PLEASE NOTE: Figures or attachments containing oversized maps or other oversized documents are not included with this copy of the Modification. A complete copy of the Modification, including all attachments and figures, can be reviewed at these document repositories:

Herculaneum City Hall
1 Parkwood Court
Herculaneum, Missouri

Jefferson County Library
Windsor Branch
7479 Metropolitan Boulevard
Barnhart, Missouri

EPA Regional Office
Records Center
901 North 5th Street
Kansas City, Kansas

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VII
901 N. 5th Street
KANSAS CITY, KANSAS 66101

06 JUL 26 PM 2:55
ENVIRONMENTAL PROTECTION AGENCY-REGION VII
REGIONAL HEARING CLERK

IN THE MATTER OF:	
THE DOE RUN RESOURCES CORPORATION Herculaneum, Missouri	
Respondent.	Docket No. RCRA-7-2000-0018 CERCLA-7-2000-0029
Proceedings under Section 7003 of the Resource Conservation and Recovery Act as amended, 42 U.S.C. Section 6973; Sections 104, 106, 107, 122 of the Comprehensive Environmental Response, Compensation, and Liability Act, as amended, 42 U.S.C. §§ 9604, 9606, 9607, and 9622; and Section 260.530 RSMo.	ADMINISTRATIVE ORDER ON CONSENT THIRD MODIFICATION

I. PRELIMINARY STATEMENT

1. In May 2001, the United States Environmental Protection Agency ("EPA"), the Missouri Department of Natural Resources ("MDNR") and The Doe Run Resources Corporation ("Doe Run" or "Respondent") voluntarily entered into an Administrative Order on Consent ("Order") concerning the Doe Run lead smelter in Herculaneum, Missouri and areas in the vicinity of the smelter that have been impacted by the smelter operation. The Order requires Respondent to conduct certain response actions to abate an imminent and substantial endangerment to the public health, welfare, and the environment that may be presented by (i) the actual or threatened release of hazardous substances at or from the facility, and/or (ii) the past or present handling, storage,

treatment, transportation, or deposition by Respondent of any solid waste or hazardous waste. The Order was issued by EPA and MDNR pursuant to Section 7003(a) of the Solid Waste Disposal Act of 1976, commonly referred to as the Resource Conservation and Recovery Act, as amended by the Hazardous and Solid Waste Amendments of 1984 (hereinafter referred to as "RCRA"), 42 U.S.C. § 6973(a); Sections 104, 106, 107, and 122 of the Comprehensive Environmental Response, Compensation, and Liability Act, as amended, 42 U.S.C. § § 9604, 9606, 9607, and 9622 (hereinafter referred to as "CERCLA"); and Section 260.530, RSMo.

2. One of the areas addressed by the Order is a slag disposal area known as the "slag storage area," also known as the "slag pile." One of the purposes of this Third Modification of the Administrative Order on Consent ("Third Modification") is to amend the portion of the Statement of Work, attached to the Order as Appendix A, which relates to the slag storage area. This Third Modification requires Respondent to implement a removal action for the slag storage area, providing for stabilization, erosion control, flood protection, stormwater collection and treatment, and wetland mitigation.

3. Paragraph 131 of the Order provides that minor modifications to any plan or schedule in the Order may be made in writing by the EPA Project Coordinator, following consultation with MDNR's Project Coordinator and Respondent's Project Coordinator. Paragraph 131 additionally provides that the remainder of the Order, including the Statement of Work attached to the Order as Appendix A, may only be modified in writing by the signature of Respondent and the delegated EPA and MDNR signatories, or their designee(s). The modifications to the Order that are being made herein are not

minor modifications, and the modifications are therefore being made pursuant to this Third Modification of the Administrative Order on Consent ("Third Modification").

4. This Third Modification is entered into voluntarily by EPA, Missouri Attorney General's Office, MDNR, and Respondent.

5. For purposes of entering into this Third Modification, Respondent agrees that EPA and MDNR have jurisdiction to issue this Third Modification and jurisdiction over the activities required by the Third Modification. Respondent's participation in this Third Modification shall not constitute or be construed as an admission of liability or of the findings or determinations contained in this Third Modification. Further, neither the utilization of the CERCLA guidance nor the use of any CERCLA terms contained in this Third Modification shall constitute or be construed as an admission by Respondent that the actions regarding the slag storage area are a response or removal action under CERCLA. Respondent agrees to comply with and be bound by the terms of the Third Modification.

6. Nothing in this Third Modification changes, modifies, or supercedes any of the terms of the Order or the First and Second Modifications to the Order, except as specifically provided for herein. All provisions of the Order and the First and Second Modifications, including all findings of fact, determinations, work to be performed, and appendices, work plans, and schedules incorporated as part of the Order and the First and Second Modifications, remain in full force and effect, except as specifically provided for in this Third Modification.

III. MODIFICATIONS

7. Additional Findings of Fact.

a. In May 2004, EPA, MDNR, and Respondent entered into a Second Modification of the May 2001 Administrative Order on Consent which provided for, among other things, development of an Engineering Evaluation/Cost Analysis ("EE/CA") for the slag storage area and a Wetland Mitigation Plan. The purpose of the EE/CA is to identify and evaluate on an expedited basis final cleanup alternatives to prevent and mitigate releases of hazardous substances from the slag storage area. The purpose of the Wetland Mitigation Plan for the recommended removal action alternative in the EE/CA is to address mitigation of wetlands impacted by the slag storage area removal action in compliance with applicable or relevant and appropriate requirements ("ARARs") in Sections 401 and 404 of the Clean Water Act, 33 U.S.C. §§ 1341 and 1344, and the Missouri Clean Water Law and Regulations.

b. The EE/CA report, prepared by Respondent and approved by EPA and MDNR, was released to the public for review and comment on March 23, 2005. A thirty-day public comment period was held from March 23, 2005 to April 22, 2005, and EPA and MDNR held a public meeting on March 30, 2005, to present the findings of the EE/CA, answer questions about the report, and accept public comments.

c. Following the close of the public comment period and consideration of all comments, EPA, in consultation with MDNR, prepared a responsiveness summary to the public comments. On October 5, 2005, after review by MDNR,

EPA issued an Action Memorandum, attached as Appendix B, which selected the removal action to be implemented for the slag storage area. The selected removal action consists of engineering measures to contain and treat stormwater runoff; control wind and water erosion; prevent direct contact other than by employees or contractors of Doe Run; provide for flood protection, long-term stability, and mitigation of wetlands disturbance.

8. Slag Storage Area Removal Action. The Parties agree that Respondent shall implement a removal action pursuant to the Statement of Work Addendum ("SOW Addendum"), attached as Appendix A to this Third Modification, and the Action Memorandum, contained in Appendix B to this Third Modification. Respondent shall also implement wetland mitigation as required by Sections 401 and 404 of the Clean Water Act, 33 U.S.C. §§ 1341 and 1344, and the Missouri Clean Water Law and Regulations, and in accordance with the Wetland Mitigation Plan, prepared by Respondent pursuant to the Second Modification of the Administrative Order on Consent, approved by EPA and MDNR, and attached as Appendix C to this Third Modification. The Parties agree that the attached Wetland Mitigation Plan is sufficient to mitigate impacts to wetlands by the Slag Storage Area Removal Action. The nine (9) acres of property owned by Doe Run adjacent to the Wetland Mitigation Plan area may be available for mitigation for wetlands impacted by the construction of a new road and bridge over Joachim Creek near the Slag Storage Area or a walking trail as proposed by the City of Herculaneum, upon all necessary approvals in accordance with Sections 401 and 404 of the Clean Water Act. For any portion of this 9-acre area not utilized to mitigate wetlands impacted by the new road and bridge over Joachim Creek or the

walking trail as proposed by the City of Herculaneum by April 30, 2009, MDNR may request that Respondent submit a Mitigation Plan Addendum for review and approval by MDNR describing construction of wetlands and other environmental enhancements to be completed in those unused portions. The Mitigation Plan Addendum, if requested, will be submitted to MDNR for review and approval within thirty (30) days of notification that any portion will not be used, but not later than May 30, 2009. MDNR may request that Respondent implement the Mitigation Plan Addendum within twelve (12) months of MDNR's approval.

a. The SOW Addendum contained in Appendix A of this Third Modification is hereby incorporated as an addition to the Statement of Work contained in Appendix A of the May 2001 Order, and the modifications to the Statement of Work made in the Second Modification.

b. Within ninety (90) days of the Effective Date of this Third Modification, Respondent shall submit to EPA and MDNR for review and approval an Addendum to the Work Plan ("Work Plan Addendum"), in accordance with Section IX.A of the Order, to provide a description of, and an expeditious, detailed schedule for the implementation of actions required pursuant to the SOW Addendum, Action Memorandum, and Wetland Mitigation Plan. The Parties agree that construction of the berm (placement of slag to design specifications) and retention basin, piping to the water treatment facility, and wetlands mitigation construction shall be completed within fifteen (15) months of approval of the Work Plan Addendum. Completion of the berm liner and cover materials shall be completed within six (6) months after quarterly monitoring of

the berm underburden settlement indicates that a 50% reduction in pore pressure, as measured by piezometers, is achieved.

c. The Work Plan Addendum shall include, but not be limited to, all data, specifications, and construction drawings needed for the design of the actions required pursuant to the SOW Addendum, Action Memorandum, and Wetland Mitigation Plan.

d. The Work Plan Addendum shall describe the management of excavated residential soils placed on the slag storage area.

e. As part of the Work Plan Addendum, Respondent shall submit for EPA and MDNR review and approval any necessary revisions to the Sampling and Analysis Plan/Quality Assurance Project Plan, in accordance with Section IX.C. of the Order and the SOW Addendum.

f. Within forty-five (45) days of the Effective Date of this Third Modification, Respondent shall submit a revised Health and Safety Plan, in accordance with Section IX.B. of the Order and the SOW Addendum.

g. Within thirty (30) days after completion of construction of the berm liner and cover materials, Respondent shall submit to EPA and MDNR for review and approval a Removal Action Report and a Post-Removal Action Site Control Plan in accordance with the SOW Addendum and Section XIV of the Order.

h. Respondent shall provide information about progress on the removal action in accordance with the SOW Addendum and Section IX.D. of the Order.

i. Respondent shall conduct all actions in this Third Modification in compliance with the applicable requirements of the Missouri Metallic Minerals

Waste Management Act ("MMMWMA") Permit Number MM-001; and Missouri State Operating Permit Number MO-0000281, issued pursuant to the Missouri Clean Water Law and Regulations, and any other applicable laws, regulations, and permits.

j. There are plans to construct a new road and bridge over Joachim Creek near the slag storage area. Respondent was approved by MDNR to supply slag as fill material for this construction project, and the slag storage area removal action design and construction process includes a reduction in the total footprint of the slag storage area, berm, and water retention basin which corresponds to the volume of slag used in the road and bridge. The footprint of the slag storage area shall not be expanded to accommodate slag should the road and bridge construction project be delayed or modified.

IV. PUBLIC PARTICIPATION

9. This Third Modification shall be subject to a public comment period of at least thirty (30) days during which the EPA will make this modification available for public comment. The EPA and MDNR may withdraw their consent to this Third Modification if comments received during this period disclose facts or considerations which indicate that this Order is inappropriate, improper, or inadequate. If, on the basis of such comments, the EPA or MDNR decide to withdraw their consent to this Modification, they will provide Respondent with written notice of such determination.

10. Following the public comment period, EPA and MDNR will determine any appropriate changes to the Third Modification as a result of public comment and notify Respondent pursuant to Section XXV of the Order of any additional work.

V. EFFECTIVE DATE

11. This Third Modification is effective as of the date of Respondent's receipt of a fully-executed copy of this Third Modification as evidenced by the date on the certified mail return receipt.

IT IS SO ORDERED.

7/24/06
Date

William W. Rice
Acting Regional Administrator
Environmental Protection Agency
Region VII

For the United States Environmental Protection Agency
Region VII:

07/19/06
Date

Dana M. Skelley
Assistant Regional Counsel

The UNDERSIGNED PARTY enters into this Third Modification of Administrative Order on Consent, Docket No. RCRA-7-2000-0018, CERCLA-7-2000-0029.

