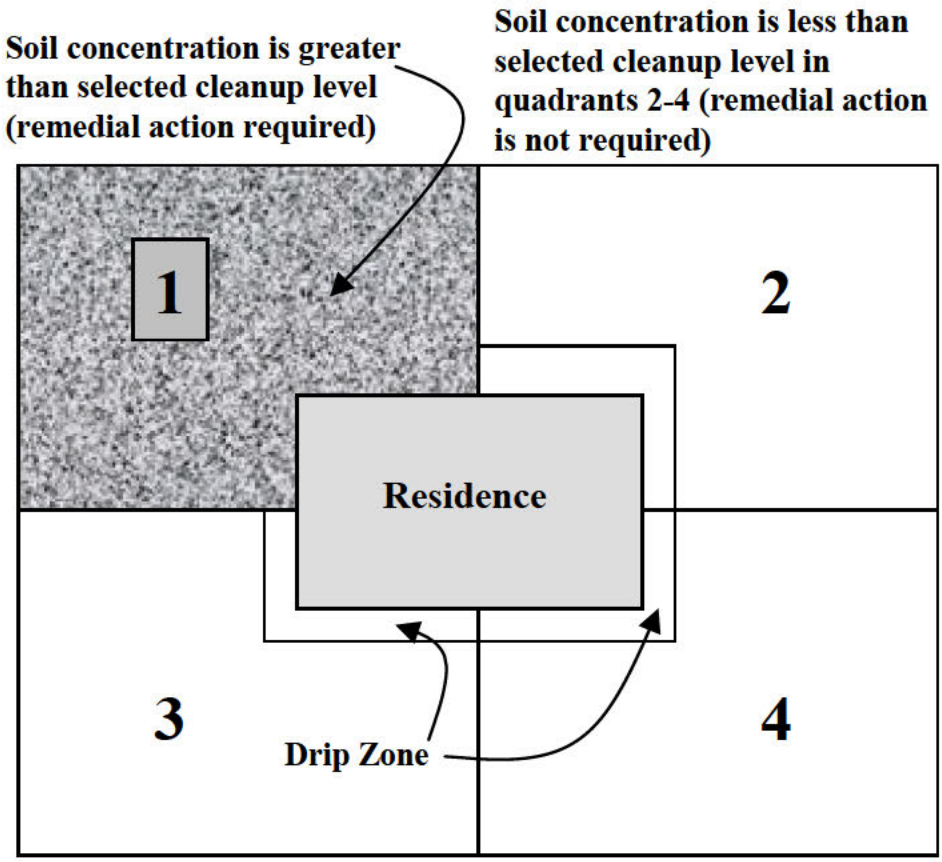


Figure 6-2b. Partial cleanup of residential lot greater than 5,000 square feet in size. In this example, the lead concentration measured in quadrant 1 exceeds the selected clean-up level while the concentration measured in quadrants 2–4 do not. Cleanup may be limited to quadrant 1 although it is recommended that the sod layer in the entire lot be removed to promote consistency in the vegetative cover on the property for homeowner satisfaction. The entire drip zone should be cleaned up if the average lead concentration exceeds the clean-up level. For example, in the above figure, the drip zone in quadrants 2–4 (as well as quadrant 1) should be cleaned up if the average concentration in the drip zone exceeds the clean-up level. Please refer to Section 6.3 for further explanation.

6.4 OTHER CLEANUP CONSIDERATIONS

The area remediated on a single property normally should not exceed one acre. This limitation is based on three factors: (1) typical lot sizes in residential areas throughout the country generally do not exceed one acre; (2) the portion of a property where the majority of exposure to contaminated soil occurs generally does not exceed one acre; and (3) EPA should generally not excavate/cover with soil the entirety of very large yards due to cost-effectiveness considerations.

The goal for cleanup of a yard that exceeds one acre is to excavate or cap the portion of the yard that is in frequent use and continue to limit exposure in the unremediated portion of the yard. To this end, it is recommended that the unremediated portion of such a yard be fenced to clearly delineate the remediated and unremediated areas and to limit the potential for off-site migration of contaminants (e.g., vehicle tracking). Exceptions to this general approach may include areas outside the one-acre area that are used for recreation and gardening, areas with the potential for residential development, and areas in close proximity to other residential areas. As stated in Section 6.5, any unremediated areas of a property should be documented on the clean-up documentation letter for such property, and consideration should be given to implementing ICs for those areas.

If contaminated soil is not removed to the full depth of contamination (i.e., where soil concentration is greater than clean-up level) on a property, a permanent barrier/marker that is permeable, easily visible and not prone to frost heave, should be placed to separate the clean fill from the contamination. This applies to both incomplete vertical excavation with placement of a soil cover and placement of a soil cover without excavating contaminated soil. Selection of an appropriate permanent barrier/marker should be based on the type of contamination left in place, the chemical/physical characteristics of the soil (e.g., pH), the potential for upward migration of the contamination, and/or the types of ICs developed for the site. Examples of suitable barriers/markers include snow fencing (usually orange), a clean, crushed limestone layer, and geofabric.

Empty lots that are zoned residential and contain soils with lead concentrations greater than the clean-up level should be cleaned up when in close proximity to other residential lots. Examples of this are lots between two houses and lots that are near occupied lots. A site-specific determination should be made for these situations. Also, unpaved lots used for vehicle parking should be sampled, and cleaned up if necessary, or access restrictions put in place to prevent recontamination (e.g., vehicle tracking of contaminants) even if no current direct exposure exists. However, it is not the intent of EPA to clean up tracts of remote, undeveloped, lead-contaminated land that may be developed into residential lots in the future. This clean-up responsibility should be borne by the land developer. Institutional controls should

be developed to ensure safe development in these areas, since under CERCLA developers could be held liable for improper cleanup.

6.4.1 Background Lead Concentrations

Many of the “Lead Sites” on the NPL are located in areas with high natural background lead concentration. Often this problem is exacerbated by the presence of high background concentrations of lead in various media (such as soil and groundwater) from anthropogenic sources such as automobile emissions, mining, and smelting (the latter two sources would be considered ‘background’ if they are not associated with the site). It should be noted that CERCLA 104 (a)(3) limits the Agency from taking response actions to address "... naturally occurring substance in its unaltered form, or altered solely through naturally occurring processes or phenomena, from a location where it is naturally found” (EPA, 2000a). Generally, under CERCLA, clean-up levels are not set below natural or anthropogenic background concentrations (EPA, 1996c, 1997d, 2002). Cleanup below natural or anthropogenic background concentrations is normally not performed because it is not cost-effective, it is technically infeasible and there is a high likelihood of recontamination by surrounding areas that have not been remediated (EPA, 2002).

Public education about ubiquitous risks should be incorporated early in the process to help the community understand that Superfund actions are designed to address risks from specific releases to the environment (EPA, 2002). In situations like these, it may be appropriate to examine land uses that limit exposures through implementation of ICs. For more information on this approach, please refer to the 1998 Clarification to the Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities (Appendix B). Site-specific factors should determine what range of alternatives and what clean-up levels will achieve a protective remedy satisfying the nine criteria specified in the NCP.

Remedial decisions often involve a comprehensive response coordinated with other responsible authorities, such as a local public health district, state departments of environmental protection, housing agencies, and private parties. An effort should be made to identify other programs or regulations that may have the authority and capability of addressing risks associated with high natural or anthropogenic background (EPA, 2002). Additional guidance is available for developing a risk management-based response strategy that is protective of human health and the environment (EPA, 1988).

6.5 YARD CLEANUP SPECIFICS

It is important to define the limits of the properties that will be remediated. The use of property lines rather than temporary features, such as fence lines, to delineate boundaries is recommended. The use of temporary features may result in partial cleanup of some properties.

Whether remediation consists of excavation and placement of soil cover or just the placement of a soil cover, consultation with the property owners is important to the development and implementation of response actions and may necessitate property-specific deviations to the guidelines listed in this section. Flexibility is essential to a successful residential lead clean-up program. Some residents may want to pay for upgrades during the cleanup of their yard, such as paving a driveway after excavation, or to have some yard features removed, such as taking out a damaged patio. Within reasonable limits, such requests should be entertained on a yard-by-yard basis. Granting such requests can greatly contribute to building public trust and satisfaction with the clean-up program. All additional costs associated with special requests and considerations must be borne by the homeowner.

Prior to cleanup of a residential yard, access from the property owner should be obtained; access obtained from tenants or renters is not sufficient. It is recommended that access be obtained by going door-to-door. If residents are not home, a blank access agreement with instructions for signature and submission to EPA, along with relevant contact information should be left at the residence (but not in the mailbox). An example access agreement form is presented on page D-6 of Appendix D. As stated in Section 4.2.1, it is suggested that access for remediation be obtained at the time access for sampling is sought. Examples of combined sampling/remediation access agreements are presented on pages D-4 and D-5. An example of a dust cleanup access agreement form is presented on page E-2 of Appendix E. Many residents may refuse access for dust cleanup while granting access for yard-soil cleanup. Combining dust access agreements with other access agreements is not recommended.

Prior to initiating clean-up activity, the condition of each property should be documented and recorded on videotape. ‘Clean-up activity’ includes any disturbance of the property, including the removal of debris and dilapidated structures that may be required prior to initiating the excavation of contaminated soil. An example of a property inspection form is provided in Appendix F. EPA should enter into a written agreement with the resident regarding any special requests or considerations in cleaning up the yard, e.g., replacing concrete walkway with brick. All additional costs associated with special requests and considerations must be borne by the homeowner. Any contaminated yard areas that will not be cleaned up, special resident concerns, and any deviations from strict soil excavation or capping should be noted on this agreement.

Other possibilities for cleanup-related agreements include sod/lawn watering agreements. A sod-watering agreement basically allows for payment to residents for watering the sod that is placed by the remediation contractor. A payment is made before watering is required to cover the water bill and some of the time involved. A second payment is made if, at the end of one month, the sod is in good condition. A similar agreement should be established for maintaining lawns that have been initiated by hydroseeding. This can be a useful incentive program that can also save money. The contract with the remediation contractor should require the contractor to establish vegetation on each property, restore the pre-construction drainage patterns on each property, and perform repairs for damages to the property.

Relocation of residents during yard soil remediation is rarely needed and is generally not recommended (EPA, 1999b). (Guidance is available online at: http://www.epa.gov/oerrpage/superfund/tools/topics/relocation/index.htm.)

Specific safety issues during residential yard cleanup, including ingress and egress to the home, should be coordinated with the property owner/residents and spelled out in the Health and Safety Plan.

Incomplete barriers (such as rock or gravel) or minimal use areas (such as areas under porches), which exceed the applicable clean-up level, should be cleaned up to the extent practical. Although removal is preferred, if it is not feasible to clean up the area, a barrier, which effectively limits access, should be constructed. For example, for areas underneath porches, typically the preferred barrier would be shot-crete (sprayed concrete that can easily be placed in tight or confined areas). It may be preferable to place asphalt rather than gravel on heavily-trafficked roads or driveways, especially those that experience severe erosion.

In all cases, every attempt should be made to clean up the entire yard (subject to cost limitations discussed below), however, any residential yard areas without permanent barriers that the resident requests to leave unremediated, such as gardens or patios, should be sampled separately to determine if the selected clean-up level is exceeded. If the clean-up level is exceeded and the owner refuses to allow cleanup of that portion of the yard, then the clean-up documentation letter issued to the owner should note the unremediated area.

The steps of a typical soil cleanup are shown in the text box below.

Steps of a Typical Soil Response Action

Step 1 (Access Agreement) - Collect access agreement(s) from each owner and/or tenant before any work is conducted.

Step 2 (Initial Survey) - Interview the resident(s) to determine if there are any specific problems that need attention, and if there are any structures or property the owner wants to have disposed, stored, or left untouched. The contractor will conduct a thorough documentation of the property using drawings, digital photographs, and videotapes. Once documented, the owner is required to sign a property agreement which documents any special requests or considerations in cleaning up the yard, any contaminated yard areas that will not be cleaned up, provisions for structural concrete and fence restoration, and deviations from strict soil excavation and capping.

Step 3 (Excavation) - Each tract is excavated by the contractor(s), who will also complete documentation and provide depth confirmations.

Step 4 (Backfill) - After excavation of properties where full excavation to depth has been performed, the excavated area is backfilled and compacted. After excavation of properties with a vertical excavation limit, a permanent, permeable barrier/marker is placed in the excavated area. After placement of the barrier/marker, the excavation area is backfilled and compacted.

Step 5 (Restoration) - Restoration of the property, including landscaping, sod/seeding, fencing, and concrete (if needed) is conducted.

Step 6 (Final Inspection) - After restoration activities are complete, the EPA, PRP, or its agent (e.g., Corps of Engineers) will conduct a final inspection.

Step 7 (Closeout Form) - A property closeout form should be signed by the property owner, which documents the owner is satisfied with the remediation of the property. Any outstanding issues between the EPA and the homeowner that have not been fully resolved should be documented in the closeout form.

Step 8 (Clean Letter) - After the homeowner signs at property closeout form, the EPA issues a "clean" letter, which documents the property has been remediated. Any areas that are not cleaned up via the owner's request, such as gardens, should be noted in the "clean" letter. For properties where contamination is not completely removed, the clean letter should also document the presence of contamination at depth, and should describe the protective measures that were taken to prevent exposure to the remaining contamination (i.e., barriers/markers).

6.6 CLEANUP OF OTHER SOURCES OF LEAD

Lead in the environment can originate from many sources. In addition to soil, the main sources to consider when performing clean-up activities are interior and exterior LBP, lead-contaminated interior dust, drinking water, and occupational exposure resulting in subsequent contamination of homes. Generally, sources other than soil, exterior paint, dust, and tap water cannot be remediated by EPA in the course of residential lead cleanups.

Ultimately, the project managers should strive to address any unacceptable lead-exposure risks at the residence. Sampling and the establishment of clean-up mechanisms needed to take action, such as HUD grants for paint abatement, should be completed as early in the remedial process as possible. Even so, it may not be possible to address all sources of lead in the ideal sequence. When this occurs, other measures should be taken to minimize the potential for recontamination (i.e., to protect the remedy). For example, if deteriorating exterior LBP is present, it is recommended that it be removed prior to initiating any soil clean-up activities in the yard.

Due to transport of lead among media, the preferred sequence of lead clean-up activities at a residence with LBP and lead-contaminated soil would be to clean up the paint first, then the yard soil, and then the interior dust. Clean-up activities performed counter to this sequence increase the risk of recontamination. For example, performing a soil cleanup first at a residence with exterior paint problems increases the potential for recontamination of the soil from the exterior paint. Similarly, interior dust can be recontaminated by interior LBP. Exterior sources have been shown to cause recontamination of the interior when cleaned before community-wide yard cleanup is completed (EPA, 2000e). Accordingly, project managers should make every effort to coordinate the sequence of clean-up activities to prevent recontamination.

CERCLA and the NCP limit Superfund authority to address interior LBP (see Section 1.2) (EPA, 1990b). If a mechanism exists for addressing the paint, such as a HUD grant or a Supplemental Environmental Project (SEP), then the timing of the paint encapsulation or abatement activities may not coincide with the soil cleanup. Additionally, residents may be more reluctant to grant access for dust remediation since it is more intrusive. On the other hand, EPA actions taken to address lead in drinking water from site sources usually can be taken independently from any soil, dust, or paint cleanups, and should be done as soon as practical.

> Supplemental Environment Project (SEP) – Environmentally beneficial projects which a defendant/respondent agree to undertake in settlement of an enforcement action, but which the defendant/respondent is not otherwise legally required to perform.

6.6.1 Lead-Based Paint

The 1998 Clarification presents OSWER's policy with respect to remediation of interior paint, exterior paint, interior dust, and lead plumbing. Regarding interior LBP, the 1998 Clarification states:

> "EPA has limited legal authority to use Superfund to address exposure from interior lead-based paint. As a policy matter, OSWER recommends that such exposures not be addressed through actual abatement activities. However, EPA Regions should promote addressing interior paint risks through actions by others, such as HUD, local governments and health authorities, or individual homeowners as a component of an overall site management strategy. Any activities to clean up interior lead-based paint by potentially responsible parties (PRPs) or other parties should not result in an increase of the risk-based soil clean-up levels" (EPA, 1998a; Appendix B).

Regarding exterior LBP, the 1998 Clarification indicates that the Regions should avoid using the Superfund trust money for removing exterior LBP and soil contaminated from LBP. However, Superfund dollars may be used to respond to exterior LBP to prevent recontamination of soils that have been remediated, but only after determining that other funding sources are not available (EPA, 1998a; Appendix B). The 1998 Clarification states: "As with interior lead-based paint abatement, EPA Regions should promote remediation of exterior lead-based paint by others, such as PRPs, local governments, or individual homeowners. Clean-up activities of exterior paint conducted by PRPs or other parties should not result in an increase of the risk-based soil clean-up levels" (EPA, 1998a; Appendix B).

As a practical matter, project managers should inform each resident regarding the presence or absence of LBP in their home, and options for encapsulation and abatement. The local health agency and/or the state health agency should be informed regarding the availability of HUD grants for paint assessment and abatement. Additionally, regarding PRP-funded cleanups, if any penalties are being considered for non-compliance (Section 6.9), consideration should be given to allowing the PRPs to perform a SEP for paint assessment and abatement in lieu of some or all of the penalty amount.

6.6.2 Interior Dust

Lead-contaminated interior dust can be derived from multiple sources, including exterior soil, interior and exterior paint, homeowner hobbies, workplace, and other exterior sources; thus, it may be difficult to differentiate between sources of dust contamination. Household lead dust contamination may be a significant contributor to elevated blood lead levels, especially for younger children (under the age of three), and may need to be evaluated in determining risks and clean-up actions at residential lead sites. However, as pointed out previously, there are limitations on EPA's authority to abate these sources of contamination to the extent they are not related to releases or threatened releases to the environment (Appendix B).

Based on the 1998 Clarification, OSWER recommends that Superfund monies should generally not be used to take CERCLA response actions for addressing residential dust exposures due solely to interior paint or other interior sources. However, Superfund monies can be used to address interior dust if it can be shown to be derived from an exterior pollution source (e.g., air lead concentration caused by lead smelter, mining, or mineral processing). Dust mat sampling, which was done at the Bunker Hill Site in Idaho (EPA, 2000e), is one possible method of lead source identification; speciation, which is costly, is another method. (Dust mats are used to measure dust lead concentration and loading rates in residences and other structures.) Where interior dust is being addressed by other authorities, the recommendations presented here may be helpful to guide the dust cleanup.

If the lead in interior dust is solely derived from interior paint, EPA should promote addressing interior dust risks through the actions of others, such as HUD, state and local governments, PRPs, or individual homeowners, as a component of an overall site management strategy. The overall site strategy, as outlined below, should also consider the proper phasing/sequencing of actions to address the multiple sources of lead risks at residential lead sites, as discussed at the beginning of Section 6.6.

The baseline risk assessment should document the relative contributions of lead uptake from all relevant media including direct soil exposures and secondary exposures to soil in indoor dust. Replacement of defaults with a site-specific value for the interior dust concentration, or the soil-to-dust relationship (M_{sd}), should be justified through the use of high quality, compelling, site-specific data (EPA, 1994b, 1998c). Dust sampling is preferred for risk assessment and remedial decisions, but dust modeling may be needed to develop or refine soil action levels.

Lead-contaminated interior residential dust presents a significant exposure pathway that can readily be addressed. Consequently, significant health benefit is gained by removal of contaminated interior dust as early in clean-up activities as possible. However, exterior contamination sources present a threat of recontamination to interior of residences (EPA, 2000e; TerraGraphics, 2001). Therefore, any interior dust clean-up actions should be periodic throughout the project and should culminate in a final cleaning of all residences exceeding an action level after the exterior sources have been remediated. As a practical matter, risk management and reduction may need a phased strategy as recommended below:

Early-Phase Actions: Public awareness and health education efforts should be initiated immediately. Entry way dust mats should be provided to residents. HEPA-filter vacuum cleaners should be provided for use by residents. If warranted, a program to abate interior lead-contaminated dust in homes with acute levels should be initiated to provide temporary risk reduction.

Establish appropriate public health partnerships with state and local health departments, ATSDR, and HUD as early as practical.

Mid-Phase Actions: The source of the interior dust lead contamination should be identified. Monitoring of the changes in lead-contaminated dust (e.g., lead loading in dust, lead concentration in dust, exterior-to-interior lead transport) should be initiated. The public awareness/health education efforts and availability of HEPA-filter vacuum cleaners for use by residents should be continued. Assistance to remove and dispose of old carpets should be provided to residents after yard cleanup has occurred.

Final-Phase Actions: Once the exterior lead sources that were found to contribute to interior dust have been addressed, the final step should consider the active remediation of interior lead-contaminated dust. Actions may include: removal of carpeting, cleaning heat and ventilation ducts, wet wiping hard surfaces and soft surfaces (furniture, draperies, bedding, clothing, etc.). Most of these actions should be limited to living spaces. Areas such as attics, crawl spaces, and other non-living spaces need not be addressed unless they are shown to be a continued source of contamination to the living areas . It is important for dust remediation to be performed as the last phase in the site clean-up process to minimize the risk of recontamination.

6.6.3 Lead Plumbing/Tap Water

The 1998 Clarification states: “Generally CERCLA does not provide legal authority to respond to risks posed by lead plumbing within residential dwellings. It should be noted that the water utility is responsible for providing clean water to the residences. As with interior dust, OSWER recommends that EPA Regions coordinate with local agencies to establish a health education program to inform residents of the hazards associated with lead plumbing and how to protect themselves by regularly flushing, or preferably, replacing lead pipes. Soil clean-up levels should not be adjusted to account for possible remediation of lead plumbing” (EPA, 1998a; Appendix B).

With regard to tap water, it should be sampled, and lead levels in the purged sample in excess of the maximum contaminant level (MCL) established by the Safe Drinking Water Act should be addressed. In general, lead concentrations in the purged sample greater than a removal action level (RAL) of 30 : g/L should be addressed through TCRAs; concentrations between the MCL and RAL should be addressed through NTCRAs or long-term remedial actions. Actions that could be taken include provision of bottled

water, connection to a municipal water supply, tap filtration, and installation of deep wells (in remote areas and where shallow groundwater is contaminated). Regarding first run exceedance for lead, the homeowners should be notified that they may need to address a plumbing or corrosion problem, which is outside of the scope of Superfund.

6.7 PREVENTION OF RECONTAMINATION

Project managers should take steps to mitigate recontamination. During site closeout and five-year reviews, the project manager should also check for recontamination at levels which may threaten the remedy.

At many large-area lead sites, cleanup occurs over a long period of time and through multiple phases, throughout which the potential for recontamination exists. During each of these phases, windblown dust sources, vehicle tracking, flooding, and other mechanisms can recontaminate previously cleaned areas. Although best management practices (BMPs) should minimize the movement of contaminated material from each residence being cleaned, vehicle tracking of contamination from areas yet to be cleaned up can significantly raise concentrations of contaminants in cleaned areas. During the early phase, typically an emergency response action, cleanup is focused towards Tier 1 properties, and cleanup favors a "hop scotch" approach to address the worst risks first. This method of remediation can result in recontamination of clean properties. Confirmation samples should be collected in any areas that have been potentially recontaminated.

Another aspect of large-area lead sites is that complete cleanup of residential properties does not always take place for a variety of reasons (see Sections 6.2 and 6.4); instead a barrier or soil cover is put in place over contaminated soils. Flooding can pose a serious problem for these areas in that flood waters can erode away clean materials leaving subsurface contamination exposed, and entrained sediments bearing contamination may be left on top of newly remediated properties. Inadequate drainage of runoff can move lead into cleaned areas (e.g., lead particles on a crowned road with no curb and gutter may be rinsed onto adjacent residential properties with normal rainfall). Additionally, the activities of burrowing animals can bring contaminated soils to the surface.

> Best Management Practice (BMP) – In general, BMPs are a combination of practices that are determined to be the most effective and practicable means of controlling point and nonpoint pollutants at levels compatible with environmental quality goals. In this document, BMPs specifically refer to measures taken during construction activities on properties where contamination has been left at depth to prevent the transfer of those contaminants to other media.

Recontamination of clean soil cover can be caused by ongoing homeowner projects, such as digging a hole through a clean barrier to install fence posts or a new tree or shrub, if preventative measures are not taken. Education and licensing of contractors who work on clean barriers/markers should generally be required (e.g., as part of a local ordinance) to ensure the longevity of the remedy. Also, at many sites (e.g., Bunker Hill), ICs have been most effective when linked to the "call before you dig" program typically operated by many counties to avoid disruption of utility service. In addition, large scale residential development projects that may raze old housing in favor of new will frequently recontaminate areas where lead-contaminated soil was left at depth, without appropriate BMPs in place. BMPs include silt fences, hay bales, etc., to limit movement of contamination off a project site, and stockpiling of contaminated soil on a tarp to prevent contamination of underlying soil (Figure 6-3). EPA provides guidance on the implementation of BMPs in construction activities at sites where contamination is present (EPA, 1997e). Best management practices typically add about 5 percent to project cost (TerraGraphics, 2000). Periodic inspections of residential areas should be performed by the local government to ensure that projects within the site are implementing BMPs.

Wind blown dust can pose a significant threat to the health of individuals at a site and can cause recontamination. Tailings impoundments that have dried can be large sources of windblown lead dust. Most tailings impoundments are large; a wind sweeping across the face of one can carry substantial amounts of contaminated dust and then deposit these particles on a downwind residential area, both causing increased exposure to contaminants, and recontaminating clean areas. Wind blown dust sources are typically a key issue to be addressed early in the sequencing of site activities to minimize this migration.

These are but a few examples of how recontamination can be an ongoing problem that needs to be considered at every site during each phase of cleanup. Although mechanisms vary from site to site, the types of response actions put in place and the sequence in which these actions take place can play a significant role in enhancing the permanence and effectiveness of a remedy.

A disposal area may be needed to dispose of contaminated soil from the site to support typical homeowner projects, as some municipal landfills may not accept contaminated soil. Without free or low cost disposal for contaminated soil available to each homeowner and renter, improper disposal is more likely, which would result in recontamination. In addition, a disposal area may be needed if certain materials at a site, such as carpets, fail TCLP and cannot be commingled with solid waste. It may even be appropriate for the remedy to provide free removal of contaminated soil and provision of clean soil to homeowners (but contractors may be required to pay for these services, or obtain material from approved sources) to encourage maximum compliance and further ensure the longevity of the remedy. The

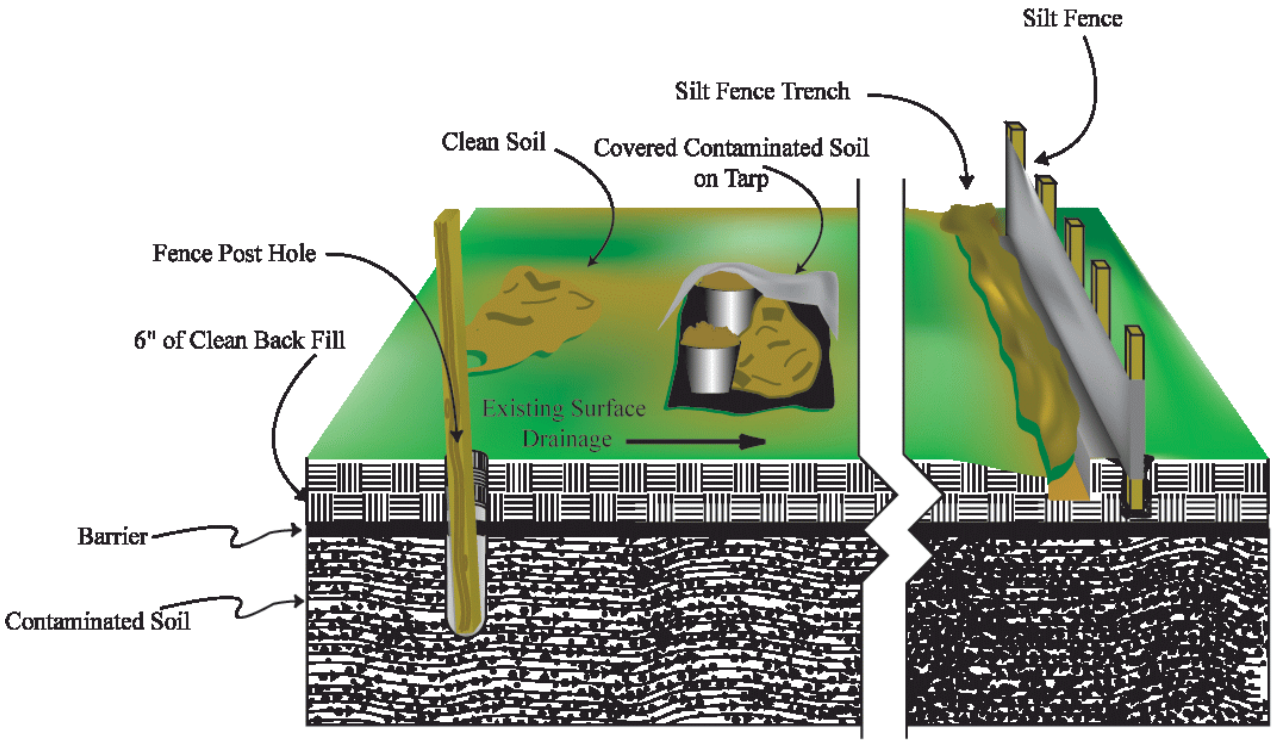


Figure 6-3. Implementing Best Management Practices (BMPs) during construction work. The best management practices (BMPs) shown in the above figure (e.g., a clean soil barrier) represent one component of the ICs which may be put in place by local ordinance to ensure the long-term protectiveness of the remedy and to prevent recontamination. The purpose of BMPs is to minimize the potential for accidental exposure of humans during construction and maintenance activities on sites where wastes have been left in place. The staging of contaminated soil on tarps and/or in small buckets, and the installation of silt fences downgradient of the construction area are examples of BMPs intended to prevent the migration of contaminated material from the construction site. Please refer to Section 6.7.3 for further explanation.

maximum concentration of lead (and perhaps other constituents) allowed in “clean” soil, and the required sampling frequency, should be specified in an IC.

Over the long term, cleanups may not be possible at every property at the same time. A trust fund should be established for the site for the cleanup of properties that are deferred for various reasons, which should be implemented by the local government. In this manner, changes in property ownership over time may be more closely monitored to determine when cleanup at deferred properties might be appropriate (see Section 6.9). Local implementation of the trust fund will ensure that cleanup of these properties occurs as soon as possible, further ensuring the protectiveness of the remedy, further ensuring the protectiveness of the remedy by minimizing the potential for recontamination to the extent possible.

6.7.1 Early Actions

Early response actions (including cleanups for sensitive subpopulations) can be an essential aspect of the response action at a site, as discussed above. These actions should be conducted simultaneously with source area control. The following are considerations that may reduce the potential for recontamination when scoping an early action.

C Seek permanence in selecting the clean-up alternative(s), if possible, such as complete removal to depth of soil contamination at properties where there is an acute risk.

C Consider cleanup of adjacent properties simultaneously that may threaten the permanence or effectiveness of the early action.

C Control fugitive dust sources, access, tracking, and erosion of contaminants to the extent possible.

C Perform HEPA street sweeping to minimize tracking of contaminants throughout a community.

C Evaluate the feasibility of conducting the cleanup of residential areas in their entirety during the early removal phase if contamination is widespread. If this is not possible, limit the early removal actions to immediate risks (Tier 1 and Tier 2 residential properties, including residences with elevated blood lead levels) in order to minimize the potential area where recontamination might occur.

C Provide informational fact sheets to homeowners on how to minimize recontamination on their property.

C Establish an IC to manage cleaned areas. This could involve local and state government agencies, and PRPs that are available to recommend best management practices for homeowner projects and provide education to the homeowner, as well as utility districts and companies likely to breach the barriers/markers put in place.

C Provide site plans or other documentation of areas that have been cleaned up, as well as information on areas that are still contaminated, to the local governmental entity responsible for the maintenance of the remedy, i.e., for monitoring ICs and for tracking properties over time.

• Establish a geographic information system (GIS) for monitoring ICs and properties.

6.7.2 Long-term Remedial Action

Some or all of the following measures may be useful to address the risk of recontamination during the remedial action (Tiers 2 and 3, if a tiered approach is used) and post-design phase:

- Evaluate the permanence and effectiveness of the various remedial actions under consideration. Consider the economic feasibility of complete contaminated soil removal to minimize reliance on ICs.

- Conduct a cost analysis comparing the cost of long term ICs to those of complete removal (EPA, 2000f). For example, property depreciation, tax base impact, additional procedures/cost of utility work, flooding complications/costs, and long term IC administration cost should be taken into account when comparing the cost of a partial removal of contaminants to a complete removal. Property depreciation, while possibly subtle for each property, may add up to substantial losses for the entire community in reference to a county tax base. Also, losses for an individual property over a lifetime of sales could add up to a significant cost. Following cleanup, increases in property valuation from source removal or drainage/infrastructure enhancements (and savings/in-kind services to municipalities) should be considered.

- Remedial action should strive to remediate the contamination in the community by segregable areas, such as a town, or a divisible segment of town. Each segregable area should be cleaned up as quickly as possible (e.g., within one construction season) to minimize recontamination of cleaned properties and to compound the protection to human health (EPA, 2000e). Each community should be cleaned up block by block within these segregable areas, utilizing BMPs to mitigate tracking of contaminants. Site experience suggests that cleanup of up to 800 properties per site per year is possible.

- Fugitive dust that may be a source for recontamination, and access to such sources should be controlled. Air monitoring along with depositional modeling may be necessary to determine if windblown dust presents a significant threat of recontamination. Significant sources of windblown dust should be controlled prior to or simultaneously with cleanup of adjacent residential areas. Consider HEPA street sweeping during remediation and immediately following completion of cleanup to minimize tracking of contaminants throughout a community.

- Complete removal of contaminants should be considered in flood prone areas or areas with a high groundwater level due to the inherent difficulty in maintaining a soil cover remedy in a flood prone area. Drainage-ways containing contamination within their 100-year floodplain, which are

not addressed in the remedy could also lead to remedy failure if the contaminants are eroded to other areas.

C Remediation of contaminated rights-of-way should occur within segregable areas simultaneously, if possible, or as close together in time as possible to minimize vehicle tracking and recontamination of driveways from the rights-of-way.

C Control measures for all remaining sources, such as mining waste piles surrounding the community, should be developed to ensure the remediated neighborhoods are kept clean. ICs should be established to ensure the control, or proper use and disposal of any wastes remaining on site.

C If the residential remedy includes replacement of soils, removal of deteriorating exterior LBP (e.g., by pressure washing) should be considered to minimize the soil recontamination potential.

• Other sources of residential property recontamination should also be considered. For example, homeowners may bring in contaminated soil for fill or other uses on their property.

C Establish permanent funding for ICs. Unless all contaminants are removed, some level of ICs may be necessary. Early establishment of a program is the key to success of a remedy that consists of a partial removal of contaminants.

6.7.3 Institutional Controls (ICs)

EPA defines ICs as administrative and/or legal mechanisms that: (1) help minimize the potential for human exposure to contamination, and (2) protect the integrity of the remedy. ICs accomplish these objectives by directly limiting land or resource use, and/or by providing information that modifies behavior. ICs are used throughout the remedy pipeline, including (1) when contamination is first discovered (i.e., prohibition of excavation of newly discovered soil contamination), (2) when the remedy is ongoing (i.e., restrictions on property use until clean-up levels are met), and (3) when hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure.

At sites where minimizing exposure is the primary purpose of the IC, it is EPA's policy that if a site cannot support "unlimited use and unrestricted exposure" (EPA, 2000f), ICs are generally required. The "unlimited use and unrestricted exposure" threshold is a site-specific determination similar to that of a five-year review. Essentially, if contamination could result in an unacceptable exposure, ICs would be

required. This is often the case at lead cleanups because residual contamination is frequently managed onsite. Note that the term "residential" is often used interchangeably with the "unlimited use and unrestricted exposure" threshold but these are not synonymous terms. For example, a lead cleanup where the top layer of soil has been removed and replaced can result in a residential use at a site that includes restrictions (e.g., restrictions on digging, requirements for elevated gardens, and an information/outreach program, etc.).

The second common purpose of an IC is to protect the integrity of a remedy. In the lead clean-up context this may mean using institutional controls to prevent penetration of a cap or damage to monitoring equipment. An important consideration in this context is what type of IC will provide the required remedy protection. For example, the primary concern for protecting a remedy in a lead clean-up scenario is typically uncontrolled excavation. For this reason it is important to select ICs that will be relevant to excavators. Examples of potentially effective ICs are local digging or drilling permits and "One-Call" or "Miss Utility" systems. Examples of potentially ineffective ICs are deed notices, because excavators seldom check land records prior to digging.

To better understand the correct IC approach, it is important to understand what tools are available. In general, there are four categories of ICs commonly used in cleanups: governmental controls, proprietary controls, enforcement and permit tools with IC components, and informational devices. The definitions provided below were taken in large part from the current EPA guidance (EPA, 2000f).

Governmental controls are usually implemented and enforced by a state or local government. Some of the more common examples include things like zoning restrictions, building/excavation permits, groundwater drilling and use permits, ordinances, or other provisions that restrict land or resource use at a site. These types of mechanisms are popular in remedies because the administrative processes are in place and are typically well understood within a particular jurisdiction. The greatest concern with this type of control is that it is often implemented, monitored, and enforced by an agency other than EPA or the state.

