

**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 7**

IN THE MATTER OF:)
)
Jasper County Site)
Superfund Site)
Jasper County, Missouri)
)
Patricia West,)
)
Respondent,)
)
)
Proceeding Under Section 104(e) of)
the Comprehensive Environmental)
Response, Compensation, and)
Liability Act, as amended,)
42 U.S.C. § 9604(e).)
_____)

ADMINISTRATIVE ORDER DIRECTING
COMPLIANCE WITH REQUEST FOR
ACCESS
And
NOTICE OF OPPORTUNITY TO
CONFER

U.S. EPA Region 7
Docket No.: CERCLA-07-2016-0011

ADMINISTRATIVE ORDER
DIRECTING COMPLIANCE
WITH REQUEST FOR ACCESS
AND NOTICE OF OPPORTUNITY
TO CONFER

TABLE OF CONTENTS

I.	JURISDICTION.....	1
II.	STATEMENT OF PURPOSE	1
III.	FINDINGS OF FACT	2
IV.	CONCLUSIONS OF LAW AND DETERMINATIONS	6
V.	ORDER	8
VI.	ENFORCEMENT	9
VII.	ADMINISTRATIVE RECORD	11
VIII.	OPPORTUNITY TO CONFER.....	11
IX.	EFFECTIVE DATE: COMPUTATION OF TIME.....	12
X.	NOTICE OF INTENT TO COMPLY	13
XI.	TERMINATION	13

Appendix A: Legal Description, Respondent's Property

Appendix B: Legal Description, Respondent's Parcels

Appendix C: Maps, Beacon – Jasper County, MO, Parcel ID Nos.

08903130024010000

08903130024011000

08903130024012000

08903130024014000

08903130024015000

08903130024016000

08903130024017000

Appendix D: Correspondence from Respondent to EPA, May 4, 2015

Appendix E: Correspondence from EPA to Respondent, April 28, 2016

Appendix F: Record of Decision (2004) and ROD Amendment (2013)

I. JURISDICTION

1. This Administrative Order (“Order”) is issued to Patricia R. West (hereinafter, “Respondent”), pursuant to the authority vested in the President of the United States by Section 104(e)(5) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (“CERCLA”), 42 U.S.C. § 9604(e)(5), and the National Oil and Hazardous Substances Pollution Contingency Plan, 40 C.F.R. § 300.400(d)(4). This authority was delegated to the Administrator of the United States Environmental Protection Agency (“EPA”) on January 23, 1987, by Executive Order 12580, 52 Fed. Reg. 2923, redelegated to the Regional Administrators of EPA on May 11, 1994, by EPA Delegation No. 14-6, and redelegated to the Superfund Division Director of EPA Region 7 on April 29, 2016, by EPA Regional Delegation No. R7-14-006.

2. This Order establishes that Respondent has denied EPA access to certain real property, sets forth the relief EPA is seeking, and provides Respondent with an opportunity to confer with EPA regarding access.

II. STATEMENT OF PURPOSE

3. This Order requires Respondent to grant EPA and its authorized representatives entry and access to the Property described in Paragraph 4 below (“the Property” or “Respondent’s Property”) and to the Respondent’s Parcels (also described in Paragraph 4 below). The Property and Parcels are located in Joplin, Missouri. Access is required for the purpose of taking a response action that may include, but is not limited to: removing trees, brush and vegetation from areas where metals exceed the action levels; excavating and removing contaminated soil, sediment and mining wastes; transporting the soils, sediments and mine wastes to adjacent mine pits for disposal; disposing of soils, sediments and mine wastes in the

mine pits, or consolidating mine wastes into a single pile, either on or off the Property and Parcels, and capping with clay, compost materials or topsoil; regrading the Property and Parcels to promote drainage and prevent ponding water; and, revegetating the disturbed areas with fescue grasses at the Jasper County Superfund Site (the "Site"). This Order further requires Respondent to refrain from interfering with access to the Property and Parcels by EPA and its authorized representatives for the purposes set forth herein.

III. FINDINGS OF FACT

4. The Respondent owns certain real property located north of Ivy Road in Oronogo, Missouri, identified as Jasper County Assessor Property Identification Number Parcels 08903130024010000, 08903130024014000, 08903130024012000, 08903130024016000, and 08903130024015000. Appendix A contains the legal description of the Respondent's Property. The Property was held as an estate in the entirety by Respondent and her spouse. The late Robert G. West, Sr. died on December 12, 2010. After that, the Property passed by Missouri law to the Respondent.

a. Adjacent to Respondent's Property, the late Robert G. West, Sr., owned two parcels identified by the Jasper County Assessor as Property Identification Number Parcels 08903130024017000 and 08903130024011000, and described in a Quit Claim Deed to him, dated July 10, 1998 (the "Parcels" or "Respondent's Parcels"). Appendix B contains the legal description. The Jasper County Tax Assessor's public records show that property taxes have been paid as of 2015. Two alternative fact scenarios are plausible: (1) the late Mr. West willed the Parcels under a Last Will and Testament and the heir did not record the transfer, or, (2) he died intestate, however, there is no such case file at the Jasper County Probate Court. Under either scenario, to the extent that Ms.

Patricia West, as the surviving spouse, holds an interest in the Parcels, this Order requires her to provide access.

b. The Respondent's Property consists of about six (6) acres. The Respondent's Parcels consist of about three (3) acres. Most of Respondent's Property and Parcels are covered with mining wastes that require cleanup. Appendix C is a map of the Property and the Parcels.

5. EPA has taken actions at the Jasper County Superfund Site in response to a release or a substantial threat of a release of hazardous substances within the Superfund Site. On August 30, 1990 (55 Fed. Reg. 35502), pursuant to Section 105 of CERCLA, 42 U.S.C. § 9605, EPA placed the Jasper County Site on the National Priorities, List, set forth at 40 C.F.R. Part 300, Appendix B. EPA issued a Record of Decision ("ROD") in September 2004, and a ROD Amendment on September 27, 2013, for the mining waste cleanup operable unit number one (OU1), which requires cleanup of the mining wastes and contaminated surface waters at the Site. On May 22 and 25, 2016, EPA issued and published an Explanation of Significant Differences ("ESD") that specifies the use of composted biosolids, where appropriate. See Appendix D for ROD, Amended ROD and ESD.

6. The Site is in the Missouri portion of the Tri-State Mining District, which also includes portions of Kansas and Oklahoma. Historically, lead and zinc mining, milling and smelting operations generated about 150 million tons of mining and milling wastes within the Site, of which about 10 million tons remain on-site and some of these mining and milling wastes are on about nine (9) acres of the Respondent's Property and Parcels.

7. The Remedial Investigation ("RI") conducted at the Site by EPA identified that the mining wastes contain concentrations of heavy metals, primarily cadmium, lead, and zinc, (i.e., the contaminants of concern or ("COCs")) that cause unacceptable risk to human health and

the environment. In addition, the RI identified COCs in the surface waters due to migration of mining wastes into surface water bodies. The levels of COCs in surface waters at this Site cause unacceptable risk to aquatic life.