For the Missouri Department of Natural Resources:

7-17-06
Date

Doyle Childers, Director
Missouri Department of Natural Resource

June 15, 2006
Date

Shelley Woods
Assistant Attorney General
Office of the Attorney General of Missouri

The UNDERSIGNED PARTY enters into this Third Modification of Administrative Order on Consent, Docket No. RCRA-7-2000-0018, CERCLA-7-2000-0029.

For The Doe Run Resources Corporation:

26 JUN 06
Date

Louis J. Marucheau
Name: LOUIS J. MARUCHEAU
Title: VICE PRESIDENT LAW

APPENDIX A

Statement of Work Addendum
Herculaneum Lead Smelter Site
Third Modification to the Administrative Order on Consent
REMOVAL ACTION

I. Purpose

This Removal Action Statement of Work Addendum ("SOW Addendum") sets forth removal action requirements for The Doe Run Company ("Respondent") for the slag storage area at the Herculaneum Lead Smelter Site ("the Site"). The Site includes the area outlined in Figure 1 of the Engineering Evaluation/Cost Analysis ("EE/CA"), which is attached as Appendix D to the Third Modification of the Administrative Order on Consent ("Third Modification"), Docket No. RCRA-7-2000-0018 and CERCLA-7-2000-0029.

The Respondent shall conduct the removal action in accordance with this SOW Addendum and as described in the Action Memorandum attached as Appendix B to the Third Modification. The Respondent shall conduct the removal action in accordance with applicable requirements of the Missouri Metallic Minerals Waste Management Act ("MMWMA") Permit Number MM-001; Missouri State Operating Permit Number MO-0000281 issued according to the Missouri Clean Water Law and Regulations, and any other applicable laws, regulations, and permits. Specifically, the Respondent shall construct a flood protection berm; a storm water retention basin; and an engineered cover on slag material following grading work. The Respondent is also required to install pump and piping necessary to route retention basin storm water to an on-site waste water treatment facility. Respondent shall also mitigate wetlands in accordance with the Wetlands Mitigation Plan attached as Appendix C to the Third Modification.

The purpose of the removal action is to stabilize erosion, provide flood protection, reduce runoff/leachate, and reduce the potential for exposure to hazardous substances which are present at the Site and which present a threat to human health and the environment.

Hazardous substances present at the Site include lead, zinc, and other metals which are contained in the slag deposited at the site during the smelting of lead ore concentrates.

Following completion of construction of the removal action, Respondent shall ensure that all post-removal actions needed to ensure the continued long-term integrity and effectiveness of the completed removal action as constructed by Respondent and approved by EPA and Missouri Department of Natural Resources ("MDNR") are performed.

II. *Removal Action Work Plan Addendum* ("Work Plan Addendum")

Within 90 days of the Effective Date of the Third Modification, Respondent shall prepare and submit for EPA and MDNR review and approval a Work Plan Addendum, which presents all data needed for the construction design, the plans, specifications, and construction drawings for the removal action and wetland mitigation, and describes the proposed tasks and schedules associated with implementation of the removal action and wetland mitigation. The Work Plan Addendum shall be provided to EPA in both paper and electronic format. Electronic format text shall be provided in Microsoft Word software. Three paper copies of the Work Plan Addendum shall also be provided to Mr. Robert Hinkson with MDNR. The Work Plan Addendum shall demonstrate sound engineering judgment and be reviewed and stamped with the seal of a registered professional engineer registered in the state of Missouri prior to submittal to EPA and MDNR. The Work Plan Addendum shall provide the following:

A. Management Chapter

A clear and concise description of roles, relationships and assignment of responsibilities among the Respondent, Project Coordinator, Quality Assurance Officer, Construction Supervisor and Construction Personnel.

B. Construction Chapter

The Work Plan Addendum shall include information necessary to implement the removal action, including, but not limited to:

1. Design data, designs, plans and specifications, drawings, and other construction documents necessary to achieve erosional and geotechnical stability of the Site.

2. Field data collected, supporting calculations, designs, drawings and specifications which demonstrate that the construction will achieve long-term reduction in threat of release of hazardous substances. Among the design aspects to be addressed are the following:

    a. Specifications of materials (soil, rock, synthetic liner, and vegetation) to be brought on site for final cover, including its gradation and total lead, cadmium, and zinc concentrations, cover rock type and gradation. Final cover soil shall contain no more than 25 percent rock by weight, and shall contain less than 240

milligrams per kilogram (mg/kg) lead.

b. A description of the revegetation strategy, including plant species, seeding and a seeding schedule; fertilizer types, application rates and times; hydromulching; identification of proposed soil amendments; off-site cover soil sources, if on-site soil source is insufficient; and any temporary seeding strategy. Soil cover shall be a minimum of 24 inches thick, and seed mix shall consist of a mixture of perennial native grasses, legumes and forbs. Cover soil shall be rolled and prepared as appropriate for seeding. Cover soil sources shall not include wetland areas outside the berm, except where soils are excavated pursuant to the Wetland Mitigation Plan or during any other wetland construction or mitigation pursuant to Section 404 of the Clean Water Act.

c. A description of construction methods, equipment, and personnel to accommodate the placement of cover material at the final grade.

d. Any assumptions made by Respondent in developing design parameters shall be clearly stated and supported by sound engineering practice and all necessary design data.

3. A Removal Action Schedule that describes each phase of the removal action. For each construction milestone, the schedule shall provide specific time periods beginning from approval of the Work Plan Addendum to completion of construction milestones for the project. Berm construction (placement of slag to design specifications), retention basin construction, piping to the waste water treatment facility, and wetlands mitigation construction shall be completed within 15 months of approval of the Work Plan Addendum. Completion of the berm liner and cover materials shall be completed within six (6) months after monitoring of the berm underburden settlement indicates that a 50% reduction in pore pressure, as measured by piezometers, is achieved. The schedule shall also include plans and a schedule for construction of the final cover phases.

4. A detailed description of site preparation activities, including establishment of security and control, definition of clearing and grubbing limits, establishment of work and support

areas, and definition of decontamination areas.

5. A description of construction quality control process necessary to successfully construct the design, including grade control method and geotechnical sampling during construction.

6. Dewatering contingency plans and fluids management procedures.

7. Procedures for construction that will comply with Missouri State Operating Permit Number MO-0000281, and other requirements of the Missouri Clean Water Law and Regulations, and the federal Clean Water Act.

8. Spill prevention, management, and reporting.

9. A detailed description of on-site soil storage and waste processing methods.

10. A dust suppression program to be used during site material handling activities, and description of the methods to be used to control fugitive dust and monitor air quality. The regrading and construction techniques must minimize the release of contaminants via airborne emissions, surface runoff, and vehicle tracking.

11. A list of heavy equipment and operators dedicated to the project and a description of decontamination procedures for heavy equipment.

12. Identification of the method of transportation for any contaminated materials to be removed from the site, manifesting requirements in accordance with federal and state Department of Transportation (DOT) regulations, state and federal hazardous and solid waste management laws and regulations, and material quantity accounting procedures. In addition, the Respondent shall provide written notice prior to any off-site shipment of hazardous material.

13. A description of how the removal action will comply with ARARs and meet substantive permitting requirements.

14. Provisions for modifying the Missouri MMWMA Permit Number MM-001 to allow for the disposal of lead-

contaminated yard soils in the slag storage area or other provisions to dispose of the contaminated yard soils, and construction of the berm, among other modifications, and for completing the removal action in compliance with this and other applicable permits.

15. A detailed description of the management of excavated residential soils placed on the slag storage area.

C. Quality Assurance Project Plan ("QAPP") Chapter

For all chemical analyses, the Respondent shall discuss the field sampling protocol, frequency of sampling, parameters to be analyzed, and the name and certification requirements for all laboratories to be used. Chemical analysis will be conducted for at least the following activities:

1. compliance with ARARs (e.g. State Operating Permit parameters);

2. analysis to document clean cover materials; and

3. analysis to confirm removal of slag from runoff areas.

Respondent shall conduct all geotechnical and all other necessary sampling and analyses for the design and construction of the removal action, and shall describe all such sampling and analyses in the QAPP Chapter.

III. *Site Specific Health And Safety Plan* ("SSHSP")

The Respondent is responsible for developing and implementing a health and safety program that complies with OSHA regulations and protocols. The SSHSP shall cover both design data collection and construction activities. The SSHSP shall be completed prior to intrusive field work. The EPA and MDNR will review the plan to assure that all necessary elements are included, but will not provide formal approval.

IV. *Execution*

The Respondent shall execute the Removal Action in accordance with the approved Work Plan Addendum. As specified in Section 104(a)(1) of CERCLA, as amended by SARA, EPA and MDNR will provide oversight of the Respondent's activities throughout the Removal Action. Respondent shall support EPA's and MDNR's initiation and conduct of activities related to the implementation of oversight activities.

V. *Removal Action Report*

Respondent shall submit to EPA and MDNR for review and approval a *Removal Action Report* 30 days after completion of construction of the berm liner and cover materials. The *Removal Action Report* shall include as-built drawings of final constructed configurations; quality control and monitoring results during construction; description of measures taken to ensure compliance with ARARS set forth in the Action Memorandum; empirical data, observations, photographs of site construction, and calculations that demonstrate that the removal action will provide long-term structural and erosional stability of the slag storage area. The *Removal Action Report* shall be reviewed and stamped with the seal of a professional engineer registered in the state of Missouri. The Removal Action Report shall also include the following certification signed by a person who supervised or directed the preparation of the Report:

"Under penalty of law, I certify that to the best of my knowledge, after appropriate inquiries of all relevant persons involved with the preparation of this report, the information submitted is 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."

VI. *Post-Removal Action Site Control*

Respondent shall provide long-term operation and maintenance of the slag storage area and retention basin to ensure the long-term effectiveness and integrity of the removal action as constructed by Respondent and as described in the approved *Removal Action Report*. Respondent shall conduct post-removal action site control in compliance with the Missouri MMWMA Permit Number MM-001, and any other applicable laws, regulations and permits. At the same time that Respondent submits the *Removal Action Report* for approval, Respondent shall also submit for EPA and MDNR review and approval a *Post-Removal Action Site Control Plan* in both paper and electronic format. This Plan shall provide for all inspection, operation, and maintenance measures that are necessary to ensure the continued long-term effectiveness and integrity of the removal action for the Site. The Plan shall provide a schedule for the implementation of repair and maintenance work at the site. The Plan shall be reviewed, stamped and certified as provided in Section V of this SOW Addendum. Once approved by EPA and MDNR, the Respondent shall implement the Post-Removal Action Site Control Plan.

The Plan shall describe timing and details of sampling inspection processes, steps to develop corrective actions, EPA and MDNR notification process for non-routine issues, measures to enhance and repair vegetation growth, measures to repair engineered covers on the slopes and berm, and intended future land-use.
The Plan shall describe phased and final closure of the slag storage area, specific institutional controls to be implemented, and long-term maintenance after final closure of the slag storage area.

At a minimum, Respondent shall inspect the site every 3 months. The Respondent shall provide EPA and MDNR with a written inspection report of the site condition within 30 days of the end of each 3-month, site inspection period. At a minimum, the inspection report shall provide a description of the condition of the engineered slope cover, final soil cover, vegetation, retention basin, berm, and security measures. The report shall also provide all data results for samples collected at the site. The Inspection Reports shall be certified in writing as described in Section V of this SOW.

Annually, a professional engineer registered in the State of Missouri, employed by or otherwise representing Respondent, shall inspect the berm's integrity and stability. The engineer's assessment shall be included with the inspection reports required above, and shall be stamped with the engineer's seal.

VII. *Community Relations*

The Respondent shall participate, as requested by the EPA, in meetings with the EPA, MDNR, and the community to discuss design and construction issues.