Proprietary controls are unique in that they have their basis in real property law and that they generally create legal property interests. An example of this type of control is an easement that provides access rights to a property so that an agency may inspect and monitor a cover system. A proprietary control may also be used to restrict certain activities on the property, such as excavating below a certain depth. These are powerful tools in that they can be made to "run-with-the-land" (i.e., effective if ownership changes), but they provide significant challenges because property interests are often transferred. EPA is limited by CERCLA §104(j) with regard to acquiring interests in real property. Prior to acquiring an interest in real property the state must provide an assurance that it will accept transfer of

that interest at completion of the remedial action. This requirement applies at both Fund-lead and enforcement-lead sites. Therefore, if a proprietary control involves the transfer of an interest in real property, EPA must obtain this assurance and find an appropriate entity to hold the interest following the remedial action. At Fund-lead sites this will most likely be the state. At enforcement sites, it may be the state, a PRP, or some other interested and qualified party. In addition, proprietary controls are based on state law, and EPA and many state environmental agencies have limited real estate or common law experience. This can complicate proprietary control enforcement.

Enforcement and permit tools with IC components under CERCLA Sections 104 and 106(a) include unilateral administrative orders (UAOs) and AOCs, which can be issued or negotiated to compel the land owner to limit certain site activities at both federal and private sites. In addition, CERCLA 122(d) authorizes the use of consent decrees at privately-owned sites. Enforcement devices are some of the more common ICs. The strength of these types of tools is that EPA or states can directly enforce them (rather than relying on a local agency for governmental controls or using real estate common law for proprietary controls). The major weakness is that they may be enforceable only against the signatory, recipient, or permitee (i.e., may not run with the land to bind future property owners).

Unilateral Administrative Order (UAO) – When EPA negotiates with a Potentially Responsible Party (PRP) to do cleanup work at a Superfund site, the agreement may be documented in an administrative order on consent (AOC). If the negotiations fail, EPA has the authority to compel the PRP to do the cleanup by issuing a unilateral administrative order (UAO). Administrative orders are issued under CERCLA sections 104 and 106.

Informational devices are types of devices that only provide information or notification that residual or capped contamination may remain on-site. These types of tools are common at lead cleanups to both provide notification of residual contamination and to provide information that may modify behavior to minimize the potential for unacceptable exposure. Examples include placing a property on a state contaminated properties registry, developing deed notices, and providing periodic lead-education advisories to residents. Due to the nature of informational devices and their non-enforceability, it is important to carefully consider the objective of this category of ICs. Informational devices are most likely to be used as a secondary "layer" to help ensure the overall reliability of other ICs.

There is typically an inverse relationship between the amount of cleanup and the degree of reliance on ICs (i.e., the more cleanup, the less reliance on ICs). EPA tends to focus on a number of considerations when evaluating the long-term viability and amount of redundancy required for ICs at a particular site. EPA guidance strongly advocates the use of ICs in "layers" and/or in "series" (EPA, 2000f). Layering ICs means using multiple ICs concurrently (e.g., a consent decree, deed notice, educational/informational devices and a covenant). Using ICs in series is appropriate when IC

mechanisms are removed or changed as site circumstances change, such as reduction in restrictions during the clean-up life-cycle. As illustrated in the descriptions of the different categories of ICs, there are inherent strengths and weaknesses with each type. The goal is to obtain the best mixture of ICs to manage the risk at a site over the long-term. There are many important factors to consider when determining how many ICs are required at a site. The following is not intended to be a comprehensive list, but rather illustrative of the site-specific nature of these types of decisions. A few common considerations include: (1) the type of enforcement mechanism used (consent decree, order, permit, ordinance); (2) who will enforce the mechanism (i.e., EPA, the state, local agency, third party, etc.); (3) who the intended IC will effect and how; (4) the level of sophistication of the party implementing the cleanup and those remaining on the property; (5) the expected property use (likelihood of redevelopment and/or resale); and (6) the degree of cooperation exhibited by the parties to the cleanup. Since ICs can impact future development at sites, it is important to work cooperatively to determine the appropriate mix of ICs. The objective is not to use as many layers of ICs as possible, but rather to strike a balance that gives the regulators the certainty that the site remedy will be protective over time while maximizing the site's future beneficial use.

At many large lead sites, GIS systems are used to track the cleanup status of properties located on the site. The tracking system facilitates the monitoring of ICs and the maintenance of the remedy. GIS systems can be operated by local governments, state governments or PRPs.

6.8 CLEAN-UP DOCUMENTATION

Upon confirmation that initial yard sampling indicates a given residential yard does not exceed the lead clean-up level for the site, or upon the completion of the cleanup of a residential yard, a letter (“clean” letter) should be sent to the property owner documenting that EPA considers the lead level in the yard to be below the level of human health concern. Prior to issuing a “clean” letter, a property closeout form should be signed by the property owner, which documents the owner is satisfied with the remediation of the property. Examples of property closeout forms are proved in Appendix G. Any areas that are not cleaned up via the owner’s request, such as gardens, should be noted in the “clean” letter. If contamination is not cleaned up to depth, this fact, along with protections (i.e., barriers/markers) that are put in place, should be stated in the “clean” letter. The “clean” letter provides official documentation to the property owner for use in future property sales or transactions. Sample “clean” letters are provided in Appendix H.

6.9 ENFORCEMENT

The project manager should strive to characterize all residences within the identified zone of contamination, and achieve cleanup at all residences where lead concentrations exceed the clean-up level. At all residential clean-up sites, a percentage of homeowners typically will refuse to grant access to EPA for sampling and/or for cleanup. In order to meet remedial goals of protecting a community, all residences suspected of being located within a zone of contamination should be sampled. It is important to work with the landowner and be sensitive to a landowner's concerns regarding property access. The project manager should educate the landowner of the dangers that lead contamination may pose. If a landowner still refuses to grant access, the Region should consider issuing an access order for sampling (EPA, 1990c).

An owner of residential property on a Superfund site may be potentially liable under CERCLA § 107(a)(1). However, EPA, as an exercise of enforcement discretion, generally will not take CERCLA enforcement actions against an owner of residential property unless the residential homeowner's activities lead to a release or threat of release of hazardous substances resulting in the taking of a response action at a site. (See Policy Towards Owners of Residential Property at Superfund Sites (July 3, 1991)). Additionally, under CERCLA a residential property owner may qualify for protection from CERCLA liability as a contiguous property owner, bona fide prospective purchaser, or innocent landowner. Under both the statute and EPA's policy, a residential property owner is expected to cooperate with EPA and the person taking the response action. This obligation includes providing access and information as requested, agreeing to comply with land use restrictions relied on in connection with the remedy, and not impeding the effectiveness the effectiveness or integrity of institutional controls. (See CERCLA §§ 101(40)(B)-(H), 107(q)(1)(a), 101(35)(A)-(B)). The project manager should work to inform and educate an owner of EPA's expectations for cooperation in connection with the remedy. If necessary, to meet the commitments of the remedy, EPA should consider taking appropriate steps, such as issuing a UAO, to secure the cooperation of an uncooperative landowner.

If some properties are not addressed under site response actions (e.g., current homeowners with no young children or women of child-bearing age), then consideration should be given to establishing a trust fund (under state authority or local law), to be administered by a local government, for the cleanup of the property at a future date, when the property is transferred (e.g., by sale) to a new owner (see text box). Buyers of contaminated properties could make use of the fund to have the property cleaned up at their discretion.

Example Trust Fund – At the Bunker Hill Superfund Site, a number of property owners refused to have their residential yards cleaned up. Without any obvious need to cleanup the property right away, e.g. an unpaved, contaminated driveway that threatens to recontaminate the neighborhood or a child living at the residence or next door, the PRPs for the site were willing to give the State funds to set aside in an interest bearing account to clean up the properties in the future, when the property changes hands. Property status is then monitored by the local Health District as part of the institutional controls program. The State then manages the funds to ensure maximum interest accrual in an irrevocable trust and disbursement according to the limitations set up in the trust -- for residential property cleanup. Cleanup then occurs under State oversight at the time new owners buy the property thereby ensuring families with children that move into the community are protected.

In the case of rental properties, EPA should order access for cleanup by UAO to all owners of contaminated rental property who refuse access. To ensure the protection of occupants, enforcement of the UAO may be necessary to clean up all rental properties with contamination greater than the clean-up level.

7.0 FIVE-YEAR REVIEW

> Five-Year Review – Pursuant to section 121 of CERCLA and the NCP, remedial actions which result in any hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure need to be reviewed every five years to ensure protection of human health and the environment.

CERCLA §121(c) requires an assessment of certain remedial actions every five years on sites where contamination has been left on site (EPA, 2000a). Guidance for conducting five-year reviews has been issued (EPA, 2001h). The purpose of a five-year review is to evaluate the performance of a remedy to determine if the remedy continues to be protective of human health and the environment. Typically, at large lead sites, such as mining and smelting sites, the volume and areal extent of contamination is such that total removal of all contamination above the health-based risk level is economically impractical. Contaminated wastes are generally left on site and covered with soil. The remedy for these types of sites typically includes some type of IC to address residual or encapsulated contamination. A five-year review can determine whether the remedy is stable (i.e., soil covers are undisturbed, and clean areas are not being recontaminated from sources remaining on the site). The review should also assess the ICs that were established for residual source control to determine their effectiveness in protecting human health. As described below, the five-year reviews at large lead sites may involve the collection and evaluation of substantial quantities of data and require significant up-front planning. Much of the following discussion may not apply to small sites.

At many sites, an exposure study has been performed prior to any clean-up activities to determine blood lead concentrations of children in the community. A follow-up exposure study of residents should be conducted during the five-year review to determine if the concentrations have decreased below levels of concern. If the blood lead concentrations have not decreased to acceptable levels, additional environmental studies and individualized, follow-up exposure investigations should be conducted to determine the pathways of exposure that may need to be addressed. Long-term exposure studies can be very useful in understanding exposure trends at a site. They also can be useful to ensure that no pathways of exposure have been missed and to help identify areas of the site that have been recontaminated. In this manner, the project manager can use health data as a means to “double check” the effectiveness of the remedy and to corroborate environmental data. However, blood lead data from limited sampling should not be used as the only metric for gauging the success of a remedy, even if it can be used to identify specific problems. The project manager should coordinate with ATSDR and the local health district with respect to planning and funding such a program.

The five-year review should include resampling at a percentage of each type of property that was remediated during the clean-up actions. A baseline level of resampling should be designed to achieve a

pre-specified level of statistical significance and power. This sampling should assess the potential for recontamination that may be occurring, and may help identify any pathways that may have been missed during remediation. Any sampling that indicates widespread or clusters of soil levels above clean backfill concentrations should be monitored over time to determine if an upward trend exists that may jeopardize the remedy.

Additionally, some level of house dust sampling should occur to determine if levels are rising or falling. House dust, being a primary exposure pathway, should be used as one indicator of remedy effectiveness and also used to detect the presence of recontamination. Lead concentrations in house dust levels often correlate to interior LBP, which is not usually addressed by Superfund (Appendix B). Therefore, interior paint sampling should also be conducted as a component of the risk assessment to aid in determining the source of the lead loading to dust.

At large lead sites, remedy protectiveness issues will often relate to the implementation and management of ICs and recontamination of areas previously cleaned. The five-year review should evaluate the effectiveness of the site ICs and recommend corrections to address any deficiencies that are identified. In order for a five-year review to be effective at sites where ICs are a component in ensuring the effectiveness of the remedy, there should be: (1) clear documentation of the specific type of ICs that were to be implemented, and (2) accurate and complete tracking of subsequent activities and changes in property use following completion of the Superfund remedy.

The following are possible deficiencies for several types of commonly-used ICs and other control measures taken to ensure the protectiveness of the remedy:

- HEPA vacuum loan program not being broadly used.
- Information on interior home cleaning not being widely distributed.
- Lack of access control along rights-of-way, and in unremediated areas.
- Inadequate decontamination of vehicles leaving areas of existing contamination.
- Erosion of unremediated areas onto remediated properties.
- Lack of or inadequate disposal area for snow (that contains contaminated soil).
- Lack of drainage infrastructure and maintenance by local entities.
- Uncontrolled utility excavation in areas with contamination at depth.
- Inadequate road maintenance in areas where contamination exists at depth.
- Inadequate disposal capacity to handle IC-generated wastes.
- Discontinuation of, or diminishing, health education program.
- Decrease of blood lead monitoring.
- Complicated/unfounded ICs and/or change in local government acceptance of ICs.

8.0 FEDERAL FACILITIES

The purpose of this section includes the following: (1) to provide direction to EPA federal facility project managers who oversee response actions involving lead contamination of soils from LBP in residential areas of federal facilities; (2) to build and elaborate on the joint March 1999 EPA and DOD Principles Memorandum (DOD/EPA, 1999a) and the December 1999 Lead-Based Paint Interim Field Guide (DOD/EPA, 1999b); (3) to address situations where the DOD service component will conduct the response actions and the regulatory agencies will provide oversight; and (4) to address the unique considerations that arise when the federal government transfers LBP-contaminated property that is subject to CERCLA §120(h) to non-federal parties (e.g., states, local governments, local reuse authorities [LRAs], and private entities, etc.).

While existing policy, guidance, and directives on lead contamination are applicable at federal facilities, property transfer issues present unique requirements that necessitate this section. This section applies to properties that will be transferred for residential use which are contaminated with lead due to LBP or to properties/parcels whose use would expose sensitive populations (e.g., infants, toddlers, small children, nursing mothers) to unacceptable exposure to lead after the properties are transferred to non-Federal entities.

Beginning in 1995, EPA and DOD began to address policy differences on the clean-up levels for lead in soils from LBP. In 1998, Sherri Goodman, then Deputy Under Secretary of Defense (Environmental Security) and Tim Fields, Assistant Administrator for OSWER, reached agreement on the management of LBP at residential and non-residential areas at BRAC properties. In March 1999, this agreement was formalized as the 'Principles Memorandum' (DOD/EPA, 1999a). The Principles Memorandum stated that for residential areas located on BRAC sites, Title X procedures provide an efficient, effective, and legally adequate framework for addressing LBP in residential areas, and that as a matter of policy, CERCLA/RCRA would apply in limited circumstances. EPA and DOD agreed that generally for residential areas that were being transferred, Title X regulations would apply and that CERCLA/RCRA would apply in limited circumstances. Residential real property is defined by Title X as real property on which there is situated one or more residential dwellings used or occupied, in whole or in part, as the home or residence of one or more persons. It is important to note that Title X defines residential property differently than the Handbook.

For federal property transfers subject to CERCLA where there is a concern about lead contamination to soils from LBP, EPA Regions, where they are involved, will need to make a determination whether the property meets the requirements of CERCLA §120(h)(3). This section of CERCLA outlines deed requirements for transferring property and requires covenants indicating that all

remedial actions have been taken at the site. Federal property contaminated with lead from LBP should be evaluated based on its use, or its intended reuse, before the property has been sold or transferred to another private entity. EPA's evaluation of the transfer should be based on an evaluation of lead contamination by either relying on existing and available information gathered through a combination of file searches and a review of existing data and/or a site risk assessment, which may require the collection and analysis of additional soil samples.

The soil sampling design should be specific to the site. The actual or suspected presence of lead contamination in soil does not necessarily require sampling. Factors to be considered before designing a sampling plan include, but are not limited to, the nature of the facility's operations, its operating records, the age of the buildings/structures under consideration, the maintenance schedule for the buildings/structure, visual inspection, and future use. Based on these factors, it may be reasonable to conclude that the potential risks posed by lead may be acceptable and no further evaluation is needed. It may also be important to consider the ultimate disposition of the property once it leaves federal control. For example, the structures may be scheduled to be demolished, so that the abatement of the hazard may be addressed in the demolition process and may negate the need to conduct clean-up activities.

The EPA project manager and, as appropriate, an EPA risk assessor should work with their federal, state, and local government counterparts to develop a sampling design, where required, that would be scientifically appropriate, minimize the cost of sampling, and provide the information required for risk management decisions. As appropriate, the local redevelopment or reuse authority should be consulted as well. Information from the sampling effort could result in different outcomes: a "no further action decision", a conclusion that more extensive sampling is necessary, or, in some cases, a response action. All of these potential outcomes should be discussed with the lead federal agency, and others as appropriate, prior to the initiation of sampling.

If there is insufficient knowledge to make a conclusion about the risk at the site or if the initial sample results indicate an unacceptable risk from lead, data may be collected by a focused sampling of an environmental media to develop an improved understanding of the risk that may be posed by the lead exposure. It may be appropriate to determine that after visual inspection and/or focused sampling, and after consultation with an EPA risk assessor, the lead from the area may not pose a significant risk that requires further evaluation. Risk evaluations should be based upon a number of factors including the reasonably anticipated future land use, exposure potential, ICs proposed or in place, and bioavailability. The Handbook user is encouraged to obtain detailed information on ICs for federal facilities in the document "Institutional Controls and Transfer of Real Property under CERCLA Section 120(h)3(A), (B), or (C)" (EPA, 2000g).

If the property has been used or will be reused as residential real property after transfer, the EPA project manager should verify that the lead federal agency has followed the Title X regulations and policies regarding sampling and risk assessment. As a guide to assist site managers in understanding Title X regulations and policies, EPA and DOD jointly issued a Field Guide (DOD/EPA, 1999b) that is used by EPA and DOD field personnel when assessing hazards due to LBP. The field guide contains information on performing a Title X paint inspection and risk assessment and outlines the requirements for abating soil contaminated by LBP

The Title X program, through the implementation of the new Title IV of TSCA, establishes certification programs and work practice standards to regulate LBP hazard evaluation and abatement in target housing and child-occupied facilities. There are two types of evaluations covered by Title X. The first evaluation is a paint inspection that includes a surface-by-surface inspection to determine the presence of LBP. All painted surfaces with distinct painting histories are sampled. Usually the paint inspection is done by a combination of portable XRF devices and paint chip sampling.

The second evaluation is a risk assessment to determine if LBP hazards exist. A risk assessment includes taking samples of all deteriorating paint, dust, and soil. The final report recommends methods to deal with all LBP hazards that were found, which could include interim controls or abatement. A comprehensive evaluation consists of a combination of a paint inspection and risk assessment. Paint inspections and risk assessment conducted in accordance with Title X must be performed by certified personnel. All results, whether positive or negative, must be disclosed at the time of sale or rental.

The final TSCA 403 regulation (EPA/HUD, 2001), defines a soil-lead hazard as bare soil on residential real property, or on property of a child-occupied facility, that contains concentrations of lead equal to or exceeding 400 ppm in the play area or an average of 1,200 ppm in the rest of the yard. EPA and DOD have agreed that as a matter of policy, for bare soil with lead concentration between 400 ppm and 1,200 ppm, the Service, in consultation with the EPA, has the option of abatement or interim controls. Based on the final HUD 1012/1013 regulations (24 CFR Part 35) (HUD, 2001), federal agencies can transfer the control and abatement requirements to the purchaser, but by law the federal agency is responsible for performing the LBP inspection and risk assessment and must assure that through contractual mechanisms, the purchaser has performed the abatement of the soil in accordance with Title X.

In cases where the EPA project manager makes a determination that actions taken to address LBP hazards are sufficient (following the requirements outlined in the Field Guide), EPA should agree with the federal agency on the transfer documents and the covenant that all remedial action necessary to protect human health and the environment with respect to any such substances remaining on the property has been taken before the date of such transfer . In the case of BRAC sites, the EPA project manager can agree on the Findings of Suitability to Transfer (FOST) or Findings of Suitability to Lease (FOSL) language, and/or the operating properly and successfully (OPS) determination as required by CERCLA. When an EPA project manager has unresolved questions as to whether actions at residential areas meet the requirements of CERCLA, she/he should raise these issues to the federal agency and provide an opportunity for response. In the case of BRAC sites, it is proper to highlight these concerns in EPA's comments on the FOST/FOSL. Efforts should be made to determine that the purchaser is fully aware that EPA has questions about the condition of the property.

Finding of Suitability to Transfer (FOST) – A process that has been established to identify and prepare property for transfer by deed. Such transfers are usually undertaken at a property where environmental response is not needed or has been taken. However, under certain conditions, new authority now permits earlier transfer. The FOST process also looks at the compatibility of an anticipated reuse with completed restoration activities and identifies restrictions necessary to protect human health and the environment.

Finding of Suitability to Lease (FOSL) – A process that has been established for leasing of property that cannot be transferred by deed because environmental restoration activities are still ongoing. The FOSL process also looks at the compatibility of a proposed reuse with ongoing restoration activities and identifies restrictions necessary to protect human health and the environment and prevent interference with the cleanup.

REFERENCES

American Society for Testing and Materials (ASTM). 1998. *Standard Test Method for Particle-Size Analysis of Soils*. D 422–63.

Borgman, LE, Gerow, K and Flatman, GT., Cost-Effective Sampling for Spatially Distributed Phenomena. In *Principles of Environmental Sampling*, 2nd Ed. Keith, LH, ed. (American Chemical Society, 1996)

Borgman, LE and Quimby, WF. 1996. Sampling for Tests of Hypothesis When Data are Correlated in Space and Time. In *Principles of Environmental Sampling*, 2nd Ed. Keith, LH, ed. (American Chemical Society, 1996)

Carbone, R., N. Laforgia, E. Crollo, A. Mautone and A. Iolascon. 1998. Maternal and neonatal lead exposure in southern Italy. *Biol. Neonate* 73: 362–366.

Centers for Disease Control and Prevention (CDC). 1991. Preventing Lead Poisoning in Young Children. October 1991. Centers for Disease Control, Atlanta, GA.

Crumbling, D.M., C. Groenjes, B. Lesnik, K. Lynch, J. Shockley, J. Van Ee, R.A. Howe, L.H. Keith, and J. McKenna. 2001. Applying the concept of effective data to contaminated sites could reduce costs and improve cleanups. *Environmental Science and Technology* 35(9):405A–409A.

Englund, E.J. and N. Heravi. 1994. Phased Sampling for Soil Remediation. *Env. Ecol. Stats* 1:247–263.

Flatman, G.T. and A.A. Yfantis. 1984. Geostatistical Strategy for Soil Sampling: The Survey and the Census. U.S. EPA EMSL. *Env. Mon. Assess* 4:335–349.

Gilbert, R.O. and Simpson, J.C. 1983. Kriging for Estimating Spatial Pattern Of Contaminants: Potential and Problems. *Environmental Monitoring and Assessment* Vol 4: 113–135.

Gilbert, R.O. 1987. *Statistical Methods for Environmental Pollution Monitoring*. Van Nostrand Reinhold. New York, New York.

Goovaerts, P. 1997. Geostatistics for Natural Resources Evaluation. Oxford University Press.

Gayer, R.A. 1990. Transplacental transport of lead. *Environ. Health Perspect* 89:101–105.

Graziano, J.H., D. Popovac, P. Factor-Litvak, P. Shrout, J. Kline, M.J. Murphy, Y. Zhao, A. Mehmeti, X. Ahmedi, B. Rajovic, Z. Zvicer, D. Nenezic, N. Lolacono and Z. Stein. 1990. Determinants of elevated blood lead during pregnancy in a population surrounding a lead smelter in Kosovo, Yugoslavia. *Environ. Health Perspect* 89:95–100.

Idaho Department of Health and Welfare and Agency for Toxic Substances and Disease Registry, Division of Health Assessment and Consultation. 2000. Coeur d'Alene River Basin Environmental Health Assessment. Atlanta, GA.

Journel, A.G. 1984. Indicator Approach to Toxic Chemical Sites; Report of Project No. CR-811235-02-0. U.S. Environmental Protection Agency, Las Vegas, NV.

Mushak, P. 1998. Uses and limits of empirical data in measuring and modeling human lead exposure. *Environ Health Perspect* 106 Suppl 6:1467–84.

National Research Council (NRC) Committee on Measuring Lead in Critical Populations, 1993.

Quimby, W.F. 1986. Selected Topics in Spatial Statistical Analysis: *Nonstationary Vector Kriging, Large Scale Conditional Simulation of Three Dimensional Gaussian Random Fields, and Hypothesis Testing in a Correlated Random Field*. PhD Thesis. University of Wyoming, Laramie. December.

Ryti, R.T. 1993. Superfund Soil Cleanup: Developing the Piazza Road Remedial Design. *J. Air Waste Manage. Assoc* 43:197–202.

Snedecor, G.W. and Cochran, W.G. 1989. *Statistical Methods*. Iowa State University Press. Ames, Iowa.

Syracuse Research Corporation (SRC). 1999. *Assessment of Background Lead Concentrations for the Coeur d'Alene, Idaho River Basin Common Use Areas Risk Assessment Report*. Prepared for U.S. EPA Region 10 under Subcontract No. SE-98-A-713. SRC TR-99-001.

TerraGraphics. 1997a. PanHandle Health District Institutional Controls Program Sampling Plan for Soil Piles and Excavations. November.

TerraGraphics. 1997b. PanHandle Health District Institutional Controls Program Sampling Plan for Gravel Sources. November.

TerraGraphics. 2000. *Final 1999 Five Year Review Report - Bunker Hill Superfund Site*. April.

TerraGraphics. 2001. *Data Summary Report for Six-Month Sampling Results, House Dust Pilot Project 2000.* August.

U.S. Department of Defense/U.S. Environmental Protection Agency (DOD/EPA). *Memorandum, Subject: Management of Lead-Based Paint in Residential and Non-Residential Areas at Base Realignment and Closure (BRAC) Properties*. March 17. 1999a.

U.S. Department of Defense (DOD)/U.S. Environmental Protection Agency (EPA). *Department of Defense and the Environmental Protection Agency Lead-Based Paint Guidelines for Disposal of Department of Defense Residential Real Property-A Field Guide*. Interim Final. December 1999b.

U.S. Department of Housing and Urban Development (HUD). Housing and Community Development Act of 1992. *Title X Residential Lead-Based Paint Hazard Reduction Act of 1992.* Public Law 102-550. U.S. Housing and Urban Development. Washington, D.C. 1992.

U.S. Department of Housing and Urban Development (HUD). *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing*. June. 1995.

U.S. Department of Housing and Urban Development (HUD). *Lead-Based Paint Poisoning Prevention in Certain Residential Structures.* 24 CFR Part 35.
Available online: http://www.access.gpo.gov/nara/cfr/cfr-table-search.html. 2001.

1986 U.S. EPA
U.S. Environmental Protection Agency (EPA). *Air Quality Criteria for Lead Volume I-IV*. Environmental Criteria and Assessment Office, Office of Research and Development, RTP, NC. EPA/600/8-83-028. 1986.

1988 U.S. EPA
U.S. Environmental Protection Agency (EPA). *CERCLA Compliance with Other Laws Manual: Interim Final*. Office of Emergency and Remedial Response, Washington, DC. EPA 540-G-89-006. August 1988.

1989 U.S. EPA
U.S. Environmental Protection Agency (EPA). *Human Health Evaluation Manual, Part A, Risk Assessment Guidance for Superfund, Volume I, Interim Final*. Office of Emergency and Remedial Response, Washington, DC. EPA/540/1-89/002. 1989.

1990 U.S. EPA
U.S. Environmental Protection Agency (EPA). *Report of the Clean Air Act Scientific Advisory Committee on its Review of the OAQPS Lead Staff Paper and the ECAO Air Quality Criteria Document Supplement.* EPA-SAB-CASAC-90-002. January 1990a.

U.S. Environmental Protection Agency. *National Oil and Hazardous Substances Pollution Contingency Plan*. Final Rule. 40 CFR 300. 55 Federal Register, 8666–8865, March 8. Washington, DC. 1990b.

U.S. Environmental Protection Agency. *OSWER Directive 9833.0-1a: Guidance on CERCLA Section 106(a) Unilateral Administrative Orders for Remedial Designs and Remedial Actions. (March 1990).* Available online:
http://www.epa.gov/compliance/resources/policies/cleanup/superfund/cerc106-uao-rpt.pdf. 1990c

1992 U.S. EPA
U.S. Environmental Protection Agency (EPA). Community Relations. 40 CFR 300.430(c)(2)(iv). 1992.

1994 U.S. EPA
U.S. Environmental Protection Agency (EPA). *OSWER Directive: Revised Interim Soil Lead (Pb) Guidance for CERCLA Sites and RCRA Corrective Action Facilities*. EPA/540/F-94/043 PB94-963282. (August 1994). Available online: http://www.epa.gov/superfund/programs/lead/products/oswerdir.pdf. 1994a.

U.S. Environmental Protection Agency (EPA). *Guidance Manual for the Integrated Exposure Uptake Biokinetic Model for Lead In Children*. EPA/540/R-93/081 PB93-963510, (February 1994). 1994b.

1995 U.S. EPA
U.S. Environmental Protection Agency (EPA). *Land Use in the CERCLA Remedy Selection Process. May*. OSWER Directive 9355.7-04. 1995a.

U.S. Environmental Protection Agency (EPA). *Guidance for Community Advisory Groups at Superfund Sites. December*. OSWER Directive 9230.0-28 PB94-963293 EPA 540-K-96-001.
Available online: http://www.epa.gov/superfund/tools/cag/resource.htm. 1995b.

U.S. Environmental Protection Agency (EPA). Engineering Forum Issue: Determination of Background Concentrations of Inorganics in Soils and Sediments at Hazardous Waste Sites. Office of Research and Development. EPA/540/S-96/500. 1995c.

1996 U.S. EPA
U.S. Environmental Protection Agency (EPA). *Record of Decision. Bunker Hill Mining & Metallurgical Complex*. Shoshone County, Idaho. Office of Emergency and Remedial Response. Washington, DC. 1996a.

U.S. Environmental Protection Agency (EPA). *Urban Soil Lead Abatement Demonstration Project*, Vol. I: Integrated Report. Office of Research and Development. 1996b.

U.S. Environmental Protection Agency (EPA). *Soil Screening Guidance.* July. Pub 9355.4-23.
Available online: http://www.epa.gov/superfund/resources/soil/ssg496.pdf. 1996c.

U.S. Environmental Protection Agency (EPA). Region 1, EPA-New England. *Standard Operating Procedure for Elemental Analysis Using the X-MET 920 Field X-RAY Fluorescence Analyzer.* Available online: http://www.epa.gov/NE/measure/xray/xrayfluor.html. 1996d.

1997 U.S. EPA

U.S. Environmental Protection Agency (EPA). *Record of Decision. Tar Creek. Ottawa County, Oklahoma*. Office of Emergency and Remedial Response. Washington, DC. 1997a

U.S. Environmental Protection Agency (EPA). *Lead Site Response Decisions: Formation of the Lead Sites Consultation Group.* Memo from Steve Luftig dated May 29, 1997. 1997b.

U.S. Environmental Protection Agency (EPA). *OSWER Directive 9200.1-18FS: Consolidated Guide to Consultation Procedures for Superfund Response Decisions.* EPA/540-F-97-009. May 1997. 1997c.

U.S. Environmental Protection Agency (EPA). *Rules of Thumb for Superfund Remedy Selection.* August. EPA 540-R-97-013 OSWER Directive 9285.6-07,P PB97-963301.
Available online: http://www.epa.gov/superfund/resources/rules/. 1997d.

U.S. Environmental Protection Agency (EPA). *Best Management Practices (BMPS) for Soil Treatment Technologies: Suggested Guidelines to Prevent Cross-Media Transfer of Contaminants During Clean-Up Activities.* EPA 530/R97/007. 1997e.

1998 U.S. EPA

U.S. Environmental Protection Agency (EPA). *OSWER Directive: Clarification to the 1994 Revised Interim Soil Lead (Pb) Guidance for CERCLA Sites and RCRA Corrective Action Facilities.* EPA/540/F-98/030, OSWER Directive 9200.4-27P, PB98-963244. (August 1998).
Available online: http://www.epa.gov/superfund/programs/lead/products/oswer98.pdf. 1998a.

U.S. Environmental Protection Agency (EPA). *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*. Vol IA, SW-846, Method 6200, Revision 0, January. 1998b.

U.S. Environmental Protection Agency (EPA). *Short Sheet: IEUBK Model Mass Fraction of Soil in Indoor Dust (M_{SD}) Variable (June 1998)*. EPA #540-F-00-008, OSWER #9285.7-34.
Available online: http://www.epa.gov/oerrpage/superfund/programs/lead/products/ssmsdcol.pdf. 1998c.

1999 U.S. EPA

U.S. Environmental Protection Agency (EPA). *Protect Your Family From Lead in Your Home*. EPA 747-K-99-001. April 1999a.

U.S. Environmental Protection Agency (EPA). *Interim Policy on the Use of Permanent Relocations as Part of Superfund Remedial Actions. (June 1999)*. EPA #540-F-98-033, OSWER #9355.0-71P. Available online: http://www.epa.gov/oerrpage/superfund/tools/topics/relocation/index.htm. 1999b.

2000 U.S. EPA

U.S. Environmental Protection Agency (EPA). *Comprehensive Environmental Response, Compensation, and Liability*. 42USC103. Section9621(c). Washington, DC. 2000a.

U.S. Environmental Protection Agency (EPA). *Grants for Technical Assistance.* 40 CFR Part 35, Subpart M. Available online: http://www.epa.gov/superfund/tools/tag/resource.htm. 2000b.

U.S. Environmental Protection Agency (EPA). *Short Sheet: TRW Recommendations for Sampling and Analysis of Soil at Lead (Pb) Sites (April 2000)*. EPA #540-F-00-010, OSWER #9285.7-38.
Available online: http://www.epa.gov/oerrpage/superfund/programs/lead/products/sssiev.pdf. 2000c.

U.S. Environmental Protection Agency (EPA). *Guidance for the Data Quality Objectives Process*. EPA QA/G-4. U.S. Environmental Protection Agency. Washington, D.C. 2000d.

U.S. Environmental Protection Agency (EPA). *Bunker Hill Populated Areas Operable Unit First Five Year Review Report.* Volume I, Seattle, WA. September 27, pp. 48. 2000e.

U.S. Environmental Protection Agency (EPA). *Institutional Controls: A Site Manager's Guide to Identifying, Evaluating and Selecting Institutional Controls at Superfund and RCRA Corrective Action Cleanups*. September 29. EPA 540-F-00-005, OSWER Directive 9355.0-74FS-P.
Available online: http://www.epa.gov/oerrpage/superfund/action/ic/guide/guide.pdf. 2000f.

U.S. Environmental Protection Agency (EPA). *Institutional Controls and Transfer of Real Property under CERCLA Section 120(h)3(A), (B), or (C)*. February 2000.
Available online: http://www.epa.gov/swerffrr/documents/fi-icops_106.htm. 2000g.

2001 U.S. EPA

U.S. Environmental Protection Agency (EPA). *Lead; Identification of Dangerous Levels of Lead*; Final Rule. FR Vol. 66 No. 4. January 5. Available online : http://www.epa.gov/lead/403_final.pdf. 2001a.

U.S. Environmental Protection Agency (EPA). *Reuse Assessments: A Tool To Implement The Superfund Land Use Directive. June*. OSWER Directive 9355.7-06P. 2001b

U.S. Environmental Protection Agency (EPA). *Abandoned Mine Site Characterization and Cleanup Handbook*. Appendix E "X-Ray Fluorescence". EPA 530-R-01-002, March 2001. 2001c.

U.S. Environmental Protection Agency (EPA). *Integrating Dynamic Field Activities Into the Superfund Response Process: A Guide for Project Managers*. Draft Final. December.
Available online: http://www.epa.gov/superfund/programs/dfa/. 2001d.

U.S. Environmental Protection Agency (EPA). *Field Analytical Technologies Encyclopedia (FATE)*. Accessed on December 17, 2001. Available online: http://fate.clu-in.org/. 2001e.

U.S. Environmental Protection Agency (EPA). *Site Assessment Guidance CD*.
Available online: http://www.epa.gov/oerrpage/superfund/sites/phonefax/descript/siteassess.htm. 2001f.

U.S. Environmental Protection Agency (EPA). *Site Assessment Web Site*. Available online: http://www.epa.gov/superfund/programs/siteasmt/index.htm. 2001g.

U.S. Environmental Protection Agency (EPA). *Comprehensive Five-Year Review Guidance*. EPA 540-R-01-007. OSWER Directive 9355.7-03B-P. June. Available online:
http://www.epa.gov/oerrpage/superfund/sites/phonefax/descript/siteassess.htm. 2001h.

U.S. Environmental Protection Agency (EPA). *Guidance for Characterizing Background Chemicals in Soil at Superfund Sites*. *External Review Draft.* EPA 540-R-01-003. OSWER Directive 9285.7-4-1. June.
Available online: http://www.epa.gov/superfund/programs/risk/background.pdf. 2001i.

2002 U.S. EPA

U.S. Environmental Protection Agency (EPA). *Role of Background in the CERCLA Cleanup Program.* April 26. OSWER Directive 9285.6-07P.
Available online: http://www.epa.gov/superfund/programs/risk/role.pdf. 2002.

von Lindern, I. and Spalinger, S. *Memorandum to Lead Remediation Review Group Regarding Interim Preventative Risk Management Activities Dust Mat Monitoring Proposed Protocol*. TerraGraphics. September 14. 2001.

APPENDIX A

TITLE X AND EPA'S TOXIC SUBSTANCES CONTROL ACT (TSCA) TITLE IV LEAD PROGRAM

TITLE X AND EPA'S TOXIC SUBSTANCES CONTROL ACT (TSCA) TITLE IV LEAD PROGRAM

Background

The Housing and Community Development Act of 1992 (PL102-550) contained Title X the "Residential Lead-Based Paint Hazard Reduction Act of 1992" (HUD, 1992). Even though this was a U.S. Department of Housing and Urban Development (HUD) authorization bill, it established a series of requirements for EPA. Title X includes a new Title IV of the Toxics Substances Control Act (TSCA). The sections that address EPA alone have section numbers in the four hundred (400) series, such as Section 403, Health Based Standards, whereas the HUD portions have numbers in the one thousand (1000) series, such as Section 1015, Task Force. There is one section, Section 1018, that Congress required both HUD and EPA to jointly issue a rule on disclosure.