8. Mining, milling wastes and soil samples collected from properties adjacent to the Respondent's Property and Parcels contain levels of lead that exceed the action levels EPA selected for the remedy, i.e., concentrations at 400 parts per million lead, 6,400 ppm zinc and 40 ppm cadmium. The Agency has determined that the same wastes are located on Respondent's Property and Parcels and the wastes require cleanup. The analysis from the EPA Remedial Investigation Report, shows that samples of mining wastes exceeding action levels were taken from adjacent and nearby properties. A series of samples collected immediately north of Respondent's Property and Parcels contain contaminants of concern in the following ranges:

Lead: 256 – 1,240 ppm
Zinc: 9,530 – 40,700 ppm
Cadmium: 61 – 234 ppm

9. To address the release or threatened release of a hazardous substance, pollutant or contaminant at and adjacent to the Property and Parcels, EPA is conducting response actions in accordance with the OU1 ROD, ROD Amendment and ESD. These actions include performing selected remedial actions at the Respondent's Property and Parcels.

10. To perform the response actions described above, it will be necessary for employees, agents, contractors, and other representatives of EPA to enter the Property and the Parcels. The activities for which entry is required may include but are not limited to: removal of vegetation and soil, excavation, capping of mine wastes, filling/capping mining pits, and revegetation of the disturbed area and establishing long-term operation and maintenance of the capped areas.

11. The EPA estimates that the duration of the required entry and access will be approximately six months to conduct cleanup.

12. EPA has undertaken considerable efforts to obtain consensual access to the Respondent's Property and Parcels, but Respondent has refused access.

a. 2010 through 2015. The EPA representatives contacted and met in person with Respondent Patricia R. West on occasion from 2010 through 2015. During these meetings, Respondent attempted to condition and limit EPA's access and refused to sign a voluntary access agreement. On April 29, 2015, EPA sent Ms. West a letter requesting access. Ms. West responded by sending a letter dated May 4, 2015, which describes meetings with EPA beginning in 2010. Some meetings included Ms. West's sons, Robert and Ron West. The May 4, 2015 letter from Ms. West requested information from EPA. However, Ms. West conditioned access upon "full disclosure." See Appendix E.

b. 2016. On March 8, 10 and 21, 2016, EPA representatives met with either Ms. West, her son Ron West, or both of them. EPA representatives provided an access agreement for signature at these meetings. Respondent and her son, Ron West, indicated she would not sign the access agreement. On or about April 28, 2016, EPA sent a letter to Ms. West requesting access to the Property and Parcels, offering to meet with her at a location convenient for her, notifying her that refusal to respond would be considered refusal to provide access, and that an administrative order could be issued to require access under the Superfund Law. Enclosed with the letter, EPA provided information pursuant to Ms. West's request about the levels of contamination and the specific cleanup activities planned for Respondent's Properties and Parcels. See Appendix F for a copy of the letter and its enclosure. EPA requested a response from Ms. West within seven days

of receipt. The letter was delivered via UPS overnight express mail on April 29, 2016. In addition, on April 13, 2016 and May 17, 2016, EPA representatives left messages on Respondent's telephone answering service about the EPA's letter and the need for a response. To date, Ms. West has not responded to the EPA's phone messages. Moreover, Respondent Patricia R. West has not responded to the EPA letter of April 28, 2016, in which EPA deems her failure to respond is a refusal to allow voluntary access for purposes of performing the response activities. During previous meetings with Respondent and her son, Ron West, and EPA representatives, Respondent has refused to grant access.

13. EPA and its contractors have been ready to perform the response activities and initiate cleanup actions since May 1, 2016, but have been prevented from so doing because of the Respondent's refusal to grant access.

IV. CONCLUSIONS OF LAW AND DETERMINATIONS

14. The Site is a "facility" within the meaning of Section 101(9) of CERCLA, 42 U.S.C. § 9601(9).

15. Respondent is a "person" within the meaning of Section 101(21) of CERCLA, 42 U.S.C. § 9601(21).

16. Cadmium, lead and zinc are hazardous substances or pollutants or contaminants within the meaning of Sections 101(14) and 101(23) of CERCLA, 42 U.S.C. §§ 9601(14), 9601(23).

17. The past disposal and migration of a hazardous substance or pollutant or contaminant at or from the Property and the Parcels constitutes an actual "release" or a threat of such a release into the "environment" within the meaning of Sections 101(8) and 101(22) of

CERCLA, 42 U.S.C. §§ 9601(8) and (22), and thus, there is a reasonable basis to believe that there may be a release or threat of release within the meaning of Section 104(e)(1) of CERCLA, 42 U.S.C. § 104(e)(1).

18. The Property and the Parcels owned or controlled by Respondent referred to in Paragraphs 3 and 4 above is, or is adjacent to, a facility, establishment, or other place or property:

- a. where a hazardous substance or pollutant or contaminant has been generated, stored, treated, disposed of, or transported from; and
- b. from or to which a hazardous substance or pollutant or contaminant has been or may have been released; and
- c. where entry is needed to determine the need for response, to identify the appropriate response, or to effectuate a response action within the meaning of Section 104(e)(3) of CERCLA, 42 U.S.C. § 9604(e)(3).

19. Entry to property owned or controlled by Respondent by the agents, contractors, or other representatives of the United States is needed for the purposes of taking a response action, within the meaning of Section 104(e)(1) of CERCLA, 42 U.S.C. § 9604(e)(1).

20. Respondent refused access for cleanup in meetings with EPA representatives. In addition, Respondent failed to respond to EPA communications with Respondent and attempted to condition EPA access with requirements such as demanding “full disclosure” in an ambiguous manner. Respondent’s expressed refusal to allow voluntary access and attempt to condition access are denials of access within the meaning of Section 104(e)(5)(A) of CERCLA, 42 U.S.C. § 9604(e)(5)(A), and 40 C.F.R. § 300.400(d)(4)(i).

V. ORDER

21. Based upon the foregoing Findings of Fact, Conclusions of Law and Determinations, and the Administrative Record, Respondent is hereby ordered to provide EPA and its officers, employees, agents, contractors, and other representatives, full and unrestricted access at all reasonable times to the Property and the Parcels for the purpose of conducting response activities, including but not limited to:

- removing trees, brush and vegetation from areas where metals exceed the action levels;
- temporarily relocating within the Property and the Parcels, as necessary, certain auto body, cars or car parts, scrap metals, or other such personal properties located on top of mining wastes on the Respondent's Property and Parcels, to enable cleanup of contaminated soils and mining wastes;
- excavating and removing contaminated soil, sediments, and mining wastes;
- transporting the soils, sediments, and mine wastes to adjacent mine pits for disposal;
- disposing of soils, sediments, and mine wastes in the mine pits;
- consolidating mine wastes into a single pile, either on or off the Property and the Parcels, and capping such pile with clay, and topsoil or gravel;
- regrading the Property and the Parcels to promote drainage and prevent ponding water;
- re-making a gravel parking lot with a clay cap and appropriate gravel for placement of certain auto body, cars or car parts, scrap metals or other such properties after cleanup;
- revegetating the disturbed areas with fescue grasses; and
- establishing operation and maintenance for any wastes disposed on the Property and the Parcels.