VIII. *Monthly Progress Reports*

Throughout the course of the removal action until approval of the *Removal Action Report*, Respondent shall submit to the EPA and MDNR written monthly progress reports in accordance with the Administrative Order on Consent. The monthly progress reports shall include, at a minimum:

1. A description of the actions completed and problems encountered during the reporting period.

2. A description of actions scheduled for completion during the reporting period which were not completed along with a statement indicating why such actions were not completed and an anticipated completion date;

3. Copies of all sampling and test results received during the reporting period;

4. Any proposed revisions to the project schedule for review and approval by EPA and MDNR; and

5. A description of the actions which are scheduled for completion and problems anticipated during the next reporting period.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VII
901 NORTH 5TH STREET
KANSAS CITY, KANSAS 66101

05 OCT 2005

ENFORCEMENT ACTION MEMORANDUM

SUBJECT: Request for Removal Action at the Herculaneum Lead Smelter Site, Herculaneum, Jefferson County, Missouri

FROM: Bruce A. Morrison, Remedial Project Manager BA Morrison
Superfund Division

THRU: Gene Gunn, Chief
FFSE/SUPR

TO: Cecilia Tapia, Director
Superfund Division

Site ID#: A717
Category of Removal: Non Time-Critical
CERCLIS ID #: MOD006266373
Nationally Significant/Precedent Setting: No

I. PURPOSE

The purpose of this Enforcement Action Memorandum is to request approval for a non time-critical removal action at the Herculaneum Lead Smelter Site (HLS), which is located at 881 Main Street in Herculaneum, Missouri, about 25 miles south of the St. Louis metropolitan area. The removal action will consist of stabilizing, berming, and covering the slag waste. The removal action will also include collection and treatment of storm water/leachate from the slag pile, and mitigation of wetlands impacted by the removal action. Slag is a waste product of the smelting process, and contains elevated levels of heavy metals including lead and zinc.

II. SITE CONDITIONS AND BACKGROUND

A. Site Description

1. Background

The HLS site is an active lead smelter, the largest of its kind in the United States, and is currently owned and operated by The Doe Run Resources Corporation. The HLS

began operations in 1892, and is currently operating at approximately 60 percent capacity today. The smelter facility consists of three main areas: (1) the smelter plant on the east side of Main Street; (2) office buildings on the west side of Main Street; and (3) the slag storage pile. The HLS site consists of the smelter facility as well as the extensive lead contamination found in the soils and dwellings of Herculaneum.

The smelter property is approximately 52 acres in size. The smelter is bordered on the east by the Mississippi River and on the north and west by residential areas. South of the smelter is the slag pile and wetland area. The slag pile is bordered to the east, west, and south by Joachim Creek, and to the north by residential areas and the smelter plant.

A slag disposal pile covering approximately 30 of the 52 acres is located south of the smelter plant in a horseshoe bend of Joachim Creek. Slag is a waste product generated as a result of smelting ore to produce lead. Historical data collected by Doe Run indicates that the slag contains lead at levels ranging from 12,900 to 27,300 parts per million (ppm) and zinc ranging from 72,800 to 130,000 ppm. The slag pile is in the flood plain of Joachim Creek, in an area classified as a wetland. The slag pile is not engineered to resist runoff or air dispersion and is not isolated from routine flooding of Joachim Creek that occurs at the site.

In May 2001, the Environmental Protection Agency (EPA), the Missouri Department of Natural Resources (MDNR), and Doe Run voluntarily entered into an Administrative Order on Consent concerning the Doe Run lead smelter in Herculaneum, Missouri, and areas in the vicinity of the smelter that the smelter operation has impacted. The Consent Order requires Doe Run to conduct certain response actions, including the cleanup of lead-contaminated residential soils in the community and developing a plan to address the release of slag from the slag disposal pile.

In May 2004, EPA, MDNR, and Doe Run agreed to amend the 2001 Consent Order for the purpose of expediting residential cleanups and the completion of an Engineering Evaluation/Cost Analysis (EE/CA) to address stabilization of the slag pile, and to provide for flood protection and storm water management. The EE/CA recommends an alternative for slag pile stabilization, flood protection, and storm water collection and treatment to address the threats posed by the slag pile.

2. Physical Location

The slag pile and most of the smelter facility are located in Jefferson County, Missouri, Section 29, Township 41 North, Range 6 East, although the northern portion of the facility extends into Section 20. Geographic coordinates of the site are 38° 15' 19.0" north latitude and 90°22' 56.7" west longitude. A map depicting the location of the slag pile is attached to this action memorandum.

3. Site Characteristics

The site encompasses approximately 539 residential properties located north and west of the site. Two schools and two parks are also located within the radius of influence of the HLS facility and are included within the current site boundaries.

Sampling results from 2001 confirmed that the levels of lead in surface soils were significantly elevated above the health-based standard of 400 parts per million (ppm) at hundreds of residential properties surrounding the HLS facility. Residential interior dust sampling detected lead in interior dusts exceeding EPA standards of 40 milligrams per square foot (mg/ft^2) on floors and 250 mg/ft^2 on window sills. Up until the second half of 2002, ambient air monitoring has consistently documented that ambient air contained lead at concentrations exceeding the national ambient air quality standard. The most recent blood lead survey conducted in Herculaneum by the Agency for Toxic Substances and Disease Registry (ATSDR) during the fall of 2002 concluded that 14 percent of children under 72 months of age had elevated blood lead concentrations exceeding 10 micrograms per deciliter (ug/dl). Historical data collected by Doe Run indicates that the slag contains lead at levels ranging from 12,900 to 27,300 ppm and zinc ranging from 72,800 to 130,000 ppm. Sampling conducted in 1997 for a Preliminary Screening Level Ecological Risk Assessment by the United States Fish and Wildlife Service detected lead levels in the livers of birds from the shoreline of Joachim Creek adjacent to the smelter ranging as high as 11.28 milligrams lead per kilogram on a wet weight basis. Samples of Joachim Creek sediments collected by the EPA's National Enforcement Investigations Center on February 9, 1998, detected lead ranging from 737 to 812 ppm.

4. Release or Threatened Release into the Environment of a Hazardous Substance, or Pollutant or Contaminant

Lead is a hazardous substance as defined by Section 101(14) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and is listed at 40 C.F.R 302.4. The slag particles range in size from coarse sand to clay and can readily become air borne when disturbed. The slag pile is adjacent to Joachim Creek and erosion channels have been observed in the pile. Direct contact of the slag pile to the Joachim Creek flood waters have also been observed and documented. Storm water that infiltrates into the slag pile is released from the toe of the pile and flows into an adjacent wetland area.

5. National Priorities List Status

The Site is not currently listed nor proposed for listing on the National Priorities List.

6. Supporting Documentation

All reports of investigations, reports of sampling and analysis, and other relevant documents regarding the contamination at the Site are contained in the Administrative Record. The Administrative Record can be found at the Herculaneum City Hall as well as the Superfund Records Center located at 901 North 5th Street, Kansas City, Kansas.

B. Other Actions to Date

1. Previous Actions

The EPA and the MDNR have monitored lead air emissions around the HLS facility since 1992. Up until 2002, the area was not in attainment of the National Ambient Air Quality Standard (1.5 ug/m^3) for lead. The Doe Run Company voluntarily replaced yard soils at approximately 80 homes near the HLS facility during the time period from1990 to 1999. Under the previously described Consent Order, Doe Run replaced surface soil at 350 additional residential properties and cleaned the interiors of 106 homes. Doe Run installed an enclosed vehicle wash station and altered their materials handling procedures at the smelter facility in an effort to reduce fugitive emissions from the site.

2. Current Action

The EPA continues to oversee cleanup actions in the community performed by Doe Run. These actions include soil replacement at residential properties and implementation of a Transportation and Materials Handling Plan previously approved by EPA. EPA also conducts surface soil sampling each quarter to monitor for lead recontamination, and monitors lead loading levels on streets. EPA and MDNR are overseeing a sampling effort designed to determine the ecological risk and natural resource damages at the site. EPA continues to participate in outreach meetings and has facilitated revitalization efforts due to the impacts the cleanup and voluntary property purchase have had on the community.

C. State and Local Actions to Date

1. State and Local Actions to Date

State and local health agencies conducted two blood lead screening surveys in the community. Results of these surveys indicated that the precedence of elevated blood lead levels in children decreased by 50 percent from 2001 to 2002. These agencies also participated in numerous public meetings to provide health information related to lead exposure.

In April 2002, the state of Missouri entered into a Settlement Agreement with Doe Run that called for Doe Run to offer to purchase approximately 170 homes located closest to the smelter facility. The home purchase agreement was voluntary for the homeowners and Doe Run was required to offer fair market value for the homes. Approximately 150 residences have accepted offers from Doe Run and either moved away or are in the process of moving away.

2. Potential for State/Local Response

The Jefferson County Health Department, MDNR, and the Missouri Department of Health and Senior Services (MDHSS) will continue to provide their services described in the previous section of this Action Memorandum. The EPA will coordinate all future activities associated with this removal action with MDNR and MDHSS.

III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

Section 300.415(b) of the National Contingency Plan (NCP) provides that the EPA may conduct a removal action when it determines that there is a threat to human health or welfare or the environment based on one or more of the eight factors listed in Section 300.415(b)(2). The factors which justify a removal action at this site are outlined below.

A. Threats to Public Health or Welfare

1. 300.415(b)(2)(i) -- Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances, or pollutants, or contaminants.

A blood lead survey conducted in the fall of 2001 by the ATSDR determined that 15 of the 62 children tested (24 percent) had blood lead levels exceeding a health-based standard of 10 ug/dl. Concentrations of lead dust collected from roadways near the HLS facility were as high as 300,000 ppm, and continue to be elevated at levels as high as 90,000 ppm. Although recent ambient air monitoring results indicated that the area was below the NAAQS for lead until the first quarter of 2005, sampling data indicates statistically significant upward trends in soil lead levels at the site.

Historical data collected by Doe Run indicates that the slag contains lead at levels ranging from 12,900 to 27,300 parts per million (ppm) and zinc ranging from 72,800 to 130,000 ppm.

Sampling conducted in 1997 for a Preliminary Screening Level Ecological Risk Assessment by the United States Fish and Wildlife Service detected lead levels in the livers of birds from the shoreline of Joachim Creek adjacent to the smelter ranging as high as 11.28 milligrams lead per kilogram on a wet weight basis. Five out of 21 birds sampled had liver lead values elevated above the threshold diagnostic of clinical lead poisoning (threshold = 6 milligrams per kilogram wet weight). Clinical poisoning is defined by impaired biological functions and can be life threatening. Eight of the remaining 16 birds had liver lead values elevated above the threshold diagnostic of subclinical lead poisoning (threshold = 2 milligrams per kilogram wet weight). Subclinical lead poisoning is defined by having physiological effects.

Lead is a metal and a constituent of D008 hazardous waste. Lead is classified by the EPA as a probable human carcinogen and is a cumulative toxicant. The early effects of lead poisoning are nonspecific and difficult to distinguish from the symptoms of minor seasonal illnesses. Lead poisoning causes decreased physical fitness, fatigue, sleep disturbance, headache, aching bones and muscles, digestive symptoms (particularly constipation), abdominal cramping, nausea, vomiting, and decreased appetite. With increased exposure, symptoms include anemia, pallor, a "lead line" on the gums, and decreased handgrip strength. Alcohol and physical exertion may precipitate these symptoms. The radial nerve is affected most severely causing weakness in the hands and wrists. Central nervous system effects include severe headaches, convulsions, coma, delirium, and possibly death. The kidneys can also be damaged after long periods of exposure to

lead, with loss of kidney function and progressive azotemia. Reproductive effects in women include decreased fertility, increased rates of miscarriage and stillbirth, decreased birth weight, premature rupture of membrane, and/or pre-term delivery. Reproductive effects in men include erectile dysfunction, decreased sperm count, abnormal sperm shape and size, and reduced semen volume. Lead exposure is associated with increases in blood pressure and left ventricular hypertrophy. A significant amount of lead that enters the body is stored in the bone for many years and can be considered an irreversible health effect.