Overview

Title X addresses LBP and LBP hazards and requires EPA and HUD to issue regulations to address those items. Title X's emphasis is on actual hazards such as deteriorating paint, lead in dust, or lead in soil versus potential hazards such as intact paint. Generally, Title X does not mandate inspections, risk assessments, abatements of LBP, or LBP hazards. The exceptions are HUD program related actions (Section 1012) or when a federal agency disposes of a property that will be used for residential purposes (Section 1013). However, if you choose to do an inspection, risk assessment, or abatement, Title X establishes certification requirements and work practice standards that must be followed. Title X requires disclosure at the time of sale or rental (Section 1018) and the provision of a brochure *Protect Your Family from Lead in Your Home* (EPA, 1999a), before rehabilitation (Section 406b). EPA may authorize state programs to operate in lieu of the federal program for the 400 series regulations but not Section 1018. See Appendix A for a full discussion of Title X.

Scope of Title X

Title X contains specific classes of structures that it regulates. The first category is "target housing", which is defined as "...any housing constructed prior to 1978 except housing for the elderly or persons with disabilities (unless any child who is less than 6 years of age resides or is expected to reside in such housing for the elderly or persons with disabilities) or any 0-bedroom dwelling."

The second category is "child occupied facilities", which are defined as "... a building or a portion of a building, constructed prior to 1978, visited regularly by the same child, 6 years of age or under, on at least two different days within any week (Sunday through Saturday period), provided that each day's visit lasts at least 3 hours and the combined weekly visit lasts at least 6 hours, and the combined annual visits last at least 60 hours. Child-occupied facilities may include, but are not limited to, day-care centers, preschools and kindergarten classrooms" (EPA, 2001a).

As of December 2001 target housing and child occupied facilities are the only classes of structures for which EPA has issued final regulations.

CERCLA 121(e)(1) exempts any response action conducted entirely on-site from having to obtain a federal, state, or local permit, where the action is carried out under §121. In general, on-site actions need to comply only with the substantive aspects of ARARs and not with the corresponding administrative requirements. Therefore, the administrative requirements laid out under TSCA 402 and 403 are not considered ARARs for actions conducted entirely on-site.

More Information

Section 405 requires EPA to establish a Hot Line and Clearing House for lead. This has been done and the National Lead Information Center's toll free number is 1-(800)-424-LEAD. Additionally the EPA web site at www.epa.gov/lead has all the rules, fact sheets, and guidance documents that the EPA Office of Pollution Prevention and Toxics has developed.

Description of the Sections of Title X

Title X Final Rules in Effect for ONLY Target Housing:

Section 1012. This section establishes the requirements for those who get assistance or mortgage insurance from HUD. The requirements are HUD program specific, but only pertain to those who are involved with a particular HUD program.

Section 1013. This section establishes the requirements for federal agencies that dispose of target housing that will be used for residential purposes.

Section 1018. Section 1018 requires that sellers and landlords disclose known LBP and LBP hazards and provide available reports to buyers and renters. Sellers and landlords must also provide a copy of *Protect Your Family from Lead in Your Home* (EPA, 1999a).

This is a joint rule between EPA and HUD. Section 1018 does not include "child occupied facilities"; EPA developed the concept of "child occupied facilities" under TSCA Title IV, the term is only in effect for TSCA four hundred (400) series rules.

TSCA Final Rules in Effect for ONLY Target Housing and Child Occupied Facilities:

Section 402/404 State Certification Programs establishes a nationally consistent federal Program for the certification of individuals and firms engaged in training, paint inspections, risk assessments, and certification of abatement workers, supervisors and training providers. There are two aspects of the program. States and tribes are encouraged to establish a program that as a whole, is at least as protective as EPA's federal program. The state programs can be more protective. When a state program is approved, it becomes the federal program in that state.

If the state or tribe does not establish an acceptable certification program, EPA operates the national program in that state. Much of the work is done in the EPA Regional Office. As of December 2001, 39 states, the District of Columbia, and 2 tribes have EPA authorized programs. Two states with large populations, which do not have authorized programs, are New York and Florida.

Section 403 establishes hazard standards for lead in paint, dust, and soil. Lead-based paint is a hazard if (1) it is deteriorated; (2) it is present on a friction surface that is subject to abrasion and the dust-lead levels on the nearest horizontal surface are equal to or greater than the applicable dust hazard standard; or (3) it is present on any chewable surface on which there is evidence of teeth marks. (Lead-based paint is statutorily defined as paint containing 1.0 milligram or more lead per square centimeter or 0.5% or more lead by weight.) Dust is a hazard if it contains 40 micrograms or more lead per square foot on floors or 250 micrograms or more lead per square foot on window sills. Soil is a hazard if it contains 400 parts per million or more in play areas or 1,200 parts per million or more in the rest of the yard.

This regulation also established the following clearance levels for interior dust: 40 micrograms lead per square foot for floors, 250 micrograms lead per square foot for window sills, and 400 micrograms lead per square foot for window troughs.

EPA's Section 403 rule was intended to prioritize risks as opposed to being inclusive of situations in which risks of concern exist. Per the rule preamble, *"The hazard standard in this TSCA rule was intended as a ''worst first'' level that will aid in setting priorities to address the greatest lead risks promptly at residential and child-occupied facilities affected by lead-based paint"* (EPA, 2001a). While identification of lead hazards (as defined under TSCA) is a necessary part of the facility reuse process, a minimal approach that would insure only that the letter of the hazard standards are met may not protect against some important risks.

Section 405 establishes standards of environmental sampling laboratories. The National Lead Laboratory Accreditation Program (NLLAP) is administered by the American Industrial Hygiene Association and the American Association for Laboratory Accreditation. All laboratory samples must be analyzed by an NLLAP accredited laboratory.

Section 406b requires that the pamphlet *Protect Your Family from Lead in Your Home* (EPA, 1999a) be distributed no more than 60 days before a renovation in the home.

TSCA Rules Being Developed

Section 402. Renovation and remodeling requirements for target housing and child occupied facilities are being drafted as a proposed rule. Requirements for bridges and structures constructed prior to 1978 are being drafted for re-proposal. Both of these could include training, certification, and work practice standards.

Lead-based Paint Debris. This rule was not required by Title X, but the need was clearly there to treat portions of the debris from lead-based activities differently than the RCRA requirements. There are two categories of waste discussed. First is the paint chips and dust, sludges and filtercakes, wash water and contaminated and decontaminated protective clothing equipment that would continue to be subject to all the requirements of RCRA. Second is the "lead-based paint architectural component debris", which would be exempt from the Toxicity Characteristics rule including Toxicity Characteristic Leaching Procedure (TCLP) testing for lead only. This would allow disposal of these components at construction-demolition (CD) landfills.

Although the Pb Debris Rule is still being developed, in the interim, **EPA has issued a Memorandum that "Regulatory Status of Waste Generated by Contractors and Residents from Lead-Based Paint Activities Conducted in Households" - signed July 31, 2000.** This memo clarifies the regulatory status of waste generated as a result of LBP activities (including abatement, renovation activities, and remodeling) in homes and other residences. This memo explains why LBP generated by contractors in households is "household waste" and thus excluded from the RCRA Subtitle C hazardous waste regulations. The household exclusion applies only to waste generated by either residents or contractors conducting LBP activities in residents. As a result, LBP waste from residences can be discarded in a municipal solid waste landfill or a municipal solid waste combustor.

APPENDIX B

1998 OSWER Directive 9200.4-27P (‘Clarification’)

9200.4-27
EPA/540/F-98/030
PB98-963244

OSWER Directive # 9200.4-27P

MEMORANDUM

SUBJECT: Clarification to the 1994 Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities

FROM: Timothy Fields, Jr.
Acting Assistant Administrator

TO: Regional Administrators I-X

PURPOSE

This directive clarifies the existing 1994 Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, OSWER Directive 9355.4-12. Specifically, this directive clarifies OSWER's policy on (1) using EPA's Science Advisory Board (SAB) reviewed Integrated Exposure Uptake Biokinetic Model (IEUBK) and blood lead studies, (2) determining the geographic area to use in evaluating human exposure to lead contamination ("exposure units"), (3) addressing multimedia lead contamination and (4) determining appropriate response actions at lead sites. The purpose for clarifying the existing 1994 directive is to promote national consistency in decision-making at CERCLA and RCRA lead sites across the country.

BACKGROUND

OSWER Directive 9355.4-12, issued on July 14, 1994 established OSWER's current approach to addressing lead in soil at CERCLA and RCRA sites. The existing directive established a streamlined approach for determining protective levels for lead in soil at CERCLA sites and RCRA facilities as follows:

- It recommends a 400 ppm screening level for lead in soil at residential properties;
- It describes how to develop site-specific preliminary remediation goals (PRGs) at CERCLA sites and media cleanup standards at RCRA Corrective Action facilities for residential land use; and,
- It describes a strategy for management of lead contamination at CERCLA sites and RCRA Corrective Action facilities that have multiple sources of lead.

The existing interim directive provides direction regarding risk assessment and risk management approaches for addressing soil lead contaminated sites. The OSWER directive states that, " ... implementation of this guidance is expected to provide more consistent decisions across the country ..." However, since that directive was released, OSWER determined that clarification of the guidance is needed. Key areas being clarified by issuance of this directive include: (1) using the IEUBK model and blood lead studies, (2) determining exposure units to be considered in evaluating risk and developing risk management strategies, (3) addressing multimedia lead contamination and (4) determining appropriate response actions at residential lead sites. The existing directive provides the following guidance on these areas:

1. The OSWER directive recommends using the Integrated Exposure Uptake Biokinetic (IEUBK) Model for Lead in Children (Pub. # 9285.7-15-1, PB93-963510) for setting site-specific residential preliminary risk-based remediation goals (PRGs) at CERCLA sites and media cleanup standards (MCSs) at RCRA corrective actions Facilities. The directive states that the IEUBK model is the best tool currently available for predicting the potential blood lead levels of children exposed to lead in the environment. OSWER's directive also recommends the evaluation of blood lead data, where available, and states that well-conducted blood lead studies provide useful information to site managers. The directive however recommends that "... blood lead data not be used alone to assess risk from lead exposure or to develop soil lead cleanup levels."

2. The directive describes OSWER's risk reduction goal as "...generally, OSWER will attempt to limit exposure to soil lead levels such that a typical (or hypothetical) child or group of similarly exposed children would have an estimated risk of no more than 5% of exceeding a 10 ⁻g/dl blood lead level." The directive also states that "... EPA recommends that a soil lead concentration be determined so that a typical child or group of children exposed to lead at this level would have an estimated risk of no more than 5% of exceeding a blood lead of 10 ⁻g/dl." OSWER generally defines an exposure unit as a geographic area where exposures occur to the receptor of concern during the time of interest and believes that for a child or group of similarly exposed children, this is typically the individual residence and other areas where routine exposures are occurring.

3. The directive recommends that risk managers assess the contribution of multiple environmental sources of lead to overall lead exposure (e.g., consideration of the importance of soil lead levels relative to lead from drinking water, paint, and household dust) which promotes development of risk reduction strategies that address all sources that contribute significantly to exposure.

4. The OSWER directive states that the IEUBK model is not the only factor to be considered in establishing lead cleanup goals. Rather, the IEUBK model is the primary risk assessment tool available for evaluating lead risk and the results of the model are used to guide selection of appropriate risk management strategies for each site.

Since the OSWER directive was issued in 1994, there has been a trend toward a more consistent approach to managing risk at residential lead sites, however, OSWER was interested in identifying areas requiring additional clarification to facilitate more effective implementation of the directive. As a first step in the process, meetings were held with various EPA Regions, States and local governments to discuss how the directive has been implemented nationally at lead sites since 1994. By participating in these meetings and by reviewing the decisions that are being made across the country, OSWER believed that clarification of certain aspects of the 1994 directive would be useful.

All of the documents and guidance referenced in this directive are available through the National Technical Information Service (NTIS) at 703-605-6000 or could be downloaded electronically from: http//epa.gov/superfund/oerr/ini_prod/lead/prods.htm.

OBJECTIVE

At lead contaminated residential sites, OSWER seeks assurance that the health of the most susceptible population (children and women of child bearing age) is protected and promotes a program that proactively assesses and addresses risk. OSWER believes that predictive tools should be used to evaluate the risk of lead exposure, and that cleanup actions should be designed to address both current and potential future risk.

While health studies, surveys, and monitoring can be valuable in identifying current exposures and promoting improved public health, they are not definitive tools in evaluating potential risk from exposure to environmental contaminants. In the case of lead exposure, blood lead monitoring programs can be of critical importance in identifying individuals experiencing potential negative health outcomes and

directing education and intervention resources to address those risks. However, CERCLA §121(b) requires EPA to select cleanup approaches that are protective of human health and the environment and that utilize permanent solutions to the maximum extent practicable. To comply with the requirements set forth in CERCLA §121(b), OSWER will generally require selection of cleanup programs that are proactive in mitigating risk and that do not simply rely on biological monitoring programs to determine if an exposure has already occurred.

To meet these objectives, OSWER will seek actions that limit exposure to soil lead levels such that a typical child or group of similarly exposed children would have an estimated risk of no more than 5% of exceeding a 10 ìg/dl blood lead level. If lead is predicted to pose a risk to the susceptible population, OSWER recommends that actions be taken to significantly minimize or eliminate this exposure to lead.

The principles laid out in the **four attached fact sheets** (Appendix) support OSWER's goals by encouraging appropriate assessment and response actions at CERCLA and RCRA lead sites across the country.

This clarification directive emphasizes the following key messages regarding the four areas and encourages the users of this directive, be they EPA Regions, States, or other stakeholders, to adopt these principles in assessing and managing CERCLA and RCRA lead sites across the country. The critical elements of the attached papers are as follows:

*I. Using Blood Lead Studies and IEUBK Model at Lead Site*s:

OSWER emphasizes the use of the IEUBK Model for estimating risks for childhood lead exposure from a number of sources, such as soils, dust, air, water, and other sources to predict blood lead levels in children 6 months to 84 (7 years) months old. The 1994 directive also recommended evaluation of available blood lead data and stated that data from a well-conducted blood lead study of children could provide useful information to site managers. In summary, OSWER's clarification policy on the appropriate use of the IEUBK and blood lead studies is that:

- OSWER recommends that the IEUBK model be used as the primary tool to generate risk-based soil cleanup levels at lead sites for current or future residential land use. If Regions propose an alternative method for generating cleanup levels, they are required to submit their approach to the national Lead Sites Consultation Group (LSCG)[1] for review and comment;

- Response actions can be taken using IEUBK predictions alone; blood lead studies are not required; and

- Blood lead studies and surveys are useful tools at lead sites and can be used to identify key site-specific exposure pathways and to direct health professionals to individuals needing immediate assistance in minimizing lead exposure; however, OSWER recommends that blood lead studies not be used for establishing long-term remedial or non-time-critical removal cleanup levels at lead sites.

II. Determining Exposure and Remediation Units at Lead Sites

---

[1]The Lead Sites Consultation Group (LSCG) is comprised of senior management representatives from the Waste Management Divisions in all 10 EPA regions along with senior representatives from the Office of Emergency and Remedial Response in EPA headquarters. The LSCG is supported by EPA's Technical Review Workgroup (TRW) for lead and the national Lead Sites Workgroup (LSW). The TRW consists of key scientific experts in lead risk assessment from various EPA Regions, labs and headquarters. The LSW is comprised of senior Regional Project Managers from various Regions and key representatives from headquarters who are experienced in addressing lead threats at Superfund sites.

OSWER recommends that cleanup levels at lead sites be designed to reduce risk to a typical or individual child receiving exposures at the residence to meet Agency guidelines *(i.e*., no greaterthan a 5% chance of exceeding a 10 ：g/dl blood lead level for a full-time child resident). Therefore, it is recommended that risk assessments conducted at lead-contaminated residential sites use the individual residence as the primary exposure unit of concern. This does not mean that a risk assessment should be conducted for every yard, rather that the soil lead contamination data from yards and other residential media (for example, interior dust and drinking water) should be input into the IEUBK model to provide a preliminary remediation goal (PRG) for the residential setting. When applicable, potential exposure to accessible site-related lead sources outside the residential setting should also be evaluated to understand how these other potential exposures contribute to the overall risk to children, and to suggest appropriate cleanup measures for those areas.

III. Addressing Multimedia Contamination at Lead Sites

EPA generally has limited legal authority to use Superfund to address exposure from **interior lead-based paint**. As a policy matter, OSWER recommends that such exposures not be addressed through actual abatement activities. However, EPA Regions should promote addressing interior paint risks through actions by others (*e.g.*, potentially responsible parties (PRPs), other government programs, etc.) as a component of an overall site management strategy. Because of other competing demands on the Superfund Trust Fund, OSWER recommends that EPA Regions avoid using the Superfund Trust Fund for removing **exterior lead-based paint** and soil contaminated from lead-based paint. Superfund dollars *may* however be used in limited circumstances to remediate exterior lead-based paint in order to protect the overall site remedy (*i.e.*, to avoid re-contamination of soils that have been remediated) but generally only after determining that other funding sources are unavailable. As with interior lead-based paint abatement, EPA Regions should promote remediation of exterior lead-based paint by others, such as PRPs, local governments or individual homeowners.

IV. Determining Appropriate Response Actions at Lead Sites

In selecting site management strategies, it is OSWER's preference to seek early risk reduction with a combination of engineering controls (actions which permanently remove or treat contaminants, or create reliable barriers to mitigate the risk of exposure) and non-engineering response actions. All potential lead sources should be identified in site assessment activities. Non-engineering response actions, such as education and health intervention programs, should be considered an integral part of early risk reduction efforts because of their potential to provide immediate health benefits. In addition, engineering controls should be implemented early at sites presenting the greatest risk to children and other susceptible subpopulations.

As a given project progresses, OSWER's goal should be to reduce the reliance on education and intervention programs to mitigate risk. The goal should be cleanup strategies that move away from reliance on long-term changes in community behavior to be protective since behavioral changes may be difficult to maintain over time. The actual remedy selected at each CERCLA site must be determined by application of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (55 FR 8666- 8865, March 8, 1990) remedy selection criteria to site-specific circumstances. This approach also recognizes the NCP preference for permanent remedies and emphasizes selection of engineering over non-engineering remedies for long-term response actions.

This directive clarifies OSWER's policy on four key issue areas addressed in the 1994 OSWER soil lead directive in order to promote a nationally consistent decision-making process for assessing and managing risks associated with lead contaminated sites across the country. The policy presented in these specific issue areas supersedes all existing OSWER policy and directives on these subjects. No other aspects of the existing 1994 directive are affected.

IMPLEMENTATION

The principles laid out in this directive (which includes the four attached factsheets) are meant to apply to all residential lead sites currently being evaluated through the CERCLA Remedial Investigation/Feasibility Study process and all future CERCLA Sites and RCRA Corrective Action Facilities contaminated with lead. The Regions will be required to submit their rationale for deviating from the policies laid out in this directive to the Lead Sites Consultation Group. This directive does not apply to previous remedy selection decisions.

Attachments

cc: Waste Management Policy Managers (Regions I-X)
Stephen Luftig, OERR
Elizabeth Cotsworth, OSW
James Woolford, FFRRO
Barry Breen, OSRE
Larry Reed, OERR
Tom Sheckells, OERR
Murray Newton, OERR
Betsy Shaw, OERR
John Cunningham, OERR
Paul Nadeau, OERR
Bruce Means, OERR
Earl Salo, OGC

NOTICE: This document provides guidance to EPA staff. The document does not, however, substitute for EPA's statutes or regulations, nor is it a regulation itself. Thus it cannot impose legally-binding requirements on EPA, states, or the regulated community, and may not apply to a particular situation based upon the circumstances. EPA may change this guidance in the future, as appropriate.

Factsheet: Using the IEUBK Model and Blood Lead Studies at Residential Lead Sites

Question: What is OSWER's policy on using the IEUBK model and blood lead studies in conducting risk assessments and setting cleanup standards at residential lead contamination sites?

Answer: OSWER's policy on using the IEUBK model and blood lead studies in conducting risk assessment and setting cleanup standards is as follows:

A. Use of the IEUBK Model:

1. The IEUBK model is a good predictor of potential long-term blood lead levels for children in residential settings. OSWER recommends that the IEUBK model be used as the primary tool to generate risk-based soil cleanup levels at lead sites for current or future residential land use. If Regions propose an alternative method for generating cleanup levels, they are required to submit their approach to the National Lead Sites Consultation Group (LSCG) for review and comment.

2. Blood lead distributions predicted by the IEUBK model illustrate a plausible range of variability in children's physiology, behavior, and household conditions.

3. Response actions can be taken, and remedial goals developed, using IEUBK predictions alone.

B. Use of Blood Lead Studies/Data:

1. Blood lead studies, surveys, and monitoring are useful tools at lead sites and can be used to help identify key site-specific exposure pathways and direct health professionals to individuals needing immediate assistance in minimizing lead exposure.

2. The utility of blood lead testing results and studies depends on how representative the information is of the population being evaluated, the design of the data collection, and the quality of the laboratory analysis. To this end, OSWER recommends that EPA Regions consult with ATSDR or CDC to assess or design studies according to their intended use.

3. Many blood lead screening, monitoring, or testing programs differ from blood lead studies in that they do not attempt to identify risk factors for childhood exposure to lead sources. Although these programs may be extremely beneficial in identifying children with elevated blood lead levels and identifying candidates for referral to medical professionals for evaluation, they may not provide an accurate representation of community-wide exposure.

4. Well-designed blood lead studies may be used to identify site specific factors and pathways to be considered in applying the IEUBK model at residential lead sites. However, OSWER recommends that blood lead studies not be used to determine future long-term risk where exposure conditions are expected to change over time; rather, they should be considered a snapshot of ongoing exposure under a specific set of circumstances (including community awareness and education) at a specific time. Long-term studies may be helpful in understanding exposure trends within a community and evaluating the effectiveness of cleanup strategies over time.

C. IEUBK and Blood Lead Studies/Data:

1. Blood lead data and IEUBK model predictions are expected to show a general concordance for most sites. However, some deviations between measured and predicted levels are expected. On some occasions, declines in blood lead levels have been observed in association with lead exposure-reduction and health education. However, long-term cleanup goals should be protective

in the absence of changes in community behavior as there is little evidence of the sustained effectiveness of these education/intervention programs over long periods of time.

2. Where actual blood lead data varies significantly from IEUBK Model predictions, the model parameters should not automatically be changed. In such a case, the issue should be raised to the Lead Technical Review Workgroup (TRW) to further identify the source of those differences. Site work need not be put on hold while the issue is being reviewed by the TRW; the site manager should review other elements of the lead directive and the "Removal Actions at Lead Sites" guidance to determine appropriate interim actions to be taken at the site.

The Regions will be required to submit their rationale for deviating from the policies laid out in this factsheet to the Lead Sites Consultation Group.

Factsheet: Determining Exposure and Remediation Units at Residential Lead Sites

Question: How does OSWER define an exposure unit, and subsequently apply this definition in conducting risk assessment and risk management activities at residential lead sites?

Answer: OSWER recognizes that defining and characterizing exposure unit(s) for a site is critically important in undertaking risk assessment activities and in designing protective cleanup strategies. An **exposure unit** is defined as a geographic area where exposures occur to the receptor of concern during the time of interest and that for a child, or group of similarly exposed children, this is typically the individual residence and other areas where chronic or ongoing exposures are occurring.

Various approaches to characterizing and managing risks by exposure units have been examined by OSWER. OSWER recognizes that lead ingestion can also cause adverse health effects in adults and fetuses but believes that by adequately limiting lead exposures to young children at residential sites, these other receptors will generally be likewise protected from adverse health impacts.

EPA's goal is to protect human health and the environment under current and future exposure scenarios. At lead sites, OSWER wants to assure that children's health is protected and promotes a program that proactively assesses risks rather than relying on biological monitoring to determine if an exposure has already occurred. OSWER emphasizes actions be taken at lead sites that will minimize or eliminate exposure of children to environmental lead contamination.

To achieve the above stated goal, OSWER recommends characterizing **exposure units as exposure potential at the individual residence as the primary unit of concern for evaluating potential risk at lead contaminated residential sites**. This recognizes that there are children whose domain and activities occur principally within the confines of a particular residential property. For determining exposure potential (and ultimately developing protective cleanup levels) at the individual home, OSWER recommends the scenario to be evaluated (through use of the IEUBK Model) would be a young child in full-time residence. This approach helps achieve OSWER's recommended health protection goal that an individual child or group of similarly exposed children would have <5% chance of exceeding a blood lead concentration of 10 • g/dl. In designing community wide cleanup strategies, it is essential that non-residential areas (*e.g.*, parks, day care facilities, playgrounds, etc.), where lead exposure may occur, also be characterized with respect to their contribution to soil-lead exposure, and appropriate cleanup actions implemented.

OSWER recommends that risk management decisions for response to residential lead contamination sites focus on reducing risk at residences, but also recommends that response strategies be developed for other site locations (exposure units) where children receive exposure. Flexibility in determining appropriate response actions that provide protection at the individual residence should be considered in context of the NCP remedy selection criteria. The lead exposure issues are complex and OSWER recommends that EPA Regions try to communicate clearly the risk characterization and risk management decisions to the site residents. Affected communities must clearly understand the context of risk management decisions, how these decisions affect the health of their children, and how cleanup actions will influence the future growth and development of the community.

The Regions will be required to submit their rationale for deviating from the policies laid out in this factsheet to the Lead Sites Consultation Group.

Factsheet: Addressing Multimedia Contamination at Residential Lead Sites

Question: What is OSWER's policy on addressing multimedia contamination at residential lead sites?

Answer: OSWER recognizes that several sources of lead-contamination, including soil, ground water, airborne particulates, lead plumbing, interior dust, and interior and exterior lead-based paint may be present at Superfund sites where children are at risk or have documented lead exposure. These lead sources may contribute to elevated blood lead levels and may need to be evaluated in determining risks and cleanup actions at residential lead sites. However, there are limitations on the Agency's statutory authority under CERCLA to abate some of these sources, such as indoor lead-based paint and lead plumbing because CERCLA responses may be taken only to releases or threatened releases into the environment (CERCLA §104 (a)(3) and (4)).

When EPA's resources, or authority to respond or to expend monies under Superfund is limited, OSWER recommends that EPA Regions identify and coordinate to the greatest extent possible with other authorities and funding sources (*e.g.*, other federal agencies and state or local programs). EPA Regions should coordinate with these other authorities to design a comprehensive, cost-effective response strategy that addresses as many sources of lead as practicable. These strategies should include actions to respond to lead-based paint, interior dust, and lead plumbing, as well as ground water sources and lead-contaminated soil.

Although OSWER will encourage that EPA Regions fully cooperate in the development of a comprehensive site management strategy, OSWER realizes that complete active cleanup of these other sources may be difficult to complete due to limited funding available to other authorities. Since complete cleanups of these sources is not guaranteed, and at most sites may be unlikely, OSWER recommends that the soil cleanup levels not be compromised. In other words, the soil cleanup levels should be calculated with the IEUBK model using existing pre-response action site specific data. This is due to the fact that soil cleanup levels at residential lead sites are generally established to protect individuals, from excess exposures to soils, and house dust attributable to those soils, and are not attributable to exposure to other sources such as interior lead paint which should be managed on a residence specific basis. Remediation of non-soil lead sources to mitigate overall lead exposure at individual residences should therefore not be used to modify site-wide soil lead cleanup levels.

The recommendations provided below represent OSWER's policy on addressing lead-contaminated media and/or sources for which EPA has limited or no authority to remediate.

Interior Paint: EPA has limited legal authority to use Superfund to address exposure from interior lead-based paint. As a policy matter, OSWER recommends that such exposures not be addressed through actual abatement activities. However, EPA Regions should promote addressing interior paint risks through actions by others, such as HUD, local governments, or individual home owners as a component of an overall site management strategy. Any activities to clean up interior lead-based paint by PRPs or other parties should not result in an increase of the risk-based soil cleanup levels.

Exterior Paint: Because of other competing demands on the Superfund Trust Fund, OSWER recommends that EPA Regions avoid using the Superfund Trust Fund for removing exterior lead-based paint and soil contaminated from lead-based paint. Superfund dollars *may* be used to respond to exterior lead-based paint for protecting the overall site remedy (*i.e.*, to prevent re-contamination of soils that have been remediated) but only after determining that other funding sources are unavailable. Where other sources of funding are not available, EPA may utilize the CERCLA monies to remediate exterior lead-based paint on homes/buildings, around which soil contaminated by other sources has been cleaned up to prevent recontamination of the soil. The Superfund should not be used to remediate exterior lead-based paint where no soil cleanup has occurred. As with interior lead-based paint abatement, EPA Regions

should promote remediation of exterior lead-based paint by others, such as PRPs, local governments or individual homeowners. Cleanup activities of exterior paint conducted by PRPs or other parties should not result in an increase of the risk-based soil cleanup levels.

Interior Dust: Lead contaminated interior dust can be derived from several sources, including interior paint, home owner hobbies, exterior soil, and other exterior sources. In many cases, it may be difficult to differentiate the source(s) for the lead contamination in the dust. In general, EPA Regions should refrain from using the Superfund Trust Fund to remediate interior dust. Because of the multi-source aspects of interior dust contamination, potential for recontamination, and the need for a continuing effort to manage interior dust exposure, OSWER recommends the use of an aggressive health education program to address interior dust exposure. Such programs, administered through the local health department (or other local agency), should be implemented in conjunction with actions to control the dust source. At a minimum, the program should include blood lead monitoring, and personal hygiene and good housekeeping education for the residents. OSWER believes that EPA Regions can also support the program by providing HEPA vacuums to the health agency for use in thoroughly cleaning home interiors.

Lead Plumbing: Generally CERCLA does not provide for legal authority to respond to risks posed by lead plumbing within residential dwellings. It should be noted that the water purveyor is responsible for providing clean water to the residences. As with interior dust, OSWER recommends that EPA Regions coordinate with local agencies to establish a health education program to inform residents of the hazards associated with lead plumbing and how to protect themselves by regularly flushing, or preferably, replacing lead pipes. Soil cleanup levels should not be adjusted to account for possible remediation of lead plumbing.

Factsheet: Determining Appropriate Response Actions at Residential Lead Sites

Question: What is OSWER's position on the appropriate use of engineering and non-engineering response actions in developing risk management strategies for lead sites?

Answer: One goal emphasized in the recent third round of Superfund Reforms is for EPA to take a consistent approach in selecting and implementing both long- and short-term response actions at lead sites in all regions. One obstacle to achieving this consistency has been differing degrees of reliance on non-engineering response actions in reducing risk.

Site management strategies at lead sites typically include a range of response actions. Alternatives range from engineering controls that permanently remove or treat the contaminant source to non-engineering response actions, such as educational programs and land use restrictions. This continuum represents the range of response options available to risk managers. This position paper clarifies the relationship between engineering and non-engineering response actions in developing site management strategies.

In selecting site management strategies, OSWER's policy will be to seek early risk reduction with a combination of engineering controls (actions which permanently remove or treat contaminants, or which create reliable barriers to mitigate the risk of exposure) and non-engineering response actions. All potential lead sources should be identified in site assessment activities. Non-engineering response actions, such as education and health intervention programs, should be considered an integral part of early risk reduction efforts due to their potential to provide immediate health benefits.[2] In addition, engineering controls should be implemented early at sites presenting the greatest risk to children and other susceptible subpopulations. Community concerns should receive a high priority in site decision-making; local support is vital to the success of health intervention and education programs.

As the project progresses, OSWER's goal should be to reduce reliance on education and intervention programs to mitigate risk. The goal should be cleanup strategies that move away from reliance on long-term changes in community behavior to be protective; behavioral changes may be difficult to maintain over time. The actual remedy selected at each site must be determined by application of the NCP remedy selection criteria to site-specific circumstances. However, this approach recognizes the NCP preference for permanent remedies and emphasizes the use of engineering controls for long-term response actions. This approach also recognizes that well-designed health intervention and education programs, when combined with deed restrictions and/or other institutional controls, may be appropriate for reducing future exposure potential and may supplement engineering controls.

In instances where Regions believe that the use of engineering controls is impracticable, and education, health intervention, or institutional controls are proposed as the sole remedy, Regions will be required to consult with the LSCG.

---

[2]The actual effectiveness of health intervention and educational programs in reducing risk continues to be a subject of discussion. Anecdotal information suggests that such programs can provide short-term benefits in some populations. Rigorous statistical studies demonstrating the benefits of educational programs in preventing lead exposure are lacking. It is generally recognized that not all segments of the population will be influenced by such programs, and that long-term benefits are less certain. Local support for such programs is critical. The active (and long-term) participation of local and state public health agencies is needed in implementing institutional controls, including health intervention and education programs; without local implementation of such programs their success is uncertain. Additional research on the effectiveness of these programs is critical to consideration of their use in future cleanups.

APPENDIX C

Contacts and Software for Sampling Design

Table C-1
Contacts and Software for Sample Planning Design

Topic		Contact(s)
Sampling plan design/ Systematic Planning	General support	EPA HQ Quality Staff Phone: (202) 564-6830 FAX: (202) 565-2441 E-mail: quality@epa.gov
	Dynamic Field Activities	Internet: http://www.epa.gov/superfund/programs/dfa/index.htm
Software	DEFT: Data Quality Objectives Decision Error Feasibility Trials	E-mail: quality@epa.gov Internet: http://www.ornl.gov/doe_oro/dqo/resdqo.htm
	FIELDS: Fully Integrated Environmental Decision Support	Internet: http://www.epa.gov/region5fields/static/pages/index.html
	Geo-EAS: Geostatistical Environmental Assessment Software	E-mail: englund.evan@epa.gov Internet: http://www.ai-geostats.org/
	SADA: Spatial Analysis Decision Assistance	E-mail: sada@tiem.utk.edu Internet: http://www.tiem.utk.edu/~sada/
	VSP: Visual Sample Plan	E-mail: nell.cliff@pnl.gov Internet: http://dqo.pnl.gov/vsp/

APPENDIX D

Examples of Property Access Agreement Forms

CONSENT FOR ACCESS TO PROPERTY FOR SAMPLING

Name: _____ Daytime Phone Number: _____

Address(es) of Property(ies): _____

_____

I consent to officers, employees, and authorized representatives of the United States Environmental Protection Agency (EPA) entering and having access to my property for the purpose of taking [DESCRIBE NUMBER OF SAMPLING LOCATIONS AND DEPTHS] which are necessary to implement the cleanup of lead contamination in the soil.

This written permission is given by me voluntarily with knowledge of my right to refuse and without threats or promises of any kind. I understand that EPA or authorized representatives of EPA will contact me at least one week in advance before the soil samples are collected. This agreement is only for the purpose of soil sampling and no other work.

_____
Date

☐ I grant access to my property

☐ I do not grant access to my property

_____
Signature

_____
Signature

☐ I would also like EPA to have a lead expert contact me to schedule a free inspection to identify potential lead hazards in my home and provide safety tips.

United States Environmental Protection Agency Region 6
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

CONSENT FOR ENTRY AND ACCESS TO PROPERTY FOR SAMPLING

Description of property (including address) for which consent to access is granted:

Example: XXXX Street, Texarkana, Arkansas, more particularly described as a lot measuring approximately 3,000 square feet, including a two-room wood structure of approximately 300 square feet

Name of Signatory: _____

Address: _____
_____
_____ Phone: (_____)_____

Relationship to property (e.g., owner, lessee, agent or employee of owner, etc.):

I HEREBY CONSENT to officers, employees and parties authorized by the U.S. Environmental Protection Agency (EPA), entering and having continued access to the property described above at reasonable times for the following purposes (List the activities to be undertaken on the property):
Example:

- Sample collection including: (1) the gathering of soil from the outside area of the property; (2) drawing water from the tap; and (3) vacuuming the inside area of any inhabitable structure in order to collect dust.

- Taking photographs to record the sampling process.

I realize that these actions are undertaken pursuant to EPA's response and enforcement responsibilities under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. Sections 9601-9675. This written permission is given by me voluntarily with the knowledge of my right to refuse and without threats or promises of any kind.

This agreement expires on: _____
(Date)

I HEREBY WARRANT that I have authority to make this access agreement.

_____ _____
Date Signature

_____
Print name

CONSENT FOR ACCESS TO PROPERTY FOR SAMPLING AND TO TAKE RESPONSE ACTION

Name: _____ Daytime Phone Number: _____

Address(es) of Property(ies): _____

_____

I consent to officers, employees, and authorized representatives of the United States Environmental Protection Agency (EPA) entering and having access to my property for the purpose of sampling and taking a response action including: (1) preparing for and excavation of soil from my property; (2) backfilling the excavated area(s) with clean soil and/or backfill; and (3) restoring any grass or other vegetation or structures to their pre-excavation state. These activities are necessary to implement the cleanup of lead contamination in the soil.

This written permission is given by me voluntarily with knowledge of my right to refuse and without threats or promises of any kind. I understand that EPA or authorized representatives of EPA will contact me approximately two weeks in advance before the removal of soil begins, to discuss the steps involved in the excavation and removal program and all measures EPA will take to restore my yard. I also understand that if there is any damage to structures such as sidewalks that is caused by the work conducted by EPA or authorized representatives of EPA, then EPA or authorized representatives of EPA shall repair such damage.

_____
Date

☐ I grant
access to my property

☐ I do not grant
access to my property

_____
Signature

_____
Signature

XXXX TRIBE OF OKLAHOMA

PROPERTY ACCESS CONSENT AGREEMENT FOR SAMPLING AND TO TAKE RESPONSE ACTION

The Property which is the subject of this agreement is described as follows:

NE 1/4 SE 1/4, Section 6, Township 28 North, Range 24 East, Xxxx County, Oklahoma otherwise described as Beaver Springs Park and Tribal Office which includes the Pow Wow grounds (hereinafter the Property).

THIS ____ DAY OF _____, 1999, by authority of the Xxxx Tribal Business Committee, permission is hereby granted to officers, employees and parties authorized by the United States Environmental Protection Agency (EPA) entering and having continued access to the Property until 4:30 pm (CST) on _____, to conduct the following work (hereinafter the work):

(1) To perform necessary response actions (e.g., excavation of contaminated soil, backfilling with clean soil or gravel, and sodding or seeding) to address lead and other metals from mining waste contamination on the above-described lands in accordance with the EPA Record of Decision issued August 27, 1997;

(2) To take necessary samples of environmental media to identify lead and other metals that may be a threat to public health or welfare or the environment.