22. Respondent shall not interfere with EPA's exercise of its access authorities pursuant to 42 U.S.C. § 9604(e) and 40 C.F.R. § 300.400(d), and shall not interfere with or

otherwise limit any activity conducted at the Property and the Parcels pursuant to this Order by EPA, its officers, employees, agents, contractors, or other representatives. Any such interference shall be deemed a violation of this Order.

23. Nothing herein limits or otherwise affects any right of entry held by the United States pursuant to applicable laws, regulations, or permits.

24. This Order shall apply to and be binding upon Respondent and her successors, heirs and assigns, and each and every agent of Respondent and upon all other persons and entities who are under the direct or indirect control of Respondent, including any and all lessees of Respondent.

25. In the event of any conveyance by Respondent, or Respondent's agents, heirs, successors and assigns, of an interest in the Property and the Parcels, Respondent or Respondent's agents, heirs, successors and assigns shall convey the interest in a manner which insures continued access to the Property and the Parcels by EPA and its representatives for the purpose of carrying out the activities pursuant to this Order. Any such conveyance shall restrict the use of the Property and the Parcels so that the use will not interfere with activities undertaken or to be undertaken by EPA and its representatives. Respondent, or Respondent's agents, heirs, successors and assigns shall notify EPA in writing at least thirty (30) days prior to the conveyance of any interest in the Property and the Parcels, and shall, prior to the transfer, notify the other parties involved in the conveyance of the provisions of this Order.

VI. ENFORCEMENT

26. Compliance with this Order shall be enforceable pursuant to Section 104(e)(5) of CERCLA, 42 U.S.C. § 9604(e)(5). A court may impose a civil penalty on Respondent of up to \$37,500 for each day that Respondent unreasonably fails to comply with this Order, as provided

in Section 104(e)(5) of CERCLA, 42 U.S.C. § 9604(e)(5), and the Civil Monetary Penalty Inflation Adjustment Rule, 78 Fed. Reg. 66643 (November 6, 2013), 40 C.F.R. § 19.4. In addition, CERCLA penalty amounts may increase to \$53,907 for any such penalty assessed beginning August 1, 2016, in accordance with the Federal Civil Penalties Inflation Adjustment Act Improvements Act of 2015 (PL 114.74). In addition, any person who is liable for a release or threat of release of a hazardous substance or pollutant or contaminant and who fails to comply with this Order may be liable for punitive damages in an amount up to three times the amount of any costs incurred by the United States as a result of such failure, as provided in Section 107(c)(3) of CERCLA, 42 U.S.C. § 9607(c)(3). Nothing herein shall preclude EPA from taking any additional enforcement actions, and/or other actions it may deem necessary for any purpose, including the prevention or abatement of a threat to the public health, welfare, or the environment arising from conditions at the Property and the Parcels, and recovery of the costs thereof.

27. Nothing in this Order constitutes a waiver, bar, release, or satisfaction of or a defense to any cause of action which EPA has now or may have in the future against Respondent, or against any entity which is not a party to this Order.

28. Nothing in this Order shall affect in any manner the right of EPA to issue any other orders to or take any other administrative or civil action against Respondent or any other parties under CERCLA which relate to this Property and the Parcels or any other site.

29. Nothing in this Order constitutes a decision on preauthorization of funds under Section 111(a)(2) of CERCLA, 42 U.S.C. § 9611(a)(2).

VII. ADMINISTRATIVE RECORD

30. EPA has established an Administrative Record which contains the documents that form the basis for the issuance of this Order. It is available for review by appointment at the EPA Regional Office in Lenexa, Kansas. To review the Administrative Record, please contact Jane Kloeckner at (913) 551-7235 to make an appointment. The Administrative Record is also available on-line for anyone with an internet connection and also at the Webb City Public Libraries by on-line internet connections. Please use the following EPA website <http://semspub.epa.gov/src/collections/07/AR64503> and for viewing at the following:

Webb City Public Library
101 South Liberty
Webb City, Missouri 64870.

VIII. OPPORTUNITY TO CONFER

31. Within three (3) days after receipt of this Order by Respondent, Respondent may request a conference with EPA, to be held no later than two (2) days after Respondent's request, on any matter pertinent to this Order, including its applicability, the factual findings and the determinations upon which it is based, the appropriateness of any actions Respondent is ordered to take, or any other relevant and material issues or contentions which Respondent may have regarding this Order. Respondent may appear in person or by an attorney or other representative at the conference. Respondent may also submit written comments or statements of position on any matter pertinent to this Order no later than the time of the conference, or at least two (2) days before the effective date of this Order if Respondent do not request a conference. EPA will deem Respondent to have waived her right to the conference or to submit written comments if she fails to request the conference or submit comments within the

specified time period(s). Any request for a conference or written comments or statements should be submitted to:

Jane Kloeckner
Office of Regional Counsel
U.S. Environmental Protection Agency, Region 7
11201 Renner Boulevard, Lenexa, Kansas 66219
Telephone: (913) 551-7235
kloeckner.jane@epa.gov

IX. EFFECTIVE DATE: COMPUTATION OF TIME

32. This Order shall be effective five (5) days after its receipt by Respondent or Respondent's designated representative unless a conference is timely requested as provided above. If a conference is timely requested, then at the conclusion of the conference or after the conference, if EPA determines that no modification to the Order is necessary, the Order shall become effective immediately upon notification by EPA of such determination. If modification of the Order is determined by EPA to be necessary, the Order shall become effective upon notification by EPA of such modification. Any EPA notification under this paragraph may, at EPA's discretion, be provided to Respondent by facsimile, electronic mail, or oral communication; provided that if EPA does use such a form of notification, it will also confirm such notification by first class, certified or express mail to Respondent or her legal counsel. Any amendment or modification of this Order by EPA shall be made or confirmed in writing.

33. For purposes of this Order, the term "day" shall mean a calendar day unless expressly stated to be a business day. "Business day" shall mean a day other than a Saturday, Sunday, or federal legal holiday. When computing any period of time under this Order, if the last day would fall on a Saturday, Sunday, or federal legal holiday, the period shall run until the next business day.

X. NOTICE OF INTENT TO COMPLY

34. On or before the effective date of this Order, Respondent shall notify EPA in writing whether Respondent will comply with the terms of this Order. Respondent's failure to notify EPA of her unconditional intent to fully comply with this Order by the time the Order becomes effective shall be (1) construed as a denial of EPA's request for access, and (2) as of the effective date of the Order, treated as a violation of the Order. Such written notice shall be sent to:

Jane Kloeckner
Office of Regional Counsel
U.S. Environmental Protection Agency, Region 7
11201 Renner Boulevard
Lenexa, Kansas 66219
Telephone: (913) 551-7235
kloeckner.jane@epa.gov

XI. TERMINATION

35. This Order shall remain in effect until Mary Peterson, Director, Region 7 Superfund Division, or her designee notifies Respondent in writing that access to the Property and the Parcels is no longer needed.

SO ORDERED.