Zinc is toxic to aquatic organisms at very low levels. The Ambient Water Quality Criteria established by the Clean Water Act has set a chronic threshold for zinc of 0.10599 milligrams per liter (mg/l). Zinc concentrations found in samples collected from surface drainage from the pile to the Joachim Creek ranged as high as 0.6 mg/l.

Zinc (Zn) is essential for normal growth and reproduction in plants and animals. Zinc is not known to bioaccumulate in food chains, because it is regulated by the body and excess zinc is eliminated.

High levels of zinc induce copper deficiency and interfere with metabolism of calcium and iron. The pancreas and bone seem to be the primary targets of zinc toxicity in birds and mammals. Pancreatic effects include cytoplasmic vacuolation, cellular atrophy, and cell death. Zinc preferentially accumulates in bone, and induces osteomalacia, a softening of bone caused by a deficiency of calcium, phosphorus and other minerals. Gill epithelium is the primary target site in fish. Zinc toxicosis results in destruction of gill tissue.

Mallard ducks exposed to 600 mg/kg BW/day zinc for a period of 30 days suffered from leg paralysis and a decrease in food consumption. Chicks of the domestic chicken exposed to 361 mg/kg BW/day zinc for two weeks had reduced body weight, serum cholesterol, and growth hormones, and thyroid follicular hyperplasia and hypertrophy. In a similar study, chicks exposed to 145 mg/kg BW/day zinc showed decreased growth and anemia.

2. 300.415(b)(2)(iv) -- High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface that may migrate.

Historical data collected by Doe Run indicates that the slag contains lead at levels ranging from 12,900 to 27,300 parts per million (ppm) and zinc ranging from 72,800 to 130,000 ppm. The slag pile is currently uncovered and side slopes are graded at the material's angle of repose. Flood waters have been photo documented in contact with the slag.

3. 300.415(b)(2)(v) -- Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released.

Weather conditions may cause the lead contamination to migrate. Seasonal flooding will continue to erode slag into Joachim Creek and the Mississippi River. Storm water infiltrates into the slag pile and is released at the toe of the pile. High winds may cause slag particles to become airborne and transported some distance from the source.

4. 300.415(b)(2)(vii) -- The availability of other appropriate federal or state response mechanisms to respond to the release.

There are no other state or federal authorities who are able to respond to the release of hazardous substances at the Site.

IV. ENDANGERMENT DETERMINATION

The actual release of a hazardous substance at this Site, if not addressed by implementing the response action selected in this Action Memorandum, presents an imminent and substantial endangerment to human health and the environment. Federal and state agencies are recommending that immediate response action be taken to reduce potential exposure to lead and zinc.

V. PROPOSED ACTIONS AND ESTIMATED COST

A. Proposed Actions

1. Proposed Action Description

The recommended removal alternative in the EE/CA proposes to utilize slag to construct a berm capable of protecting the pile from a 500-year flood event. The exterior side slope of the berm would be graded to 4 horizontal to 1 vertical and the interior side slope would be graded to a 3 horizontal to 1 vertical. The exterior side slope of the berm would be covered with a synthetic liner followed by a protective cover material and rip rap rock to protect against future floods. In addition to the berm, a storm water collection basin would be constructed within the berm perimeter to collect storm water runoff which would be treated prior to offsite discharge. Final closure of the pile will consist of a synthetic liner and rip rap for areas below the 500-year flood elevation and a 24-inch soil cap and vegetation for areas of the slag pile that are above the 500-year flood elevation. Grading and covering of the slag pile will be a progressive phased closure in order to minimize the area holding uncovered slag. Further details of the alternative can be found in section 4.7 of the EE/CA (attached).

2. Contribution to Remedial Performance

The removal action described in this Action Memorandum will be consistent with future remedial actions that may be taken at this Site.

3. Applicable Relevant and Appropriate Requirements (ARARs)

The ARARs for the removal action, which were discussed in detail in the EE/CA, include the following:

- National Ambient Air Quality Standards (NAAQS)
- Fugitive Particulate Matter Regulations
- Surface Mining Control and Reclamation Act

- Clean Water Act Direct Discharge Requirements
- Storm Water Requirements (10 CSR 20-6.200)
- Protection of Flood Plains
- RCRA Subtitle D Solid Waste Disposal Regulations
- RCRA Subtitle C Hazardous Waste Management Regulations
- State of Missouri Metallic Minerals Act

Applicable requirements are also contained in the Missouri Metallic Minerals Waste Management Act Permit MM-001, and the Missouri State Operating Permit MO-0000281 issued under the Missouri Clean Water Law.

4. Engineering Evaluation/Cost Analysis (EE/CA)

The EE/CA was released for public comment March 23, 2005. The public comment period ended on April 22, 2005. EPA held a public meeting in Herculaneum on March 30, 2005. A summary of the comments/questions received and EPA's responses are in the attached Responsiveness Summary.

5. Project Schedule and Cost

The total estimated cost for the implementation of the selected removal action alternative is $7.98 million. Construction of the berm and retention basin will be constructed in phases if possible. Construction of these items will take one to two years depending on the manpower and equipment dedicated to the project. The final design of the removal action will include a schedule and a dedicated equipment and labor list for the project. Because this action includes the continued use of the area as a disposal site for slag under the Missouri Metallic Minerals Permit, final closure of the pile is not anticipated for several decades.

VI. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

Conditions at this Site will continue to pose a threat to public health and the environment until response actions are implemented.

VII. OUTSTANDING POLICY ISSUES

None.

VIII. ENFORCEMENT

See attached Confidential Enforcement Addendum.

IX. RECOMMENDATION

This decision document represents a selected removal action for the Herculaneum Lead Smelter Site, Herculaneum, Missouri, developed in accordance with CERCLA as amended and is

consistent with the National Contingency Plan (NCP). Conditions at the site meet the criteria for a removal action set forth in Section 300.415(b)(2) of the NCP.

Conditions at the Site meet NCP Section 300.415(b)(2) criteria for a removal action and I recommend your approval of the proposed removal action.

Approved:

Cecilia Tapia, Director
Superfund Division

10-5-05
Date

Attachments: 4

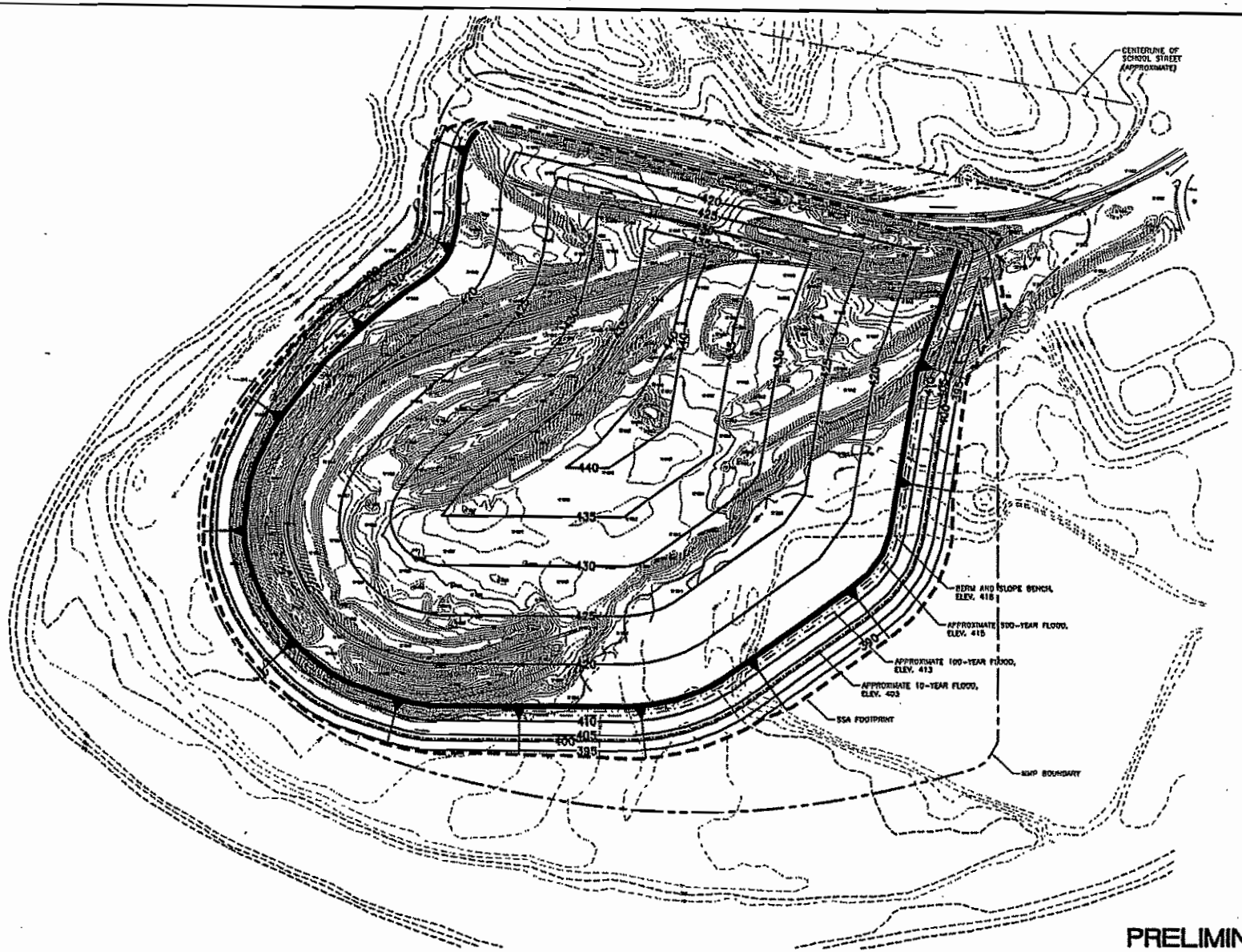
The Doe Run Resources Corporation, a mining company that has performed similar removal actions at other mine waste sites in the Region, has participated in developing the EE/CA for the Site. EPA anticipates that Doe Run will implement the recommended removal action described in this Action Memorandum pursuant to a modification to the Administrative Order on Consent, Docket No. RCRA-7-2000-0018 and CERCLA-7-2000-0029. In exchange for a commitment from Doe Run to complete construction of the slag pile berm and retention basin, as well as the wetland mitigation, within 15 months; EPA will agree to forego a requirement for financial assurance. If Doe Run will not agree to the terms of an AOC modification, EPA will issue a Unilateral Administrative Order to Doe Run for implementation of the slag pile removal action.

EPA costs for this removal action include:

EPA Direct Intramural Costs:	$25,000
EPA Indirect Intramural Costs:	$13,200
Total Intramural Costs:	$38,200

The total EPA costs for this removal action based on full-cost accounting practices that will be eligible for cost recovery are estimated to be $38,200.

Direct Costs include direct extramural costs and direct intramural costs. Indirect costs are calculated based on an estimated indirect cost rate expressed as a percentage of site-specific direct costs, consistent with the full cost accounting methodology effective October 2, 2000. These estimates do not include pre-judgment interest, do not take into account other enforcement costs, including Department of Justice costs, and may be adjusted during the course of a removal action. The estimates are for illustrative purposes only and their use is not intended to create any rights for responsible parties. Neither the lack of a total cost estimate nor deviation of actual total costs from this estimate will affect the United States' right to cost recovery.



PRELIMINARY DESIGN

NO	BY	CHK	APP	DATE	REVISION DESCRIPTION
1	TLM	TLM	JYD	01-24-05	POOLED NORTH/SOUTH CROSS SECTION LINE AND 10-YEAR, 100-YEAR, AND 500-YEAR FLOOD ELEVATIONS
2	BJT	TLM	JYD	04-12-05	REVISED FOOTPRINT

ISSUED FOR: BID / CONSTRUCTION
RELEASED TO/FOR
DATE RELEASED: A | B | C | D | 1 | 2 | 3

BARR
Engineering Incorporated
Minneapolis, Minnesota
800 1-800-632-2277
Project Office
BARR ENGINEERING CO.
3239 EMERALD LANE
JEFFERSON CITY, MO 65109
Ph: 1-888-724-2333
Fax: (573) 636-9001
www.barr.com

Scale	AS SHOWN
Date	5/13/05
Drawn	SDL
Checked	JYD
Designed	JYD
Approved	

THE DOE RUN COMPANY
HERCULANEUM, MISSOURI

SLAG STORAGE AREA CLOSURE
HERCULANEUM, MISSOURI
REVISED CONCEPTUAL GRADING PLAN

BARR PROJECT No. 25/51-016
COUNT PROJECT No.
DRG. No. Figure 5A
REV. No.