Nothing contained in this permit shall operate to delay or prevent a termination of Federal trust responsibilities with respect to the Property by the issuance of a fee patent or otherwise during the term of the work; however, such termination shall not serve to terminate the work. The Xxxx Tribal Business Committee shall notify EPA of any change in status or ownership of the Property.

The Xxxx Tribal Business Committee realizes that the work will be undertaken pursuant to EPA's Superfund authority under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. Sections 9601-9675.

This written permission is given by the Xxxx Tribal Business Committee voluntarily with the knowledge of its right to refuse and without threats or promises of any kind.

The Xxxx Tribal Business Committee is the property owner or a responsible representative of the property owner and I, Xx Xxxx, as Chairman of that Committee, warrant that I have authority to make this access agreement.

_____ _____

Xx Xxxx
Xxxx Tribal Chairman
Xxxx Tribe of Oklahoma

Date

_____ _____

U.S. Environmental Protection Agency

Date

CONSENT FOR ACCESS TO PROPERTY TO TAKE RESPONSE ACTION

Name: _____ Daytime Phone Number: _____

Address(es) of Property(ies): _____

_____

I consent to officers, employees, and authorized representatives of the United States Environmental Protection Agency (EPA) entering and having access to my property for the purpose of taking a response action including: (1) preparing for and excavation of soil from my property; (2) backfilling the excavated area(s) with clean soil and/or backfill; and (3) restoring any grass or other vegetation or structures to their pre-excavation state. These activities are necessary to implement the cleanup of lead contamination in the soil.

This written permission is given by me voluntarily with knowledge of my right to refuse and without threats or promises of any kind. I understand that EPA or authorized representatives of EPA will contact me approximately two weeks in advance before the removal of soil begins, to discuss the steps involved in the excavation and removal program and all measures EPA will take to restore my yard. I also understand that if there is any damage to structures such as sidewalks that is caused by the work conducted by EPA or authorized representatives of EPA, then EPA or authorized representatives of EPA shall repair such damage.

_____
Date

☐ I grant
access to my property

☐ I do not grant
access to my property

_____
Signature

_____
Signature

APPENDIX E

Example of Dust Abatement Access Form

CONSENT FOR ACCESS TO PROPERTY

Name: _____ Daytime Phone Number: _____

Address(es) of Property(ies): _____

_____

I hereby consent to grant officers, employees, contractors, sub-contractors and authorized representatives of the United States Environmental Protection Agency (EPA) access to the interior of my home and/or property for the purpose of interior dust abatement. The home dust abatement program being offered at this time consists of vacuuming floors and walls with a special vacuuming system. This system is portable and compact and easy to use. A team of bonded representatives will be providing the service at no charge to the homeowner.

Videotaping of the interior of the residence will be necessary to provide backup documentation in the event of any claims. It will be necessary that someone remain at the residence for one or two days while it is being vacuumed. This lead abatement program is offered only to homeowners who have or will grant access to their property for the remediation of in their yards. These activities are necessary to interrupt the movement of lead through soil dust, house dust, and paint dust.

If you want the process completed in your home and prefer to do it yourself, please note in the appropriate space and arrangements will be made to schedule the loan of a HEPA-VAC unit to you.

This written permission is given voluntarily with the knowledge of its right to refuse and without threats or promises of any kind. I understand that , if any damage to my property results from these activities or any work conducted by the USEPA or its authorized representatives, then the USEPA or its authorized representatives shall repair or replace such damage.

_____

Date

‘ I grant access to my property for Representatives of the EPA to video and vacuum.
‘ I wish to make arrangements to vacuum myself.
‘ I do not grant access to my property.

_____

Signature

Please return as soon as possible for scheduling of work. If you should have any questions please contact [LOCAL CONTACT NAME] at [PHONE NUMBER].

APPENDIX F

Example of Property Inspection Checklist

TAR CREEK PROJECT
PROPERTY HOME INSPECTION CHECKLIST

_____ _____
Address Date

_____
Property Group Number

Home Interior Access (check one, see comments):
☐ Approved by Property Owner ☐ Denied by Property Owner

Property (Yard) Access (check one, see comments):
☐ Approved by Property Owner ☐ Denied by Property Owner

	OK	NA	PROBLEM/CONDITION
YARD AREA			
1. Lawn Area			
A. Location of Flower/Plant Boxes			
B. Soil (grade) next to house			
C. Shrubbery			
D. Trees			
E. Low areas near house (that could cause ponding of water)			
F. Other: _____			
2. Utility			
A. Water Meter			
B. Gas Meter			
C. Sewer Lines			
D. Other: _____			
3. Driveway			
A. Concrete cracked, damaged			
B. Blacktop cracked, damaged			
C. Uneven Settling			
D. Other: _____			

	OK	NA	PROBLEM/CONDITION
YARD AREA (cont.)			
4. Streetwalk & Walkways			
A. Concrete cracked, eroded			
B. Tripping hazards			
C. Tree roots cracking, lifting slab			
D. Sections missing			
E. Other _____			
5. Garage			
A. Settlement cracks in walls			
B. Concrete floor slab cracked, damaged			
C. Door jambs damaged, rotted			
D. Door hard to open, close			
E. Other: _____			
6. Swimming Pool (Above Ground)			
A. Leakage			
B. Visible damage			
C. Other: _____			
7. Swimming Pool (Below Ground)			
A. Leakage			
B. Visible damage			
C. Other _____			
8. Storm Cellar			
A. Damaged			
B. Indication of Flooding			
C. Other: _____			

	OK	NA	PROBLEM/CONDITION
YARD AREA (cont.)			
9. Electrical Service			
A. Damaged circuit breaker panel box			
B. Wiring hanging outside			
C. Damaged electric meter			
D. Other:_____			
EXTERIOR AREA			
10. ☐ Brick ☐ Siding			
A. Brick bulging, spalling, cracking			
B. Mortar loose, needs repointing			
C. Lintel needs repair			
D. Stucco bulging, cracking			
E. Siding dented, damaged			
F. Finish wearing off siding			
G. Siding loose, not level, missing			
H. Siding rotted, termites			
I. Composite shingles worn, broken, missing			
J. Windows damaged			
K. Other:_____			
11. Roofing			
A. Age of covering			
B. Shingles worn, damaged, patched			
C. Brick chimney broken, leaning			
D. Joint open between chimney & exterior wall			
E. Need flashing at chimney, vents, walls			

	OK	NA	PROBLEM/CONDITION
EXTERIOR AREA (cont.)			
F. Parapet wall leaning			
G. Roof sagging			
H. Metal flashing damaged, missing			
I. Other: _____			
12. Gutters & Leaders 9 Yes 9 No			
A. Copper discolored, greenish, damaged			
B. Galvanized rusted, patched			
C. Fascia board rotted, damaged, patched			
D. Drain onto foundation wall			
E. Need to divert water from wall			
F. Soffit venting 9 Yes 9 No			
G. Concrete slab cracked, deteriorated			
H. Concrete slab/splash block need			
I. Other: _____			
13. Entrance Steps			
A. Concrete cracked			
B. Brick cracked, mortar loose			
C. Structurally sound			
D. Handrail			
E. Other: _____			
14. Exterior Doors			
A. Damaged			
B. Opens/closes freely			
C. Weatherstripping			
D. Trim rotted, missing			

	OK	NA	PROBLEM/CONDITION
EXTERIOR AREA (cont.)			
E. Jambs rotted, damaged			
F. Frame separation from walls			
G. Other:_____			
INTERIOR AREA			
15. Windows			
A. Trim/sills rotted			
B. Broken glass			
C. Open freely			
E. Frame separation from walls			
F. Other: _____			
16. Kitchen			
A. Cracked walls, ceiling			
B. Loose nails, tape on drywall			
C. Soft, springy floors			
D. Wood, tiles on floor damaged			
E. Faucet leaks			
F. Doors don't close			
G. Cabinets don't close			
H. Moisture in cabinets			
I. Walls have moisture damage			
J. Other: _____			
17. Interior Rooms			
A. Cracked walls, ceiling			
B. Loose nails, tape on drywall			
C. Soft, springy floor			
D. Carpeting water damaged			
E. Water stains near windows			

	OK	NA	PROBLEM/CONDITION
INTERIOR AREA (cont.)			
F. Mold/mildew on walls			
G. Other:_____			
18. Toilet Facility			
A. Cracked tile, plaster on walls			
B. Cracked plaster on ceilings			
C. Loose tiles on walls, floors			
D. Loose nails, tape on drywall			
E. Toilet cracked			
F. Water leaks at closet flange			
G. Grout missing around tub			
H. Shower pan damaged, missing			
I. Shower door damaged, missing			
J. Need new shower door			
K. Water stains on ceiling below bathroom			
L. Hot water heater tank corroded			
M. Water stains on floor around hot water heater			
N. Moisture present around hot water heater			
O. Other:_____			
19. Interior Doors			
A. Open freely			
B. Frame separation from walls			
C. Other:_____			
20. Attic			
A. Only if visual indicator			
B. Other:_____			

	OK	NA	PROBLEM/CONDITION
INTERIOR AREA (cont.)			
21. Foundation			
A. Minor cracks			
B. Settlement cracks at corners, walls			
C. Wall bulging inward			
D. Seepage into basement/cellar			
E. Mortar deteriorating			
F. Other: _____			
22. Basement or Cellar			
A. Seepage, water stains on floor/wall			
B. Sump pump installed			
C. Water pipe leaks			
D. Sewer pipe leaks			
E. Other: _____			
FOUNDATION AREA			
23. Foundation (Slab on Grade)			
A. Settlement cracks			
B. Joint separation			
C. Spalding			
D. Other: _____			
24. Foundation (Elevated Slab w/Crawl Space)			
A. Concrete support integrity			
B. Evidence of moisture or visible moisture in crawl space			
C. Evidence of water accumulation (e.g., water stains)			

	OK	NA	PROBLEM/CONDITION
FOUNDATION AREA (cont.)			
D. Sagging joist/support girders			
E. Fungus growth evident			
F. Sump pump evident			
G. Vents present			
H. Vapor barriers			
I. Pier settlement			
J. Uneven subgrade			
K. Insect damage			
L. Sill plate damaged			
M. Subfloor damaged, loose			
N. Need subfloor			
O. Other:_____			
25. Plumbing (Raised Floors Only)			
A. Pipe insulation crumbling, missing			
B. Need to insulate pipes			
C. Water pipes leaking			
D. Sewer pipes leaking			
E. Water pipe condition			
F. Other: _____			
26. Plumbing			
A. Water pipe conditions			
B. Sewage pipe conditions			
C. Pipes leaking			
D. Pipe insulation			
E. Corrosion on drain lines			
F. Other: _____			

	OK	NA	PROBLEM/CONDITION
FOUNDATION AREA (cont.)			
27. Other Area			
A. _____			
B. _____			
C. _____			
D. _____			

COMMENTS: _____

_____

_____

Topo Survey Requested 9 Yes 9 No

_____ _____

Inspector Signature Date

APPENDIX G

Examples of Property Closeout Forms

USEPA REMEDIATION AGREEMENT FORM

Name: Sam's Restaurant

Address: 5000 Main St.

Madison, IL 62060

Phone: 000-123-4567

This form documents the completion of remedial activity performed on my property. My signature will designate that I am satisfied with the restoration of my property, and that no items are in question, now, or at any time in the future, except those items listed below, if any.

Comments: 100% satisfied

Restoration items in question:

1. NONE
2.
3.
4.
5.
6.
7.

Chloe Irish	Chloe Irish	01/24/98
Resident Signature	Printed Name	Date
Brad W. Bradley	Brad W. Bradley	04/13/98
USEPA Representative Signature	Printed Name	Date

RESIDENTIAL REMEDIATION INSPECTION/AGREEMENT FORM

Name Sara O'Mara

Address [redacted]

Phone [redacted]

This form documents the completion of remedial activities performed on my property. My signature will designate that I am satisfied with the restoration of my property, and that no items are in question, now, or at any time in the future, except those items listed below, if any.

Comments

Restoration Items in Question:

1. Roll netting on sod to be trimmed off.
2. Stone left side, more stone to be added, taper from building.
3. At double doors back left corner, add rock up to lip to allow vehicle to get in.
4. Also add rock at back of building in middle in front of concrete ledge.
5. Also add rock in open parking area & grade the tops off of the high spots.
6. Check outside of fence on 7th Street, clean up dirt clods rolling under sod & fence.
7.

Property Inspection Date 12/04/98

Lawn Care Instructions Reviewed/Delivered 12/04/98

Sara O'Mara	Sara O'Mara	12/09/98
Resident Signature	Printed Name	Date

Brad W. Bradley	Brad W. Bradley	02/12/99
USEPA Representative Signature	Printed Name	Date

APPENDIX H

Examples of Clean Letters

EPA LOGO AND ADDRESS

Date

Name
Address
City, State Zip

Dear :

The U.S. Environmental Protection Agency (EPA) has completed the cleanup of the lead contamination in your yard located at [ADDRESS, CITY, STATE], in connection with the [SITE NAME] site in [CITY, STATE] (the Site). By way of this letter, U.S. EPA is certifying that your yard has been cleaned up to less than [CLEAN-UP LEVEL] parts per million lead, the level which U.S. EPA considers protective of children's health at the Site.

Thank you for your cooperation in this clean-up effort. It has been our pleasure to work with you. If you have any questions concerning this letter or need further information, please contact me at [PROJECT MANAGER'S PHONE NUMBER].

Sincerely,

[PROJECT MANAGER NAME]
Remedial Project Manager

EPA LOGO AND ADDRESS

Date

Name
Address
City, State Zip

Dear :

The United States Environmental Protection Agency (U.S. EPA) has sampled your yard located at [ADDRESS, CITY, STATE] for lead. The results of this sampling, which are enclosed with this letter, indicate that your yard contains less than [CLEAN-UP LEVEL] per million lead, the level which U.S. EPA considers protective of children's health at the [SITE NAME, CITY, STATE]. Thus, U.S. EPA will not need to perform soil clean-up activities in your yard.

If you have any questions concerning this letter or the enclosure, please contact me at [PROJECT MANAGER'S PHONE NUMBER].

Sincerely,

PROJECT MANAGER NAME
Remedial Project Manager

Enclosure

ENCLOSURE

Analytical results for [ADDRESS]
in parts per million (ppm) of lead:

Depth Zone (inches)	Yards		OR Quadrant			
	Front	Back	1	2	3	4
0 to 1	ppm	ppm	ppm	ppm	ppm	ppm
1 to 6	ppm	ppm	ppm	ppm	ppm	ppm
6 to 12	ppm	ppm	ppm	ppm	ppm	ppm
18 to 24	ppm	ppm	ppm	ppm	ppm	ppm
Deeper Zones (if applicable)	ppm	ppm	ppm	ppm	ppm	ppm
Drip Zone Composite	ppm	ppm	ppm	ppm	ppm	ppm

Mr. John Smith
[redacted]

Dear Mr. Smith,

This letter serves as written notification that a lead-contaminated soil clean-up action was performed under authority of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 as amended by the Superfund Amendments and reauthorization Act of 1986 on property you have an interest in at the Jasper County, National Priorities Listed Superfund site. Our records show that your property located at [redacted] was included in this action. The clean-up action conducted by the U.S. Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers (COE) addressed residences with soil lead levels over 800 ppm, day care facilities, and residences with children under six years of age with blood lead levels over 15 g/dL.

Briefly, the primary objective of the clean-up action on your property was to remove highly lead-contaminated near-surface yard soils that were located at your residence. In some cases trees, shrubs, flowers, and other vegetation were left in place. As a result a small amount of lead-contaminated soils may be left near the surface on your property. This small amount of contamination should not cause a health threat under normal circumstances. In the future if additional landscaping, or planting requiring excavation below six inches are done, care should be exercised to minimize recontamination.

The excavation criteria for the project was as follows:

A) From the surface to 12 inches, excavation continued until 500 ppm or less lead levels concentrations were achieved;

B) If the residual lead concentrations at a depth of one foot exceeded 1,500 ppm a "marker barrier" was placed at that depth. The marker barrier used was the temporary orange plastic construction-type fence. This material is permeable, and will allow water and plant roots to pass through it. Only a small number of properties required the installation of the barrier. The primary purpose of this marker barrier is to inhibit and alert individuals excavating in these areas in future years.

In general, all areas of the yard that exceeded 500 mg/kg lead at the surface were removed. Soil brought in to backfill the excavation contained less than 240 mg/kg lead.

IF YOU HAVE PLANS TO DO ANY EXCAVATION WORK AT YOUR PROPERTY AND YOU ENCOUNTER THE ORANGE BARRIER PLEASE CONTACT YOUR LOCAL HEALTH DEPARTMENT, THE MISSOURI DEPARTMENT OF NATURAL RESOURCES, OR THE EPA FOR GUIDANCE.

Please save this document for your permanent records. In the event you sell or transfer the property to someone you can show the next owner that a lead cleanup was performed. If you require more specific information concerning the excavation on your property, please feel free to contact me at (xxx) xxx-xxxx.

Sincerely,

(Project Manager)

APPENDIX C

TO
CONSENT DECREE
BETWEEN THE UNITED STATES
AND THE STATE OF INDIANA
IN THE MATTER OF
UNITED STATES AND INDIANA V. ATLANTIC RICHFIELD CO., ET AL. (N.D IND.)

USS LEAD SUPERFUND SITE
EAST CHICAGO, INDIANA

U.S. Smelter and Lead Refinery, Inc. Superfund Site

Operable Unit 1

East Chicago, Lake County, Indiana

Record of Decision

U.S. Environmental Protection Agency Region 5

77 W Jackson Blvd.
Chicago, IL 60604

November 2012

Table of Contents

Section **Page**

Tables

Appendices

Part 1 – Declaration

1.1 – Site Name and Location

U.S. Smelter and Lead Refinery, Inc. Site
Operable Unit 1 (residential area)
CERCLIS ID# IND047030226
East Chicago, Lake County, Indiana

1.2 – Statement of Basis and Purpose

This decision document presents the Selected Remedy for Operable Unit 1 (OU1) at the U.S. Smelter and Lead Refinery, Inc. (USS Lead) Site in East Chicago, Lake County, Indiana. The U.S. Environmental Protection Agency (EPA) chose the Selected Remedy for OU1 in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986, and, to the extent practicable, the National Contingency Plan (NCP). The decision is based on the Administrative Record for the USS Lead Site.

The State of Indiana concurs with the Selected Remedy.

1.3 - Assessment of Site

The response action selected in this Record of Decision (ROD) is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

1.4 - Description of Selected Remedy

The USS Lead Site is being addressed as two operable units under the framework set forth in CERCLA. The selected remedy specified in this ROD addresses OU1. OU1 contains residential yards[1] contaminated with lead and arsenic at levels that pose a threat to human health via ingestion, inhalation and direct contact. EPA's selected remedy for OU1 addresses these risks from exposure to contaminated soils through the excavation and off-site disposal of contaminated soils. The remedial action levels (RALs) at OU1 are 400 milligrams per kilogram (mg/kg) for lead at residential properties, 800 mg/kg for lead at industrial/commercial properties, and 26 mg/kg for arsenic at both residential and industrial/commercial properties. EPA's Selected Remedy for OU1 at the USS Lead Site consists of:

[1] Yards are the risk management unit in OU1. Each individual property consists of one or more yards. Sampling during the remedial investigation demonstrated that contaminant levels in one yard were not reliably correlated with contaminant levels in other yards on the same property. The Human Health Risk Assessment evaluated the risk to human health and the environment by property, not by yard.

- Excavation of soil that contains lead or arsenic in concentrations that exceed the RALs to a maximum excavation depth of 24 inches.
- Disposal of excavated soil at an off-site Subtitle D landfill; some excavated soils may require chemical stabilization prior to off-site disposal to address exceedances of the toxicity characteristic (TC) regulatory threshold. Contaminated soil that exceeds the TC threshold is considered principal threat waste.
- If contaminated soil is identified at a depth greater than 24 inches below ground surface (bgs), a visual barrier, such as orange construction fencing or landscape fabric, will be placed above the contaminated soil before the yard is backfilled with clean soil. Institutional controls will be implemented to protect the visual barrier that separates clean backfill from impacted soils and to ensure that users of the property are not exposed to contaminated soil that remains at depth.
- Excavated soil will be replaced with clean soil to maintain the original grade. The top 6 inches of fill will consist of topsoil. Each yard will be restored as close as practicable to its pre-remedial condition.

This Selected Remedy is the first of two remedial decisions for the USS Lead Site. EPA has not yet begun the remedial investigation (RI) of Operable Unit 2 (OU2). OU2 consists of the former USS Lead property. In the future, EPA will develop a remedial investigation, feasibility study (FS), Proposed Plan, and ROD for OU2.

1.5 - Statutory Determinations

The Selected Remedy is protective of human health and the environment, complies with federal and state requirements that are applicable or relevant and appropriate to the remedial action, is cost-effective, and utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable.

This remedy satisfies the statutory preference for treatment as a principal element of the remedy (i.e., reduces the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants as a principal element through treatment). Soils at OU1 that have lead concentrations exceeding the TC threshold and that are therefore defined under the Resource Conservation and Recovery Act (RCRA) as hazardous waste will be treated prior to disposal. This treatment will reduce the mobility of the lead. The remaining volume of relatively low-level soil contamination that is being addressed in this remedy does not lend itself to any cost-effective treatment.

Because this remedy will likely result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of the remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

1.6 – Data Certification Checklist

The following information is included in the *Decision Summary* section of this ROD. Additional information can be found in the Administrative Record for this site.

Information Item	Location in ROD
Contaminants of concern and their respective concentrations	Section 2.7.2
Baseline risk represented by the contaminants of concern	Section 2.7
Cleanup levels established for contaminants of concern and the basis for these levels	Section 2.8
How source materials that constitute principal threats will be addressed	Sections 2.11 and 2.13
Current and reasonably anticipated future land use assumptions in the baseline risk assessment and the ROD	Section 2.7.1
Estimated capital, annual operation and maintenance, and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected	Section 2.9 and Appendix D
Key factor(s) that led to the selection of the remedy	Sections 2.10 and 2.12

1.7 - Authorizing Signatures

EPA, as the lead agency for the U.S. Smelter and Lead Refinery, Inc. Superfund Site (IND047030226), formally authorizes this Record of Decision.

Richard C. Karl, Director
Superfund Division
EPA Region 5

11-30-12
Date

The State of Indiana Department of Environmental Management (IDEM), as the support agency for the USS Lead Superfund Site, formally concurs with this ROD. IDEM has prepared a separate concurrence letter which is included as Appendix A.

Part 2 – Decision Summary

2.1 - Site Name, Location, and Brief Description

The USS Lead Site is located in the City of East Chicago, Indiana (see Figure 1). East Chicago is located on the shore of Lake Michigan and lies approximately 18 miles southeast of Chicago, Illinois. It has a total area of approximately 16 square miles (mi^2) of which approximately 14 mi^2 are land and 2 mi^2 are water. The USS Lead Site comprises two separate areas each of which is called an operable unit (OU). OU1 is a predominantly residential area located in the southern portion of the City of East Chicago, north of the former USS Lead industrial facility (see Figure 1). The USS Lead facility is referred to as OU2. This ROD sets forth the remedy for OU1. OU1 is a residential soil cleanup site. Lead is the primary contaminant of concern (COC). Accordingly, EPA has followed its 2003 *Superfund Lead-Contaminated Residential Sites Handbook* in the development of the RI, FS, and ROD for OU1.

The residential area that comprises OU1 has been contaminated by aerial deposition of windblown contaminants from the USS Lead facility and other local industrial facilities and by direct deposition of contaminated fill materials. The other industrial sources of contamination in OU1 include operations conducted by the Anaconda Copper Refining Company on property within OU1 and from property located just south of OU1 owned and operated by E.I. duPont deNemours and Company (DuPont) (see Figure 2).

EPA is the lead agency for the USS Lead Site. IDEM serves as the support agency. EPA conducted the RI/FS for OU1 using federal funding. EPA intends to pursue responsible parties to fund or undertake the remedial design and remedial action for OU1.

2.2 - Site History and Enforcement Activities

The USS Lead facility is located at 5300 Kennedy Avenue, East Chicago, Indiana. The facility (OU2) was constructed in the early 1900s by the Delamar Copper Refinery Company to produce copper. In 1920, the property was purchased by U.S. Smelting Refinery and Mining and later by USS Lead. USS Lead operated a primary lead smelter at the facility. An electrolytic process called the "Betts process" was used for refining lead ores into high-purity lead. During production, the Betts process can release fugitive metals like lead.

United States Geological Survey aerial photographs from 1939, 1951, 1959, and 2005 show OU2 and OU1 over time (Figure 3). These photographs indicate the progression of residential development within OU1. For the area located west of Huish Avenue, the photographs show that the majority of the residences were built before 1939. For the area located east of Huish Avenue, approximately half of the homes were built before 1939, approximately 75 to 80 percent of the homes were built between 1939 and 1951, and by 1959 most of the homes were built. These photographs also show that the Anaconda Copper Company was located on the area now occupied by the Gosch Elementary School and a public housing residential complex (the southwest portion of OU1). The Gosch Elementary School and the East Chicago public housing complex were built on the former Anaconda Copper Company site after 1959.

Between 1972 and 1973, the USS Lead facility was converted into a secondary lead smelter which, instead of refining lead ore, recovered lead from scrap metal and automotive batteries. All operations at OU2 were discontinued in 1985. Two primary waste materials were generated as a result of the smelting operations: (1) blast-furnace slag and (2) lead-containing dust from the blast-furnace stack. Blast-furnace slag was stockpiled south of the plant building and once per year spread over an adjoining 21-acre wetland. The blast-furnace baghouse collected approximately 300 tons of baghouse flue dust per month during maximum operating conditions. Some of the flue dust escaped the baghouse capture system and was deposited by the wind within the boundaries of OU1. By the late 1970s, USS Lead stored onsite approximately 8,000 tons of baghouse dust.

The East Chicago area in the vicinity of OU1 has historically supported a variety of industries. In addition to the USS Lead smelting operation, other industrial operations have managed lead and other metals and are sources of contamination in OU1. Immediately east of OU2, across Kennedy Avenue, is the former DuPont site (currently leased and operated by W.R. Grace & Co., Grace Davison). At this location, DuPont manufactured the pesticide lead arsenate. Anaconda Lead Products and International Lead Refining Company, two smelter operations that managed lead and other metals, operated within OU1 at the location currently occupied by an East Chicago public housing facility. Anaconda Lead Products was a manufacturer of white lead and zinc oxide, and the International Lead Refining Company was a metal-refining facility. These facilities included the following: a pulverizing mill, white-lead storage areas, a chemical laboratory, a machine shop, a zinc-oxide experimental unit building and plant, a silver refinery, a lead refinery, a baghouse, and other miscellaneous buildings and processing areas.

Starting in 1993, USS Lead began a cleanup at its facility (OU2) pursuant to an agreement with EPA under the Resource Conservation and Recovery Act. USS Lead addressed the majority of the contamination in OU2 by excavating contaminated soils and consolidating those soils within a corrective action management unit located within OU2. As part of the OU2 RCRA activities, investigations were conducted in the residential area now known as OU1 to investigate the source and identify the extent of lead-contaminated soils. Modeling of air deposition of lead in the residential area was also performed.

Responsibility for the further investigation of conditions at OU1 and OU2 was subsequently transferred from EPA's RCRA program to its Superfund program. During this transition, EPA's Superfund program conducted some limited sampling of the residential area in 2007. The Superfund program subsequently listed the USS Lead Site on the National Priorities List (NPL) in April 2009. As part of the NPL listing process, EPA and IDEM evaluated contaminant concentrations focusing on the southwestern portion of the residential area. This evaluation was later expanded during the RI to cover the entirety of OU1. EPA sampled 7% of the properties during its full-scale remedial investigation. During these investigations, EPA identified properties with lead concentrations in surface soils greater than 1,200 mg/kg. Lead in surface soils in concentrations greater than 1,200 mg/kg poses an imminent and substantial threat to human health. EPA's emergency response program addressed these most highly-contaminated parcels. EPA removed the contaminated soils to a maximum depth of two feet and backfilled the

excavated areas with clean soils. A total of 29 properties were remediated by the Superfund emergency response program in 2008 and 2011.

Although some residential properties have been cleaned up, contamination remains at many properties within OU1. This ROD sets forth EPA's approach for addressing the contaminated soils throughout OU1 that still require cleanup.

2.3 – Community Participation

The RI/FS Reports and the Proposed Plan for the USS Lead Site were made available to the public in early July 2012. These documents can be found in the Administrative Record for the site. The Administrative Record is maintained at the EPA Docket Room in Chicago, Illinois, and the East Chicago Public Libraries on Chicago Avenue and Columbus Avenue. After issuing the Proposed Plan, EPA held a public comment period between July 12 and September 12, 2012. In addition, EPA held a public meeting on July 25, 2012, to present the Proposed Plan to a community audience. When the Proposed Plan was issued, EPA mailed a fact sheet to area residents informing them about the Proposed Plan. The fact sheet advised residents that the RI, FS, and Proposed Plan were available for viewing at the public repositories. The fact sheet included the date, time and location of the public meeting. At the public meeting, EPA and IDEM representatives answered questions about the site and the remedial alternatives. EPA's responses to the comments received during the public comment period are included in the *Responsiveness Summary*, which is Part 3 of this ROD.

2.4 - Scope and Role of Operable Unit or Response Action

The USS Lead Superfund Site includes the former USS Lead facility with its surrounding property (OU2) and the residential area north of it (OU1). EPA estimates that approximately 57 percent of the yards (i.e., approximately 723 of the 1,271 properties) in OU1 contain concentrations of lead and/or arsenic that pose a risk to human health. EPA has concluded that USS Lead, DuPont, Anaconda Lead and International Refining were sources of contamination to OU1 through historic aerial deposition and/or direct releases to the ground. These facilities are not ongoing sources of contamination to the residential area.

EPA has organized the USS Lead Superfund Site into two OUs:

- Operable Unit 1 – The residential area north of the former USS Lead facility. OU1 is bounded by Chicago Avenue to the north, Parrish to the east, the Calumet Canal to the west, and 150th/151st Streets to the south. This ROD addresses yards in OU1 that contain lead and/or arsenic concentrations in soil that pose a threat to human health.

- Operable Unit 2 – The former USS Lead facility, its surrounding property, and site-wide groundwater. OU2 will be addressed in a future RI/FS and decision document.

The Selected Remedy for OU1 will address the principal threats by treating contaminated soil that exceeds the toxicity characteristic regulatory threshold for lead before disposing of the soil at an off-site landfill. During the RI, EPA did not test for arsenic exceedances of the TC

threshold because very few soil samples had high enough concentrations of arsenic to warrant toxicity characteristic leaching procedure (TCLP) analysis. Although the highest arsenic soil concentration detected at OU1 during the RI was 567 mg/kg, the arsenic concentration in soil was often below 100 mg/kg, the lowest concentration of arsenic in soil that would possibly fail the TCLP test and therefore be considered a hazardous waste. Based on TCLP analysis for lead conducted during the RI, EPA estimates that OU1 soils will exceed the TC threshold for lead when concentrations exceed 2,400 mg/kg. EPA does not expect the highest arsenic concentrations found at OU1 to exceed the TC threshold. Additionally, the highest concentrations of arsenic were found to be co-located with high lead concentrations. Because of this, soils with the highest arsenic concentrations are likely to be subject to treatment because they are frequently co-located with the lead concentrations that require treatment.

2.5 – Site Characteristics

2.5.1 - Conceptual Site Model

The conceptual site model (CSM) for the USS Lead Superfund Site (Figure 4) considers four potentially affected media at the site: air, soil, surface water, and groundwater. The CSM shows that the USS Lead Site comprises within an urban setting historically industrial areas, the residential area (OU1), and a canal. The former smelter plants are the primary source of contamination. During plant operations, the smelters generated airborne emissions from plant stacks. Leaks and spills were also likely. Fill material used to raise the ground level in OU1 is a second potential source of contaminants. Approximately two feet of fill overlie native sands throughout OU1. Metals and polycyclic aromatic hydrocarbons (PAHs) are the main constituents of interest (COIs) associated with these sources. The water table in the vicinity of the site lies approximately 8.5 feet bgs. The groundwater flows south/southwest towards the Grand Calumet River.

Contaminants were deposited at OU1 through airborne emissions from the industrial plants and direct deposition of contaminated fill material. Other possible sources of contaminants at OU1 are fertilizers and pesticides. These chemicals may have been applied to individual properties. Fertilizer can contain measurable levels of heavy metals such as lead, arsenic, and cadmium. The DuPont facility manufactured the pesticide lead arsenate using two ingredients: lead and arsenic. Both are contaminants of concern at the USS Lead Site.

Potential migration routes for COIs were assessed according to the properties of the contaminants and fate-and-transport processes. Potential migration pathways for COIs to be released, deposited, or redistributed in surface soils include:

- particulate erosion and redeposition by wind
- runoff, particulate erosion, and redeposition by surface water
- surface water percolation
- surface soil filling and excavation activities

Contaminants may migrate into the air by two distinct emission mechanisms: entrainment of contaminated particles by the wind and volatilization of chemical compounds. The most likely

transport mechanism for the COIs at OU1 is by windborne transport of contaminated dust and soil erosion. The COIs have a strong tendency to adsorb to soil particles. Wind and the concomitant release of wind-borne dust is the primary pathway for site COIs to be released to the atmosphere.

Surface-water runoff is another migration pathway that was considered. Surface-water runoff can erode surface soils and transport particles by overland flow and result in contaminated soil being picked up and redeposited at lower elevations. Because OU1 is flat and is served by a municipal sewer system, redeposition in low-lying areas is not expected to be of major significance at the site.

Excavation and filling activities are also likely migration pathways. EPA has observed these activities at the site. Excavation potentially exposes the subsurface to fugitive dust erosion and deposition. Filling activities result in topsoil that is not as compact as native soils and which may result in faster percolation and/or erosion rates. There is also a possibility that amended fill materials may be contaminated, particularly if obtained from a nearby, contaminated source.

Human and ecological receptors can be exposed to the COIs through direct dermal exposure to soil, inhalation of windborne soils, ingestion of soils, or ingestion of produce grown in affected soils. Based upon the distribution of PAHs, EPA has concluded that their presence in OU1 is not attributable to neighboring industrial activities. Rather, it is consistent with an urban residential setting. Therefore, the Selected Remedy does not address PAHs but does address lead and arsenic in surface and subsurface soils.

2.5.2 - Overview of site

OU1 encompasses approximately 322 acres and is bounded by East Chicago Avenue on the north, East 151st Street on the south, the Indiana Harbor Canal on the west, and Parrish Avenue on the east (see Figure 2). OU1 is a mixed residential and commercial/industrial area north of the former USS Lead industrial facility. The mixed-use area includes the following uses: (1) residences including single and multi-family units some of which, in the southwest corner of the area, are public housing, (2) generally small commercial/industrial operations, (3) municipal and community offices and operations, (4) two schools (the Carrie Gosch Elementary School and the Carmelite School for Girls), (5) four parks, and (6) numerous places of worship. Residences, schools, and public parks constitute the large majority of properties and acreage within OU1.

The average annual precipitation in East Chicago between 1961 and 1990 was 36.82 inches. A five-year wind-rose plot for the years 1987 to 1991 at a site in nearby Hammond, Indiana, indicates that prevailing winds are from the southwest and north at less than 20 miles per hour.

2.5.3 - Geologic and Hydrogeologic Setting

During site investigations, five main soil varieties were identified within OU1, including the following: organic topsoil, fill, fill with construction debris, fill with slag, and native sand. All but the native sand were found from the surface down to depths of as much as 24 inches bgs. Native sand was typically located 18 to 24 inches bgs. Nearby soil borings indicate that the

Equality Formation underlies the top few feet of soils at OU1. The Equality Formation, also known as the Calumet Aquifer, is primarily a sand unit with some silts, clays, and gravel lenses. The Equality Formation is estimated to extend to approximately 25 feet bgs.

EPA did not evaluate groundwater as part of the remedial investigation for OU1. Site-wide groundwater will be investigated as part of the OU2 RI. Residents and businesses in East Chicago are served by a municipal water system.

2.5.4 - Sampling Strategy

EPA's sampling approach at OU1 followed the methodology described in its 2003 *Superfund Lead-Contaminated Residential Sites Handbook*. As part of the RI, EPA collected surface and subsurface soil samples between December 2009 and September 2010. EPA sampled a total of 88 properties, including 74 residential properties and 14 non-residential properties (i.e., schools, parks, and commercial properties). In total, EPA sampled 232 distinct yards (including drip zone samples and quadrants from larger properties such as parks and schools) in order to characterize the nature and extent of COIs in and around OU1. Drip zone samples are soil samples collected from beneath the gutters and downspouts of buildings. The purpose of drip zone sampling is to investigate whether airborne contamination is concentrating or has concentrated along the drip lines of roofs. These 232 separate "yards" included 75 front yards, 76 back yards, 21 quadrants, and 60 drip zones. EPA elected to consider drip zones as separate "yards" because they covered a geographic area that was not confined to a front yard, back yard, or quadrant. EPA used the term "yard" throughout the RI and the FS to represent one unit of remedial area. A single remedial area generally consists of a front yard, back yard, or drip zone of a residential property, or any quadrant of a park, commercial property, easement, or school. A residential property can have up to three yards (front, back, drip zone) and a park, commercial property, easement, or school can be divided into a maximum of four yards (otherwise referred to as quadrants in the RI).

Soils from four different horizons (0-6", 6-12", 12-18", and 18-24" bgs) were analyzed from front yards, back yards, and quadrants of larger properties. The purpose of sampling soils from different soil horizons was to evaluate vertical contamination profiles. Aerial deposition of contaminants would be expected to yield contamination profiles with higher concentrations near the surface and lower concentrations at depth.