Date: 6/15/2016

Mary P. Peterson
Mary P. Peterson
Director, Superfund Division

CERTIFICATE OF SERVICE

I certify that on the date noted below, I sent a true and exact copy of this letter, the Administrative Order Directing Compliance with Request for Access and an Opportunity to Confer (Docket No.: CERCLA-07-2016-0011) and attached documents by Overnight Delivery (UPS), return receipt requested to:

Patricia R. West
380 South 4th Street
Oronogo, Missouri 64855

6/15/16
Date


Signature

Anna M. Rock
Print Name

the 1990s, the number of people in the world who are undernourished has increased from 600 million to 800 million (FAO 1996).

There is a growing awareness of the need to improve the nutritional status of the world's population. The United Nations World Food Programme (WFP) has been instrumental in the development of the *World Food Summit Declaration* (WFP 1996) and the *World Declaration on Nutrition* (WHO 1996).

The *World Food Summit Declaration* states that 'the world must ensure that all people have access to sufficient food and that the nutritional status of the world's population is improved'. The *World Declaration on Nutrition* states that 'the world must ensure that all people have access to sufficient food and that the nutritional status of the world's population is improved'.

The *World Food Summit Declaration* and the *World Declaration on Nutrition* are the first international agreements to address the issue of nutrition. They provide a framework for action and a basis for the development of national policies and programmes.

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US EPA Region 7, Docket No.: CERCLA-07-2016-0011

Appendix A: Legal Description, Respondent's Property

Corporation Warranty Deed

This Indenture, Made on the _____ **day of** November **A. D., One**

Thousand Nine Hundred and Eighty-nine by and between

J & S Holding Company, Inc., a Missouri corporation

a corporation duly organized under the laws of the State of Missouri, of the County

of Jasper, State of Missouri, party of the first part, and

Robert West and Patricia West

of the County of Jasper, State of Missouri, parties of the second part.

(Mailing address of said first named grantor is P.O. Box 138, Oronogo, MO 64455)

WITNESSETH: THAT SAID PARTY OF THE FIRST PART, in consideration of the sum of
ONE AND NO/100----- DOLLARS.

to it in hand paid by the said part of the second part, the receipt of which is hereby acknowledged,
does by these presents, **GRANT, BARGAIN AND SELL, CONVEY AND CONFIRM**, unto the said
parties of the second part, their heirs and assigns, the following described lots, tracts or
parcels of land, lying, being and situate in the County of Jasper and State of

to-wit: All

Lots N 1/2 Lot 9, 10 and 11 except North 30' Lot 11, Hendrickson's Addition

Commencing at intersection of South line Lot 23, Rankins Addition
with West line 1st Street, thence South 50' thence West 100' thence
North 50' thence East to point of beginning

Lots 18-23 inclusive in Rankins Addition

Misc'l Tract of Land commencing at SW Corner of Lot 23, Rankins addi-
tion to Oronogo thence south 100', thence east 100' thence North
100' thence west to beginning in Sec 31 twp 29 rge 32

EXCEPT easements and encumbrances of record and all taxes due and
payable in the year 1989 and thereafter.

**TO HAVE AND TO HOLD, The premises aforesaid, with all and singular the rights, privileges,
appurtenances and immunities thereto belonging or in anywise appertaining, unto the said part**
of the second part and unto heirs and assigns forever, the said

J & S Holding Company, Inc.

hereby covenanting that it is lawfully seized of an indefeasible estate in fee in the premises herein
conveyed; that it has good right to convey the same; that the said premises are free and clear from any
incumbrance done or suffered by it or those under whom it claims; and that

J & S Holding Company, Inc.

will warrant and defend the title of the said premises unto the said parties of the second part
and unto their heirs and assigns forever, against the lawful claims and demands of all persons
whomsoever.

**IN WITNESS WHEREOF, The said party of the first part has caused these presents to be signed
by its President and attested by its Secretary, and the corporate seal to be hereto attached, the day and
year first above written.**

John C. Campbell
JOHN C. CAMPBELL Secretary.

J & S Holding Company, Inc.
By *Stephen C. Glass*
STEPHEN C. GLASS President

1371 0242

MISSOURI CORPORATION ACKNOWLEDGMENT

STATE OF Missouri }
COUNTY OF Jasper } On this 6th day of February 1992
before me, appeared STEPHEN C. GLASS and JOHN C. CAMPBELL
to me personally known, who being by me duly sworn, did say that he is the President of
J & S HOLDING COMPANY, INC.
a corporation, and that the seal affixed to the foregoing instrument is the corporate seal of said corporation
and that said instrument was signed and sealed in behalf of said corporation by authority of its Board of
Directors, and said STEPHEN C. GLASS AND JOHN C. CAMPBELL
acknowledged said instrument to be the free act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my notarial seal
at my office in OREGON Missouri, the day and year last above written.



My commission expires January 7, 1992 [Signature]
Notary Public within and for said County and State

2178

Warranty Deed

FROM

TO

Filed for record this 20 day
of February A.D., 1992
at 1 o'clock, 23 minutes, P M.
Recorded in Book _____ at Page _____
Edie Swingle Recorder.
By: Cheryl D. Hargis Deputy.
Recorder's Fee \$ 4.00 FF 400

[Signature]

STATE OF Missouri }
COUNTY OF Jasper }

IN THE RECORDER'S OFFICE

I, EDIE SWINGLE Recorder of said County, do hereby certify that the within
instrument of writing was, at 1 o'clock and 23 minutes P M., on the 20 day of February,
A. D., 1992, duly filed for record in my office, and is recorded in the records of this office, in book 1371, at page 242.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal at CARTHAGE, Missouri
this 20 day of February, A. D., 1992.

EDIE SWINGLE RECORDER

BQC 1233 06 648

_____ (Seal)

MISSOURI ACKNOWLEDGMENT—UNMARRIED PERSON

STATE OF Missouri }
COUNTY OF Jasper } On this 22 day of March, 19 80

Camp J. Bulger a Notary Public, personally appeared

Earlene Copher

the person described in and who executed the foregoing instrument, and acknowledges that she free act and deed. And the said Earlene Copher herself to be single and unmarried.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my official seal at my office in Carterville the day and year last above written.

September 9, 19 80

Camp J. Bulger
Notary Public in and for said County and State.

Camp J. Bulger

MISSOURI ACKNOWLEDGMENT—MAN AND WIFE

STATE OF _____ }
COUNTY OF _____ } On this _____ day of _____, 19 _____

before me, _____ a Notary Public, personally appeared

his wife, to me known to be the persons described in and who executed the foregoing instrument, and acknowledged that they executed the same as their free act and deed.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my official seal at my office in _____ the day and year last above written.

My term expires _____, 19 _____ Notary Public in and for said County and State.

INDEXED 3437 COMPARED

Quit-Claim Deed

FROM

TO

Filed for record this 21 day

of April A.D., 19 80

at 11 o'clock, 55 minutes, 21 M.

Recorded in Book _____ at Page _____

By Walter P. Braham Recorder.

Deputy.

Recorder's Fee, \$ 5.00 12 00 cash

Return to Jasper
Patent West
and to Co. 138
Orange No. 1855

US EPA Region 7, Docket No.: CERCLA-07-2016-0011

Appendix B: Legal Description, Respondent's Parcels

THIS INDENTURE, Made and entered into this 10 day of July , 1998, by and between

RONALD G. WEST, a single person

party or parties of the first part, of Jasper County, State of MISSOURI, grantor(s), and

ROBERT G. WEST

party or parties of the second part, of Jasper County, State of MISSOURI, grantee(s).