RESPONSIVENESS SUMMARY

ENGINEERING EVALUATION/COST ANALYSIS

HERCULANEUM LEAD SMELTER SITE (SLAG PILE)

The National Oil and Hazardous Substances Pollution Contingency Plan (National Contingency Plan or NCP), 40 CFR §300 et seq., establishes procedures for evaluation of potential response actions at sites contaminated with hazardous substances. 40 CFR §300.415(b)(4) requires that, in instances where a planning period of at least six months exists, an Engineering Evaluation/Cost Analysis (EE/CA) shall be prepared that develops and evaluates potential response alternatives to address site contaminants. The EE/CA process involves providing an opportunity for public comment on the alternatives under consideration. This document presents the United States Environmental Protection Agency's (EPA) responses to public comments received concerning the May, 2004 draft EE/CA for the Slag Pile at the Herculaneum Lead Smelter Site (the Site), with input from the Missouri Department of Natural Resources (MDNR).

Upon consideration of conditions at the Site, EPA determined that preparation of an EE/CA was warranted since at least six months planning time was available. An agreement was reached between EPA, the MDNR, and the identified Potentially Responsible Party (PRP) for the Site at that time, The Doe Run Company (Doe Run), whereby Doe Run agreed to take a lead role in the preparation of the EE/CA.

Doe Run submitted the draft EE/CA to EPA and the MDNR in May 2004. Both agencies approved the EE/CA for release for public comment by January 19, 2005. A public comment period was announced, commencing March 23, 2005, and ending April 22, 2005. A public meeting was conducted on March 30, 2005, at the Senn Thomas Middle School in Herculaneum, Missouri, to present the findings of the draft EE/CA and to hear questions and comments from the community in attendance. A transcript of this public meeting was prepared to enable EPA to better respond to individual comments received from the community at that meeting.

During the public comment period, EPA received one letter from a community member providing comments on the draft EE/CA. Electronic mail comments were also received from the Washington University Interdisciplinary Environmental Clinic on behalf of the Missouri Coalition for the Environment.

Copies of the individual comments received by EPA concerning the EE/CA are available for public review in the Administrative Record located at the Herculaneum City Hall, the Windsor Branch of the Jefferson County Library, or at the EPA Regional Office, 901 North 5th Street, Kansas City, Kansas, 66101. Questions regarding the document repositories should be directed to Dianna Whitaker at (913) 551-7598, or toll-free at 1-800-223-0425.

Upon consideration of public comments received, EPA has elected to approve the draft EE/CA and proceed with the decision document, also known as the Enforcement Action Memorandum, finalizing EPA's decision to implement alternative 7 in the EE/CA.

PUBLIC COMMENTS AND EPA RESPONSES

1. Comment:

A commenter stated that the recommended alternative in the EE/CA did not prevent, minimize, or mitigate damage to the environment caused by the slag pile as required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

Response:

As stated in the regulations implementing CERCLA, 40 CFR Part 300.415 (b)(1), "The lead agency may take any appropriate removal action to abate, prevent, minimize, stabilize, mitigate, or eliminate the release or the threat of release." EPA disagrees with the commenter because the recommended removal alternative in the EE/CA will stabilize the slag and minimize future releases from the site. The recommended removal action alternative requires that the slag be secured behind a berm that will capture surface runoff from the pile and prevent contact with Joachim Creek flood waters. Prior to the closure of the slag pile, surface runoff water from the pile will be captured in a retention basin and treated at the smelter facility prior to release. Any slag that migrates from the pile via surface runoff will also be captured by the retention basin. In addition, the recommended removal action alternative includes a phased closure that will provide for an engineered cover on the slag pile that will further reduce the threat of surface runoff and eliminate the potential for air borne releases.

Although the recommended alternative provides for expansion of the slag pile into wetlands, all substantive requirements of Section 404 and 401 of the Clean Water Act are required to be met prior to this expansion. Specifically for this site, wetlands mitigation is required as part of the recommended removal action alternative.

2. Comment:

Several commenters raised concern or inquired that the recommended removal alternative does not constitute a final response action for the slag pile because it allows for the continued disposal of slag into the pile.

Response:

The selected removal alternative provides final stabilization measures and final closure criteria while allowing its continued use for slag disposal. The recommended alternative will minimize releases from the slag pile and remain consistent with the Missouri Metallic Minerals Permit Number MM-001 issued to Doe Run that allows for continued disposal of slag at the site. Following the implementation of the recommended alternative the slag pile will be surrounded by

a berm that will prevent the run off of slag and contaminated storm water, protect the pile from contact with flood water, and will provide for the phased covering of the slag which will minimize air borne emissions and direct contact threats. Based on current information, final closure of the slag pile in accordance with the recommended removal action alternative and the Missouri Metallic Minerals Permit will provide an effective final closure that minimizes the threat of a release of slag from the site during continued operation and after final closure.

Under the recommended removal alternative, portions of the slag pile will remain open while it is being utilized to full capacity and until final closure. The recommended removal action alternative is intended to contain the current slag pile on the sides with an armored berm, leaving room for the placement of additional slag from continued lead smelting. As the disposal area is filled to design capacity with slag, the top cover of the pile will be constructed to complete the enclosure of the slag pile. The cover construction will be completed in phases as the design capacity of the pile is met.

3. Comment:

A commenter stated that cost was weighed more heavily than other evaluation criteria when the comparison of evaluation criteria was performed.

Response:

Under CERCLA, non-time-critical removal action alternatives are to be evaluated using a comparative analysis that evaluates the criteria of effectiveness, implementability, and cost. The EE/CA identified removal alternatives 3 though 7 as effective in reducing the threat to public health and the environment. The EE/CA also provided varying degrees of implementability for these alternatives, but concluded that they were all implementable. Therefore, the comparative evaluation criteria of cost was significant in eliminating alternatives 3 and 4 from recommendation due to their comparative costs to alternatives 5, 6, and 7. The cost of alternatives 3 and 4 ranged from $96,800,000 to $110,802,000 while alternatives 5, 6, and 7 ranged from $9,294,000 to $5,765,000. The magnitude of cost differential was the primary reason alternatives 3 and 4 were not recommended for selection in the EE/CA. EPA also considered consistency with other similar removal sites and the Missouri Metallic Minerals Waste Management Act Permit when evaluating alternative 4, treatment and off-site disposal. Moving 2 million tons of slag to another location, when the facility was permitted by the state of Missouri to dispose of the slag at its current location, was impractical and inconsistent with nearly all other CERCLA sites in the country. Risks posed by the addition of an estimated 10,000 truck loads of slag to the roadways was also considered in comparative analysis. EPA weighed more heavily the criteria of effectiveness and implementability when it compared alternatives 5, 6, and 7 because their costs were in the same general range. EPA was most concerned with storm water retention capacity, effective flood protection, and the minimization of wetlands impacts when it compared these three alternatives. EPA's goal in evaluating these alternatives was to maximize storm water retention capacity and minimize the use of additional wetlands acreage. Alternative 7 provides an effective compromise between both of these goals.

4. Comment:

Several commenters stated that the EE/CA fails to resolve the disposition of the 22 acres of wetlands south of Joachim Creek that is owned by Doe Run and where slag would be disposed of following closure of the slag pile.

Response:

The scope of the EE/CA is to address the release and threat of release from the current slag pile, and is not intended to address future slag disposal options beyond the life of the current pile. Although Doe Run currently has a Missouri Metallic Minerals Waste Management Act Permit to dispose of slag on the 22 acres in question, they are required to obtain a section 404 permit under the Clean Water Act from the U. S. Army Corps of Engineers and a section 401 water quality certification from the MDNR prior to disposing of slag in said 22 acres. Based on the facility's current lead production rates, the recommended removal alternative will provide at least 25 years of additional slag disposal capacity. At that time, the smelter operator will be required to find a new slag disposal location that is in compliance with all state and federal laws and regulations. The scope of this EE/CA is not intended to address the smelter's slag disposal beyond the life of the currently utilized slag pile.

5. Comment:

Several commenters stated that the recommended removal action alternative will continue to pose a significant threat to wildlife due to the potential for burrowing animals utilizing the slag pile and birds using the retention basin.

Response:

The EPA believes that the threat to wildlife posed by the recommended removal action alternative will be minimal. Runoff water in the retention basin, when present after a rainfall event will be drained in a matter of days and therefore will provide only an intermittent attractive nuisance for birds. Smelter operational activity will likely discourage birds from extended use of the retention basin. EPA believes that the vast surface water bodies (Joachim Creek and Mississippi River) adjacent to the site will offer a more attractive site for birds to use.

The closure design of the pile cover including a synthetic liner will deter some of the burrowing animals common to the area. However, EPA will ensure that the Post Removal Action Site Control Plan required by the EE/CA will address burrowing animal deterrence and removal practices at the slag pile.

6. Comment:

Several commenters stated concern over the lack of engineering design detail in the EE/CA and the potential for failure of the recommended alternative due to the lack of this information.

Response:

The recommended removal action alternative has been evaluated by a competent and experienced professional engineer, certified by the state of Missouri. It is common practice to recommend and select removal action alternatives at Superfund Sites prior to completing engineering testing and design work. The basic engineering principals being employed in the recommended removal action alternative are common to the industry and have been successfully utilized at similar Superfund sites in the region. All field data needed for implementation of the recommended removal action alternative will be collected during the construction design process and will be presented in support of the removal action design plans. In completing design work and constructing the removal action alternative it is possible that modifications to the recommended alternative will be necessary, but it is unlikely these modifications will significantly alter the fundamental design of the removal action.

7. Comment:

Several commenters stated that the EE/CA did not ensure funding for long-term inspection and maintenance of the slag pile or in the event that the smelter operator went out of business prior to closure of the slag pile.

Response:

The EPA believes that the EE/CA adequately addresses the issue of long-term maintenance of the slag pile following closure by requiring the development of a Post Removal Action Site Control Plan. The Missouri Metallic Minerals Waste Management Act Permit also requires a continuation of monitoring and maintenance of the slag pile by Doe Run. Post removal site control and maintenance is a common component of Superfund Sites of this nature. EPA must ensure that post removal site control and maintenance are addressed through enforcement, such as an administrative order, or by acquiring the state's agreement to accept these responsibilities in the case of a site with no viable responsible parties. Acquiring financial assurance from owners and operators is a matter that is addressed through administrative enforcement procedures and is outside the scope of the EE/CA and the EE/CA process. EPA is aware of the benefits of financial assurance and routinely pursues acquiring guaranteed funding at Superfund Sites.

8. Comment:

One commenter stated that they preferred the recommended alternative because it avoided additional truck traffic through town to haul the slag elsewhere.

Response:

EPA agrees that the additional truck traffic needed to haul the slag pile elsewhere, as in alternative 4, would be burdensome to the residents of Herculaneum and pose additional risks such as truck spills, accidents, and capacity and site security at the new disposal location.

9. Comment:

One commenter requested that the Power Point Presentation from the public meeting and the EE/CA be placed on the EPA's web site.

Response:

The EE/CA and the Power Point Presentation are large documents that would take up an excess amount of space on EPA's web site. In addition, EPA believes that the Power Point Presentation is not appropriate for posting on the web site because it is intended for presentation with a narrative from a presenter. Copies of the EE/CA are available at the Herculaneum City Hall and the Windsor Branch of the Jefferson County Library. Copies of the aforementioned documents can be obtained from EPA through the Freedom of Information Act process. Requests for documents should be mailed to: Kathy Montalte, USEPA, 901 North 5th Street, Kansas City, Kansas 66101.