2.5.5 - Sources of Contamination

As previously discussed, the primary sources of site-related contamination are the industrial facilities that formerly operated in and around OU1, including DuPont, Anaconda Lead, Industrial Refining and the USS Lead facility. None of these facilities are still in operation, and none of them are ongoing sources of contamination to OU1. The placement of fill material and the individual application of materials such as pesticides are other potential sources of contamination in OU1 that may be ongoing.

2.5.6 - Types of Contaminants and Affected Media

Metals are the primary contaminants and soil is the affected media in OU1. All soil samples were analyzed for lead. In addition, a subset of samples was analyzed for various combinations of total metals, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), PAHs, polychlorinated biphenyls (PCBs), and pesticides to provide a basis for more fully assessing contamination in shallow soils in OU1. Although SVOCs (including PAHs), pesticides, and PCBs were sampled for and discussed in the RI and evaluated in the risk assessment, there is no reasonable basis from which to conclude that there were consistent releases of these compounds into OU1 from the local industrial facilities. Rather, EPA has concluded that the detection of these compounds is associated with other anthropogenic sources typical of a metropolitan industrial area. EPA's RI Report for OU1 includes all available sampling results and a full discussion of those results.

The sampling results were evaluated in the human health risk assessment. The risk assessment determined the contaminants of potential concern (COPCs) and identified which chemicals and affected media drive potential risk at the site. These findings are summarized in Section 2.7.2 of this ROD and discussed in greater detail in the RI Report. The human health risk assessment was completed using site-specific data. EPA has determined that the contaminants of concern (COCs) are lead and arsenic in residential soils.

2.5.7 - Extent of Contamination

Lead is the primary COC at OU1. EPA used the *Superfund Lead-Contaminated Residential Sites Handbook*, EPA remedial screening levels (RSLs), and the State of Indiana's Risk Integrated System of Closure Technical Resource Guidance Document to set the site screening levels (SSLs) for lead at 400 mg/kg for residential areas and 800 mg/kg for industrial areas. Although lead was found to be the most widespread contaminant at OU1, arsenic was also present at locations within the residential area. As detailed in the RI Report, the SSLs for arsenic in surface and subsurface soils are 14.1 mg/kg and 13.2 mg/kg, respectively, at both residential and commercial/industrial properties.

Data analysis indicated that lead and arsenic were generally correlated; arsenic was present in areas with high lead concentrations. Based on the data, OU1 soils typically do not exceed the arsenic SSL unless lead also exceeds the lead SSL. Additionally, lead and PAHs were not correlated; EPA did not discern a correlation between high lead concentrations and high concentrations of PAHs. The lack of correlation between PAHs and lead supports the hypothesis that PAHs are not site-related compounds and are likely associated with other anthropogenic sources.

During the RI sampling events in OU1, EPA analyzed samples from all 232 yards for lead. The surface and/or subsurface soil in 123 yards (53 percent of those tested) exceeded the lead SSL. The potential lateral extent of lead-impacted soil includes all areas within the OU1 boundaries. The area west of Huish Avenue contained a higher frequency of exceedances for lead in both surface and subsurface soil samples than the eastern half of OU1. Lead concentrations in all of

the nine properties (20 yards) sampled in the East Chicago Housing Authority complex in the southwest portion of the study area exceeded the SSL for lead.

During the RI sampling events, a total of 136 yards in OU1 were analyzed for arsenic. The surface and/or subsurface soil in 75 yards (55 percent of those tested) exceeded the arsenic SSL. EPA performed an analysis of arsenic concentrations in soils to further understand site conditions and to assess the evidence for aerial deposition of arsenic at OU1. Because arsenic concentrations in the public housing area soils likely resulted from direct deposition of contaminants from the former industrial facility and because operations at the industrial facility and construction of the housing area likely redistributed soils, the vertical profile of arsenic in the public housing area was excluded from the analysis. When the public housing area was excluded from the arsenic data set, it became evident that the arsenic in the remainder of OU1 was primarily dispersed due to aerial deposition because the shallow soil horizons contain higher arsenic concentrations than the deeper soil horizons.

An analysis of front and back yards suggests that there is an approximately 75% chance that if the COIs in one yard are in excess of the SSLs, then the COIs in the other yard at the same property will exceed the SSLs. In addition, based on the observed vertical distributions of lead, arsenic, and PAHs, there is only a 13% chance that sampling only the upper two depth intervals (0-6" and 6-12" bgs) would miss contamination in the lower two depth intervals (12-18" and 18-24" bgs). A comparison of soil type to COI concentration concluded that soil type is not a reliable indicator of the presence or absence of COIs. There is one exception to this rule: the native sands are generally free of contamination.

EPA concluded that the concentration levels of VOCs, SVOCs (including PAHs), PCBs, and pesticides do not require further evaluation. EPA found the highest lead and arsenic concentrations in OU1 in the East Chicago Housing Authority complex. The high concentrations in this area appear to be related to the historical operations at the Anaconda Copper Company facility.

2.6 – Current and Potential Future Site and Resource Uses

The current land use at OU1 is largely residential and recreational (parks and school yards), with a small number of commercial and light industrial properties. The adjacent OU2 includes the RCRA landfill and wetland areas. EPA expects that the land use at OU1 will remain unchanged. The City of East Chicago has shared with EPA its development plans for OU1 and the surrounding area, which confirm that the land use within OU1 is not likely to dramatically change.

Lake Michigan is the municipal water source for East Chicago, and properties within OU1 do not access site-wide groundwater for any use. The surface water in the vicinity of OU1 is the Indiana Harbor Canal (OU1's western boundary) and the Grand Calumet River (south of OU2). The portion of the Indiana Harbor Canal near OU1 is not subject to much industrial use in contrast with much higher industrial activity in the northern part of the canal. The Grand Calumet River in this area is not navigable. Neither water body appears to be used recreationally.

In July 2009, East Chicago had a population of 29,900, of which 51.6% was Hispanic, 40.3% was African-American, and 7.2% was White, non-Hispanic. The density of East Chicago was approximately 2,496 people per square mile, and the average household size was 2.8 people (City-Data 2011). Based on the average household size and the number of homes in OU1, the approximate density within OU1 is 7,000 people per square mile. Based on an inspection of historical aerial photographs, the primary land use in East Chicago is industrial. Residential land use accounts for approximately 20% of the land within the city. OU1 is one of the most densely populated areas in East Chicago.

The East Chicago median household income is $28,289, versus the Indiana median household income of $45,424. The March 2011 unemployment rate for East Chicago was 12.7%, compared to Indiana's March 2011 unemployment rate of 8.8%. EPA considers East Chicago an environmental justice community. An environmental justice community is one characterized by low income and burdened with significant environmental challenges.

2.7 - Summary of Site Risks

A human health risk assessment (HHRA) estimates what risks a site poses to human health if no action is taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. This section of the ROD summarizes the results of the HHRA for the USS Lead site. More detailed information can be found in the RI Report. The HHRA relied on Tier I screening-level evaluations to identify media and exposure pathways that may pose unacceptable risks. More detailed (Tier II) risk assessments were considered if the Tier I screening level evaluations identified potentially significant risks. The HHRA evaluated the potential risks that could result to people from exposure to the contaminants at the site. EPA conducted the HHRA consistent with EPA's Risk Assessment Guidance for Superfund (RAGS) and other supplemental guidance to evaluate human health risks. The HHRA identified possible receptors and potentially complete pathways of exposure. The information used in the HHRA helped define site-specific, risk-based screening levels. The HHRA determined that the COCs for the site are lead and arsenic for residential soils and that cleanup levels of 400 mg/kg for lead and 26 mg/kg for arsenic are protective of human health and the environment for current and future residential use.

The information presented here focuses on the information that is driving the need for a response action at the site and does not necessarily summarize the entire HHRA. Further information is contained in the risk assessment within the RI Report and is included in the Administrative Record.

EPA did not identify any ecological habitats in OU1 so did not conduct an ecological risk assessment.

2.7.1 - Summary of Human Health Risk Assessment

The HHRA for the USS Lead site evaluated risks by individual property rather than by individual yard. Each property consists of one or more yards. The HHRA did not include lead

in its carcinogenic risk and non-carcinogenic hazard calculations because EPA's *Superfund Lead-Contaminated Residential Sites Handbook* specifies that lead cleanup levels should be calculated by using the Integrated Exposure Uptake Biokinetic (IEUBK) model. As discussed in the RI Report and explained in more detail in Section 2.7.7 of this ROD, EPA evaluated the available site-specific information (such as lead in drinking water and blood lead levels in children) in relation to the default exposure assumptions in the IEUBK model and concluded that there was no need to modify the default exposure assumptions.

The objectives of the risk evaluation using the HHRA (which includes the results of the IEUBK model) were the following: (1) to investigate whether site-related constituents detected in environmental media pose unacceptable risks to current and future human receptors, and (2) to provide information to support decisions concerning the need for further evaluation or action, based upon current and reasonably anticipated future land use. For the purposes of the risk assessment, future land uses were assumed to be the same as current land uses. Current land uses are primarily residential, commercial/industrial, and recreational. Human receptors at OU1 include the following: child and adult residents; adult utility and construction workers; students; teachers (indoor and outdoor); adult and child recreationalists; and park workers (indoor and outdoor). All the receptors were assumed to be exposed to surface (current and future land use conditions) and subsurface soil (future land use conditions) through incidental ingestion, dermal contact, and inhalation of particulates in ambient air. Subsurface soils were included under the future land use conditions because residents and utility/construction workers may rework soils and expose deeper horizons.

In the HHRA risk characterization, the toxicity factors were integrated with concentrations of COIs and intake assumptions to estimate potential cancer risks and non-carcinogenic hazards. Risks and hazards were calculated using standard risk assessment methodologies. Risks were compared to EPA's acceptable risk range: from $1x10^{-6}$ (one cancer per one million exposed receptors) to $1x10^{-4}$ (one cancer per ten thousand exposed receptors). Risks less than $1x10^{-6}$ are considered insignificant. Risks within the above range are remediated at the discretion of EPA risk managers. Risks greater than $1x10^{-4}$ typically require remediation. Non-carcinogenic hazards are compared to a target hazard index (HI) of 1. Risks posed by lead in soil were evaluated by comparing lead exposure point concentrations (EPCs) in soil at each property to receptor-specific lead preliminary remediation goals (PRGs). Chemicals that have a risk identified through the risk assessment process become COCs.

Risks associated with lead are present throughout the study area. The HHRA found that risks and hazards associated with other compounds exist under both current and future land use conditions for between 30 and 40 percent of residential properties. At these properties, risks above EPA's acceptable risk range ($1x10^{-4}$ to $1x10^{-6}$) and hazard index (greater than 1) from compounds other than lead are driven primarily by exposure to arsenic and PAHs through ingestion of homegrown produce and incidental ingestion of soil. As discussed in the RI Report, the PAHs detected in soil at OU1 are typical of urban soils in the Chicago metropolitan statistical area and are not related to any specific onsite or nearby offsite sources. Therefore, PAHs are not considered site-related COCs and were not addressed in the FS.

In addition, a risk management decision was made to address risk from arsenic concentrations in soil that exceed the upper tolerance limit (UTL) for background arsenic concentrations. Because of the similarity between the bulk soil concentrations for arsenic at OU1 and the background concentrations for arsenic, EPA calculated a UTL for arsenic concentrations in soil to distinguish between soil concentrations that are distributed among the naturally-occurring values at the site and those that may be impacted by activities in and around the USS Lead site. The approach of using the UTL as a value for the RAL has been used at other CERCLA sites, including the Jacobsville Neighborhood Soil Contamination site in Evansville, Indiana. This approach is discussed in greater detail in that site's RI Report. The UTL also corresponds with the soil concentration that is equivalent to a $1x10^{-4}$ cancer risk level assuming that 25% of the total produce consumed by residents in OU1 is comprised of homegrown produce.

2.7.2 - Identification of Contaminants of Concern

The COCs at OU1 are lead and arsenic, with lead being the primary COC. Based on lead concentrations observed during the RI, lead-contaminated soils at the USS Lead site require remedial action to address unacceptable risks. Data analysis indicates that lead and arsenic are generally co-located. The range of detected concentrations and frequency of detections for lead and arsenic in soil at OU1 are presented in Table 1.

Table 1 – Summary of Contaminants of Concern for OU1

Exposure Point	COC	Concentration Deteeted (mg/kg)		Frequency of Detection	Exposure Point Coneentration (mg/kg)		Statistieal Measure
		Min	Max		Min	Max	
Residences	Arsenic	1.6	567	252/252	8.4	169	95 UCL
	Lead	4.7	27,100	848/850	233	5,910	MAX
Parks	Arsenic	0.99	414	40/40	31.8	43.4	95 UCL
	Lead	7	6,770	82/84	276	1,460	MAX
Schools	Arsenic[1]	2.9	11	21/21	N/A	N/A	95 UCL
	Lead	15.6	572	39/40	257	260	MAX

2.7.3 - Data Quality and Usability

Data were evaluated based on completeness, holding times, initial and continuing calibrations, surrogate recoveries, internal standards, compound identification, laboratory and field quality assurance/quality control (QA/QC) procedures and results, reporting limits, documentation practices, and application of validation qualifiers. Analytical data collected as part of Phase I and Phase II RI sampling were considered to be acceptable for use in the HHRA. Data were reduced based on consideration of essential nutrient and duplicate status as described below.

- Calcium, magnesium, potassium, and sodium are classified as essential nutrients and, therefore, were eliminated from further quantitative evaluation.

- Duplicate pairs were reduced to a single value based on an evaluation of the relative percent difference between the paired results.

2.7.4 - Exposure Point Concentrations

EPCs were developed for both modeling and non-modeling scenarios. The same chemical-specific EPCs were used for both reasonable maximum exposure (RME) and central tendancy exposure (CTE) scenarios. The approaches used to calculate EPCs under the two scenarios are presented in the HHRA.

EPCs were calculated only for chemicals with at least eight detected results. Calculations were performed for metals and PAHs in surface soil (0 to 6" bgs) and for all soil depths combined. EPCs were calculated using the 95 percent upper confidence limit of the mean following the decision rules in ProUCL 4.00.05, a statistical analysis software tool. Because EPA uses the IEUBK/Adult Lead Model in its evaluation of lead, the risk assessment used the average concentration under both RME and CTE conditions as the EPC for lead.

EPA used the approach described above to generate EPCs for all receptors except utility and construction workers. Because utility and construction workers may conduct their work within a limited area, the maximum detected concentration was used as the EPC for those receptors under both RME and CTE conditions.

EPCs were calculated following the methods and recommendations provided in EPA's risk assessment guidance. Modeling was used to generate medium-specific EPCs for media not sampled directly. Specifically, modeling was used to estimate EPCs for blood lead, outdoor air (from soil), and homegrown produce, as summarized below.

- EPA used the IEUBK model and the Adult Lead Model (ALM) to estimate soil concentrations that correspond to acceptable blood-lead concentrations for residents and non-residents, respectively. Appendix C of the HHRA presents the methodology based on the IEUBK and ALM models used to calculate acceptable receptor-specific soil lead concentrations (referred to as PRGs). The lead PRGs were compared to the lead EPCs (average lead concentrations) to evaluate whether adverse effects could result from exposure to lead in soil.

- EPA estimated concentrations of non-volatile constituents from soil in ambient air using constituent-specific and site-specific particulate emission factors as presented in the Regional Screening Level User's Guide.

- EPA evaluated the uptake of COPCs from soil into homegrown produce for current and future residents at the site using COPC-specific uptake factors. Uptakes into aboveground and belowground produce were evaluated separately. COPC-specific uptake factors were obtained from or calculated consistent with EPA's "Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities."

Singular EPCs were not calculated for OU1 based on exposure scenarios. Instead, EPCs were calculated on a property-specific basis for the HHRA. EPCs for all COPCs from each of the 88

individual properties evaluated are presented in Appendix A (RAGs Table 7) of the HHRA. A summary of the EPCs for the COCs lead and arsenic is provided in Table 1 above.

2.7.5 - Exposure Assessment

Exposure assessment is the process of measuring or estimating the intensity, frequency, and duration of human exposure to a chemical in the environment. OU1 includes the following land uses: (1) numerous residences, including single and multi-family units, some of which are public housing, (2) various, generally small commercial/industrial operations, (3) various municipal and community offices and operations, (4) two schools (the Carrie Gosch Elementary School and the Carmelite School for Girls), (5) four parks, and (6) numerous places of worship. Residences, schools, and public parks constitute the large majority of properties and acreage within the USS Lead site. These properties are unlikely to soon be redeveloped and replaced by alternate property types. As a conservative approach, places of worship and commercial/municipal properties were treated as residential properties as the likely users of these properties are residents of OU1. Industrial cleanup criteria were applied to industrial properties.

The conceptual site model links contaminant concentrations in various media to potential human exposure. The CSM identified the following exposure scenarios for each of the property types:

- Residential Properties
  - Current and future residents were assumed to be exposed to surface and subsurface soil through incidental ingestion, dermal contact, inhalation of particulates in ambient air, and ingestion of homegrown produce.
  - Current and future utility and construction workers were assumed to be exposed to subsurface soil through incidental ingestion, dermal contact, and inhalation of particulates.

- Schools
  - Current and future students, teachers, and staff were assumed to be exposed to surface and subsurface soil through incidental ingestion, dermal contact, and inhalation of particulates in ambient air.
  - Current and future utility and construction workers were assumed to be exposed to subsurface soil.

- Parks
  - Current and future recreationalists and park staff were assumed to be exposed to surface and subsurface soil through incidental ingestion, dermal contact, and inhalation of particulates in ambient air.
  - Current and future utility and construction workers were assumed to be exposed to subsurface soil.

Assumptions about exposure frequency, duration, and other exposure factors are discussed in the HHRA. Sensitive sub-populations considered in the HHRA included children and adolescents. EPA used the IEUBK model to develop soil-lead PRGs for child and adolescent receptors, including child residents, adolescent school children, and child recreationalists.

2.7.6 - Toxicity Assessment

The toxicity assessment provides a description of the relationship between a dose of a chemical and the potential likelihood of an adverse health effect. The purpose of the toxicity assessment is to provide a quantitative estimate of the inherent toxicity of COCs for use in risk characterization. Potential health risks for COCs are evaluated for both carcinogenic and non-carcinogenic risks.

The risk assessment for the USS Lead site used the default toxicity values presented in the EPA RSL tables. The default values were obtained from the following sources:

- Integrated Risk Information System (IRIS) on-line database;
- Provisional Peer Reviewed Toxicity Values (PPRTV) derived by EPA's Superfund Health Risk Technical Support Center;
- Technical Support Center for the EPA Superfund program;
- The Agency for Toxic Substances and Disease Registry (ATSDR) minimal risk levels;
- The California Environmental Protection Agency/Office of Environmental Health Hazard Assessment's toxicity values;
- Screening toxicity values in appendices to certain PPRTV assessments; and
- The EPA Superfund program's Health Effects Assessment Summary Tables (HEAST).

Toxicity values used in the HHRA for all COPCs are presented in Tables A5.1 and A5.2 (non-cancer toxicity values) and Tables A6.1 and A6.2 (cancer toxicity values) of Appendix A of the HHRA. For the COCs lead and arsenic, the cancer toxicity data are summarized in Table 2 below and the non-cancer toxicity data are summarized in Table 3.

2.7.7 - Risk Characterization

For carcinogens, such as arsenic, risks are generally expressed as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to the carcinogen. Excess lifetime cancer risk is calculated from the following equation:

$$Risk = CDI \times SF$$

Where:

risk = a unitless probability (e.g., $2x10^{-5}$) of an individual's developing cancer
CDI = chronic daily intake averaged over 70 years (mg/kg-day)
SF = slope factor, expressed as $(mg/kg\text{-}day)^{-1}$

These risks are probabilities that are expressed typically in scientific notation (e.g., $1x10^{-6}$). An excess lifetime risk of $1x10^{-6}$ indicates that an individual experiencing the RME estimate has a 1 in 1,000,000 chance of developing cancer as a result of site-related exposure. This is referred to as excess lifetime cancer risk because it would be in addition to the risks of cancer individuals face from other causes such as smoking or exposure to too much sun. The chance of an

Table 2
Cancer Toxicity Data Summary

Pathway: Ingestion, Dermal

COC	Oral Cancer Slope Factor	Dermal Cancer Slope factor	Slope Factor Units	Weight of Evidence/ Cancer Guideline Description	Source	Date
Arsenic	1.5	1.5	$(mg/kg\text{-}day)^{-1}$	A	IRIS	Nov-2010
Lead	NA	NA	NA	NA	IRIS	Nov-2010

Pathway: Inhalation

COC	Unit Risk	Units	Inhalation Cancer Slope factor	Slope Factor Units	Weight of Evidence/ Cancer Guideline Description	Source	Date
Arsenic	0.0043	$(\mu g/m^3)^{-1}$	15	$(mg/kg\text{-}day)^{-1}$	A	IRIS	Nov-2010
Lead	NA	NA	NA	NA	NA	IRIS	Nov-2010

Notes:
COC: Contaminant of concern
NA: Not available
IRIS: Integrated Risk Information System, EPA

A - Known Human Carcinogen
B1- Probable human carcinogen - indicates that limited human data are available
B2- Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans
C- Possible human carcinogen
D- Not classifiable as a human carcinogen
E- Evidence of non-carcinogenicity

This table provides carcinogenic risk information which is relevant to the contaminants of concern in soil. At this time, slope factors are not available for lead for oral, dermal, or inhalation routes of exposures. An adjustment factor is sometimes applied, and is dependent upon how well the chemical is absorbed via the oral route. An adjustment factor of 95% was used for arsenic. Therefore, a slightly lower value than is presented above was used as the dermal carcinogenic slope factor for arsenic.

Table 3
Non-Cancer Toxicity Data Summary

Pathway: Ingestion, Dermal

COC	Chronic/ Subchronic	Oral RfD value[1]	Oral RfD Units	Dermal RfD Value[2]	Dermal RfD Units	Primary Target Organ[3]	Combined UF/MF[4]	Sources of RfD Target Organ[5]	Date
Arsenic	Chronic	0.0003	mg/kg-day	0.0003	mg/kg-day	Cardiovascular Dermal	3	IRIS	Nov-2010
Lead	NA	NA	NA	NA	NA	NA	NA	IRIS	Nov-2010

Pathway: Inhalation

COC	Chronic/ Subchronic	Inhalation RfC value	Inhalation RfC Units	Inhalation RfD Value	Inhalation RfD Units	Primary Target Organ[6]	Combined UF/MF	Sources of RfC Target Organ	Date
Arsenic	Chronic	$1.5x10^{-5}$	mg/m^3	NA	NA	Development Cardiovascular CNS	NA	CalEPA	Nov-2010
Lead	NA	NA	NA	NA	NA	NA	NA	IRIS	Nov-2010

Notes:

COC: Contaminant of concern

NA: Value not available/not calculated

1) Oral RfD = Oral reference dose (EPA, 2010)

2) Dermal RfD = Dermal reference dose calculated as: RfDd = RfDo x GIABS (Gastrointestinal absorption efficiency EPA, 2010).

3) Primary target organ/system based on information from the Agency for Toxic Substances and Disease Registry "ToxFAQs" (ATSDR, 2010).

4) UF/MF = Uncertainty factor/modifying factor (EPA-IRIS, 2010)

5) Primary source of RfDo as cited in the RSL Tables (EPA, 2010) and date of RSL Table update. Primary sources include: 1) IRIS - Integrated Risk Information System; 2) PPRTV - Provisional Peer Reviewed Toxicity Values; 3) ATSDR = Agency for Toxic Substances and Disease Registry; 4) CalEPA - California Environmental Protection Agency; 5) HEAST - Health Effects Assessment Summary Table; 6) NJ - New Jersey Department of Environmental Quality.

6) Primary source of RfC as cited in the RSL Tables (EPA, 2010) and date of RSL Table update. Primary sources include: 1) IRIS - Integrated Risk Information System; 2) PPRTV - Provisional Peer Reviewed Toxicity Values; 3) ATSDR = Agency for Toxic Substances and Disease Registry; 4) CalEPA – California Environmental Protection Agency; 5) HEAST - Health Effects Assessment Summary Table; 6) NJ - New Jersey Department of Environmental Quality; 7) X-PPRTV = PPRTV Appendix; 8) ECAO = Environmental Criteria and Assessment Office.

This table provides non-carcinogenic risk information which is relevant to the contaminants of concern in soil. At this time, RfDs are not available for lead for oral, dermal, or inhalation routes of exposure. An adjustment factor is sometimes applied, and is dependent upon how well the chemical is absorbed vial the oral route. An adjustment factor of 95% was used for arsenic. Therefore, a slightly lower value than was presented above is used as the dermal non-carcinogenic slope factor for arsenic.

individual developing cancer from all other causes has been estimated to be as high as one in three. EPA's generally-acceptable risk range for site-related exposures is $1x10^{-4}$ to $1x10^{-6}$.

The potential for non-carcinogenic effects is evaluated by comparing an exposure level over a specified time period (e.g., lifetime) with a reference dose (RfD) derived for a similar exposure period. An RfD represents a level that an individual may be exposed to that is not expected to cause any adverse effect. The ratio of exposure to toxicity is called a hazard quotient (HQ). An HQ less than 1 indicates that a receptor's dose of a single contaminant is less than the RfD, and that toxic non-carcinogenic effects from that chemical are unlikely. The hazard index is generated by adding the HQs for all COCs to which a given individual may reasonably be exposed that affect the same target organ (e.g., liver) or that act through the same mechanism of action within a medium or across all media. An HI less than 1 indicates that, based on the sum of all HQs from different contaminants and exposure routes, toxic non-carcinogenic effects from all contaminants are unlikely. An HI greater than 1 indicates that site-related exposures may present a risk to human health.

The HQ is calculated as follows:

Non-cancer HQ = CDI/RfD

Where:

CDI = chronic daily intake
RfD = reference dose

CDI and RfD are expressed in the same units and represent the same exposure period (i.e., chronic, subchronic, or short-term).

Because lead does not pose a cancer risk and does not have a nationally-approved reference dose, slope factor, or other accepted toxicological factor which can be used to assess risk, standard risk assessment methods cannot be used to evaluate the health risks associated with lead contamination. EPA has developed the Integrated Exposure Uptake Biokinetic Model for Lead in Children to predict blood lead levels (BLLs) in children exposed to lead. The IEUBK model calculates the probability that a child will have a BLL greater than 10 micrograms of lead per deciliter of blood (µg/dL). BLLs above 10 µg/dL have been directly related to adverse health effects in adults and children. EPA developed the IEUBK model to assist in establishing lead cleanup levels at Superfund sites.

The IEUBK model for lead in children was used to evaluate the non-carcinogenic risks posed to young children as a result of the lead contamination at OU1. EPA ran the IEUBK model using the available site-specific data to predict a lead soil level that will be protective of children and other residents. Site-specific soil concentrations for lead were used in place of model default values. Drip zone samples were included in the IEUBK model calculations.

A blood-lead-level study was not conducted at OU1. EPA used the IEUBK model to develop soil-lead PRGs for child and adolescent receptors, including child residents, adolescent school children, and child recreationalists. For the remaining receptors considered in the OU1 HHRA, EPA used the ALM to develop soil-lead PRGs. For residential child receptors, the average lead concentration in soil at each property was compared to the EPA residential soil RSL of 400

mg/kg. The 400 mg/kg RSL was calculated using EPA's IEUBK model and default exposure assumptions.

Available site-specific information was below regulatory levels and did not appear to be significantly different from the default parameters of the IEUBK model. This information included the municipal lead result for drinking water (3.6 micrograms per liter (µg/l)), low reported blood lead concentrations in school children, and low bioavailability of lead in soil at the site based on leachability studies. For other site-specific factors, insufficient information was available (for example, localized concentrations of lead in air, water, and foodstuffs) to warrant calculation of a site-specific residential soil PRG. For these reasons, EPA determined it was the best practice to use the default parameters in the model rather than to use site-specific data for only certain inputs. The output from the IEUBK model identified residential properties with average lead concentrations in soil greater than 400 mg/kg as presenting potential lead risks to residential receptors.

PRGs for lead in soil for both adolescent school children and child recreationalists were calculated in accordance with EPA's "Assessing Intermittent or Variable Exposures at Lead Sites" (EPA-540-R-03-008). In performing the calculations, EPA assumed that the overall average concentration of lead in soil to which these receptors could be safely exposed was the residential soil PRG of 400 mg/kg. For each receptor, three inputs were identified: (1) the average concentration to which the receptor would be exposed at home, (2) the fraction of time the receptor would spend at home, and (3) the fraction of time the receptor would spend at the alternate exposure point (for an adolescent school child, this would be the school; for a child recreationalist, this would be a park). Using these inputs and the target acceptable overall average lead concentration of 400 mg/kg, EPA calculated receptor-specific soil-lead PRGs (the acceptable concentration of lead in soil at the alternate location) for schools and parks. The calculated soil-lead PRG for an adolescent school child is 583 mg/kg, and for a child recreationalist the soil-lead PRG is 693 mg/kg.

After evaluating all COPCs for the appropriate exposure scenarios, EPA retained only lead and arsenic as COCs. Non-carcinogenic effects attributable to COPCs other than lead at OU1 were found to be negligible for all exposure scenarios.

Tables 4, 5, and 6 summarize the total carcinogenic risks from all COPCs to residents, utility workers, and construction workers, respectively. Tables 7, 8, and 9 summarize the total non-carcinogenic risks from all COPCs to residents, utility workers, and construction workers, respectively. Because the HHRA evaluated risks on an individual, property-by-property basis, Tables 4 through 9 show the range of the property-specific risk results for each exposure route.

Table 4
Risk Characterization Summary for Residents - Carcinogens

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Adult/Child

Medium	Exposure Location	Exposure Point	Carcinogenic Risk									
			Ingestion		Inhalation		Dermal		Home Grown Produce Ingestion		Exposure Routes Total	
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Surface/Subsurface Soil	Schools	Soil On-Site Adult/Child RME	3.9×10^{-8}	6.2×10^{-6}	7.5×10^{-9}	4.7×10^{-6}	4.9×10^{-17}	8.1×10^{-9}	1.2×10^{-5}	6.4×10^{-5}	1.2×10^{-5}	7.5×10^{-5}
	Parks	Soil On-Site Adult/Child RME	4.7×10^{-8}	7.9×10^{-5}	4.9×10^{-9}	1.8×10^{-5}	3.7×10^{-16}	6.4×10^{-9}	N/A	N/A	5.2×10^{-8}	9.7×10^{-5}
	Residential	Soil On-Site Adult/Child RME	0.0	1.3×10^{-3}	0.0	2.4×10^{-4}	0.0	1.9×10^{-3}	0.0	4.5×10^{-3}	0.0	7.9×10^{-3}

Table 5
Risk Characterization Summary for Utility Workers - Carcinogens

Scenario Timeframe: Current/Future
Receptor Population: Utility Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Carcinogenic Risk									
			Ingestion		Inhalation		Dermal		Home Grown Produce Ingestion		Exposure Routes Total	
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Surface/Subsurface Soil	Schools	Soil On-Site Adult RME	0.0	6.0×10^{-6}	0.0	3.1×10^{-11}	0.0	2.3×10^{-6}	N/A	N/A	0.0	8.3×10^{-6}
	Parks	Soil On-Site Adult RME	5.2×10^{-6}	5.8×10^{-5}	5.7×10^{-10}	6.4×10^{-9}	4.9×10^{-7}	5.6×10^{-6}	N/A	N/A	5.7×10^{-6}	6.4×10^{-5}
	Residential	Soil On-Site Adult RME	6.5×10^{-8}	7.8×10^{-5}	2.7×10^{-13}	6.0×10^{-9}	2.5×10^{-8}	7.1×10^{-6}	N/A	N/A	1.8×10^{-7}	8.5×10^{-5}

Table 6
Risk Characterization Summary for Construction Workers - Carcinogens

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Carcinogenic Risk									
			Ingestion		Inhalation		Dermal		Home Grown Produce Ingestion		Exposure Routes Total	
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Surface/Subsurface Soil	Schools	Soil On-Site Adult RME	0.0	3.6×10^{-7}	0.0	3.7×10^{-12}	0.0	1.4×10^{-7}	N/A	N/A	0.0	5.0×10^{-7}
	Parks	Soil On-Site Adult RME	3.1×10^{-7}	3.5×10^{-6}	6.9×10^{-11}	7.7×10^{-10}	7.0×10^{-11}	3.4×10^{-7}	N/A	N/A	3.1×10^{-7}	3.8×10^{-6}
	Residential	Soil On-Site Adult RME	3.9×10^{-9}	4.7×10^{-6}	3.3×10^{-14}	1.8×10^{-7}	5.7×10^{-11}	1.6×10^{-1}	N/A	N/A	7.9×10^{-9}	1.6×10^{-1}

Table 7
Risk Characterization Summary for Residents - Non-Carcinogens

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Adult/Child

Medium	Exposure Medium	Exposure Point	Non-Carcinogenic Risk (Hazard Index)									
			Ingestion		Inhalation		Dermal		Home Grown Produce Ingestion		Exposure Routes Total	
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Surface/Subsurface Soil	Schools	Soil On-Site Adult/Child RME	0.0	$2.7x10^{-1}$	0.0	$2.7x10^{-3}$	0.0	$2.2x10^{-2}$	0.0	$2.5x10^{-1}$	0.0	$5.4x10^{-1}$
	Parks	Soil On-Site Adult/Child RME	$4.6x10^{-3}$	6.4	$1.2 x10^{-4}$	$5.9x10^{-1}$	$4.8x10^{-4}$	$4.2x10^{-1}$	N/A	N/A	$5.2x10^{-3}$	7.4
	Residential	Soil On-Site Adult/Child RME	0.0	$1.6x10^{+2}$	0.0	$3.0x10^{+1}$	0.0	2.1	0.0	$5.3x10^{+2}$	0.0	$7.2x10^{+2}$

Table 8
Risk Characterization Summary for Utility Workers - Non-Carcinogens

Scenario Timeframe: Current/Future
Receptor Population: Utility Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Non-Carcinogenic Risk (Hazard Index)									
			Ingestion		Inhalation		Dermal		Home Grown Produce Ingestion		Exposure Routes Total	
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Surface/Subsurface Soil	Schools	Soil On-Site Adult RME	0.0	6.0×10^{-6}	0.0	3.1×10^{-11}	0.0	2.3×10^{-6}	N/A	N/A	0.0	8.3×10^{-6}
	Parks	Soil On-Site Adult RME	4.5×10^{-2}	4.9×10^{-1}	2.3×10^{-4}	4.2×10^{-4}	2.9×10^{-3}	3.2×10^{-2}	N/A	N/A	4.8×10^{-2}	5.2×10^{-1}
	Residential	Soil On-Site Adult RME	2.1×10^{-6}	1.2	3.3×10^{-10}	1.1×10^{-3}	3.0×10^{-4}	4.5×10^{-2}	N/A	N/A	3.0×10^{-4}	1.2

Table 9
Risk Characterization Summary for Construction Workers - Non-Carcinogens

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Non-Carcinogenic Risk (Hazard Index)									
			Ingestion		Inhalation		Dermal		Home Grown Produce Ingestion		Exposure Routes Total	
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Surface/Subsurface Soil	Schools	Soil On-Site Adult RME	0.0	$1.9x10^{-1}$	0.0	$2.7x10^{-3}$	0.0	0.0	N/A	N/A	0.0	$1.9x10^{-1}$
	Parks	Soil On-Site Adult RME	$5.8 x10^{-1}$	6.4	$6.0 x10^{-3}$	$1.1 x10^{-2}$	$7.8 x10^{-3}$	$4.2 x10^{-1}$	N/A	N/A	$6.0 x10^{-3}$	6.8
	Residential	Soil On-Site Adult RME	$2.6 x10^{-7}$	15	$1.6 x10^{-4}$	$2.4 x10^{-1}$	$2.8 x10^{-3}$	$5.8 x10^{-1}$	N/A	N/A	$3.0 x10^{-3}$	16

Risk characterization results are discussed by property and receptor type in the following order: residential, school, and recreational properties. For each, there is a discussion of the likely exposure of the primary receptor, followed by the likely exposure to utility and construction workers (which are assumed to be potentially exposed at all properties). (See Section 2.7.5 for a discussion of the various exposure scenarios that were evaluated.)

Residential Properties

The majority of OU1 is made up of residential properties. Risk was evaluated discretely at each of the 74 residential properties that were tested during the RI. Exposure routes at residential properties to lead- and arsenic-contaminated surface and subsurface soils include incidental ingestion, dermal contact, inhalation of particulates in ambient air, and ingestion of homegrown produce. For lead, these were integrated together in the IEUBK model. For other COPCs, risks were quantified individually for each exposure route at each property. The HHRA evaluated risks associated with both current and future land uses. For current land use, the HHRA considered the upper 12 inches of soil in yards and 24 inches where gardens are currently located. Future land use assumes that gardens can be relocated anywhere in the yard and the HHRA considered the top 24 inches of soil throughout the yard. Individual risks for each property can be found in the HHRA, which is included in the RI Report. The sensitive subpopulation for lead is children.

The primary non-lead drivers of risk are arsenic and carcinogenic PAHs. EPA has determined that the PAHs at OU1 are not site-related. The primary hazard drivers are arsenic, antimony, manganese, and mercury, as well as a series of other metals at a small number of properties. Risks and hazards are driven by ingestion of homegrown produce and incidental ingestion of soil. No carcinogenic COPCs were identified at 35 of the 74 residential properties tested.