Grantee's mailing address is P.O. BOX 574 WEBB CITY, MO. 64870

WITNESSETH, that the said party or parties of the first part, for and in consideration of the sum of One Dollar and other valuable considerations paid by the said party or parties of the second part, the receipt of which is hereby acknowledged does or do by these presents REMISE, RELEASE AND FOREVER QUIT CLAIM unto the said party or parties of the second part, the following described Real Estate, situated in the County of Jasper State of Missouri, to wit:

Tract 1: All of Lots Numbered Three (3), Four (4), Five (5), Six (6), Seven (7) and Eight (8) in HENDRICKSON'S ADDITION to Minersville, now the City of Oronogo, Jasper County, Missouri, according to the recorded Plat thereof.

Tract 2: All that part of the Southwest Quarter (SW1/4) of the Southwest Fractional Quarter (SWFrct11/4) of Section 31, Township 29, Range 32, in the City of Oronogo, Jasper County, Missouri, described as beginning at the Southeast corner of Lot 23 in Rankin's Addition to the City of Oronogo, thence South to the Section line, thence West to First Street, if extended, thence North to the South line of said Lot 23, thence East to the point of beginning, EXCEPT beginning 330 feet South and 60 feet West of the Southeast corner of Lot 23 in Rankin's Addition, thence North 50 feet, thence West 50 feet, thence South 50 feet, thence East 50 feet to the point of beginning.

Subject to Easements, Restrictions, and Reservations of Record, if any.

TO HAVE AND TO HOLD THE SAME, together with all rights immunities, privileges and appurtenances to the same belonging, unto the said party or parties of the second part forever; so that neither the said party or parties of the first part nor heirs nor any other person or persons, for HIM or in HIS name or behalf, shall or will hereinafter claim or demand any right or title to the aforesaid premises or any part thereof but they and each of them shall, by these presents, be excluded and forever barred.

IN WITNESS WHEREOF, the said party or parties of the first part has or have hereunto set their hand or hands the day and year first above written.

Ronald G. West

RONALD G. WEST

STATE OF MISSOURI)
COUNTY OF JASPER) ss.

On this 10th day of JULY, 19 98

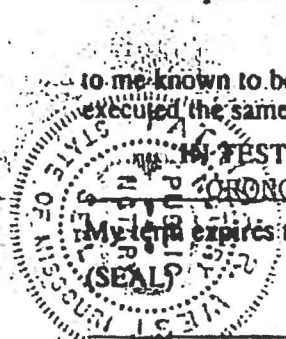
before me personally appeared RONALD G. WEST, a single person

to me known to be the person or persons described in and who executed the foregoing instrument, and acknowledged that th

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my official seal at my office in ORONOGO Missouri, the day and year first above written.

My term expires the 27th day of MAY, 2000 Signature *Patricia R. West*

Type or Print PATRICIA R. WEST
Notary Public



STATE OF MISSOURI)
COUNTY OF JASPER) ss.

IN THE RECORDER'S OFFICE



003475

STATE OF MISSOURI
COUNTY OF JASPER
RECORDER'S CERTIFICATION

'99 FEB 18 AM 11 54

BOOK 1590 PAGE 1369 -
EDIE NEIL 1370
RECORDER OF DEEDS

BK1590PG1370

1590
1370

Appendix C: Maps, Beacon – Jasper County, MO, Parcel ID Nos.

08903130024010000

08903130024011000

08903130024012000

08903130024014000

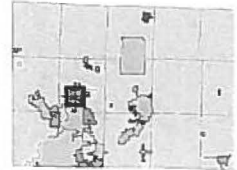
08903130024015000

08903130024016000

08903130024017000



Overview



Legend

- County Boundary
- Parcels
- Major Roads
- Local Roads

Date created: 5/16/2016

US EPA Region 7, Docket No.: CERCLA-07-2016-0011

Appendix D: Correspondence from Respondent to EPA, May 4, 2015

May 4, 2015

Certified Mail # 7014 2120 1170 90854439

Gene Gunn, Chief
Federal Facilities/Special Emphasis Branch
United States Environmental Protection Agency
Region 7
11201 Renner Boulevard
Lenexa, Kansas, 66219

Re: Access to Property for Superfund Cleanup of Hazardous Substances Jasper County
Superfund Site, Mining Waste Cleanup, Operable Unit #1

Dear Mr. Gunn,

This letter is in response to the letter I received from you, via UPS Delivery, on Thursday April 30, 2015, at approximately 2:30 pm. There are statements made in your letter to be clarified, changes to be made to the Access to Property and information received I/we requested in our previous letters for my review before I can sign an Access to Property.

In April 2010, my husband received a letter from GEOTECHNOLOGY INC., Kenny J. Hemmen, with Temporary Access form enclosed to be Signed. He replied with a letter requesting information it lacked and clarifications he needed before he could sign the agreement. He sent that letter certified mail. That letter was received and receipt signed. He received no response to that letter. In September 2010, he received notice EPA was seeking consent to access property. We replied with a letter requesting a complete copy of CERCLA including definitions and a complete copy of The Missouri Covenant Act including definitions. He could not sign anything unless all parties are in full disclosure, therefore he needed to review in full all documents, their jurisdiction and how they will effect property value and use rights. No response was received to that letter. On June 25, 2011, Mr. Steve Glass hand delivered to me a certified letter from GEOTECHNOLOGY INC., Mr. Rick Pershall, on behalf of Blue Tee Corp., that had been sent to him and his daughter but letter inside addressed to Robert G. West, Sr. and Robert G. West, Jr., included with the letter was a new Access Agreement to review and sign. After reviewing, a certified letter requesting information addressing five (5) different issues, was sent to Mr. Pershall, asking him to please respond within the next ten (10) calendar days. That letter was received and receipt signed. Received no response to that letter.

In 2011, my son Bob came to me and informed me that Mr. Doolan, representing the EPA, was wanting to meet with us and my son Ron. I agreed to the meeting thinking that finally I was going to receive the information requested in our letters. Attending that meeting, with the four of us, was a representative from Blue Tee Mining Company. Mr. Doolan presented me with a letter and Consent for Access form like those received in 2010. I told him I couldn't sign the form like it was written, land ID. Numbers only, no legal descriptions, I felt I could be signing Consent for Access to land not belonging to me. Mr. Doolan stated I had to sign the consent form right then, like it was, without any changes. I stated that I wanted the information that had been requested in the letters previously sent before I signed anything. Mr. Doolan stated he knew nothing about any letters, again stated I had to sign the consent. I stated letters had been sent and showed him the signed receipts, to which he stated, I didn't sign for them. I told him that results of testing performed on mine waste on our property were enclosed with each letter. Mr. Doolan stated, I didn't do the tests, when I test it, it will be hot. The meeting ended.