10. Comment:

One commenter asked how other contaminants found in the slag would be addressed.

Response:

The recommended removal action alternative is a containment design that will contain the slag and the metals constituents found in the slag. Storm water run off will be captured and treated to meet site-specific discharge criteria prior to its discharge to the Mississippi River.

11. Comment:

One commenter asked if the EE/CA had a backup alternative or plan if the recommended plan failed.

Response:

The EPA believes there is a high likelihood of the recommended removal action alternative meeting the removal action objectives and has not selected a backup or contingency alternative in the EE/CA. However, under CERCLA the smelter owner/operator would be responsible for mitigating the release or threat of release of the slag, if the recommended removal action alternative failed to meet its objectives.

12. Comment:

One commenter asked who would be responsible for operating the smelter's wastewater treatment facility if the smelter would go out of business after 30 years.

Response:

Final closure of the slag pile is estimated to occur in 25 years, at which time the storm water detention basin will be filled with slag and provided final cover. Once the final cover is placed on the slag pile, the treatment of storm water runoff from the pile will not be necessary because surface water runoff will no longer come into contact with the slag. EPA will likely require the smelter operator to immediately close i.e., place cover on the entire slag pile, should operations cease at the smelter prior to closure of the slag pile.

13. Comment:

One commenter asked if there was a mechanism that would require future owners of the property to comply with an Order that Doe Run had entered into.

Response:

Typically, responsibility to implement an action under an Order issued by EPA under the authority of CERCLA remains the responsibility of the party to whom it was issued, even if ownership of the property is transferred, unless the new owner agrees to accept this responsibility as a condition of the sale transaction.

14. Comment:

One commenter stated that after April 22, 2005, the public will no longer have the opportunity to comment on or learn about the final action plan for the slag pile.

Response:

The public comment period for the EE/CA ended on April 22, 2005. However, EPA will continue to provide regular updates to the community on site progress. The final design for the removal action will be a public document that must be made available to the public upon request.

4.7 Alternative 7 – Existing Footprint plus Stormwater Collection and Flood Protection

Alternative 7 (Figure 5), the existing footprint plus stormwater collection and flood protection, is a compromise of Alternative 5 (Construct Slag Storage Area to MMP Boundary) and Alternative 6 (Utilize Existing Footprint). The conceptual design of this alternative is based on standard designs utilizing medium to coarse sand and fine gravel. Design experience from work on sites in the Old Lead Belt was also utilized in this conceptual design. Geotechnical testing, as described in Section 2.6, along with stability analysis will be completed as part of the detailed design process for the chosen alternative. Alternative 7 meets all of the goals and objectives outlined in the removal action scope.

A 500-year flood elevation berm would be constructed for flood protection and a stormwater retention basin would be constructed within the interior of the berm to provide for stormwater runoff collection. Stormwater will be collected from the slag storage area and from an area immediately west of the plant as illustrated on Figure 1. Any visible accumulation of slag beyond the projected footprint would be removed and incorporated into the slag storage area during construction of the flood berm. A pumping and pipe collection system would be constructed to transport the stormwater to the plant wastewater treatment system. As part of the construction of the flood berm and stormwater retention basin, an additional 12 acres of suspected wetlands would be disturbed. This is the minimal wetlands area to be impacted while providing sufficient area for construction of the flood berm and stormwater collection basin. A conceptual design based on an additional 30 to 35-year capacity demonstrates that this alternative provides a more stable and visually compatible area upon completion of the slag storage area than Alternative 6.

The 500-year flood protection berm would be comprised of approximately equal lengths of newly constructed berm and berm incorporated into existing portions of the slag storage area. The new section of berm would be constructed by placing slag from the storage area across the southeast portion of the site along the alignment shown on Figure 6. The incorporated section of the berm would be constructed by regrading the southwest and west slopes of the slag storage area using the alignment shown on Figure 6. Working the side slopes down and expanding the footprint allows installation of a drain line along the existing toe of the side slope prior to expanding the footprint. This allows improved internal drainage of the slag storage area by expediting drainage to the southeast and subsequently to the stormwater collection basin. In addition, past experience in remediation of lead tailings sites in the Old Lead Belt has demonstrated that remediation of steep side slopes can be accomplished with better control of operations and in a more economically feasible manner by pushing material down the side slope rather than moving the material up to the top of the slope. This is primarily due to the efficient type of equipment that can be utilized and the tonnage of material moved versus time expended. The relatively small amount of additional wetlands impacted is the trade-off for the improved design and operations.

The conceptual design for the flood protection berm specifies a 3 horizontal to 1 vertical (3:1) interior side slope and a 4 horizontal to 1 vertical (4:1) exterior side slope. A synthetic liner would be placed along the exterior side slope of the entire length of the berm. A protective layer or liner would be placed over the synthetic liner with a subsequent rock riprap layer, or equivalent, flood erosion protection. Typical cross section views of the new berm and incorporated berm construction are shown in Figure 7. Section 1 generally illustrates a cut from the southeast to the northwest whereas Section 2 generally illustrates a cut from the southwest to the northeast.

A stormwater retention basin with a 10-year 24-hour storm event capacity would be constructed between the interior side slope of the berm and the existing edge of the slag in the southeast corner of the slag storage area. A plan view of the stormwater retention basin is illustrated on Figures 5 and 6. The retention basin would have a storage capacity of approximately four million gallons before water is backed up into the slag. Due to the height of the flood protection berm in comparison to the elevation of the stormwater retention berm, there is no potential for overtopping the flood protection berm if the 10-year 24-hour storm event capacity is exceeded. A synthetic liner would be installed along the interior side slope of the berm for the length of the retention basin to prevent migration of the stored stormwater into the flood protection berm. A typical cross section view of the stormwater retention basin in relation to the flood protection berm and the slag storage area is shown on Figure 7.

The closure of the slag storage area would be a progressive phased closure. The completion of the slag storage area would start at the northwest corner of the site and would be phased to the south and southeast. When final elevations are reached, the area would be graded prior to placement of a synthetic liner. Below the 500-year flood elevation, the synthetic liner would be covered with riprap or an equivalent flood protection cover. Above the 500-year flood elevation, the synthetic liner would be covered with 18 inches of cover soil and 6 inches of vegetative soil. The 18 inches of cover soil may utilize excavated residential clean-up soil, if available, whereas the 6 inches of vegetative soil would be noncontaminated soil obtained from offsite. Following the placement of soil, the area would be vegetated. A detailed discussion of the slag storage area closure and restoration would be included in the final design.

Profile drawings of Alternatives 6 and 7 are shown on Figure 8 to illustrate the increased stability and visual compatibility of Alternative 7 versus Alternative 6. The cross section locations are shown on Figures 4 and 5.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VII
901 NORTH 5TH STREET
KANSAS CITY, KANSAS 66101

JUN 12 2006

Aaron Miller
Project Coordinator
881 Main Street
Herculaneum, MO 63048

Dear Mr. Miller:

RE: Approval with Modifications of Wetlands Mitigation Plan for the Slag Pile Removal Action at the Herculaneum Lead Smelter Site

The United States Environmental Protection Agency (EPA) and the Missouri Department of Natural Resources (MDNR) are approving with conditions the Wetlands Mitigation Plan dated May 2006 (Plan), required pursuant to Appendix A, Paragraph IV.1.b. of the Administrative Order on Consent, Docket No. RCRA-7-2000-0018 and CERCLA-7-2000-0029 (Second Modification). The following changes shall be made to the appropriate pages of the Plan and the pages replaced accordingly. Copies of the replacement pages shall be submitted to EPA and MDNR.

1. The Plan shall be edited to remove all references to the approximately nine-acre tract of the site south of the utility easement. These references include the cover letter (fifth sentence); section 1.0 (entire third paragraph); Figure 5 (all marking and labeling of the south tract); and Figure 6 (labeling of 10.20 acres of deed restricted area).

2. The Plan shall be edited to remove all references to an inlet structure and more than one basin. These references include Figure 5; section 4.1.1 (paragraph 1, sentence 6); section 5.0 (bullet 5); and section 7.0 (paragraph 1, last sentence).

3. In section 4.1 (paragraph 1, last sentence), insert the word "berm" after "AT&T", and clarify the sentence to ensure that the wetlands, and not the berm, "will be excavated deeper…".

I can be reached at 913-551-7755 if you have any questions concerning these changes.

Sincerely,

Bruce A. Morrison
Project Manager
Superfund Division

cc: Robert Hinkson, MDNR

SCI ENGINEERING, INC.
9701 GREEN PARK INDUSTRIAL DRIVE
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Formal Mitigation Plan

DOE RUN SLAG STORAGE AREA – OFF-SITE MITIGATION FESTUS, MISSOURI

June 2006

Prepared for:
THE DOE RUN COMPANY

SCI No. 2004-2077.31

SCI ENGINEERING, INC.
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CONSULTANTS IN DEVELOPMENT, DESIGN, AND CONSTRUCTION
GEOTECHNICAL
ENVIRONMENTAL
CULTURAL RESOURCES
NATURAL RESOURCES
CONSTRUCTION SERVICES

June 29, 2006

Mr. Bruce Morrison
U.S. Environmental Protection Agency
Superfund Division
901 North 5th Street
Kansas City, Kansas 66101

Re: Formal Mitigation Plan
Doe Run Slag Storage Area – Off – Site Mitigation
Festus, Missouri
SCI No. 2004-2077.31

Dear Mr. Morrison:

On behalf of the Doe Run Company (Doe Run), SCI Engineering, Inc. (SCI) is submitting the fourth revised mitigation plan, which seeks approval for mitigation proposed at an off-site location near Festus, Missouri. The report includes a wetland impact assessment associated with the slag storage facility proposed at Doe Run's Herculaneum Smelter, in addition to the mitigation plan. Total proposed impacts for the slag storage facility consist of 8.6 acres. Overall, the created wetland design has not been significantly changed since the March 2006 submittal. The plan has incorporated suggestions provided by all commenting agencies. It outlines procedures to create approximately 12.45 acres of emergent wetland habitat, 6.83 acres of scrub-shrub wetland habitat, restore approximately 3.36 acres of Joachim Creek's riparian corridor, and preserve approximately 3.74 acres of Joachim Creek's bankline. A total of 27.80 acres is proposed to be deed restricted in perpetuity with Jefferson County.

Doe Run has minimized proposed impacts associated with the slag storage area, provided mitigation within the Joachim Creek Watershed, applied appropriate mitigation ratios, and have incorporated suggestions and requests provided by all commenting agencies. Based on these factors, Doe Run and SCI request approval of the following mitigation plan.

Please call if you have any questions or need additional information.

Respectfully,

SCI ENGINEERING, INC.

Sara Hayes
for
Laurie M. Farmer
Project Scientist

Scott D. Harding, CPSS/SC
Vice President

LMF/SDH/mab

Enclosure

C: Mr. Robert Hinkson, Missouri Department of Natural Resources
Mr. Ward Lenz, U.S. Army Corps of Engineers
Mr. Aaron Miller, The Doe Run Company (5)

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DOE RUN SLAG STORAGE AREA –
OFF-SITE MITIGATION
FESTUS, MISSOURI

1.0 INTRODUCTION

On behalf of the Doe Run Company (Doe Run), SCI Engineering, Inc. (SCI) has prepared a formal mitigation plan, outlining a proposal to offset wetland impacts associated with the slag storage facility at the Doe Run Smelter in Herculaneum, Missouri. The Doe Run slag storage facility and mitigation efforts are under the direction of an Administrative Order on Consent entered into by the U.S. Environmental Protection Agency (USEPA), Missouri Department of Natural Resources Hazardous Waste Program (HWP), and Doe Run. The USEPA and HWP have requested the technical assistance of the U.S. Army Corps of Engineers (CE) and the Missouri Department of Natural Resources – Water Pollution Control Program (WPCP) to make certain that mitigation is processed in accordance to standard protocol associated with the CE's Section 404 program and WPCP's 401 Water Quality Certification. The following report is the fourth mitigation plan submitted by SCI to the USEPA and HWP, seeking approval for an off-site mitigation area located in Festus, Missouri (Figure 3).