Residents

As shown in Table 4, the total carcinogenic risk for residents under both current and future land uses from all COPCs at the residential properties tested ranges from zero to $7.9x10^{-3}$. Table 7 shows that the non-carcinogenic hazard index from all COPCs at the residential properties tested ranges from zero to 720. However, some of the COPCs were determined not to be site-related. The risks to residents when considering only the site-related COCs are summarized as follows:

- For residents under current land uses (exposed to the upper 12 inches of soil), 27 of the 74 residential properties tested have total current risks greater than $1x10^{-4}$, the upper end of EPA's acceptable risk range. The total risks at these properties range from $2x10^{-4}$ to $5x10^{-3}$.
- For residents under future land uses (potentially exposed to the upper 24 inches of soil), 36 of the 74 properties tested have total future risks greater than $1x10^{-4}$, the upper end of EPA's acceptable risk range. The total risks at these properties range from $2x10^{-4}$ to $5x10^{-3}$.
- Lead poses a risk to residents at 47 of the 74 residential properties that were tested.

Utility Worker

The HHRA evaluated potential exposure of utility workers at the residential properties. As shown in Table 5, the total carcinogenic risk for utility workers from all COPCs ranges from $1.8x10^{-7}$ (below EPA's acceptable risk range) to $8.5x10^{-5}$ (within EPA's acceptable risk range). Table 8 shows that the non-carcinogenic hazard index from all COPCs ranges from 0.0003 (insignificant) to 1.2. However, when considering risks to utility workers only due to site-related COCs, non-carcinogenic hazards are less than 1 and insignificant at all properties. Lead poses a risk to utility workers at three of the 74 residential properties that were tested.

Construction Worker

The HHRA evaluated potential exposure of construction workers at the residential properties. As shown in Table 6, the total carcinogenic risk for construction workers from all COPCs ranges from $7.9x10^{-9}$ (below EPA's acceptable risk range) to $1.6x10^{-1}$ (above EPA's acceptable risk range). Table 9 shows that the non-carcinogenic hazard index from all COPCs ranges from 0.003 to 16. However, when considering risks to construction workers only due to site-related COCs, carcinogenic risks were either less than $1x10^{-6}$ and considered insignificant or were within EPA's acceptable risk range. Non-carcinogenic hazards for construction workers due to the COCs exceed an HI of 1 at 11 of the residential properties that were tested. Lead poses a risk to construction workers at 16 of the 74 residential properties that were tested. The majority of the 16 properties are clustered in the public housing area at the southwest corner of OU1.

Schools

There are two schools within the study area, the Carmelite School for Girls and Carrie Gosch Elementary School. The Carmelite School contains some residents. Therefore, the exposure assumptions were different for the two schools. Human health risks for students and teachers are summarized as follows:

Carmelite School for Girls

Under both current (C) and future (F) land use conditions, total risks from all COPCs for adolescent students ($5x10^{-5}$ [C] and $7x10^{-5}$ [F]) and adult teachers and staff ($4x10^{-5}$ [C] and $1x10^{-4}$ [F]) are within EPA's acceptable risk range. Non-carcinogenic hazards for both receptor groups are less than an HI of 1 and considered insignificant. At Carmelite School for Girls, lead does not pose a risk to either adolescent students or adult teachers and staff.

Carrie Gosch Elementary School

At Carrie Gosch Elementary School, under both current and future land use conditions, total risks from all COPCs for adolescent students, indoor teachers and staff, and outdoor teachers and staff are less than or equal to $1x10^{-5}$ and within EPA's acceptable risk range. Non-carcinogenic hazards are less than an HI of 1 and considered insignificant for all receptors. At Carrie Gosch Elementary School, lead does not pose a risk to any receptors.

Construction and Utility Workers

There were no unacceptable risks for construction or utility workers at either school under current or future land use conditions.

Parks

Under current land use conditions, total carcinogenic risks to the following groups are within EPA's acceptable risk range: (1) child, adolescent, and adult recreationalists; (2) indoor park workers; and (3) outdoor park workers at Riley Park, Goodman Park, and Kennedy Gardens Park. The maximum risk is $3x10^{-5}$ (within EPA's acceptable risk range) for an outdoor park worker at Goodman Park. Total non-carcinogenic hazards at all three parks are less than an HI of 1 and considered insignificant for all receptors.

Lead poses the following types of risk at each park:

- Riley Park – lead does not pose a risk to any receptors.
- Goodman Park – lead poses a risk to child recreationalists, indoor park workers, and outdoor park workers.
- Kennedy Gardens Park – lead poses a risk to all recreational receptors.

Under future land use conditions, the carcinogenic risks increase slightly for all receptors but remain within EPA's acceptable risk range, and non-carcinogenic hazards at the three parks also remain insignificant. The risks from lead remain similar to those described under current land use conditions.

Construction and Utility Workers

There are no unacceptable risks for utility workers at the three parks under current or future land use conditions. For construction workers, the non-carcinogenic hazard index from all COPCs ranges from 0.006 to 6.8 (see Table 9), with the values exceeding 1 driven by concentrations of arsenic at or below background levels. When taking such non-site-related concentrations out of the evaluation, there are no unacceptable risks to construction workers at the three parks.

2.7.8 - Uncertainties

Uncertainties are inherent in the process of quantitative risk assessment because of the use of environmental sampling results, assumptions regarding exposure, and the quantitative representation of chemical toxicity. Potentially significant sources of uncertainty for this assessment are discussed in the HHRA and include analytical data, exposure estimates, toxicity estimates, and background conditions. The uncertainties associated with analytical data are summarized below.

At OU1 of the USS Lead Site, there are four primary sources of uncertainty with regard to the analytical data used in the HHRA: (1) the depth of surface soil samples, (2) the use of x-ray fluorescence (XRF) data, (3) the limited number of soil samples analyzed for constituents other than lead, and (4) a limited number of samples at each property. Each of these sources of uncertainty is summarized below.

- Surface soil samples were collected from 0 to 6 inches bgs. However, EPA guidance suggests that concentrations of some constituents, particularly lead, may be highest in the uppermost few centimeters (1 inch). Therefore, collection of surface soil samples from 0 to 6 inches bgs may result in a dilution of lead concentrations in surface soil samples. At OU1, EPA evaluated the concentration of lead in soil samples collected during the limited investigation in 2007. EPA concluded that concentrations of lead measured in soil samples collected from 0 to 1 inch bgs did not differ from measured lead concentrations in samples collected from 1 to 6 inches bgs at the same location.

- Field-based analytical methods have been found acceptable for use in investigating hazardous waste sites if a particular method (in this case XRF) is generally accepted and performed in accordance with QA/QC protocols and procedures. The XRF technique, well established and routinely used in site investigations, was performed using an established analytical method (Method 6200). Therefore, EPA concluded that XRF data (obtained by EPA) are acceptable for use in the RI and HHRA for the USS Lead Site. Furthermore, all XRF data used in the HHRA were first adjusted based on a correlation developed between samples analyzed using both XRF and laboratory analysis.

- All soil samples collected during the RI were analyzed for lead, either by XRF (and later adjusted as described above) or by an off-site laboratory. However, only 20 percent of the Phase I soil samples were sent to an off-site laboratory for total metals analysis. (Note: All Phase II soil samples were sent offsite for total metals analysis). Also, only eight Phase I soil samples were sent offsite for VOC, SVOC (including PAHs), PCB, and pesticide analyses. VOCs, non-PAH SVOCs, PCBs, and pesticides were not detected in any of those eight samples; therefore, VOCs, non-PAH SVOCs, PCBs, and pesticides were not analytes in Phase II sampling. Consequently, the EPCs (and in turn risks and hazards) for non-lead COPCs, particularly arsenic and PAHs, are subject to a moderate to large amount of uncertainty.

- As noted above, samples analyzed for COCs other than lead were collected less frequently than samples analyzed for lead. As a result, EPCs for COCs other than lead at individual properties are based on fewer samples than EPCs for lead. This means that EPCs for some analytes could not be calculated at some properties. At other properties, the EPCs are subject to at least a moderate amount of uncertainty because they are based on a limited number of samples. In such instances, the maximum detected concentration was used as the EPC. This may result in an overestimation of the EPC.

2.7.9 - Risk Assessment Conclusions

The risk to human health from lead and arsenic in residential soils drives the need for remedial action at OU1 of the USS Lead Site. The response action selected in this ROD is therefore necessary to protect public health or welfare or the environment from actual or threatened releases of pollutants or contaminants that may present an imminent and substantial endangerment.

2.8 – Remedial Action Objectives

Remedial action objectives (RAOs) are goals specific to media or operable units for protecting human health and the environment. Risk can be associated with current or potential future exposures. RAOs should be as specific as possible, but not so specific that the range of alternatives to be developed is unduly limited. Objectives aimed at protecting human health and the environment should specify: (1) COCs; (2) exposure routes and receptors; and (3) an acceptable contaminant level or range of levels for each exposure route.

As discussed in Section 2.7, the OU1 HHRA recognized the following receptors for current and future land-use scenarios: child, adolescent, and adult residents; child, adolescent, and adult recreationalists; and adult indoor and outdoor workers. Section 2.7 also details the exposure routes for each receptor. Current land uses within OU1 include residential, recreational, school, and industrial/commercial properties. For the purposes of the HHRA and the development of RAOs, EPA assumed that future land uses of all properties would be the same as current land uses. As land use and the potential for exposure to contaminated material is not likely to change, the RAO must reduce the risks posed by soils in yards at OU1.

EPA has identified the following RAO for OU1 of the USS Lead Site:

- Reduce to acceptable levels human health risk from exposure to COCs (lead and arsenic) in impacted surface and subsurface soils, through ingestion, direct contact, or inhalation exposure pathways, assuming reasonably anticipated future land-use scenarios.

Portions of OU1 are currently paved or covered with buildings, which limits potential exposure. However, significant portions of OU1, including yards, parks, and lawns, are unpaved. The intent of the RAO above is to address open areas to protect residents, recreationalists, and workers. A cleanup that achieves this RAO will be protective of human health and the environment as it will ensure that the soil to which residents are exposed, now and in the future, does not pose a health risk.

Remedial Action Levels

Lead

As discussed in Section 2.7.7, the HHRA evaluated lead by using the IEUBK model and default exposure assumptions to calculate a screening level very similar to the 400 mg/kg RSL. Available site-specific information was not significantly different than the standard parameters

of the IEUBK model, and insufficient information was available for other site-specific factors. EPA therefore used the default parameters for the IEUBK model and the ALM in its calculation of site-specific residential soil PRGs for lead, and identified average lead concentrations in soil greater than 400 mg/kg as presenting potential lead risks to residential receptors. EPA is therefore selecting 400 mg/kg as the RAL for lead in residential yards.

At schools and parks, where the calculated soil PRG is above 400 mg/kg, EPA has conservatively chosen to use the residential RSL of 400 mg/kg as the RAL since it is likely that the children potentially exposed at schools and/or parks are also exposed at residences within OU1. Given the small size of the yards at many residences within OU1, it is possible that some children spend more time outside at schools and parks than they do at home. Selecting 400 mg/kg as the lead RAL for all property types therefore takes into account cumulative risk from exposure of children at schools and parks as well as at residential properties.

At industrial/commercial properties, EPA used the ALM to identify a RAL of 800 mg/kg for lead in soil.

Arsenic

As discussed in Section 2.7.1, the RAL for arsenic is based upon the upper tolerance limit of naturally-occurring concentrations of arsenic at OU1. Arsenic concentrations in soil samples collected within OU1 are distributed around both the site-specific background concentration of 14.1 mg/kg and the Illinois metropolitan background concentration of 13.0 mg/kg. Because of the similarity between the bulk soil concentrations for arsenic at OU1 and the naturally-occurring background concentrations, EPA made a risk-management decision to use the UTL to distinguish between arsenic soil concentrations that are distributed among the naturally-occurring values at OU1 and those that may have been impacted by activities in and around the site. The 95% UTL for arsenic in soil at OU1 is 26 mg/kg, which corresponds to the upper bound of the naturally-occurring (i.e. background) concentrations. The 26 mg/kg RAL for arsenic will be applied to residential, recreational, and commercial/industrial properties. The approach of using the UTL as a RAL has been used at other CERCLA sites, including the Jacobsville Neighborhood Soil Contamination Site in Evansville, Indiana, and is discussed more fully in the RI Report for OU1 of the USS Lead Site.

EPA notes that an arsenic soil concentration of 26 mg/kg also corresponds with a risk level of $1x10^{-4}$ for residential land use if one assumes that 25 percent of the produce consumed by residents of OU1 is comprised of homegrown produce (grown within OU1).

RAL Summary

Table 10 summarizes the remedial action levels for soils at OU1.

Table 10
Soil Remedial Action Levels for OU1 of the USS Lead Site

Analyte Group	Analyte Name	OU1 Soil RAL
Metals	Arsenic	26 mg/kg
	Lead	400 mg/kg (Residential) 800 mg/kg (Industrial/Commercial)

2.9 – Description of Alternatives

This section presents the remedial alternatives for OU1, which are numbered to correspond with the numbering system used in the FS Report. The alternatives are described more fully in Section 2.9.2. The alternatives listed in bold font are those that EPA carried forward for detailed analysis in the FS.

- **Alternative 1 – No Action**
- Alternative 2 – Institutional Controls
- **Alternative 3 – On-site Soil Cover + Institutional Controls**
- **Alternative 4A – Excavation of Soil Exceeding RALs + Off-site Disposal + *Ex-situ* Treatment Option**
- **Alternative 4B – Excavation to Native Sand + Off-site Disposal + *Ex-situ* Treatment Option**
- Alternative 5 – *In-situ* Treatment by Chemical Stabilization

In accordance with EPA guidance, the potential remedial alternatives identified in the FS and listed above were screened against three broad criteria: (1) effectiveness (both short-term and long-term), (2) implementability (including technical and administrative feasibility), and (3) relative cost (capital and operation and maintenance [O&M]). The purpose of the screening evaluation was to reduce the number of alternatives chosen for a more thorough analysis. EPA eliminated Alternative 2 (exclusive reliance on institutional controls to prevent exposure) and Alternative 5 (in-place treatment by chemical stabilization) from further consideration because EPA did not consider them to be effective for OU1. Alternative 2 does not reduce human health risk from exposure to COCs because the impacted soils would remain in place without protective barriers. Alternative 5, chemical stabilization through the introduction of ground fish bones to achieve phosphate immobilization, was eliminated because it is not proven for long-term effectiveness; there are few case studies available for review.

2.9.1 - Common Element of Alternatives

Pre-Remedial Sampling

Prior to remedy implementation, pre-remedial sampling must be conducted at the remainder of the properties in OU1 (i.e., those that have not yet been tested) to determine which yards require remediation. The pre-remedial sampling will take place during the remedial design phase. All field activities will be conducted in accordance with an EPA-approved, site-specific quality assurance project plan. The sampling methodologies employed will be the same as those used during the RI field work. Because EPA has secured access to fewer than 25% of the properties in OU1, additional access agreements for the remaining properties will be obtained before initiating the pre-remedial field investigation. The pre-remedial sampling results will be used in the remedial design to identify the yards that require remediation. For Alternative 4A, the pre-remedial sampling will also identify the depth of RAL exceedances in each yard. The cost of the pre-remedial sampling is included in each retained alternative, with the exception of Alternative 1, No Action.

Assumed Number of Properties Requiring Remediation

Based on the representative sampling conducted during the RI, of the 1,271 properties in OU1, 53 percent or 672 properties are likely to require remedial action to address risks associated with lead. An additional four percent or 51 properties are likely to require remediation to address risks associated only with arsenic. In total, 723 properties are likely to require remediation.

2.9.2 – Summary of Remedial Alternatives

Alternative 1 – No Action
Estimated Capital Cost: $0
Estimated Total O&M Cost: $0
Cost Estimate Contingency: $0
Estimated Present Worth Cost: $0
Estimated Construction Timeframe: None

Regulations governing the Superfund program generally require that the "no action" alternative be evaluated to establish a baseline against which EPA and the public can compare the costs and benefits of other alternatives. Under this alternative, EPA would take no action at OU1 to prevent exposure to the soil contamination, and statutory five-year reviews would not be required.

Alternative 3 – On-site Soil Cover + Institutional Controls
Estimated Capital Cost: $16,705,000
Estimated Total O&M Cost: $735,000
Cost Estimate Contingency: $3,500,000
Estimated Present Worth Cost: $20,900,000
Estimated Construction Timeframe: 18 months

Alternative 3 would achieve the RAO of preventing exposure to contaminated soil by installing a soil cover that limits direct contact with impacted soil. A visible barrier, such as orange construction fencing or landscaping fabric, would be placed over the contaminated soil and then the contaminated soil and visible barrier would be covered with clean soil. Contamination would be left in place and capped with a 12-inch-thick soil cover as specified in EPA's *Superfund Lead-Contaminated Residential Sites Handbook*. The soil cover would be composed of 6 inches of imported select borrow material topped with 6 inches of top soil, and is meant to prevent direct contact with contaminated soil. The soil cover would be placed directly on top of the existing grade. After installation of the soil cover, each yard would be restored to its pre-remedial condition. As part of the O&M cost calculations, EPA assumed that the soil cover would be inspected and repaired as needed on a semi-annual basis for the first 5 years, followed by an annual inspection for years 6 through 30. Annual repairs would include re-grading portions of the soil cover, placing additional soil to maintain the 12-inch cover, and seeding or sodding the yards as needed. Institutional controls would be implemented to maintain the integrity of the soil cover so that users of the impacted yards would not be exposed to COCs in soil. Institutional controls may include property restrictions, such as the following:

- limiting gardening to raised beds;
- requiring that all subsurface work (utility maintenance, foundation work, etc.) be done in accordance with the remedial design in order to protect workers and residents;
- requiring that sufficient coverage of impacted soils be maintained.

In accordance with CERCLA requirements, EPA would perform five-year reviews of this remedy since impacted soil would be left in place above levels that allow for unlimited use and unrestricted exposure. After remediation work is complete, this alternative would allow for the continued residential use of impacted yards.

Alternative 4A - Excavation of Soil Exceeding RALs + Off-site Disposal + *Ex-situ* Treatment Option
Estimated Capital Cost: $24,795,000
Estimated Total O&M Cost: $67,000
Cost Estimate Contingency: $4,980,000
Estimated Present Worth Cost: $29,900,000
Estimated Construction Timeframe: 26 months

Alternative 4A would achieve the RAO of preventing exposure to contaminated soil by removing impacted soil that exceeds RALs, to a maximum excavation depth of 24 inches, while leaving in place soils that do not exceed the RALs. This alternative requires excavation of soil exceeding RALs, disposal of excavated soil at an off-site Subtitle D landfill, and, as necessary, chemical stabilization of some excavated soil to address lead concentrations that exceed the toxicity characteristic regulatory threshold. Based upon testing conducted during the RI, EPA estimates that soil with lead concentrations above 2,400 mg/kg (an estimated 7% of the excavated yards at OU1) will exceed the TC regulatory threshold. EPA considers the soils that exceed the TC regulatory threshold to be principal threat waste, and under Alternative 4A, the principal threat wastes would be treated.

Pre-remedial sampling would be conducted at impacted properties to determine the approximate excavation depth required in each yard. The maximum excavation depth would be 24 inches, but may be less than 24 inches at many properties. Confirmation samples would be collected as needed during the excavation work to determine the final excavation depth (up to 24 inches) and to confirm that all soils exceeding RALs within the top 24 inches were excavated. If contaminated soil is identified at a depth greater than 24 inches bgs, a visual barrier such as orange construction fencing or landscape fabric would be placed above the contaminated soil and beneath the clean backfill soil. In such instances, institutional controls would be implemented, in the same way as described in Alternative 3, to ensure that users of the property are not exposed to COCs in soil. Unlike the ICs for Alternative 3, however, the ICs for Alternative 4A would not limit gardening to raised beds.

Based on the results of the RI, the native sand/soil horizon is estimated to be no more than 24 inches bgs and is clean. During the RI, native sand was encountered at most sample locations between 0 and 24 inches bgs. For this reason, EPA expects that excavating to a maximum depth of 24 inches under Alternative 4A would remove all of the soil exceeding RALs at the majority of the impacted yards within OU1.

Since no local stockpile area has been identified, EPA assumes that soil would be loaded directly into roll-off containers and transported to the landfill. If a stockpiling location is identified that is acceptable to the community, then excavated soils could be stockpiled prior to being transported off-site for disposal.

Excavated soil would be replaced with clean soil, including 6 inches of top soil, to maintain the original grade. Each yard would be restored as close as practicable to its pre-remedial condition. Once the properties are sodded or seeded, O&M of the sod or seed, including watering, fertilizing, and cutting, would be conducted for 30 days. After the initial 30-day period, property owners would be responsible for the maintenance of their own yards. Because some soil exceeding RALs would likely be left in place at OU1 (e.g., within some yards deeper than 24 inches bgs), a five-year review would be required in accordance with CERCLA. After remediation is complete, this alternative would allow for the continued residential use of impacted yards.

Alternative 4B - Excavation to Native Sand + Off-site Disposal + *Ex-situ* Treatment Option
Estimated Capital Cost: $37,760,000
Estimated Total O&M Cost: $0
Cost Estimate Contingency: $7,560,000
Estimated Present Worth Cost: $45,400,000
Estimated Construction Timeframe: 40 months

Alternative 4B would achieve the RAO of preventing exposure to contaminated soil by removing all of the soil at impacted yards to the native sand, even if some of the excavated soils do not exceed RALs. EPA has observed that lead is not found in the native sand layer. Under this alternative, EPA would not collect confirmation samples during the excavation work. Instead, EPA would assume that, for yards that have soils exceeding the RALs, complete removal of all

soils above the native sand layer would achieve the RAO. The goal of this alternative is the total removal of soil at identified yards down to the native sand, disposal of excavated soil at an off-site Subtitle D landfill, and, as necessary, chemical stabilization of some excavated soil to address lead concentrations that exceed the TC regulatory threshold. EPA considers the soils that exceed the TC regulatory threshold to be principal threat waste, and under Alternative 4B, the principal threat wastes would be treated.

Soil in those yards that have RAL exceedances would be excavated from the surface grade down to the native sand/soil horizon without pre-remedial testing to determine the depth of contamination. Based on the results of the RI, the native sand/soil horizon is estimated to be no more than 24 inches bgs. During the RI, native sand was encountered at most sample locations between 0 and 24 inches bgs. RI results indicated that the native sand beneath the fill soils is both clean and by sight very easily distinguished from soil and fill material. The cost estimate for this alternative assumes that all soil above the native sand would be excavated and disposed offsite with no post-excavation confirmation samples.

Since no local stockpile area has been identified, EPA assumes that soil would be loaded directly into roll-off containers and transported to the landfill. If a stockpiling location is identified that is acceptable to the community, then excavated soils could be stockpiled prior to being transported off-site for disposal.

Excavated soil would be replaced with clean soil, including 6 inches of top soil, to maintain the original grade. Each yard would be restored as close as practicable to its pre-remedial condition. Once the properties are sodded or seeded, O&M of the sod or seed, including watering, fertilizing, and cutting, would be conducted for 30 days. After the initial 30-day period, property owners would be responsible for the maintenance of their own yards. This alternative would result in the removal of all impacted soils (since excavations would go down to the native sand, and the native sand layer is clean). No institutional controls would be needed, and CERCLA would not require five-year reviews because waste would not be left in place above levels that allow for unlimited use and unrestricted exposure. After remediation is complete, this alternative would allow for the continued residential use of impacted yards.

2.10 – Comparative Analysis of Alternatives

As required by CERCLA, nine criteria were used to evaluate the different remediation alternatives individually and against each other in order to select a remedy. This section of the *Record of Decision* summarizes the performance of each alternative against the nine criteria and notes how they compare to the other options under consideration.

The nine evaluation criteria fall into three groups: threshold criteria, primary balancing criteria, and modifying criteria. Threshold criteria, which include overall protection of human health and the environment and compliance with ARARs, are requirements that each alternative must meet in order to be eligible for selection. Primary balancing criteria, which include long-term effectiveness and permanence, reduction of toxicity, mobility, or volume of contaminants through treatment, short-term effectiveness, implementability, and cost, are used to weigh major trade-offs among alternatives. Modifying criteria, which include state/support agency

acceptance and community acceptance, can be fully considered only after public comment is received on the Proposed Plan, so were not evaluated in the FS. In the final balancing of trade-offs between alternatives, upon which the final remedy selection is based, modifying criteria are of equal importance to the balancing criteria. The nine evaluation criteria are discussed below.

2.10.1 - Overall Protection of Human Health and the Environment

This criterion assesses how well the alternatives achieve and maintain protection of human health and the environment.

Alternative 1 (No Action) would provide no improvement over current conditions, would provide no risk reduction, and would not be protective of human health or the environment.

Alternatives 3, 4A, and 4B are each expected to be effective remedies for OU1 that would be protective of human health and the environment. Protection of human health and the environment would be achieved by addressing potential pathways of exposure to contaminated soils. Alternative 3 relies on a soil cover and compliance with institutional controls, such as restricting gardens to raised beds, to achieve protectiveness. Alternatives 4A and 4B would achieve protectiveness through removal of contaminated soils. As discussed in Section 2.5.1, the exposure pathways through which people can be exposed to the lead- and arsenic-contaminated surface and subsurface soils at OU1 are ingestion, direct contact, and inhalation.

Ingestion of contaminated soils in yards is the primary exposure route at OU1. Residents may be exposed to contaminants adhering to soils through ingestion of homegrown produce or through direct ingestion of contaminated soil. Alternatives 3, 4A, and 4B are all considered effective at preventing ingestion of contaminants.

Exposure to contaminated soils through direct contact may result from recreational activities, gardening, landscaping, or excavation activities. Each of the active alternatives would prevent most direct contact by covering or removing the contaminated soils. However, direct contact may be more likely to result from unauthorized excavation activities under Alternative 3 because the contaminated soils would remain in place under a soil cover that is only 12 inches thick.

Exposure through inhalation would most likely occur through windborne transport of contaminated dust and soil due to the COCs' low volatility and strong tendency to adsorb to soil particles. Each of the active alternatives would prevent exposure to contaminated dust over the long term by removing or covering the contaminated soils. However, the remedial activities may generate dust and cause short-term exposure, particularly under Alternatives 4A and 4B, which would excavate contaminated soils.[2]

Alternatives 3, 4A, and 4B address potential exposure to contaminants by covering or removing the contaminated soil. Alternative 4B would eliminate all potential exposure pathways because

[2] Any dust generated under Alternative 3 would be created by the placement of clean soils as cover material, since excavation of contaminated soils is not part of that alternative.

all of the soil at yards that exceed the RALs would be removed down to native sand. Alternatives 3 and 4A would reduce or eliminate potential exposure pathways. Alternative 3 would leave contaminated soil behind at all properties under a 12-inch soil cover, and EPA would rely on institutional controls (such as prohibiting excavation work deeper than 12 inches and limiting gardening to raised beds) to prevent exposure. Alternative 4A would leave contaminated soil in place at some properties at depths greater than 24 inches. At those properties where contaminated soil remains at depth, EPA would rely on institutional controls (such as prohibiting excavation of contaminated soils) to prevent exposure.

Each active remedial alternative is expected to be protective of human health and the environment, provided that the cover is properly maintained under Alternative 3 and institutional controls are effective under Alternatives 3 and 4A. Active Alternatives 3 and 4A could allow exposure to contaminated soils through unauthorized excavation, if institutional controls are not effective. The potential for such exposure is highest for Alternative 3 where the greatest volume of contaminated soils would remain in place.

2.10.2 - Compliance with Applicable or Relevant and Appropriate Requirements

This criterion assesses how the alternatives comply with regulatory requirements. Federal and state regulatory requirements that are either applicable or relevant and appropriate are known as ARARs. Only state requirements that are more stringent than federal requirements are ARARs. There are three different categories of ARARs: chemical-specific, action-specific, and location-specific ARARs. Potential ARARs were identified during the FS and were included in Table 1 of EPA's July 2012 Proposed Plan.

Alternatives 3, 4A and 4B would all comply with ARARs. Alternative 1 would not comply with ARARs.

The ARARs that have been identified for the Selected Remedy are included in this ROD as Appendix B.

2.10.3 - Long-term Effectiveness and Permanence

This criterion evaluates the effectiveness of the alternatives in protecting human health and the environment in the long term, after the cleanup is complete.

Alternative 1 would not provide any degree of long-term effectiveness or permanence because no action would be taken. Each of the remaining, active alternatives would meet the RAO and provide long-term effectiveness and permanence once the RAO is met. The active alternatives are combinations of proven and reliable remedial processes, and the potential for failure of any individual component is low. The evaluation of the active alternatives against this criterion resulted in the following findings:

- Alternative 3 would achieve long-term effectiveness through covering the metals-contaminated soil onsite as the primary component of the remedy, with O&M and

institutional controls to ensure and verify the ongoing effectiveness and permanence of the remedy. Implementation of Alternative 3 would introduce topographic changes to the properties that would need to be maintained to ensure protectiveness. Therefore, the long-term effectiveness of this alternative is completely dependent on (1) O&M to prevent erosion and potential exposure to contaminated soils that remain in place, and (2) institutional controls to prevent unauthorized activities that could result in exposure to contaminated soils that remain in place.

- Alternative 4A would achieve long-term effectiveness by removing soil that exceeds RALs and disposing of it at an off-site disposal facility. Alternative 4A would likely leave some contaminated material in place deeper than 24 inches bgs if the contamination exceeding RALs extends deeper than 24 inches. (Native sand was encountered above 24 inches bgs at all but a few locations in OU1 where borings were advanced.) Any material exceeding RALs that is left in place would require O&M and institutional controls to maintain the effectiveness and permanence of the remedy.

- Alternative 4B would achieve long-term effectiveness by removing all non-native soils down to native sand (estimated to be no more than 24 inches bgs at most properties) from yards that exceed RALs and disposing of those soils at an off-site disposal facility.

Alternatives 3, 4A, and 4B are all proven methodologies that meet the requirements for long-term effectiveness and permanence. Compared to Alternative 3, Alternatives 4A and 4B would provide an additional level of protectiveness because wastes above RALs would be removed and sent off-site for disposal. Alternative 4B would provide the greatest degree of long-term effectiveness and permanence because all soil exceeding RALs would be removed from impacted yards.

2.10.4 - Reduction of Toxicity, Mobility, or Volume through Treatment

This criterion addresses the preference for selecting remedial actions that use treatment technologies that permanently and significantly reduce the toxicity, mobility, or volume of the hazardous substances. This preference is satisfied when treatment is used to reduce the principal threats at a site through destruction of toxic contaminants, reduction of the total mass of toxic contaminants, irreversible encapsulation, or reduction of total volume of contaminated media.

EPA has estimated that approximately 7% of the soils at OU1 have lead concentrations that exceed the TC threshold and that would therefore be considered hazardous waste. These soils are considered principal threat wastes due to their toxicity and potential to leach to groundwater.

Alternatives 1 and 3 would not reduce the toxicity, mobility, or volume of contaminated materials since no treatment would be applied. Alternatives 4A and 4B would reduce the toxicity and mobility of those soils with lead levels that exceed the TC threshold through the use of ex-situ treatment prior to disposal. The amount of material requiring treatment is expected to be the same for Alternatives 4A and 4B. The treatment used under Alternatives 4A and 4B would not reduce the volume of contaminated materials.

2.10.5 - Short-term Effectiveness

This criterion examines the effectiveness of the alternatives in protecting human health and the environment during implementation of the cleanup until the cleanup is complete. It considers protection of the community, workers, and the environment during the cleanup. For OU1, the short-term effectiveness criterion is primarily related to the volume of contaminated soils addressed in each alternative, the time necessary to implement the remedy, potential risks to workers, and potential impacts to the community during implementation of the remedy.

Each of the active alternatives would have short-term impacts that include increased potential for exposure to lead-contaminated soils and construction-related risks. Potential for exposure to lead-contaminated soils would increase in the short term through creation of dust during excavation activities and increased potential for workers to come in contact with lead-contaminated soils above RALs. Construction-related risks include the potential for vehicle accidents, traffic and noise from construction vehicles, increased wear on local roads, and other risks associated with construction work. These impacts can be mitigated by implementing a project-specific health and safety plan, keeping excavation areas properly wetted to reduce dust generation, planning truck routes to minimize disturbances to the surrounding community, and using other best management practices.

There are no short-term impacts associated with Alternative 1 since no action would be taken. Of the action alternatives, Alternative 3 requires the least disturbance of lead-contaminated soils and the shortest duration of construction. Compared to Alternative 3, Alternatives 4A and 4B present greater short-term impacts because they require a greater amount of material to be moved to and from the site. Construction of these alternatives would also take longer than Alternative 3. The duration of construction work for the action alternatives progresses from an estimated 18 months for Alternative 3, to 26 months for Alternative 4A, to 40 months for Alternative 4B. Increasing the duration of construction means increased truck traffic, potential for vehicle accidents, construction-related and exposure risks to workers, as well as extending the time during which the local community would be subjected to increased dust and noise.

2.10.6 - Implementability

This criterion assesses the technical and administrative feasibility of an alternative and the availability of required goods and services. Technical feasibility considers the ability to construct and operate a technology and its reliability, the ease of undertaking additional remedial actions, and the ability to monitor the effectiveness of a remedy. Administrative feasibility considers the ability to obtain approvals from other parties or agencies and the extent of required coordination with other parties or agencies.

Alternative 1 could easily be implemented as no action would be taken. Alternatives 3, 4A, and 4B are proven, could be readily implemented, and have been used successfully for other environmental cleanup projects. In addition, Alternatives 3, 4A, and 4B could all be completed using readily available conventional earth-moving equipment. EPA expects that most of the necessary services and construction materials are readily available. Qualified commercial contractors with experience are available locally to perform the work.

Alternative 3 would be more difficult to implement than Alternatives 4A and 4B since it requires a more detailed remedial design plan to maintain safe grading for each of the contaminated yards. Raising the grade of each impacted yard by 12 inches under Alternative 3 would pose technical and administrative challenges. The areas where the soil cover must be tied into the existing grade (such as at streets) would require excavation and would likely erode more rapidly than the surrounding areas. This could pose physical safety concerns for the elderly and young. Each yard would need to undergo a custom remedial design to achieve proper storm water drainage.

All of the alternatives are administratively feasible. Although no permits would be required, a similar level of coordination would be needed with state and local parties during design and construction activities for the action alternatives. However, Alternative 3 would likely be more difficult to implement because property owners may not want the grade of their properties raised by 12 inches; access may therefore be difficult to obtain.

2.10.7 - Cost

This criterion evaluates the capital and operation and maintenance costs of each alternative. Present-worth costs are presented to help compare costs among alternatives with different implementation times.

The present worth costs for the alternatives are presented within the descriptions of alternatives in Section 2.9.2 of this ROD. The detailed cost estimates and associated assumptions for all alternatives are in the FS and other documents within the administrative record. The cost estimates are consistent with the level of estimation required in the FS phase. The estimate is within a range of accuracy of +50 to -30 percent. A final cost estimate will be developed and refined during the remedial design process.

Alternative 1 has no associated capital or O&M costs since no action would be taken. The remaining three alternatives are progressively more expensive. Alternative 3 is the least costly action alternative ($20.9 million) and Alternative 4A is the next most costly option ($29.9 million). Alternative 4B is the most costly alternative ($45.4 million), costing more than twice as much as Alternative 3. The cost savings anticipated to be realized in Alternative 4B by not collecting and analyzing post-excavation confirmation samples are more than offset by the increased cost of handling and transporting for off-site disposal a greater volume of soil, since the process of removing all soils down to the native sand would include soils that do not exceed the RALs.

2.10.8 - State/Support Agency Acceptance and Community Acceptance

State/support agency acceptance considers the state's preferences among or concerns about the alternatives, including comments on regulatory criteria or proposed use of waivers. Community acceptance considers the community's preferences or concerns about the alternatives.

The State of Indiana supports the selection of Alternative 4A as the Selected Remedy. The State's concurrence letter is included as Appendix A.

During the public comment period, the community expressed general support for Alternative 4A, although some citizens and the City of East Chicago supported Alternative 4B. All attendees who expressed their opinion at the proposed plan public meeting strongly disliked Alternative 3. A complete list of the public comments and EPA's response to the comments is contained in the *Responsiveness Summary*, which is Part 3 of this ROD. In addition, the transcript from the proposed plan public meeting is included in the administrative record.

2.10.9 – Comparative Analysis Summary

Appendix C provides a summary, in table form, of the comparative analysis of the alternatives described in Sections 2.10.1 through 2.10.8 above.

2.11 – Principal Threat Waste

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP §300.430(a)(1)(iii)(A)). Identifying principal threat wastes combines concepts of both hazard and risk. In general, principal threat wastes are those source materials considered to be highly toxic or highly mobile which generally cannot be contained in a reliable manner or will present a significant risk to human health or the environment should exposure occur. Conversely, low-level threat wastes are those source materials that generally can be reliably contained and that will present only a low risk in the event of exposure. The manner in which principal threats are addressed generally will determine whether the statutory preference for treatment as a principal element is satisfied.

Wastes that generally will be considered to constitute principal threats include but are not limited to the following:

- **Liquid source material** - wastes contained in drums, lagoons or tanks, or free product in the subsurface (i.e., non-aqueous phase liquids) containing contaminants of concern (generally excluding groundwater).

- **Mobile source material** - surface soil or subsurface soil containing high concentrations of chemicals of concern that are (or potentially are) mobile due to wind entrainment, volatilization (e.g., volatile organic compounds), surface runoff, or subsurface transport.

- **Highly toxic source material** – buried, drummed non-liquid wastes; buried tanks containing non-liquid wastes; or soils containing significant concentrations of highly toxic materials.

Wastes that generally will not constitute principal threats include but are not limited to the following:

- **Non-mobile contaminated source material of low to moderate toxicity** - surface soil containing chemicals of concern that generally are relatively immobile in air or

groundwater (i.e., non-liquid, low volatility, low leachability contaminants such as high molecular weight compounds) in the specific environmental setting.

• **Low toxicity source material** - soil and subsurface soil concentrations not greatly above reference dose levels or that present an exeess cancer risk near the acceptable risk range if exposure were to occur.

At OU1 of the USS Lead site, EPA considers soils with lead concentrations exceeding the TC threshold to be principal threat waste that requires chemical stabilization prior to disposal. Without treatment, lead from such soils could potentially leach to groundwater.