US EPA Region 7, Docket No.: CERCLA-07-2016-0011

Appendix D: Correspondence from Respondent to EPA, May 4, 2015

May 4, 2015

Certified Mail # 7014 3120 NYD 70854438

Gene Gunn, Chief
Federal Facilities/Special Emphasis Branch
United States Environmental Protection Agency
Region 7
11201 Renner Boulevard
Lenexa, Kansas, 66219

Re: Access to Property for Superfund Cleanup of Hazardous Substances Jasper County
Superfund Site, Mining Waste Cleanup, Operable Unit #1

Dear Mr. Gunn,

This letter is in response to the letter I received from you, via UPS Delivery, on Thursday April 30, 2015, at approximately 2:30 pm. There are statements made in your letter to be clarified, changes to be made to the Access to Property and information received I/we requested in our previous letters for my review before I can sign an Access to Property.

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This was the only meeting I attended and last contact from any official representative I have had until Monday April 27, 2015, at 1:35 pm and 1:42 pm, when I received the voicemail. I did not attend a meeting a year ago with your representatives, nor have I received several phone messages. To my knowledge my son Bob is to whom all contact has been made. I still request that the requests made in letters be answered and information sent to me so I can review the information and make a well informed, educated decision. I am sure some agreement can be reached when full disclosure of all definitions, superfund laws are made to all involved.

The Consent for Access, Land ID. is numbers only no legal locations, descriptions, measurements, detailed Metes and Bounds. I feel that signing it as written I could be giving consent to access to land anywhere in Oronogo, Jasper County, Missouri. Blacks Law, Grantor: the person by whom a grant is made the transfer of land. I feel that signing as Grantor I will be transferring my land to EPA relinquishing all rights I have to my land. Also approximately 60% of the land has been filled with the overburden from the installation of the Oronogo Wastewater System and leveled with vegetation growing.

Yes, I see the results of the cleanup when I drive to the post office, north on MM highway past the old Circle Mine, west from my house on Ivy Road and south from my house into Webb City. I personally know most of the property owners as I have lived in Oronogo 72 yrs. 2 mos. 20 days of my life. My grandparents moved to Oronogo in 1908, the men to work in the mines, as did my father, father in law and their siblings. I see land left covered with clay and rock large enough the land can not be mowed and properly maintained. I see one parcel of land directly north of the post office that has been filled, leveled, capped with clay and topsoil, with grasses growing, as the property owner was told would be done. Your Consent to Access number 4 and number 5 states, then capping with clay and topsoil. When will the topsoil be applied to the land with clay and rock visible?

After I receive the previously requested information and have time to review that information, I will send you a time and place to meet with you, the agency and hope to come to a mutually agreeable arrangement. I thank you for your consideration and time you will take in retrieving the information requested and sending it to me.

Sincerely,



Ms. Patricia West
380 South 4th Street
Oronogo, Missouri, 64855

Cc: Ms. Jane Kloeckner, Attorney
Kloeckner.jane@epa.gov

US EPA Region 7, Docket No.: CERCLA-07-2016-0011

Appendix E: Correspondence from EPA to Respondent, April 28, 2016



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 7**

11201 Renner Boulevard
Lenexa, Kansas 66219

APR 28 2016

**URGENT LEGAL MATTER
PROMPT REPLY REQUESTED**

OVERNIGHT MAIL

Ms. Patricia West
380 South 4th Street
Oronogo, Missouri 64855

RE: Access to Property for Superfund Cleanup of Hazardous Substances, Jasper County Superfund Site, Mining Waste Cleanup, Operable Unit #1

Dear Ms. West:

This letter requests that you provide access to property located in Oronogo, Jasper County, Missouri. We are requesting an opportunity to discuss this matter with you at your earliest convenience. Please contact us no later than seven (7) calendar days from your receipt of this letter to set a time to discuss our cleanup plans for your property. Our contact information is provided below.

Last year we sent you a letter requesting access, dated April 29, 2015. You responded with a letter dated May 4, 2015. We understand that you have a number of concerns. We appreciate very much the statement in your letter that "some agreement can be reached with full disclosure." The EPA has carefully considered the concerns mentioned in your 2015 letter. Our responses are provided in the enclosed summary.

Cleaning up the hazardous substances on your property has become a priority for the 2016 construction season. We need access this summer. We did not send a formal response to your May 2015 letter because last year we had to prioritize cleanup at other locations. However, we hope to resolve your concerns about access and obtain your permission to enter and conduct the cleanup beginning this summer.

In order to re-start this discussion, our representatives met and visited with you or your son, Ron, on March 8, 10 and 21, 2016. However, during those meetings you and your son indicated you would like us to make some changes in the access agreement, and Ron provided a number of suggested changes. Enclosed with this letter, please find a response to Ron's suggestions and the concerns in your 2015 letter. Also, we enclose a revised Access Agreement.

As you know, the Superfund Law authorizes the EPA to obtain access to real property for purposes of cleaning up hazardous substances. Cleanup of your property is necessary for the protection of human health and the environment. We issued a Record of Decision in 2004, as amended in 2013, which specifies the type of cleanup actions that must be taken on your property including removal of mining

30286011



wastes, recontouring, grading and re-vegetation. If you would like a copy of the 2004 ROD, and the amendment, please use this webpage <https://semspub.epa.gov/work/07/40161806.pdf>. For the 2013 Amendment, use this webpage <https://semspub.epa.gov/work/07/30284904.pdf>. These links will take you to the EPA's Superfund Sites webpage where you can download a copy of the documents. A copy of the documents is also available at the Webb City Public Library.

We would appreciate meeting with you to obtain your permission to access the property. If you would like to visit with us in person or with your attorney or other representative, please send us a suggested time and place to meet. We will be happy to meet when and where convenient for you or by telephone conference.

We anticipate that you will want to meet with us. However, if we do not hear back from you, it will be inferred that you are unwilling to grant access and other enforcement measures may become necessary to secure cleanup of the mining wastes on your property. The agency may issue Orders to obtain access under Section 104(e)(4) of the Superfund Law – see 42 U.S.C. Section 104(e)(3) and (4). In addition, when an Order is issued, it can be enforceable and a court may impose civil penalties for unreasonable failure to comply under Section 104(e)(5) of the Superfund Law. An Order would also provide the recipient with an opportunity to confer with the agency regarding any matter pertinent to the Order.

We request that you contact the agency as soon as possible and no later than seven (7) calendar days from the date of receipt of this letter. Let us know if you intend to provide access and allow the agency to cleanup the mining wastes on your properties. Also, if the enclosed revised agreement is acceptable, please sign and return it to the EPA in the stamped and addressed envelope. As soon as we receive it, we will notify you promptly of the cleanup plans.

Thank you for your time and consideration of this important matter. We believe this access request is essential to protect human health and the environment. Please contact Ms. Jane Kloeckner, Attorney, directly by phone at (913) 551-7235 or by email at kloeckner.jane@epa.gov regarding this letter.

Sincerely,



Gene Gunn
Chief
Special Emphasis Remedial Branch
Superfund Division

Enclosures

cc: Danny Lyskowski, Attorney, Missouri Department of Natural Resources

LETTER ENCLOSURE

RESPONSE TO CONCERNS ABOUT ACCESS TO PATRICIA WEST PROPERTY JASPER COUNTY, MISSOURI

1. Request that the EPA attach legal descriptions to the access agreement instead of tax assessor land identification numbers.