The following mitigation plan incorporates verbal and written comments provided by all agencies generated from our previous submittals, dated November 4, 2004, March 22, 2005, and March 16, 2006. Doe Run has worked to reduce proposed wetland impacts at the Herculaneum Smelter, as well as provide an appropriate amount of mitigation at the site located in Festus, Missouri. Due to the reduction of impacts, Doe Run has received guidance provided by the Missouri Department of Natural Resources (MDNR), indicating that acceptable mitigation for this project may now consist of 27.80 acres. In total, proposed mitigation will consist of approximately 6.83 acres of created scrub-shrub wetland habitat, 12.45 acres of created emergent wetland habitat, 3.36 acres of restored riparian corridor, and 3.74 acres of preserved riparian corridor. The above-referenced 27.80 acre mitigation area exists north of an on-site AT&T easement. The following mitigation plan will discuss only areas existing north of the AT&T easement. A total of 27.80 acres is proposed to be deed restricted by Doe Run within the property.

2.0 MITIGATION PLAN OVERVIEW

The proposed wetland mitigation site is located in Festus, Missouri and adjacent to Joachim Creek (see Figure 3). This site is located approximately 11 river miles upstream of the site of impacts in Herculaneum, Missouri. SCI has received positive feedback from the USEPA, HWP, and the CE regarding its potential to become a viable mitigation site. Due to the positive feedback, Doe Run

purchased the property in February 2005. Additionally, the CE has preliminarily indicated the site can likely be transformed into a wetland based upon SCI's verbal description of the site conditions.

When preparing the following mitigation plan, ratios were considered to provide a plan that adequately compensates for proposed impacts associated with the slag storage facility. Proposed impacts now consist of approximately 8.6 acres to emergent wetland habitat and scrub-shrub wetland habitat. The following is a breakdown of applied mitigation ratios. The USEPA has indicated that a credit would be given at a 4:1 mitigation ratio to riparian buffer planting and preservation. SCI has identified that approximately 7.1 acres of riparian restoration (3.36 acres) and preservation (3.74 acres) can be provided by Doe Run. At a 4:1 mitigation credit ratio, riparian restoration and preservation should yield approximately 1.78 acres, thus reducing impact acreage to approximately 6.82 acres (8.6 acres – 1.78 acres = 6.82 acres). The following mitigation plan proposes approximately 19.28 acres of created emergent and scrub-shrub wetlands, which equates to a ratio at approximately 2.83 acres mitigation to 1 acre of impact (19.28 acres ÷ 6.82 acres = 2.83 acres). A total of 27.80 acres of wetland, riparian corridor, and non-wetland habitat is proposed to be deed restricted within the Joachim Creek watershed.

SCI and Doe Run have adhered to the requests made by commenting agencies. We anticipate the formal mitigation plan offers adequate compensatory mitigation through applying appropriate mitigation ratios. The following sections describe the proposed mitigation site's details and methods by which Doe Run will create wetlands to compensate for unavoidable losses to State and Federal waters.

3.0 MITIGATION SITE OVERVIEW

In 2004, SCI and Doe Run identified property within the floodplain of Joachim Creek, in Festus, Missouri (Figure 3) as a viable mitigation option. The U.S. Geological Survey (USGS) topographic map quadrangle and the National Wetlands Inventory (NWI) map were reviewed for background information concerning the site. The USGS map depicted a gently sloping landscape, shedding water in a northerly direction. The NWI map did not identify any potential wetlands. The USGS map and NWI map are enclosed as Figures 3 and 4, respectively.

SCI performed a site visit in October of 2004 to document the existing or "baseline" conditions of the proposed mitigation area. The property consisted of a gentle- to moderately-sloping landscape, draining in a northwesterly direction. The mitigation site was relatively flat, with the exception of a hill, approximately 10 feet high, located near the southeastern corner of the property. This elevation change, as well as potential cultural resource concerns, excludes the southeastern corner of the property from

becoming functional mitigation acreage. The property's land use in 2004 consisted of agriculture under soybean production. However, the property was allowed to go fallow during the growing season of 2005. The Jefferson County Natural Resources Conservation Service has mapped the proposed wetland mitigation site as Horsecreek silt loam within the higher elevations, while the lower elevations were mapped as Kaintuck fine sandy loam.

Soil borings up to 60 inches were advanced in the proposed mitigation site (Figure 5). SCI did not exhibit evidence of existing regulated wetland conditions. The soil texture varies throughout the site with the predominant texture consisting of fine sandy loam. Other soil textures include clay loam and silt loam with fine sandy loam intermixed. The soils were already exhibiting matrixes of 10 YR 4/2. Within some soil boring locations, SCI observed evidence of mottling within the top 12 inches. Based on these observations, SCI estimates that the seasonal high water table is located approximately 10 to 24 inches deep. The soil on the site appears to exhibit a high enough permeability to allow for relatively unrestricted exchange between the constructed wetland and subsurface groundwater fluctuations. No coarse sand lenses were encountered in any of our soil borings within the proposed constructed wetland area. Sand lenses within the soil stratum can prevent the accumulation of water within a constructed wetland, often leading to its failure to meet performance standards. A summary of the site's soil conditions have been provided in Table 3.1.

Table 3.1 – Existing Soil Conditions

Soil Boring	Depth (inches)	Soil Matrix	Mottles	Texture
1	0 – 32	10 YR 4/4	---	cl
	33 – 60	7.5 YR 4/4	---	fsl, sil
2	0 – 10	10 YR 4/3	---	sil
	11 – 60	10 YR 4/2	10 YR 2/1 10 YR 4/6	sil
3	0 – 36	10 YR 4/2	---	fsl, sil
	37 – 60	10 YR 4/3	10 YR 6/3	fsl, sil
4	0 – 9	10 YR 4/2	---	sil
	10 – 36	10 YR 4/2	faint 10 YR 2/1	fsl
	37 – 60	10 YR 4/2	Common 10 YR 6/3	fsl

The existing riparian corridor at the proposed mitigation site consists of a thin to single-tree lined streambank. Along the northern edge of the property, the riparian corridor consists of single tree line to even just a few scattered trees. The trees present are mostly mature silver maples (*Acer saccharinum*)

with few scattered osage oranges (*Maclura pomifera*). Along the western property boundary, the riparian corridor consists of a very narrow riparian corridor, measuring approximately 20 to 30 feet in width. Species along the western property boundary consist of silver maple (*Acer saccharinum*), hackberry (*Celtis occidentalis*), red buckeye (*Aesculus pavia*), and American sycamore (*Platanus occidentalis*). Streambanks along the western property boundary consist of near vertical banks, measuring approximately 13 to 16 feet tall. Evidence of Ordinary High Water Marks, consisting of rafted debris and vegetation patterns suggesting high stream flow, were observed. Along the northern property boundary, the banks range from approximately 7 to 10 feet tall with Joachim Creek containing sandbars downslope of the bank's edge.

4.0 MITIGATION DESIGN

The CE typically requires several standard criteria before a constructed wetland can be accepted as a mitigation site. Ultimately, the wetland must display characteristics of a regulated wetland as outlined in the CE's 1987 wetland Delineation Manual. The hydrology of the wetland area must be sufficient to support a predominance of hydrophytic vegetation as well as promote the development of hydric soils characteristics. The recruitment of hydrophytic vegetation and establishment of hydric soils is directly linked to the creation of wetland hydrology. Therefore, Doe Run will focus on constructing a wetland that mimics natural wetland hydrology in order to meet the typical requirements of the CE. Based on the above description of the existing soils conditions (which were close to already displaying hydric soil characteristics), it is anticipated that hydric soils characteristics should develop easily with minor manipulation.

4.1 Hydrology

Hydrology is often the most difficult component of a constructed wetland to achieve. This proposed mitigation site has two potential sources for hydrology, making it a viable site for wetland construction. The two sources of hydrology include excavation to intercept the seasonal high water table and overland flow from the surrounding watershed. The constructed wetlands, which will be excavated deeper to provide a 12.45-acre emergent wetland habitat, as well as a 6.83-acre scrub-shrub wetland, are proposed to exist north of an AT&T berm.

4.1.1 Excavation to Seasonal High Water Table

The primary source of hydrology to the created wetlands will be derived from fluctuations of the seasonal high water table. The extent of excavation recommended is based on the existing elevation of the landscape and the depth to the seasonal high water table. Within the subject site, SCI observed evidence

of mottling within 10 to 24 inches of extracted soil profiles, thus suggesting appropriate cuts should measure approximately 2 feet to intercept the estimated seasonal high water table. Based on these observable features, final constructed grades are proposed to measure approximately el. 403.0 within areas of the emergent wetlands and el. 404 within areas of the scrub-shrub wetlands (see Conceptual Cross-Section – Figure 7). The elevation of the scrub-shrub wetland is proposed at a higher elevation than the emergent to promote greater survivability of desired vegetation. The bottom of both wetland habitats should be graded to contain a rolling or undulating finished grade that varies from 6 to 18 inches overall. However, the average grade should be within the targeted elevation. The undulating bottom is necessary to more closely match the grades of natural wetlands, and will serve to establish microhabitats that will increase the overall diversity of the constructed wetland.

Side slopes descending from Joachim Creek side will consist of slopes no steeper than 6 horizontal to 1 vertical (6H:1V). A setback of approximately 75 feet from the Joachim Creek will be established as an area of no excavation and riparian enhancement (see Figures 6 and 7). Additionally, a 50-foot setback along the Union Pacific railroad easement has been included to allow access to the mitigation areas and Joachim Creek. Both the 50-foot and 75-foot will contain a 15-foot wide dirt path to allow site maintenance and monitoring.

Silt control devices, such as silt fences must also be placed near Joachim Creek to protect against sedimentation during grading activities. Any site(s) utilized for placement of the excavated material shall comply with all Federal, State, and local agencies. Material placed within the 100-year flood plain shall require approval by the appropriate authorities.

4.1.2 Overland Flow

Overland flow of surface stormwater will help contribute to the created wetlands' hydrology. Unfortunately, the amount of watershed acreage contributing to the created wetland exists only within the confines of the property boundary. Areas east of the property have been severed by an existing Union Pacific railroad easement. As previously indicated, property located south of the AT&T easement contains a slight hill that sheds water in the north and west direction. Water flowing to the north is expected to direct additional water to the wetlands.

4.2 Vegetation

Hydrophytic vegetation is defined as species that are best suited or specially adapted to life under moist or saturated soil conditions that result in a substrate that is at least periodically deficient in oxygen.

Hydrophytic species are characterized as having an indicator status of facultative or wetter (OBL, FACW, or FAC, excluding FAC-). Upon establishment, the vegetation growing in the wetlands should be composed of more than 50 percent hydrophytic species. The relative cover of hydrophytic species within the wetlands should total at least 75 percent. Relative cover should be interpreted as the cover of all hydrophytic species as a percent of the total plant cover. Doe Run will attempt to construct the wetlands in order to maintain 75 percent hydrophytic coverage and composition. See Section 7.1 for more detailed description on Performance Criteria.

4.3 Seeding and Mulching for Stabilization

Seeding with a nurse crop and mulching shall be performed on all graded side slopes. The nurse crop mix used shall be composed of quick growing, annual species such as oats or annual rye grass. The nurse crop will reduce the potential for erosion and sedimentation on the site.

4.4 Emergent

It is likely that the on-site soil does not contain a seedbank sufficient to naturally revegetate the newly-graded areas with herbaceous cover given the past agricultural history. Therefore, a seed mix containing species suited for mesic to saturated soil conditions is recommended for the 12.45 acres of proposed emergent wetland.

Additionally, per the recommendation of the USEPA and the HWP, soil from the top 6 inches of excavated material will be stockpiled to provide an additional seedbank source, as well as provide soil rich in organic matter content. This soil will be utilized to reline the area following completion of grading activities. Listed in Table 4.1 are species that are suited to wetland conditions, and may be included within the seed mix. Fall or spring seeding should result in the highest probability for successful wetland plant establishment.