Cleanup Alternatives 4A and 4B will best address the principal threat wastes at OU1 by chemically stabilizing those soils with lead concentrations above the TC threshold prior to disposal.

2.12 – Selected Remedy

The Selected Remedy for OU1 of the USS Lead Site is Remedial Alternative 4A: Excavation of Soil Exceeding RALs + Off-site Disposal + *Ex-situ* Treatment Option.

Summary of the Rationale for the Selected Remedy

EPA chose Alternative 4A as the Selected Remedy because it represents the best balance of the evaluation criteria among all the alternatives. Alternative 4A meets the RAO of reducing exposure of residents to contaminated soils that pose a health risk through the removal and off-site disposal of those soils, and allows for the continued residential use of impacted residential properties within OU1. Alternative 4A is more easily implemented and requires fewer restrictions on property use than Alternative 3, which involves placing a soil cover on the contaminated soil. Alternative 4A also reduces risk within a more reasonable time frame and at a lower cost than the other excavation alternative (Alternative 4B), and provides for long-term reliability of the remedy.

Based on the information available at this time, EPA and the State of Indiana believe that the Selected Remedy will (1) be protective of human health and the environment, (2) comply with ARARs, (3) be cost-effective, and (4) utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. Because it will treat those soils constituting principal threats, the remedy also will meet the statutory preference for the selection of a remedy that involves treatment as a principal element.

Description of the Selected Remedy

The Selected Remedy achieves protectiveness by removing impacted soil that exceeds RALs, to a maximum excavation depth of 24 inches, while leaving in place soils with concentrations below the RALs. The RALs for lead are 400 mg/kg at residential properties and 800 mg/kg for commercial/industrial properties. The RAL for arsenic is 26 mg/kg. Under the Selected Remedy, soil exceeding RALs will be excavated from impacted yards within OU1 to a maximum depth of 24 inches bgs and transported off-site for disposal at a Subtitle D landfill.

Excavated soil that exceeds the TC regulatory threshold will be chemically stabilized prior to disposal. EPA estimates that soil with lead concentrations above 2,400 mg/kg (an estimated 7% of the excavated yards at OU1) exceeds the TC regulatory threshold and considers these soils to be principal threat waste.

Pre-remedial sampling will be conducted at impacted properties to determine the approximate excavation depth required in each yard, and confirmation samples will be collected as needed during the excavation work to confirm that all soils exceeding RALs within the top 24 inches were excavated. If contaminated soil is identified at a depth greater than 24 inches bgs, a visual barrier such as orange construction fencing or landscape fabric will be placed above the contaminated soil and beneath the clean backfill soil. In such instances, institutional controls will be implemented to ensure that users of the property are not exposed to COCs in soil. The institutional controls will be deed restrictions that will require the use of the proper procedures for handling contaminated material in the event that any future excavation work must intrude into the underlying contamination.

EPA assumes that soil will be loaded directly into roll-off containers and transported to the landfill for disposal. If a stockpiling location that is acceptable to the community is identified, then excavated soils could be stockpiled prior to being transported to the landfill.

Excavated soil will be replaced with clean soil, including 6 inches of top soil, to maintain the original grade. Each yard will be restored as close as practicable to its pre-remedial condition. Once the properties are sodded or seeded, O&M of the sod or seed, including watering, fertilizing, and cutting, will be conducted for 30 days. After the initial 30-day period, property owners will be responsible for the maintenance of their own yards. Since some soil exceeding RALs will likely be left in place at OU1 (e.g. within some yards deeper than 24 inches bgs), statutory five-year reviews of the remedy will be required in accordance with CERCLA.

Summary of the Estimated Remedy Costs

The estimated cost of implementing the Selected Remedy at OU1 is $29.9 million. A detailed cost estimate for the Selected Remedy, Alternative 4A, is included as Appendix D. The cost estimate is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data that will be collected during the remedial design phase. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost.

Expected Outcome of the Selected Remedy

The expected outcome of the Selected Remedy is that residents in OU1 will no longer be exposed to soil that poses a threat to human health. The land use of the properties will remain unchanged, and the Selected Remedy will allow for the continued residential use of impacted yards. As noted above, some properties may require institutional controls, for those situations where contamination remains in place at depths greater than 24 inches bgs.

2.13 – Statutory Determinations

Under CERCLA §121 and the NCP, the lead agency must select remedies that are protective of human health and the environment, comply with applicable or relevant and appropriate requirements (unless a statutory waiver is justified), are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element and a bias against off-site disposal of untreated wastes. The following sections discuss how the Selected Remedy meets these statutory requirements.

Protection of Human Health and the Environment

The current and potential future risks at OU1 are due to the presence of lead and arsenic in residential soils. Implementation of the Selected Remedy, Alternative 4A, will be protective of human health and the environment through the removal of soils with lead concentrations above 400 mg/kg at residential properties, schools and parks, 800 mg/kg at commercial or industrial properties, and/or arsenic concentrations above 26 mg/kg. The site-specific RAO was developed to protect current and future receptors that are potentially at risk from exposure to the contaminants at OU1. The Selected Remedy will achieve the RAO. Institutional controls will be employed at those properties where contamination is left in place at depths greater than 24 inches bgs in order to ensure that the remedy remains protective.

Compliance with Applicable or Relevant and Appropriate Requirements

Section 121(d) of CERCLA requires that Superfund remedial actions meet ARARs. Appendix B provides all ARARs that have been identified for the remedial action. The Selected Remedy will comply with the identified ARARs.

Cost-Effectiveness

EPA has concluded that the Selected Remedy is cost-effective and represents a reasonable value for the money to be spent. In making this determination, the following definition was used: "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness" (NCP §300.430(f)(1)(ii)(D)). For OU1, this determination was made by evaluating the "overall effectiveness" of those alternatives that satisfied the threshold criteria (i.e., were both protective of human health and the environment and ARAR-compliant). Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness). Overall effectiveness was then compared to costs to determine cost-effectiveness. The relationship of the overall effectiveness of the Selected Remedy was determined to be proportional to its costs. The Selected Remedy therefore represents a reasonable value for the money to be spent.

Utilization of Permanent Solutions and Alternative Treatment Technologies (or Resource Recovery Technologies) to the Maximum Extent Practicable

EPA has determined that the Selected Remedy for OU1 represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner. Of those alternatives that are protective of human health and the environment and comply with ARARs, EPA has determined that the Selected Remedy provides the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principal element and bias against off-site disposal, and considering state and community acceptance. The Selected Remedy removes the contaminated soils at OU1 from the top 24 inches of impacted yards, and treats those materials constituting principal threats. The Selected Remedy therefore provides a permanent solution for both the low-level and principal threat wastes at OU1 that is effective in the long term, and achieves significant reductions in leachability to groundwater. The short-term risks associated with the Selected Remedy are greater than those presented by Alternative 3 and less than those presented by Alternative 4B, but those risks are offset by implementability and cost considerations.

Preference for Treatment as a Principal Element

By treating those soils that exceed the TC threshold prior to disposal, the Selected Remedy addresses the principal threats posed at OU1 through the use of chemical stabilization treatment technologies. By utilizing treatment as a portion of the remedy, the Selected Remedy satisfies to the maximum extent practicable the statutory preference for remedies that employ treatment as a principal element.

Five-Year Review Requirements

Because this remedy will likely result in hazardous substances, pollutants, or contaminants remaining on-site, at depth but above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of the remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

2.14 – Documentation of Significant Changes

The Proposed Plan for OU1 was released for public comment on July 12, 2012. The Proposed Plan identified as the preferred alternative Remedial Alternative 4A, Excavation of Soil Exceeding RALs + Off-site Disposal + *Ex-situ* Treatment Option. After carefully reviewing all written and verbal comments submitted during the public comment period, EPA has determined that no significant changes to the remedy as originally identified in the Proposed Plan are necessary or appropriate. While not considered a significant change, EPA notes that the cost estimates and estimated construction timeframes for Alternatives 3, 4A and 4B are slightly different in the ROD than in the Proposed Plan. After release of the Proposed Plan, the cost and time estimates were revised as a result of refined estimates of the volume of contamination that would need to be addressed under each of the alternatives. The revised cost and time estimates neither impact the outcome of the comparison of alternatives nor alter EPA's selection of Alternative 4A as the Selected Remedy.

Part 3 – Responsiveness Summary

The Proposed Plan for the USS Lead Site was released for public comment on July 12, 2012. At the request of the City of East Chicago, Indiana, EPA extended the public comment period for thirty days until September 12, 2012. EPA held a public meeting in East Chicago, Indiana, on July 25, 2012, to describe the Proposed Plan and answer questions about the different cleanup alternatives. The public meeting also provided the community with an opportunity to comment on the proposed cleanup alternative and the other alternatives evaluated. EPA received several general comments and a few technical comments at the public meeting. Additional comments were provided to EPA in writing during the comment period. These comments and responses are divided into two parts in this *Responsiveness Summary*. Part 1 includes general stakeholder issues and lead agency responses. Part 2 includes specific technical comments related to the alternatives evaluated in the Proposed Plan.

3.1 – Stakeholder Comments and Lead Agency Responses

Comment: A resident expressed support for EPA's preferred remedy (Alternative 4A).

Response: EPA has noted the support.

Comment: Two persons stated that EPA should select Alternative 4B.

Response: EPA carefully considered Alternative 4B during its comparative analysis of the various cleanup alternatives. Under Alternative 4B, impacted yards would be excavated down to native sand without confirmation sampling, which means that clean soils that do not exceed RALs would also be excavated and transported off-site for disposal along with contaminated soils. EPA selected Alternative 4A, which excavates contaminated soils to a maximum depth of 24 inches and includes confirmation sampling, because it represents the best balance of the evaluation criteria. EPA determined that Alternative 4B is not significantly more protective in the long term than Alternative 4A. It is, however, much more expensive, would take longer to implement, and would pose higher short-term risks to the community than Alternative 4A. Because Alternative 4B is estimated to cost about $15 million more than Alternative 4A while providing only an insignificant increase in long-term effectiveness, it is much less cost effective than Alternative 4A. Both alternatives remove all of the soils above RALs that pose a risk to residents – namely the contamination within the top two feet of impacted yards.

Comment: Several persons commented that EPA should conduct medical testing of residents in the area, particularly lifelong residents. One commenter stated that she is a life-long resident of the area and suffer from illnesses.

Response: EPA does not intend to conduct medical testing as a part of the remedy. EPA is confident that the remedy, once implemented, will reduce to an acceptable level the risk to human health and the environment posed by lead- and arsenic-contaminated soils. Section 104 of CERCLA (the Superfund law) authorized the creation of the Agency for Toxic Substances and Disease Registry (ATSDR). ATSDR has the primary

responsibility at the federal level for performing health assessments. The Indiana Department of Health and the Lake County, Indiana, Department of Health may also be better positioned to address these concerns.

Comment: A commenter requested that EPA conduct health studies on residents in conjunction with implementation of the remedy. The commenter stated that they are a life-long resident of the area and suffer from illnesses.

Response: EPA conducts cleanups based upon the current or future risk of human or environmental exposure to contaminated material. This approach is conservative in that there does not need to be actual current exposure – or evidence of adverse impacts to human health or the environment – for EPA to require a cleanup. Health studies are based upon current conditions and at USS Lead would reflect how current residents are using their yards. As future residents may use yards differently than current residents, health studies done on current residents may not reflect future health risks posed to future residents. For these reasons, EPA does not conduct health studies as a part of the remedy selection process.

Comment: EPA should not dispose of contaminated soil removed from the USS Lead Site at the new East Chicago Landfill.

Response: EPA does not yet know where the contaminated soil excavated from OU1 will be sent for disposal. EPA does not always select the disposal location during the remedy selection process, but does require that the disposal location be permitted to accept the waste materials from the site and be in compliance with federal and state regulations. EPA will decide where to dispose of the contaminated soil from OU1 during the remedial design phase.

Comment: One commenter stated that he did not believe the soil at his property is contaminated and for that reason does not want his property excavated.

Response: EPA will respect the wishes of individual homeowners if they refuse access to their property, though it strongly encourages homeowners to allow their yards to be tested and remediated if appropriate. All testing and cleanup work will be conducted at no cost to the property owner.

Comment: The City of East Chicago commented that EPA should consider area restoration and reuse and partner with the city throughout the cleanup process.

Response: The area that makes up OU1 of the USS Lead Site is predominantly residential. EPA's Selected Remedy will maintain current land uses within OU1. Further, the Selected Remedy does not prevent construction or redevelopment at any property within OU1, although if any properties have contamination left behind deeper than 24 inches bgs, institutional controls would require that all subsurface work at those properties be done in accordance with approved procedures. Additionally, EPA will communicate and coordinate closely with the city during the OU1 cleanup process.

3.2 – Technical and Legal Issues

Comment: EPA should evaluate use of the USS Lead property as a disposal facility.

> **Response:** EPA does not intend to dispose of contaminated material at the USS Lead facility (OU2) for the following reasons: (1) The residential portion of the USS Lead Site is located within an environmental justice community that is already home to several disposal facilities. Further disposal at the USS Lead property, immediately adjacent to the southern edge of OU1, would increase the environmental burden already borne by the residents of OU1; (2) contamination still remains at the USS Lead property that requires further evaluation; and, (3) some of the material that will be excavated and require disposal will be a hazardous waste; the corrective action management unit located within the USS Lead facility is not a hazardous waste landfill and cannot accept such wastes.

Comment: The ATSDR's January 27, 2011, report does not support EPA's determination that the USS Lead Site requires a cleanup.

> **Response:** ATSDR's statement that, "Breathing the air, drinking tap water or playing in soil in neighborhoods near the USS Lead Site is not expected to harm people's health," is based upon low blood lead levels in children within East Chicago. In determining whether to perform response actions, EPA evaluates the current and potential threats to human health and the environment posed by exposure to hazardous substances. EPA estimates these threats by using risk calculations that are based upon the physical characteristics of the site and the general characteristics of the hazardous substances. Present day blood lead levels reflect neither current nor future risk of exposure. EPA has analyzed the current and potential threats posed by contaminated soil within the residential portion of the USS Lead Site and concluded that soils with lead levels exceeding 400 mg/kg and arsenic levels exceeding 26 mg/kg pose a risk to the health of residents living within OU1. EPA has concluded that these conditions require it to undertake response actions.

Comment: Several persons commented that a RAL for lead of 400 mg/kg is too conservative. They recommended that EPA calculate a site-specific Preliminary Remediation Goal for lead and noted that the RAL of 400 mg/kg (the standard output from the IEUBK model) is not site-specific. They also stated that EPA should perform a bioavailability study for the site, and argued that a bioavailability study would likely conclude that lead in the residential portion of the USS Lead Site poses a low risk because it is not readily bioavailable.

> **Response:** EPA did evaluate the use of site-specific inputs for the IEUBK model but decided to use the IEUBK model set to the general default parameters. EPA compared the available site-specific data with the default parameters and concluded that the site-specific information was not significantly different from the default inputs. For example, EPA looked at lead uptake through drinking water at the USS Lead site. The source drinking water lead data is from samples collected annually by the City of East Chicago at 30 residential taps within East Chicago. In 2011, the lead in drinking water in East Chicago was reported as 3.6 ppb (or 4 ppb if you round up to the nearest integer). The

default drinking water input for the IEUBK model is 4 ppb. As these concentrations are not significantly different, EPA deemed it appropriate to use the base input parameter.

Comment: EPA should not select cleanup Alternative 4A (excavation with confirmation sampling to a maximum depth of 24 inches) as it is not cost effective. The commenter added that Alternative 3 (installation of a 12-inch soil cap) is cost effective and should be the selected remedy.

Response: EPA determines cost effectiveness by comparing the cost of an alternative with its long-term effectiveness and permanence, reduction of toxicity, mobility, or volume through treatment, and short-term effectiveness. Alternative 3 would leave all contaminated materials in place and would introduce topographic changes to the properties. These changes would need to be maintained to ensure the remedy's permanence and long-term effectiveness. Alternative 4A removes the soil contamination within the top two feet bgs and restores yards to their existing topography, so erosion of soil barriers is not a concern with Alternative 4A. Alternative 4A therefore offers greater long-term effectiveness and permanence than Alternative 3. Alternative 4A represents the best combination of all the balancing criteria. Alternative 4A will also treat those soils considered to be principal threat waste, while the principal threat waste would go untreated in Alternative 3. For these reasons, Alternative 4A is more cost-effective than Alternative 3, despite its higher absolute cost.

Comment: One commenter stated that it is inappropriate for EPA to require the excavation of all soils at yards down to 24 inches if EPA collects a single sample with a concentration of lead above 400 mg/kg.

Response: The commenter's statement is not accurate. Under Alternative 4A, the decision to clean up any given yard will typically be made based on the results of composite soil samples collected from discrete 6-inch horizons. A composite soil sample combines the soil collected from several different areas within the yard, and therefore represents the average concentration in that yard. The only exception to this is that single, discrete soil samples will be considered when evaluating the contamination levels in gardens and play areas. Additionally, contaminated yards will not automatically be excavated to the depth of 24 inches. The maximum excavation depth is 24 inches, but could be less based on the amount of contamination present in a particular yard.

Comment: Alternative 3 would be preferable to the community as it is less intrusive in the community.

Response: During the public meeting on July 25, 2012, the community expressed general disapproval of Alternative 3.

Comment: USS Lead Refinery, Inc. is bankrupt and unable to fund a cleanup.

Response: EPA's remedy selection process is independent of available funding. EPA intends to pursue other potentially responsible parties to design and conduct the Selected Remedy.

Comment: It is unclear if EPA followed the *Superfund Lead-Contaminated Residential Sites Handbook* in consideration of future land use or sampling techniques.

> **Response:** EPA followed the Residential Lead Sites Handbook throughout the RI and FS processes, including sampling techniques and consideration of future land use.

Comment: The *Superfund Lead-Contaminated Residential Sites Handbook* is not straightforward.

> **Response:** EPA disagrees with this comment and is confident in its ability to follow and interpret the cited document.

Comment: Several persons commented that EPA should consider alternative remediation techniques.

> **Response:** EPA did consider alternative remediation techniques during the Feasibility Study. In-situ treatment technologies for soils contaminated with metals largely consist of encapsulation or the introduction of soil amendments to make the metals less bioavailable. These technologies show promise but the duration of their effectiveness is not yet known. It is possible that following treatment, metals over time may again become bioavailable. For these reasons, EPA decided that an alternative treatment technology remedy for OU1 of the USS Lead Site would not be protective of human health and the environment. EPA elected not to carry an alternative remediation technique remedy forward into the final array of cleanup alternatives.

Comment: The City of East Chicago stated its support for Alternative 4B (excavation down to native sand without confirmation sampling) over Alternative 4A (excavation to a maximum depth of 24 inches with confirmation sampling) because the former is more protective than Alternative 4A.

> **Response:** EPA has determined that at OU1 of the USS Lead Site, soils that exceed RALs in the top 24 inches of residential yards pose a threat to current and future residents. Alternative 4A may leave some contaminated soil deeper than 24 inches bgs at a limited number of yards, but EPA has concluded that soil deeper than 24 inches does not pose a risk to residents, and institutional controls will be implemented in situations where contamination remains at depth. Alternative 4B is not significantly more protective in the long term than Alternative 4A. It is, however, much more expensive, would take longer to implement, and would pose higher short-term risks to the community than Alternative 4A. Because Alternative 4B is estimated to cost about $15 million more than Alternative 4A while providing only an insignificant increase in long-term effectiveness, it is much less cost effective than Alternative 4A. Both alternatives remove all of the soils above RALs that pose a risk to residents – namely the contamination within the top two feet of impacted yards.

Comment: The City of East Chicago supports Alternative 4B over Alternative 4A because excavation to native sand would not leave in place any contamiuated soil. If contaminated soil is left in place, the remedy requires the installation of subsurface barriers, maintenance of a soil cover, and the recording of deed restrictions or other requirements for construction activities at some properties located within the site. Alternative 4B is consistent with EPA's *Superfund Lead-Contaminated Residential Sites Handbook* that sets forth EPA's preference for permanent remedies that allow for remediated yards to be returned to unrestricted use. Furthermore, leaving contaminated material below 24 inches will make it more difficult or costly for the city or others to redevelop properties.

Response: EPA recognizes that leaving some contaminated soils in place imposes burdens on the city and affected property owners. EPA has concluded, however, that these burdens do not warrant the expenditure of an additional $15 million when the expenditure will not yield any greater protection of human health or the environment.

Comment: A reader cannot determine which properties are to be remediated.

Response: EPA intentionally removed references to individual addresses out of concern for the privacy of the property owners.

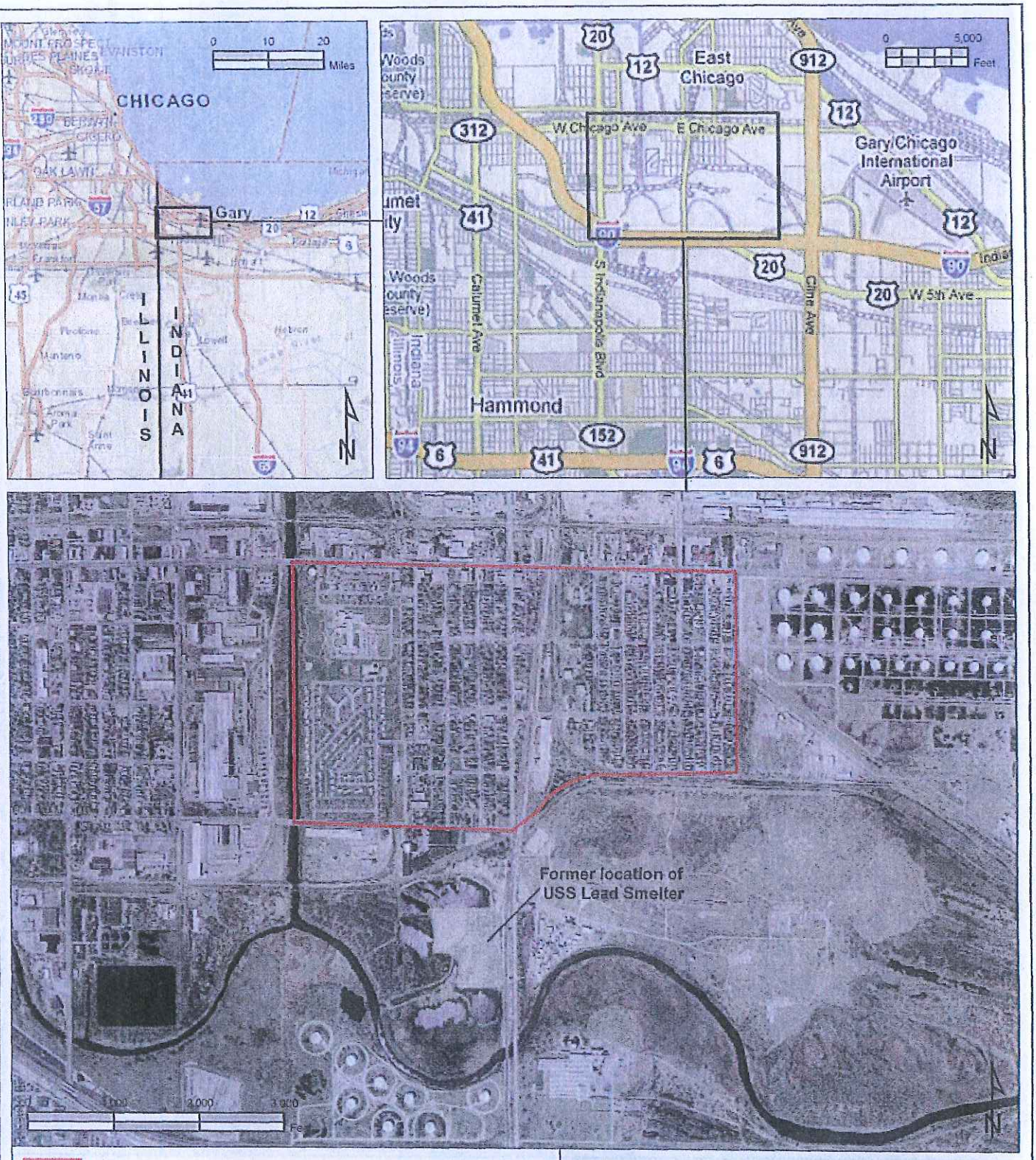
Comment: There are areas of the RI/FS in which EPA's data analysis is not transparent. Also, the text and tables present conflicting information. Finally, steps could be taken to increase the clarity of EPA's data analysis.

Response: EPA is not aware of places within the RI/FS where statements in the text conflict with information presented in the tables. EPA has provided tables to indicate which data were included in statistics and how they were evaluated. The Human Health Risk Assessment Appendix to the RI contains close to 1700 pages of detailed tables that provide the data EPA considered for its evaluation of risks to human health. Section 5.2 of the RI contains a detailed description of the data upon which the RI is based. Section 5.3 of the RI contains a detailed description of the statistical treatment of data and data used for each contaminant of concern.

Comment: It is difficult to follow EPA's calculations for the purpose of estimating remedial volume.

Response: Volume estimates are based on a number of factors, including the number of yards within each sub-area of the site, the average yard size for different types of properties, the proportion of those yards estimated to require cleanup, and the anticipated depths of excavation for the various different remedial alternatives. EPA calculated these volumes based on the information it collected during the RI so that it could conduct a comparison of relative costs of cleanup alternatives. During the remedial design phase, EPA will calculate more precise remedial volumes based upon data from many, if not all, of the properties in OU1.

FIGURES



Imagery sources (clockwise from upper left):
ESRI Resource Center
Google Maps
ISDP (Indiana Spatial Data Portal)

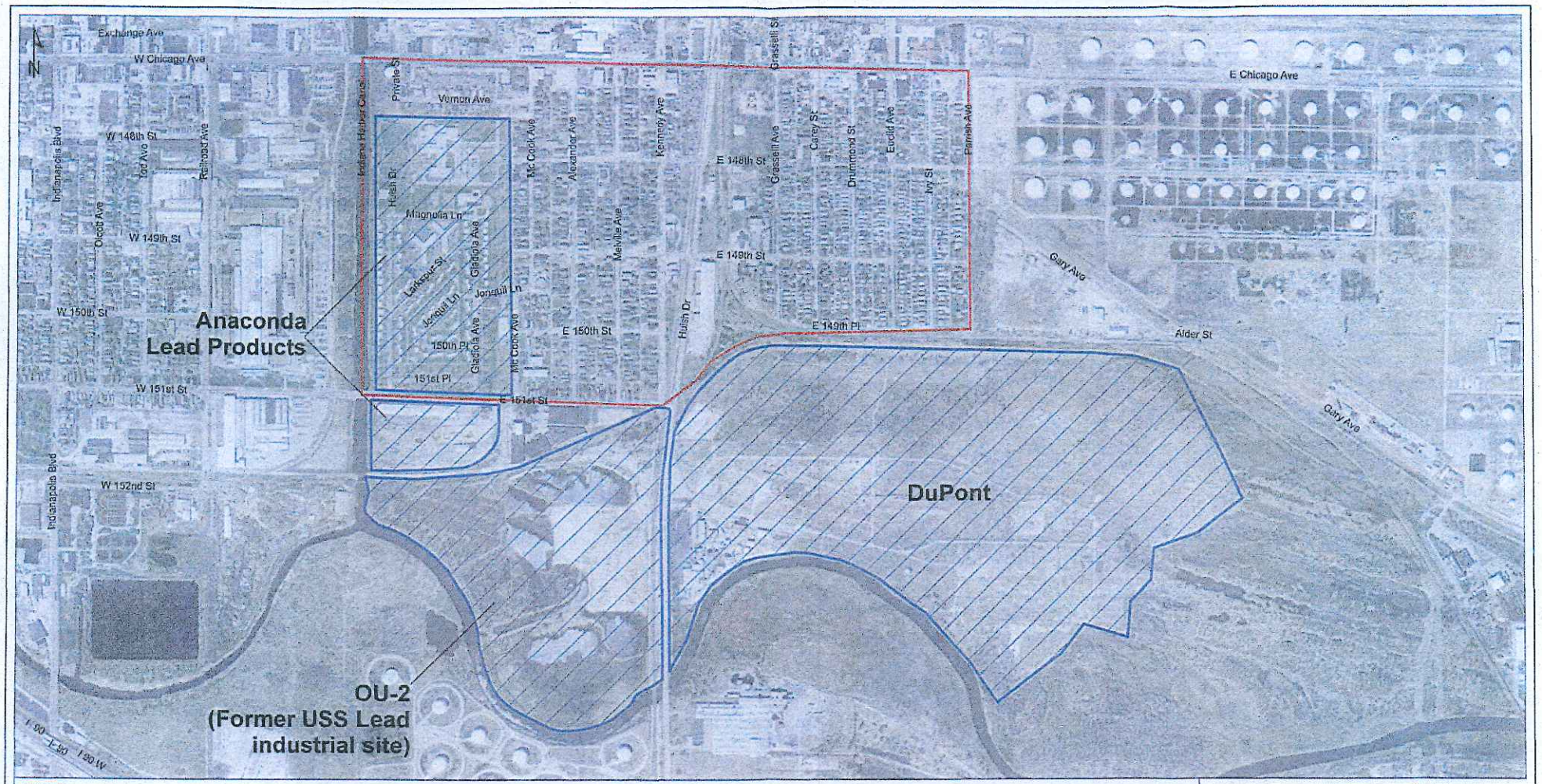
US SMELTER & LEAD REFINERY
LAKE COUNTY, EAST CHICAGO, INDIANA

RECORD OF DECISION

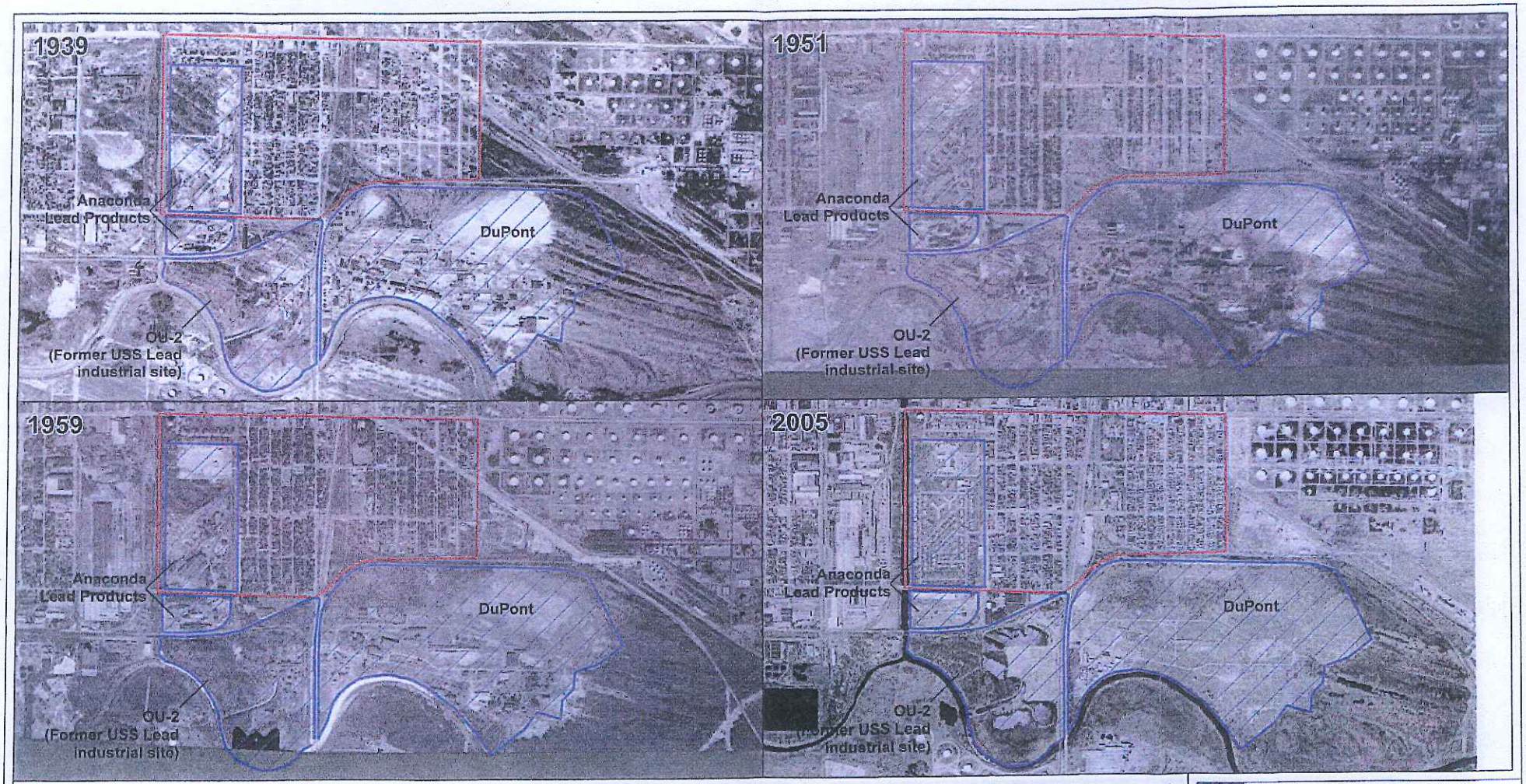
FIGURE 1
USS LEAD RESIDENTIAL AREA
SITE LOCATION MAP

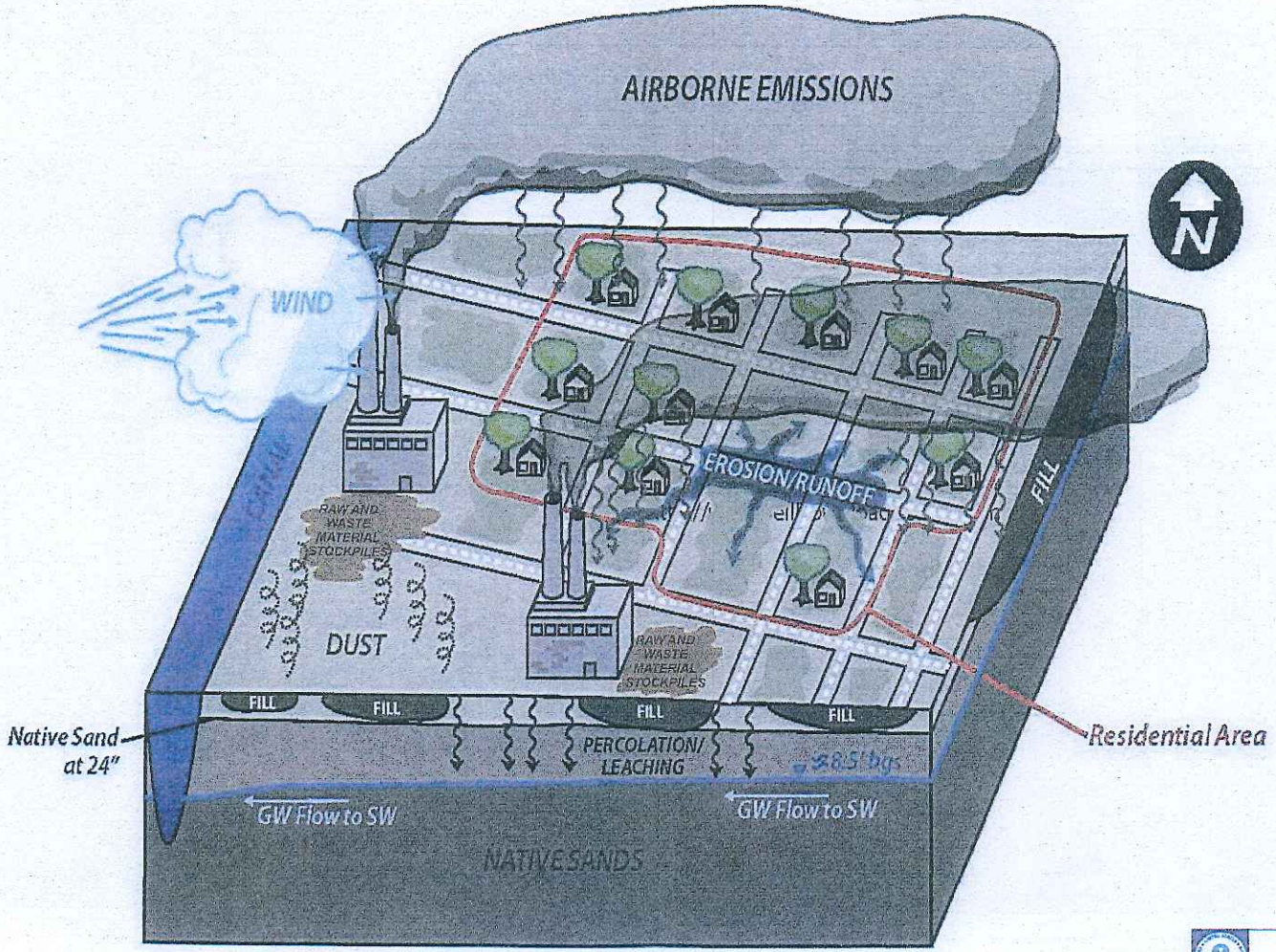
EPA REGION 5 RAC 2 | REVISION 0 | AUGUST 2012

SulTRAC



US SMELTER & LEAD REFINERY
LAKE COUNTY, EAST CHICAGO, INDIANA
RECORD OF DECISION
FIGURE 2
HISTORICAL OVERVIEW OF STUDY AREA
EPA REGION 5 RAC 2 | REVISION 0 | AUGUST 2012
SulTRAC


1939
Anaconda Lead Products
DuPont
OU-2 (Former USS Lead industrial site)
1951
Anaconda Lead Products
DuPont
OU-2 (Former USS Lead industrial site)
1959
Anaconda Lead Products
DuPont
OU-2 (Former USS Lead industrial site)
2005
Anaconda Lead Products
DuPont
OU-2 (Former USS Lead industrial site)
OU-1 boundary
Industrial sites
Imagery sources (clockwise from upper left):
Indiana State Archives,
USGS EarthExplorer,
ISDP (Indiana Spatial Data Portal),
USGS EarthExplorer
N
Note: Graphic scale is approximate for the 1939, 1951 & 1959 imagery
0 1,000 2,000 3,000 4,000 5,000 approximate feet
1 inch approximately = 1,500 feet
US SMELTER & LEAD REFINERY
LAKE COUNTY, EAST CHICAGO, INDIANA
RECORD OF DECISION
FIGURE 3
HISTORICAL IMAGERY
EPA REGION 5 RAC 2 | REVISION 0 | AUGUST 2012
SulTRAC



US SMELTER & LEAD REFINERY
LAKE COUNTY, EAST CHICAGO, INDIANA
RECORD OF DECISION
FIGURE 4
CONCEPTUAL SITE MODEL
EPA REGION 5 RAC 2 | REVISION 0 | AUGUST 2012
ST SulTRAC

APPENDIX A

State Concurrence Letter

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
We Protect Hoosiers and Our Environment.