RESPONSE: Enclosed please find copies of the deeds to your properties. We will include these specific legal descriptions as attachments to the Access Agreement.

2. Request that the EPA provide copies of the Superfund Law, also known as the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

RESPONSE: You can find a copy of the Superfund Law on the EPA's webpages; here is a link to CERCLA: <http://www.epw.senate.gov/cercla.pdf>.

3. Request that the EPA provide results from EPA testing and sampling of mining wastes from Ms. West's properties.

RESPONSE: The EPA has results from sampling and analyzing mining wastes on property adjacent to your properties. We have determined that the same wastes are located on your properties and require cleanup. The analysis from the EPA Remedial Investigation Report shows that samples of mining wastes exceeding action levels were taken from adjacent and nearby properties. A series of samples collected immediately north of the West properties contain contaminants of concern in the following ranges:

Lead: 256 – 1,240 ppm

Zinc: 9,530 – 40,700 ppm

Cadmium: 61 – 234 ppm

4. Concern about work performed by Blue Tee and Geotechnology, Inc. and access agreements with responsible parties.

RESPONSE: We reached an agreement with Blue Tee in 2009, which was signed and issued by a federal judge. It requires Blue Tee to conduct cleanup on certain property. Blue Tee is required to obtain access permission for the work it does. Geotechnology, Inc. does the work for Blue Tee. They may have agreements with you.

5. Concern about the excavation of mining wastes, recontouring and revegetation vs. construction of a repository for disposal of the mining wastes with a cap; the EPA uses topsoil and clay for the repository, but not for excavated areas.

RESPONSE: The EPA uses topsoil and clay covers for the repository areas. However, the areas that are excavated do not require topsoil or clay covers.

6. Concern about communications with the EPA through the project manager, the contractor representatives and personnel in Kansas City.

RESPONSE: We believe that communications between you and EPA representatives could be enhanced. To add clarity and aid disclosure and certainty, we recommend that our discussions about this Access Agreement be conducted by Gene Gunn, Branch Chief, Special Emphasis Remedial Branch, Superfund Division. Gene can be reached at (913) 551-7776 or gunn.gene@epa.gov

7. Revisions to the Access Agreement

RESPONSE: See the attached revised Access Agreement. We incorporated as many changes and suggestions from your son as possible.

8. Concern about using the term "grantor" in the Access Agreement and the lack of signature by an EPA official on these kind of agreements.

RESPONSE: According to an on-line version of Black's Law Dictionary, the definition of "grantor" is "the person by whom a grant is made." See <http://thelawdictionary.org/grantor/>. The EPA is not providing you with legal advice. We recommend that you obtain legal counsel in this matter. However, the Agency does not consider the word "grantor" in your access agreement to be an essential term. Thus, we have used the term "owner" in the revised agreement. We require that the owner grant (or give) access to real property to the government for a period of time to conduct the cleanup work. The EPA does not need to sign this Access Agreement. It is essentially the permission from the owner to the Agency. We appreciate your cooperation and permission to enter and conduct this cleanup work.



U.S. Environmental Protection Agency Region 7

ORONOGO-DUENWEG MINING BELT SUPERFUND SITE

Jasper County, Missouri
Mine Waste Cleanup Action

CONSENT TO ACCESS FOR INVESTIGATION AND CLEANUP ACTIONS

Owner: **Patricia West**

Property ID: **08903130024016000, 08903130024014000, 08903130024015000,
08903130024017000, 08903130024012000, and 08903130024011000**

Legal Descriptions: **Attached are the deeds to the property with legal descriptions of the real estate.**

The Owner hereby consents to and permits the United States Environmental Protection Agency and its authorized employees, contractors, and agents (EPA), and the Missouri Department of Natural Resources and its authorized employees, contractors, and agents (MDNR) to enter upon the Property and conduct activities to investigate and respond to the release or threat of release of a hazardous substance, pollutant, or contaminant at, on, or from, the Property, in accordance with Section 104 of the Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA"), 42 U.S.C. 9604.

Such response may include, but is not necessarily limited to, the following:

- 1) Remove trees, brush, and vegetation from areas where metals exceed the action levels.
- 2) Excavate and remove contaminated sediments in the stream tributary located along the eastern side of the properties.
- 3) Excavate and remove contaminated mining wastes piles and contaminated soils on the northern portion of the properties.
- 4) Grade the relatively flat southern portion of the property currently used by the owner for storage to promote proper drainage, and cap this portion with six inches of clay and four inches of gravel.
- 5) Most of the excavated soils, sediments, and mine wastes will be transported to the Oronogo Circle mine pit for disposal.
- 6) Regrade the excavated portions of the property to promote drainage and prevent ponding water.
- 7) Revegetate the excavated areas with grasses.
- 8) Establish property use restrictions through a deed notice under the Missouri Environmental Covenant Act for certain areas where mine wastes repositories will be located on the property. The Environmental Covenant will be to restrict residential dwelling construction on the repository areas.

The EPA and MDNR are also granted access to the Property for periodic inspection and maintenance of the capped and revegetated areas. The consent granted hereby shall terminate upon Grantor's receipt of written notice from the EPA that all actions taken at the Property have been completed.

Owner _____ Date _____
Address _____
Daytime Phone _____

Corporation Warranty Deed

This Indenture, Made on the _____ day of November A. D., One

Thousand Nine Hundred and Eighty-nine by and between
J & S Holding Company, Inc., a Missouri corporation

a corporation duly organized under the laws of the State of Missouri, of the County
of Jasper, State of Missouri, party of the first part, and
Robert West and Patricia West

of the County of Jasper, State of Missouri, parties of the second part.

(Mailing address of said first named grantor is P.O. Box 139, Oronogo, MO 64455)

WITNESSETH: THAT SAID PARTY OF THE FIRST PART, in consideration of the sum of
ONE AND NO/100----- DOLLARS.

to it in hand paid by the said party of the second part, the receipt of which is hereby acknowledged,
does by these presents, **GRANT, BARGAIN AND SELL, CONVEY AND CONFIRM**, unto the said
parties of the second part, their heirs and assigns, the following described lots, tracts or
parcels of land, lying, being and situate in the County of Jasper and State of

to-wit: All

Lots N 1/2 Lot 9, 10 and 11 except North 30' Lot 11, Hendrickson's Addition

Commencing at intersection of South line Lot 23, Rankins Addition
with West line 1st Street, thence South 50' thence West 100' thence
North 50' thence East to point of beginning

Lots 18-23 inclusive in Rankins Addition

Misc Tract of Land commencing at SW Corner of Lot 23, Rankins addi-
tion to Oronogo thence south 100', thence east 100' thence North
100' thence west to beginning in Sec 31 twp 29 rge 32

EXCEPT easements and encumbrances of record and all taxes due and
payable in the year 1989 and thereafter.