Table 4.1 – Herbaceous Wetland Species

Common Name	Scientific Name	Indicator Status
Sweet Flag	*Acorus calamus*	OBL
Swamp Milkweed	*Asclepias incarnata*	OBL
Panicled Aster	*Aster simplex*	FACW
Tickseed – Sunflower	*Bidens coronata*	OBL
Sweet Joe Pye Weed	*Eupatorium purpureus*	FAC
Northern Bedstraw	*Galium boreale*	FAC
White Avens	*Geum canadense*	FAC
Sneezeweed	*Helenium autumnale*	FACW+
Spotted Touch-Me-Not	*Impatiens capensis*	FACW
Blue Flag Iris	*Iris virginiea shrevei*	OBL
Great Blue Lobelia	*Lobelia siphilitica*	FACW+
Bunch Flower	*Melanthium virginicum*	FACW+
Monkey Flower	*Mimulus ringens*	OBL
Ditch Stonecrop	*Penthorum sedoides*	OBL
Bristly Buttercup	*Ranunculus hispidus*	FAC
Curly Dock	*Rumex crispus*	FAC+
Slender Wheat Grass	*Agropyron trachycauluna*	FAC
Bearded Beggar Ticks	*Bidens gristosa*	FACW
Fringed Sedge	*Carex crinita*	OBL
Fox Sedge	*Carex vulpinoidea*	OBL
Virginia Wild Rye	*Elymus virginicus*	FACW-
Fowl Manna Grass	*Glyceria striata*	OBL
Rice Cut Grass	*Leersia oryzoides*	OBL
Dark-green Bulrush	*Scripus atrovirens*	OBL
Cord Grass	*Spartina pectinata*	FACW+
Bur-Reed Sedge	*Carex sparganioides*	FAC
Wool Grass	*Scirpus cyperinus*	OBL
Softstem Bulrush	*Scirpus validus*	OBL

4.5 Scrub-Shrub

Within the proposed 6.83-acre scrub-shrub wetlands, Doe Run has the opportunity to diversify the vegetation of the constructed wetlands in comparison to the monotypic plant species within the wetland to be impacted. Doe Run will plant established shrubs within the designated scrub-shrub wetland habitat. The plants to be installed will consist of 2- to 3-gallon containerized advanced root system varieties, which have been proven to produce faster growing plants with high survival rates. Shrubs will be

installed with tree guards and weed mats to reduce vegetative competition and animal browsing. Per guidance from the USEPA, all shrubs will be planted on no more than 15-foot staggered spacing, which will result in the planting of approximately 194 shrubs per acre. Listed in Table 4.2 are species that are suited to wetland conditions, and may be included within the scrub-shrub planting areas.

Table 4.2 – Proposed Shrub Species

Common Name	Scientific Name	Indicator Status
Silky Dogwood	*Cornus amomum*	FACW+
Common Buttonbush	*Cephalanthus occidentalis*	OBL
Deciduous Holly	*Ilex deciduas*	FACW
Northern Spicebush	*Lindera benzoin*	FACW-
Common Elderberry	*Sambucus canadensis*	FACW-
Rough-Leaf Dogwood	*Cornus drummondii*	FAC
Black Willow	*Salix nigra*	OBL

4.6 Restored Riparian Buffer

As previously described, the riparian buffer along Joachim Creek contains few scattered and light seeded tree species, while the remaining site conditions consist of recent agriculture production. Doe Run is willing to restore and create a forested, riparian buffer by planting the 75-foot setback along the Joachim Creek bankline. A total of 3.36 acres of riparian corridor restoration will be provided. Planting within these locations will consist of mostly tree species, rather than shrub species. Tree densities will be provided using 30-foot staggered spacing (108 trees per acre) and 2- to 3-gallon containerized stock will be planted.

Table 4.3 – Proposed Tree and Shrub Species for Riparian Area

Common Name	Scientific Name	Indicator Status
Shingle Oak	*Quercus imbricaria*	FAC-
Silky Dogwood	*Cornus amomum*	FACW+
Black Haw	*Virburnum prunifolium*	FACU
Black Walnut	*Juglans nigra*	FACU
Bur Oak	*Quercus macrocarpa*	FAC
Common Persimmon	*Disopyros virginiana*	FAC
Hackberry	*Celtis occidentalis*	FAC-
Eastern Redbud	*Cercis canadensis*	FACU
Rough-Leaf Dogwood	*Cornus drummondii*	FAC
Gray Dogwood	*Cornus racemosa*	NI
Sweet Gum	*Liquidambar styraciflua*	FACW
Shellbark Hickory	*Carya laciniosa*	FACW
Bitternut Hickory	*Carya cordiformis*	FAC

Listed in Table 4.4 are habitats provided as mitigation for impacts associated with the Doe Run Slag Storage Area.

Table 4.4 - Proposed Mitigation Areas

Habitat	Acreage
Emergent Wetland	12.45
Scrub-Shrub Wetland	6.83
Restored Riparian Buffer	3.36
Areas of Preservation	3.74
Area of Transitional Side Slopes	1.42
Total Area to be Deed Restricted	**27.8**

5.0 AS BUILT REPORT

An "As Built" report will be submitted to the agencies within three months of completing the mitigation project. The report will include the following items as written in a letter provided by the USEPA dated May 3, 2005:

- A description of all Mitigation Plan features completed, including wetland slopes and wetland contours less than 12 inches;
- Deviations from the approved Mitigation Plan;

- Cross-sectional diagrams;
- Planting locations and types;
- Elevations associated with the constructed wetlands;
- Location of permanently staked photo sites with labeled points;
- Dates that construction was completed;
- Problems encountered or observed during construction; and
- Any corrective action anticipated.

6.0 SITE CONSERVATION

A total of 27.80 acres are proposed to be protected in perpetuity under a Declaration of Covenants and Restrictions by Doe Run, which includes 12.45 acres of constructed emergent wetlands, 6.83 acres of constructed scrub-shrub wetlands, 3.36 acres of riparian restoration, and 3.74 acres of preservation (see Figure 6). The 27.80 acres of deed restriction does not include the AT&T utility easement or the 50-foot setback from Union Pacific Railroad Easement. There shall be no removal or destruction of trees or plants, mowing, filling, draining, plowing, mining, removal of topsoil, sand, rock, gravel, minerals, or other materials within the subject site, except as necessary for completion of the mitigation plan. The Declaration of Covenants and Restrictions will preserve the wetland in perpetuity and restrict conflicting uses such as all-terrain-vehicle usage, with the exception of monitoring and maintenance purposes. The restrictions will be recorded with the Jefferson County Recorder of Deeds to protect the area from future development and disturbance. Doe Run will utilize the sample Declaration of Covenants and Restrictions as provided by the USEPA to record with Jefferson county. Doe Run will provide the USEPA, HWP, WPCP, and the CE with a copy of the recorded Declaration of Covenants and Restrictions, including the date, book, and page number of the recording with Jefferson County. The Declaration of Covenants and Restrictions for the project site will preserve the area for aquatic habitat and wildlife purposes.

7.0 MAINTENANCE AND MONITORING

Mitigation observation studies will be conducted annually, for a period of five years following final grading and planting of the mitigation sites. Fixed monitoring locations will be established within each designated habitat which includes: emergent wetlands, scrub-shrub wetland, and enhanced riparian corridor, and upland hill. Stakes will be installed to identify monitoring locations. Photos of the monitoring locations will be provided with the same approximate vantage point annually, and maps shall

be provided where the monitoring photographs were taken. Photographs will be labeled with the date of the photograph, direction of view and location, and a brief description of the photograph.

Site visits for wetland monitoring will be conducted during the growing season, prior to September 1st of each year. The monitoring report shall include a list of parties responsible for the annual monitoring activities. The data collected in each yearly study will be detailed in a formal report, including photographs and suggestions or plans to improve or repair any deficiencies that may exist. Data collected will be quantified and presented, which will include the following measurements: overall percent vegetative cover using Daubenmire cover Class Method (per USEPA), percent species survivorship in wetlands, riparian buffer, and uplands, and composition of hydrophytic species for each stratum, and percent nuisance/exotic cover. Annual monitoring will include extensive cruising of the mitigation site to identify any development of nuisance/exotic species. Cruising will be conducted via transect method, with transects spaced approximately 200 feet apart. The annual report will be submitted to the CE, USEPA, and HWP by January 31st following each monitoring year. It is then the responsibility of these agencies to advise Doe Run on suggested plans for improvement, if necessary. The observation reports as well as any corrective measures are the responsibility of Doe Run.

7.1 Performance Criteria

The following performance criteria will be reviewed as success measures during the annual observation studies. Tree and shrub survivability of planted species must equal or exceed 80 percent, and tree and shrub species composition shall equal or exceed 5 species. Herbaceous vegetation coverage will equal or exceed 75 percent of the ground surface coverage, and herbaceous species composition shall equal or exceed 15 species. Overall, hydrophytic species composition should meet or exceed 50 percent with the established wetland areas. Invasive, exotic, and nuisance species are not to exceed more than 10 percent coverage of the mitigation area which includes, but not limited to the following species: common hop-vine (*Humulus lupulus*), purple loosestrife (*Lythrum salicaria*), and reed canary grass (*Phlaris arundinacea*). Additionally, to prevent the development of a monoculture of cattail (*Typha latifolia* and *Typha angustifolia*), aerial coverage of this species should be limited to approximately 25 percent. Per the requests of the USEPA, tree guards will be closely monitored for small mammal nesting materials to prevent tree girdling and aid with tree survivability.

Hydrologic and soil conditions will be investigated, and any deficiencies or problems identified. Hydrologic and soil conditions will be subject to the same parameters as established in the CE's 1987 Wetland Delineation Manual (CE Manual). Evidence of achieving wetland soils and hydrology is

based upon observable features. Hydrology is often measured through the presence of primary and/or secondary hydrologic indicators, such as standing water, saturated soil, drift lines, and water-marks on adjacent trees. Soil colors can also indicate hydrologic conditions on the site. Mottling and low chroma matrix colors are indicators of a site with an active water regime. However, these characteristics develop at varying rates. Therefore, the use of soil colors will not be heavily relied upon when determining the establishment or success of the constructed wetlands. However, Doe Run recognizes that added emphasis will be put on identifying hydric soils characteristics in the event primary and/or secondary hydrologic features are not observed at the time of monitoring.

The standards of regulated wetlands (i.e., wetland hydrology, wetland soils characteristics, and wetland vegetation), as detailed within the 1987 CE Manual, will also be considered and treated as the performance criteria for the created wetland areas. Monitoring will be provided annually, for a minimum of five years. If after five years, the mitigation areas have met the regulated characteristics of wetlands, as identified in the standards of the CE Manual, monitoring will no longer be necessary. If performance criteria are not met after five years, Doe Run will submit a plan providing corrective measures to address any remaining concerns, as well as a schedule for any additional work and achievement to meet the standards established in the CE Manual. Plans for any corrective measures shall be approved by the USEPA and MDNR, prior to incorporating measures in the field.

8.0 LIMITATIONS

This report has been prepared for the exclusive use of the Doe Run Company. SCI is not responsible for independent conclusions or recommendations made by others. The quantification of the proposed mitigation acreage at the Festus site was determined by SCI through surveys that were prepared by Govero Land Services. The quantification of wetland impacts at the Doe Run facility in Herculaneum were based upon survey provided by Effan Survey Company, development plans prepared by Barr Engineering, and wetland delineation prepared by Yoder Baer. SCI is not responsible for surveys, calculations, or plans that were prepared by others. Furthermore, written consent must be provided by SCI should anyone other than our clients and its lender (if applicable) wish to excerpt, or rely on, the contents of this report. Additionally, SCI in no way guarantees the successful establishment of the aforementioned mitigation areas. The plan is based on practices commonly performed and accepted. Various unforeseen factors can lead to the failure of a mitigation area.