Mitchell E. Daniels, Jr.
Governor

Thomas W. Easterly
Commissioner

100 North Senate Avenue
Indianapolis, Indiana 46204
(317) 232-8603
Toll Free (800) 451-6027
www.idem.IN.gov

September 25, 2012

Ms. Susan Hedman
Regional Administrator
U.S. EPA, Region V
77 West Jackson St.
Chicago, Illinois 60604-3507
Mail Code: SRF-6J

Dear Ms. Hedman:

Re: Draft Record of Decision (*ROD*)
USS Lead Superfund Site
East Chicago, Indiana

The Indiana Department of Environmental Management (*IDEM*) has reviewed the U.S. Environmental Protection Agency's draft Record of Decision (*ROD*) document for the USS Lead Superfund site in East Chicago, Indiana. IDEM is in full concurrence with the major components of the selected remedy outlined in the document which include the following:

- Excavation of impacted soils that exceed Remedial Action Levels (*RALs*) to a maximum depth of two feet below the ground surface (*bgs*) and replacement with clean soil.
- Chemical stabilization of excavated soils, as necessary prior to disposal, to address soils exceeding the toxicity characteristic (*TC*) regulatory threshold.
- Disposal of excavated soils at an off-site Subtitle D landfill.
- Placement of a buried visual barrier, such as orange construction fencing, above soils exceeding the RALs if such soils are identified at a depth greater than two feet bgs, and the placement of Environmental Restrictive Covenants (*ERCs*) to protect the barrier.

IDEM staff agree that the selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost effective. IDEM staff have been working closely with Region V staff in the selection of an appropriate remedy and are satisfied with the selected alternative.

Please be assured that IDEM is committed to accomplish cleanup at all Indiana sites on the National Priorities List and intends to fulfill all obligations required by law to achieve that goal. We look forward to beginning remediation work on this project.

Sincerely,

Bruce H Palin

Bruce H Palin
Assistant Commissioner
Office of Land Quality

BP:DP:bl
cc: Peggy Dorsey, IDEM
Bruce Oertel, IDEM
Rex Osborn, IDEM
Michael Berkoff, EPA

APPENDIX B

List of Applicable or Relevant and Appropriate Requirements

APPENDIX B
List of Applicable or Relevant and Appropriate Requirements
USS Lead Site, OU1
East Chicago, Indiana

Applicable/ Relevant and Appropriate Requirements	Description	Type of ARAR	Applicable/ Relevant and Appropriate	Comment
CLEAN AIR ACT (CAA) of 1974				
42 USC Section 7401-7671	The Act is intended to protect the quality of air and promote public health. Title I of the Act directed the U.S. Environmental Protection Agency (EPA) to publish national ambient air quality standards for "criteria pollutants." In addition, EPA has provided national emission standards for hazardous air pollutants under Title III of the Act. Hazardous air pollutants are also designated hazardous substances under CERCLA. The Clean Air Act amendments of 1990 greatly expanded the role of National Emission Standards for Hazardous Air Pollutants by designating 179 new hazardous air pollutants and directed EPA to attain maximum achievable control technology standards for emission sources. Such emission standards are potential ARARs if selected remedial technologies produce air emissions of regulated hazardous air pollutants.	Action-specific	Applicable	The Act is considered an ARAR for remedies that involve creation of air emissions, such as excavation activities that might create dust. Also includes emissions rules that apply to equipment working on the project (based on date of manufacture and/or rebuild and/or overhaul).
FLOODPLAIN MANAGEMENT EXECUTIVE ORDER No. 11988				
40 CFR Part 6, Appendix A	Requires federal agencies to evaluate the potential adverse effects associated with direct and indirect development of a floodplain. Alternatives that involve modification/ construction within a floodplain may not be	Location-specific	Applicable	The Act is considered an ARAR as some properties within OU1 are adjacent to the Calumet Canal which feeds into the Grand Calumet River.

APPENDIX B
List of Applicable or Relevant and Appropriate Requirements
USS Lead Site, OU1
East Chicago, Indiana

Applicable/ Relevant and Appropriate Requirements	Description	Type of ARAR	Applicable/ Relevant and Appropriate	Comment
	selected unless a determination is made that no practicable alternative exists. If no practicable alternative exists, potential harm must be minimized and action taken to restore and preserve the natural and beneficial values of the floodplain.			
CLEAN WATER ACT (CWA) OF 1977				
Protection of Wetlands Executive Order 11990 [40 CFR Part 6, Appendix A]	Under this Order, federal agencies are required to minimize the destruction, loss, or degradation of wetlands, and preserve and enhance natural and beneficial values of wetlands. If remediation is required within wetland areas and no practical alternative exists, potential harm must be minimized and action taken to restore natural and beneficial values.	Location-specific	Applicable	Applicability will be determined by location of wetlands, if any, along Grand Calumet River
Federal Water Pollution Control Act Section 401: Water Quality Certification	Establishes a permit program to regulate a discharge into the navigable waters of the U.S., including wetlands.	Action-specific	Relevant and Appropriate	

APPENDIX B
List of Applicable or Relevant and Appropriate Requirements
USS Lead Site, OU1
East Chicago, Indiana

Applicable/ Relevant and Appropriate Requirements	Description	Type of ARAR	Applicable/ Relevant and Appropriate	Comment
National Pollutant Discharge Elimination System 33 U.S.C. §§1251-1387 Clean Water Act NPDES Permit Program (40 CFR 122)	Regulates discharges of pollutants to navigable waters.	Action-specific and may be Chemical-specific	Relevant and Appropriate	Applies to disturbances of one acre or more of total land area and disturbances of less than one acre of land that are part of a larger common plan of development or sale if the larger common plan will ultimately disturb one or more acres of land.
FISH AND WILDLIFE COORDINATION ACT				
Fish and Wildlife Coordination Act; 16 U.S.C. §§661 et seq. 16 USC 742a 16 USC 2901 40 CFR 6.302 50 CFR 402	Actions that affect species/habitat require consultation with U.S. Department of Interior, U.S. Fish and Wildlife Service, and National Marine Fisheries Service, and/or state agencies, as appropriate, to ensure that proposed actions do not jeopardize the continued existence of the species or adversely modify or destroy critical habitat. The effects of water-related projects on fish and wildlife resources must be considered. Action must be taken to prevent, mitigate, or compensate for project-related damages or losses to fish and wildlife resources. Consultation with the responsible agency is also strongly recommended for on-site actions. Under 40 CFR Part 300.38, these requirements apply to all response activities under the National Contingency Plan.	Location-specific	Applicable	

APPENDIX B
List of Applicable or Relevant and Appropriate Requirements
USS Lead Site, OU1
East Chicago, Indiana

Applicable/ Relevant and Appropriate Requirements	Description	Type of ARAR	Applicable/ Relevant and Appropriate	Comment
RESOURCE CONSERVATION AND RECOVERY ACT OF 1976				
Off-Site Land Disposal Subtitle C [40 CFR 260-268]	Soil and/or sediment that is excavated for off-site disposal and constitutes a hazardous waste must be managed in accordance with the requirements of RCRA.	Action-specific	Applicable	Applicable for management of soils that are characteristic hazardous wastes.
Land Disposal Restrictions [40 CFR 268.2]	The land disposal restrictions (LDR) provide a second measure of protection from threats posed by hazardous waste disposal by ensuring that hazardous waste cannot be placed on the land until the waste meets specific treatment standards to reduce the mobility or toxicity of its hazardous constituents. Hazardous waste destined for land disposal must meet the applicable Land Disposal Regulations of 40 CFR 268.	Action-specific	Relevant and Appropriate	Relevant for treatment of soils that are characteristic hazardous wastes.
Land Treatment [40 CFR 264.270 to 264.283 Subpart M]	Establishes standards applicable for owners and operators of facilities that treat or dispose of hazardous waste in land treatment units to ensure that hazardous constituents placed in or on the treatment zone are degraded, transformed, or immobilized within the treatment zone.	Action-specific	Relevant and Appropriate	Applicable if treatment of residue piles to render them non-hazardous occurs in a land treatment unit.
Special Provisions for Cleanup [40 CFR 264.550 to 264.555 Subpart S]	Establishes standards for corrective action management units, temporary units, and staging piles.	Action-specific	Applicable	Staging piles or temporary units may be needed for residue that may be a characteristic hazardous waste.

APPENDIX B
List of Applicable or Relevant and Appropriate Requirements
USS Lead Site, OU1
East Chicago, Indiana

Applicable/ Relevant and Appropriate Requirements	Description	Type of ARAR	Applicable/ Relevant and Appropriate	Comment
Miscellaneous Units [40 CFR 264.600 to 264.603 Subpart X]	Establishes design and operating requirements, detection and monitoring requirements, and requirements for responses to releases of hazardous waste or hazardous constituents from the unit.	Action-specific	Applicable/Relevant and Appropriate	ARAR if treatment or storage of the TCLP hazardous materials is in miscellaneous units.
Definition of a hazardous waste [40 CFR 261.3(d) and 329 IAC 3.1]	Applies to contaminated containment components, contaminated soils, and structures and equipment contaminated with waste.	Action-specific	Relevant and Appropriate	Substantive requirements are ARARs for identifying and managing characteristic hazardous waste.
Hazardous waste determination [40 CFR 262.11 and 329 IAC 3.1-6]	Requires that a proper hazardous waste determination must be made on all wastes generated from remedial actions.	Action-specific	Relevant and Appropriate	Substantive requirements are ARARs for identifying and managing characteristic hazardous waste.
Pre-Transportation Requirements [40 CFR 262.30, 262.31, 262.32, and 262.33 and 329 IAC 3.1-7 and 329 IAC 3.1-8]	All hazardous waste must be properly packaged, with labels, markings, and placards, prior to transport.	Action-specific	Relevant and Appropriate	
Standards applicable to the generators of hazardous waste - The manifest [40 CFR 262, Subpart B and 329 IAC 3.1-7 and 329 IAC 3.1-8]	Hazardous waste stored on-site in containers for greater than 90 days shall be managed in accordance with 40 CFR 262, Subpart B (329 IAC 3.1-7 and 329 IAC 3.1-8).	Action-specific	Applicable	

APPENDIX B
List of Applicable or Relevant and Appropriate Requirements
USS Lead Site, OU1
East Chicago, Indiana

Applicable/ Relevant and Appropriate Requirements	Description	Type of ARAR	Applicable/ Relevant and Appropriate	Comment
Standards applicable to the generators of hazardous waste - The manifest [40 CFR 262, Subpart B and 329 IAC 3.1-7 and 329 IAC 3.1-8]	Hazardous waste must be manifested as such for transport to a permitted treatment, storage, or disposal facility (TSDF)	Action-specific	Relevant and Appropriate	
Standards for owners and operators of hazardous waste treatment, storage, and disposal facilities - Waste piles [40 CFR 264, Subpart L]	Any excavated contaminated soils must not be placed back on the ground so as to create a waste pile. Covered rolloff containers may be used.	Action-specific	Relevant and Appropriate	
Use and management of containers [40 CFR 265, Subpart I and 329 IAC 3.1-10]	Hazardous waste stored on-site in containers for 90 days or less shall be managed in accordance with the standards of 40 CFR 265, Subpart I (329 IAC 3.1-10).	Action-specific	Relevant and Appropriate	
SOLID WASTE DISPOSAL ACT				
Identification and Listing of Hazardous Waste (40 CFR 261) Subpart B	Sets criteria for identifying a hazardous waste.	Action-specific	Relevant and Appropriate	

APPENDIX B
List of Applicable or Relevant and Appropriate Requirements
USS Lead Site, OU1
East Chicago, Indiana

Applicable/ Relevant and Appropriate Requirements	Description	Type of ARAR	Applicable/ Relevant and Appropriate	Comment
Identification and Listing of Hazardous Waste (40 CFR 261) Subpart C	Identifies the characteristics of a hazardous waste.	Action-specific	Relevant and Appropriate	
Identification and Listing of Hazardous Waste (40 CFR 261) Subpart D, List of Hazardous Waste	Lists hazardous waste from sources	Action-specific	Relevant and Appropriate	
Standards for Hazardous Waste Generators (40 CFR 263)	General requirements for packaging, labeling, marking, and manifesting hazardous wastes for temporary storage and transportation off-site	Action-specific	Applicable	
Solid Wastes (40 CFR 264), Subpart D	Hazardous waste and debris may be placed in units known as containment buildings for the purpose of interim storage or treatment.	Action-specific	Applicable	
ENDANGERED SPECIES ACT				
Endangered Species Act [16 USC 1531]; 50 CFR 200	Requires that federal agencies ensure that any action authorized, funded, or carried out by the agency is not likely to jeopardize the continued existence of any threatened or endangered species or adversely modify critical habitat.	Location-specific	Applicable	No endangered species are known to be present on the site that would be affected by remedial actions.

APPENDIX B
List of Applicable or Relevant and Appropriate Requirements
USS Lead Site, OU1
East Chicago, Indiana

Applicable/ Relevant and Appropriate Requirements	Description	Type of ARAR	Applicable/ Relevant and Appropriate	Comment
NATURAL HISTORIC PRESERVATION ACT				
National Historic Preservation Act [16 USC 661 et seq.] 36 CFR Part 65	Establishes procedures to provide for preservation of scientific, historical, and archaeological data that might be destroyed through alteration of terrain as a result of a federal construction project or a federally licensed activity or program. If scientific, historical, or archaeological artifacts are discovered at the site, work in the area of the site affected by such discovery will be halted pending a completion of any data recovery and preservation activities required pursuant to the act and any implementing regulations.	Location-specific	Applicable	No part of the USS Lead Residential Area is listed on the national register of historic places. Would be applicable during remedial activities if scientific, historic, or archaeological artifacts are identified during implementation of the remedy.
DEPARTMENT OF TRANSPORTATION				
Requirements for the Transport of Hazardous Materials [40 CFR 172]	Transportation of hazardous materials on public roadways must comply with the requirements.	Action-specific	Applicable	
OTHER FEDERAL GUIDELINES TO BE CONSIDERED				
Integrated Risk Information System (IRIS)	Risk reference doses (RfD) are estimates of daily exposure levels that are unlikely to cause adverse non-carcinogenic health effects over a lifetime. Cancer Slope Factors (CSF) are used to compute the incremental cancer risk from exposure to site	Chemical-specific	To Be Considered	Levels may be considered for use as cleanup goals.

APPENDIX B
List of Applicable or Relevant and Appropriate Requirements
USS Lead Site, OU1
East Chicago, Indiana

Applicable/ Relevant and Appropriate Requirements	Description	Type of ARAR	Applicable/ Relevant and Appropriate	Comment
	contaminants and represent the most up-to-date information on cancer risk from EPA's Carcinogen Assessment Group.			
EPA Regional Screening Levels	EPA Regional Screening Levels (RSLs and associated guidance necessary to calculate them) are risk-based screening levels developed using risk assessment guidance from the USEPA Superfund program. These are risk-based concentrations derived from standardized equations combining exposure information assumptions with USEPA toxicity data. Screening levels are considered to be protective for humans over a lifetime; however, screening levels do not address non-human health endpoints, such as ecological impacts.	Chemical-specific	To Be Considered	Levels may be considered for use as cleanup goals.
EPA Area of Contamination Policy under RCRA	Allows wastes within an Area of Contamination to be consolidated and treated in-situ without triggering RCRA LDRs or minimum technology requirements. This policy does not have the effect of law.	Action-specific	To Be Considered	Applicable to on-site consolidation, treatment and covering/capping of soils and sediments.
EPA's Contained-in Policy under RCRA	Deals with management of remediation waste. This policy does not have the effect of law.	Action-specific	To Be Considered	
Occupational Safety and Health Act [29 CFR 61]	The Act was passed in 1970 to ensure worker safety on the job. Worker safety at hazardous waste sites is addressed under 29 CFR 1910.120:	Action-specific	Applicable	The Act is considered an ARAR for construction activities performed during the implementation of remedies.

APPENDIX B
List of Applicable or Relevant and Appropriate Requirements
USS Lead Site, OU1
East Chicago, Indiana

Applicable/ Relevant and Appropriate Requirements	Description	Type of ARAR	Applicable/ Relevant and Appropriate	Comment
	Hazardous Waste Operations and Emergency Response. General worker safety is covered elsewhere within the law.			
INDIANA ADMINISTRATIVE CODE				
Indiana Solid Waste Rules (IAC Title 329)	This law applies to remedies that involve off-site disposal of materials typically involved with excavations. Contaminated soils or wastes that are excavated for off-site disposal would be tested for hazardous waste characteristics and requirements of the Rules would be followed if hazardous waste is found.	Action-specific	Relevant and Appropriate	
Generator Responsibilities for Waste Information (329 IAC 10-7.2-1)	Requires all wastes undergo a waste determination, and if found to be nonhazardous, be disposed of in a permitted solid waste disposal facility.	Action-specific	Relevant and Appropriate	
Indiana Air Pollution Control Regulations (IAC Title 326)	This law applies to the regulation of air emissions, for activities such as excavation, that have the potential to create dust and sets emissions limits for particulates.	Action-specific and may be Chemical-specific	Relevant and Appropriate	
Rule 4. Fugitive Dust Emission (326 IAC 6-4-1[4])	Rule 4 establishes that visible fugitive dust must not escape beyond the property line or boundaries of the property, right-of-way, or easement on which the source is located.	Location/Action-specific	Relevant and Appropriate	

APPENDIX B
List of Applicable or Relevant and Appropriate Requirements
USS Lead Site, OU1
East Chicago, Indiana

Applicable/ Relevant and Appropriate Requirements	Description	Type of ARAR	Applicable/ Relevant and Appropriate	Comment
Motor vehicle fugitive dust sources (326 IAC 6-4-4)	No vehicle driven on any public right of way may allow its contents to escape and form fugitive dust.	Action-specific	Relevant and Appropriate	
Storm Water Run-off Associated with Construction Activity (327 IAC 15-5)	Sets requirements for managing storm water during construction activities, including sediment and erosion control.	Action-specific	Relevant and Appropriate	Will be required if remedial activities generate storm water runoff.
Voluntary Remediation of Hazardous Substances and Petroleum (Indiana Code [IC] 13-25-5)	IC 13-25-5 established the Voluntary Remediation Program in 1993 and gave the IDEM the authority to establish guidelines for voluntary site closure. Under this authority IDEM developed a non-rule policy document, the Risk Integrated System of Closure (RISC), to guide site closures within the authority of IDEM's remediation programs. This guidance document does not have the effect of law.	Chemical-specific	To Be Considered	The RISC document provides a methodology for establishing remedial goals and determining that remediation has been achieved. The RISC policy does not apply to Superfund sites, but does apply to remedial sites under several state programs, including the state version of RCRA, the state Leaking Underground Storage Tank program, the State Cleanup Program (state equivalent of the Federal Superfund Program) and the Voluntary Remediation Program.

APPENDIX C

Remedial Alternatives Evaluation Summary

APPENDIX C
Remedial Alternatives Evaluation Summary
USS Lead Site, OU-1
East Chicago, Indiana

Evaluation Criteria	**Alternative 1** No Action	**Alternative 3** On-Site Soil Cover + Institutional Controls	**Alternative 4A** Excavation of Soil Exceeding RALs + Off-Site Disposal + *Ex Situ* Treatment Option	**Alternative 4B** Excavation to Native Sand + Off-Site Disposal + *Ex Situ* Treatment Option
Overall Protection to Human Health and the Environment				
Protection of human health and the environment	Not protective	Protective	Protective	Protective
Compliance with ARARs				
Location-specific ARARs	Not in compliance	In compliance	In compliance	In compliance
Action-specific ARARs	Not in compliance	In compliance	In compliance	In compliance
Chemical-specific ARARs	Not in compliance	In compliance	In compliance	In compliance
Long-Term Effectiveness and Permanence				
Magnitude of residual risk	Residual risk remains	Some residual risk	Minimal residual risk	No residual risk
Adequacy and reliability of controls	No controls	Somewhat reliable	Reliable to very reliable	Very reliable
Need for 5-year review	Required	Required	May be required	Not required
Reduction of Toxicity, Mobility, or Volume through Treatment				
Treatment processes used and materials treated	None	None	Some treatment utilitized	Some treatment utilitized
Amount of hazardous material destroyed or treated	None	None	~7% treatment	~7% treatment
Expected reduction in toxicity, mobility, or volume of the waste	None	None	Toxicity and mobility reduced	Toxicity and mobility reduced
Irreversibility of treatment	Not applicable	Not applicable	Not likely reversible	Not likely reversible
Type and quantity of residuals that will remain following treatment	Not applicable	Not applicable	Metals less than TC threshold	Metals less than TC threshold
Statutory preference for treatment	Does not satisfy	Does not satisfy	Partially satisfies	Partially satisfies
Short-Term Effectiveness				
Protection of workers during remedial action	Not applicable	High	Moderate-High	Moderate-High
Protection of the community during remedial action	Not applicable	High	Moderate-High	Moderate-High
Potential environmental impacts of remedial action	Not applicable	Low	Low	Low
Time until protection is achieved	Protection not achieved	Immediate	Immediate	Immediate
Implementability				
Technical feasibility	Not applicable	Moderate	Easy	Easy
Reliability of technology	Not applicable	Somewhat reliable	Very reliable	Very reliable
Administrative feasibility	Not applicable	Difficult	Feasible	Feasible
Availability of services, equipment, and materials	Not applicable	Readily available	Readily available	Readily available
Cost				
Total construction cost	$0	$13,905,000	$21,600,000	$32,800,000
Total engineering and construction management cost	$0	$2,800,000	$3,195,000	$4,960,000
Total present worth O&M	$0	$735,000	$67,000	$0
Period of analysis (yrs)	NA	30	30	NA
Total cost (including 20% contingency)	$0	$20,900,000	$29,900,000	$45,400,000

APPENDIX D

Feasibility Study Cost Estimate for Alternative 4A

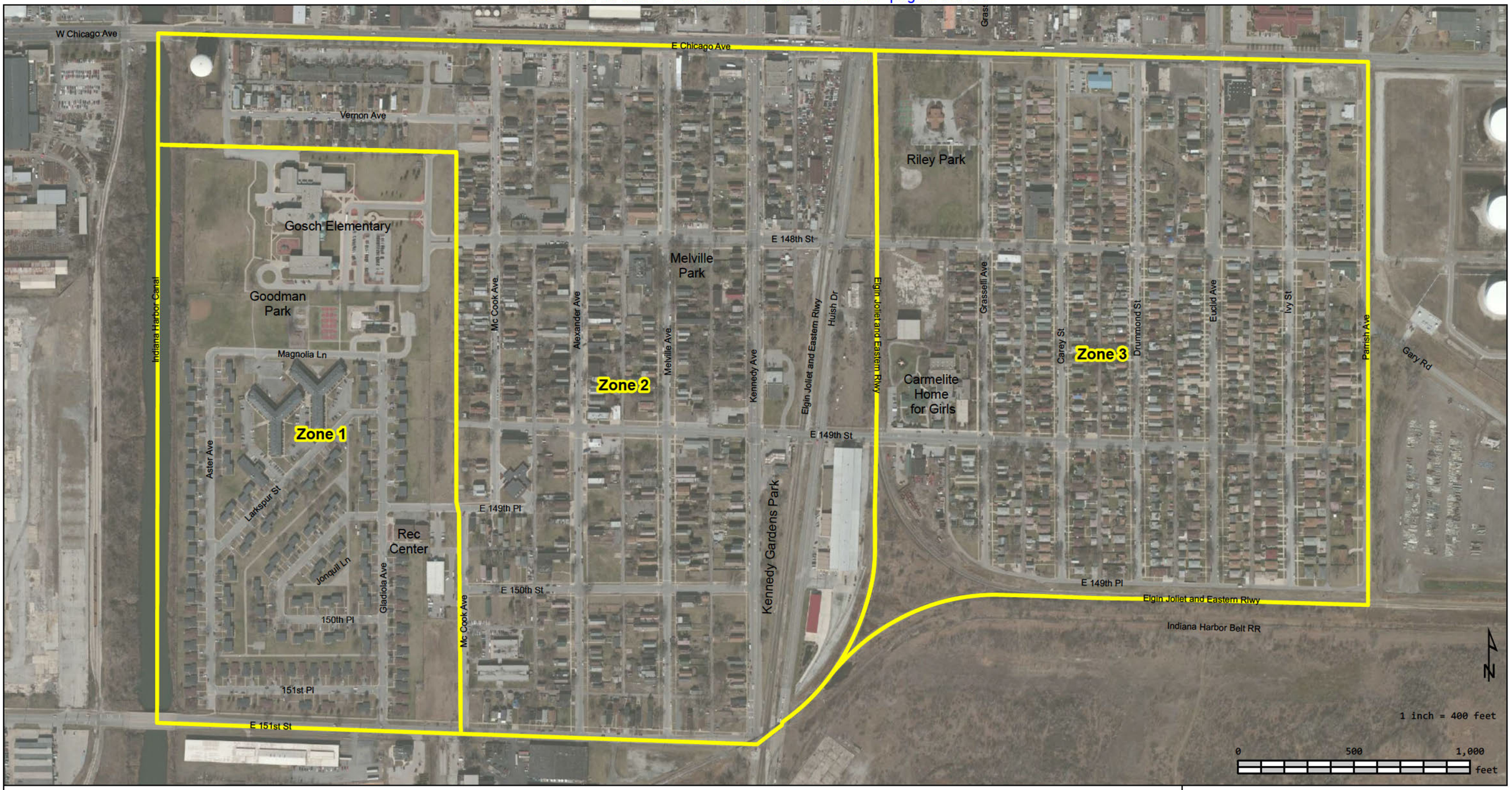
APPENDIX D
FEASIBILITY STUDY COST ESTIMATE
ALTERNATIVE 4A: EXCAVATION OF SOIL EXCEEDING RALS + OFF-SITE DISPOSAL + EX SITU TREATMENT OPTION
USS Lead Site, OU-1
East Chicago, Indiana

Estimate Category	Cost			
	Eastern Area	Southwestern Area	Northwestern Area	TOTAL
PRE-REMEDIAL DESIGN SAMPLING				
Sample Labor	$583,000	$408,000	$451,000	$1,442,000
ODCs	$84,000	$60,000	$66,000	$210,000
REMEDY CONSTRUCTION				
Preconstruction Activities	$180,000	$186,000	$173,000	$539,000
Site Preparation and Access	$460,000	$685,000	$268,000	$1,413,000
Institutional Controls	$5,000	$5,000	$5,000	$15,000
Contaminated Soil Excavation and Backfilling	$2,203,000	$3,793,000	$1,548,000	$7,544,000
Contaminated Soil Transportation and Disposal	$1,509,000	$2,411,000	$943,000	$4,863,000
Soil Cover	$1,000	$2,000	$1,000	$4,000
Property Restoration	$1,407,000	$2,278,000	$927,000	$4,612,000
Contractor's Oversight, Health & Safety, Quality Control	$280,000	$455,000	$175,000	$910,000
Construction Subtotal	**$6,700,000**	**$10,300,000**	**$4,600,000**	**$21,600,000**
ENGINEERING & CONSTRUCTION MANAGEMENT	**$991,000**	**$1,548,000**	**$656,000**	**$3,195,000**
OPERATIONS AND MAINTENANCE	**$27,068**	**$18,961**	**$20,971**	**$67,000**
Project Subtotal	**$7,700,000**	**$11,900,000**	**$5,300,000**	**$24,900,000**
20% Contingency	$1,540,000	$2,380,000	$1,060,000	$4,980,000
Project Total	**$9,200,000**	**$14,300,000**	**$6,400,000**	**$29,900,000**

APPENDIX D

TO
CONSENT DECREE
BETWEEN THE UNITED STATES
AND THE STATE OF INDIANA
IN THE MATTER OF
UNITED STATES AND INDIANA V. ATLANTIC RICHFIELD CO., ET AL. (N.D IND.)

USS LEAD SUPERFUND SITE
EAST CHICAGO, INDIANA



Zone

Basemap source: Esri

US SMELTER & LEAD REFINERY
LAKE COUNTY, EAST CHICAGO, INDIANA

APPENDIX D

OU1 ZONES

EPA REGION 5 RAC 2 | REVISION 0 | JULY 2014

SulTRAC

APPENDIX E

TO
CONSENT DECREE
BETWEEN THE UNITED STATES
AND THE STATE OF INDIANA
IN THE MATTER OF
UNITED STATES AND INDIANA V. ATLANTIC RICHFIELD CO., ET AL. (N.D IND.)

USS LEAD SUPERFUND SITE
EAST CHICAGO, INDIANA

APPENDIX E
Form of Performance Guarantee

Consent Decree Relating to Response Actions and Response Costs in Zones 1 and 3 of Operable Unit 1 of the USS Lead Site

[Letterhead of Bond Issuer]

PAYMENT BOND

Surety's Payment Bond Number: _____

Date of Execution of Payment Bond: _____

Effective Date of Payment Bond: _____

Total Dollar Amount of Payment Bond: $21 million (Twenty One Million Dollars and No Cents)

Principal:

Legal Name and Address: E. I. du Pont de Nemours and Company, 1007 Market Street, Wilmington, Delaware, 19898

State and Type of Organization: Delaware Corporation

Surety:

Legal Name and Address: [name and business address of surety providing the bond]

Type of Organization: [insert "individual," "partnership," "limited liability company," "corporation," etc.]

State of Organization:

Beneficiary:

Legal Name and Address: Regional Administrator, EPA Region 5, 77 West Jackson Boulevard, Chicago, Illinois 60604

Site Information:

Name and Location of Site: U.S. Smelter and Lead Refinery, Inc, Superfund Site, East Chicago, Indiana (the "Site")

Agreement Governing Site Work: Consent Decree Relating to Response Actions and Response Costs in Zones 1 and 3 of Operable Unit 1 of the USS Lead Site, dated **[insert date]** and among the United States of America, the State of Indiana, Atlantic Richfield Company, and E. I. du Pont de Nemours and Company (N.D. Ind.)

APPENDIX E
Form of Performance Guarantee

KNOW ALL PERSONS BY THESE PRESENTS, THAT:

WHEREAS, said Principal is required, under the above-described Agreement entered pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended ("CERCLA"), to perform Transportation and Disposal activities in Zones 1 and 3 of OU1 of the Site as described and defined in such Agreement (hereinafter "SDs' Z1&3 T&D Work") and to pay EPA's costs for performing other work in Zones 1 and 3; and

WHEREAS, the above-described Agreement defines all of said Principal's obligations under the Agreement as well as EPA's work as the "Z1&3 Work," which shall be the term used hereinafter in this document; and

WHEREAS, said Principal is required by the Agreement to provide financial assurance securing full and final completion of the Z1&3 Work.

NOW, THEREFORE, in consideration of the foregoing, and for other good and valuable consideration the receipt of which is hereby acknowledged, the parties hereto agree as follows:

1. The Principal and Surety hereto are firmly bound to the United States Environmental Protection Agency (hereinafter, "EPA"), in the above Total Dollar Amount, for the payment of which we, the Principal and Surety, bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, subject to and in accordance with the terms and conditions hereof.

2. The conditions of the Surety's obligation hereunder are such that if the Principal shall promptly, faithfully, fully, and finally completes all of its obligations under the Agreement in accordance with the terms of the Agreement, the Surety's obligation hereunder shall be null and void; otherwise it is to remain in full force and effect.

3. The Surety shall become liable on the obligation evidenced hereby only upon the occurrence of one or both of the two events described in Paragraph 32 of the Agreement. Those events are the commencement by EPA of an SDs' Z1&3 T&D Work Takeover (as such term is defined in Paragraph 75 of the Agreement) or the failure of Said Principal to timely pay any costs due under Section XIII of the Agreement. At any time and from time to time upon notification by the EPA Regional Administrator or Regional Superfund Director for EPA Region 5 (or any of their designees) that either of these conditions has occurred, the Surety shall promptly (and in any event within fifteen (15) days after receiving such notification) pay funds up to the Total Dollar Amount in such amounts and to such person(s), account(s), or otherwise, as the EPA Regional Administrator or Regional Superfund Director (or their designee) may direct. If the Surety does not render such payment within the specified 15-day period, the Surety shall be deemed to be in default of this Payment Bond and EPA shall be entitled to enforce any remedy available to it at law, in equity, or otherwise.

4. The liability of the Surety shall not be discharged by any payment or succession of payments hereunder, unless and until such payment or payments shall amount in the aggregate to the

APPENDIX E
Form of Performance Guarantee

Total Dollar Amount of this Payment Bond, but in no event shall the aggregate obligation of the Surety hereunder exceed the amount of said sum.

5. The Surety may cancel this Payment Bond only by sending notice of cancellation to the Principal and to the EPA Regional Administrator for EPA Region 5, provided, however, that no such cancellation shall be effective during the 120-day period beginning on the date of receipt of the notice of cancellation by both the Principal and the EPA Regional Administrator. If after ninety (90) days of such 120-day period, the Principal has not established a replacement financial assurance mechanism pursuant to and in accordance with the terms of the Agreement, EPA shall have the right to draw upon the full amount of this Payment Bond.

6. The Principal may terminate this Payment Bond only by sending written notice of termination to the Surety and to the EPA Regional Administrator for EPA Region 5, provided, however, that no such termination shall become effective unless and until the Surety receives written authorization for termination of this Payment Bond by the EPA Regional Administrator (or his or her designee).

7. Any modification, revision, or amendment which may be made in the terms of the Agreement or in the obligations of Principal thereunder, or any extension of the Agreement, or other forbearance on the part of either the Principal or EPA to the other, shall not in any way release the Principal and the Surety, or either of them, or their heirs, executors, administrators, successors or assigns from liability hereunder. The Surety hereby expressly waives notice of any change, revision, or amendment to the Agreement or to any related obligations between the Principal and EPA.

8. The Surety will immediately notify EPA of any of the following events: (a) the filing by the Surety of a petition seeking to take advantage of any laws relating to bankruptcy, insolvency, reorganization, winding up or composition or adjustment of debts; (b) the Surety's consent to (or failure to contest in a timely manner) any petition filed against it in an involuntary case under such bankruptcy or other laws; (c) the Surety's application for (or consent to or failure to contest in a timely manner) the appointment of, or the taking of possession by, a receiver, custodian, trustee, liquidator, or the like of itself or of all or a substantial part of its assets; (d) the Surety's making a general assignment for the benefit of creditors; or (e) the Surety's taking any corporate action for the purpose of effecting any of the foregoing.

9. Any provision in this Payment Bond that conflicts with CERCLA or any other applicable statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or legal requirement shall be deemed incorporated herein.

APPENDIX E
Form of Performance Guarantee

10. All notices, consents, approvals and requests required or permitted hereunder shall be given in writing and shall be effective for all purposes if hand delivered or sent by (a) certified or registered United States mail, postage prepaid, return receipt requested or (b) expedited prepaid delivery service, either commercial or United States Postal Service, with proof of attempted delivery, to the address of EPA shown on this first page of this Payment Bond (with Attention to: Superfund Division, USS Lead Site, Site ID 05 3J).

    All notices, elections, requests and demands under this Payment Bond shall be effective and deemed received upon the earliest of (a) the actual receipt of the same by personal delivery or otherwise, (b) one (1) business day after being deposited with a nationally recognized overnight courier service as required above, or (c) three (3) business days after being deposited in the United States mail as required above. Rejection or other refusal to accept or the inability to deliver because of changed address of which no notice was given as herein required shall be deemed to be receipt of the notice, election, request, or demand sent.

11. The Surety hereby agrees that the obligations of the Surety under this Payment Bond shall be in no way impaired or affected by any winding up, insolvency, bankruptcy or reorganization of the Principal or by any other arrangement or rearrangement of the Principal for the benefit of creditors.

12. No right of action shall accrue on this Payment Bond to or for the use of any person other than EPA or the executors, administrators, successors or assigns of EPA.

[Signatures on Next Page]

APPENDIX E
Form of Performance Guarantee

IN WITNESS WHEREOF, the Principal and Surety have executed this Payment Bond and have affixed their seals on the date set forth above.

The persons whose signatures appear below hereby represent, warrant, and certify that they are authorized to execute this Payment Bond on behalf of the Principal and Surety, respectively.

PRINCIPAL:

E. I. du Pont de Nemours and Company, a Corporation organized and in good standing in the State of Delaware

Attest: _____

By: _____

Name: _____

Name: _____

Title: _____

SURETY:

[_____], a [corporation/partnership/limited liability company] organized and in good standing in the State of [_____]

Attest: _____

By: _____

Name: _____

Name: _____

Title: _____

APPENDIX E
Form of Performance Guarantee

CORPORATE ACKNOWLEDGEMENTS

STATE OF_____)
SS:
COUNTY OF _____)

On _____, 201_, before me, the undersigned, a Notary Public in and for said State, personally appeared _____, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person on behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public

STATE OF_____)
SS:
COUNTY OF _____)

On _____, 201_, before me, the undersigned, a Notary Public in and for said State, personally appeared _____, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person on behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public