TO HAVE AND TO HOLD, The premises aforesaid, with all and singular the rights, privileges,
appurtenances and immunities thereto belonging or in anywise appertaining, unto the said party
of the second part and unto their heirs and assigns forever, the said

J & S Holding Company, Inc.

hereby covenanting that it is lawfully seized of an indefeasible estate in fee in the premises herein
conveyed; that it has good right to convey the same; that the said premises are free and clear from any
incumbrance done or suffered by it or those under whom it claims; and that

J & S Holding Company, Inc.

will warrant and defend the title of the said premises unto the said parties of the second part
and unto their heirs and assigns forever, against the lawful claims and demands of all persons
whomsoever.

IN WITNESS WHEREOF, The said party of the first part has caused these presents to be signed
by its President and attested by its Secretary, and the corporate seal to be hereunto attached, this day and
year first above written.

John C. Campbell
JOHN C. CAMPBELL Secretary.

Stephen C. Glass
STEPHEN C. GLASS President.

1371 0242

MISSOURI CORPORATION ACKNOWLEDGMENT

STATE OF Missouri
COUNTY OF Jasper On this 6th day of February, 1920
before me, appeared STEPHEN C. GLASS and JOHN C. CAMPBELL
to me personally known, who being by me duly sworn, did say that he is the President of
J & S HOLDING COMPANY, INC.
a corporation, and that the seal affixed to the foregoing instrument is the corporate seal of said corporation
and that said instrument was signed and sealed in behalf of said corporation by authority of its Board of
Directors, and said STEPHEN C. GLASS AND JOHN C. CAMPBELL
acknowledged said instrument to be the free act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my notarial seal
at my office in DEONSO, Missouri, the day and year last above written.



W. H. K. [Signature]
Notary Public within and for said County and State

2178

Warranty Deed

FROM _____

TO _____

Filed for record this 20 day
of February, A.D., 1920
at 1 o'clock, 23 minutes, P.M.
Recorded in Book _____ at Page _____
Edie Swingle Recorder.
By W. H. K. [Signature] Deputy.
Recorder's Fee & 800 12 FF 12 FF
[Signature]

STATE OF Missouri
COUNTY OF Jasper IN THE RECORDER'S OFFICE

I, EDIE SWINGLE Recorder of said County, do hereby certify that the within
instrument of writing was at 1 o'clock and 23 minutes P.M., on the 20 day of February
A.D., 1920, duly filed for record in my office, and is recorded in the records of this office, in book 111 at page 241-242.
IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal at Catchers, Missouri
this 20 day of February, A.D., 1920.

EDIE SWINGLE RECORDER
[Signature]

RECORDER'S CERTIFICATION

'99 FEB 18 AM 11 54

BOOK 1590 PAGE 1369 -

EDIE NEIL

1370

RECORDER OF DEEDS

Quit-Claim Deed

BK 1590 PG 1369

Filed for Record on _____, 19____, at _____ o'clock _____ M. in Jasper County, Missouri.

Document No. _____ recorded in Book _____, Page _____
Recorder of Deeds

THIS INDENTURE, Made and entered into this 10 day of July, 1998, by and between

RONALD G. WEST, a single person

party or parties of the first part, of Jasper County, State of MISSOURI, grantor(s), and

ROBERT G. WEST

party or parties of the second part, of Jasper County, State of MISSOURI, grantee(s).

Grantee's mailing address is P.O. BOX 574 WEBB CITY, MO. 64870

WITNESSETH, that the said party or parties of the first part, for and in consideration of the sum of One Dollar and other valuable considerations paid by the said party or parties of the second part, the receipt of which is hereby acknowledged does or do by these presents REMISE, RELEASE AND FOREVER QUIT CLAIM unto the said party or parties of the second part, the following described Real Estate, situated in the County of Jasper State of Missouri, to wit:

Tract 1: All of Lots Numbered Three (3), Four (4), Five (5), Six (6), Seven (7) and Eight (8) in HENDRICKSON'S ADDITION to Minersville, now the City of Oronogo, Jasper County, Missouri, according to the recorded Plat thereof.

Tract 2: All that part of the Southwest Quarter (SW1/4) of the Southwest Fractional Quarter (SWFrct1/4) of Section 31, Township 29, Range 32, in the City of Oronogo, Jasper County, Missouri, described as beginning at the Southeast corner of Lot 23 in Rankin's Addition to the City of Oronogo, thence South to the Section line, thence West to First Street, if extended, thence North to the South line of said Lot 23, thence East to the point of beginning, EXCEPT beginning 330 feet South and 60 feet West of the Southeast corner of Lot 23 in Rankin's Addition, thence North 50 feet, thence West 50 feet, thence South 50 feet, thence East 50 feet to the point of beginning.

Subject to Easements, Restrictions, and Reservations of Record, if any.

TO HAVE AND TO HOLD THE SAME, together with all rights immunities, privileges and appurtenances to the same belonging, unto the said party or parties of the second part forever; so that neither the said party or parties of the first part nor heirs nor any other person or persons, for HIM or in HIS name or behalf, shall or will hereinafter claim or demand any right or title to the aforesaid premises or any part thereof but they and each of them shall, by these presents, be excluded and forever barred.

IN WITNESS WHEREOF, the said party or parties of the first part has or have hereunto set their hand or hands the day and year first above written.



RONALD G. WEST

STATE OF MISSOURI)
COUNTY OF JASPER) ss.

On this 10th day of JULY, 19 98

before me personally appeared RONALD G. WEST, a single person

to me known to be the person or persons described in and who executed the foregoing instrument, and acknowledged that they executed the same as their free act and deed.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my official seal at my office in Oronogo, Missouri, the day and year first above written.

My term expires the 27th day of MAY, 2000

Signature



Type or Print

PATRICIA R. WEST

Notary Public

STATE OF MISSOURI)
COUNTY OF Jasper) ss.

IN THE RECORDER'S OFFICE

I, Recorder of said County, do hereby certify that the within instrument of Writing was at _____ o'clock _____ M. on the _____ day of _____, 19____, duly filed for record in this office, and has been recorded in Book _____, Page _____.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal at _____ Missouri, on the day and year aforesaid.

(SEAL)

Recorder of Deeds

By _____

Quit-Claim Deed

BOOK 1233 PAGE 648

This Indenture, Made on the 22 day of March A. D., One
Thousand Nine Hundred and Eighty by and between Earlene Copher
 (widow of Cecil Copher, deceased)
 of the County of Jasper, State of Missouri part of the first part, and
Robert O. West and Patricia R. West (husband and wife)
 of the County of Jasper, State of Missouri part 1st of the second part.
 (Mailing address of said first named grantee is _____).

WITNESSETH, that the said party of the first part, in consideration of the sum of

One Dollar and other valuable considerations
 to her paid by the said parties of the second part (the receipt of which is hereby acknowledged)
 do by these presents REMISE, RELEASE and FOREVER QUIT CLAIM unto the said parties
 of the second part, the following described lots, tracts or parcels of land, lying, being and situate in the
 County of Jasper and State of Missouri, to-wit:

Commencing 100 feet S. SW Corner of Lot Numbered Thirteen (13) S. to
 TWP. Line, E. to 1st Street N. 300 feet N-L W. 100 feet S, 50 feet W.
 In Oronogo Misc 31-29-32 Rankins Addition to the City of Oronogo,
 Jasper County, Missouri.

TO HAVE AND TO HOLD THE SAME, with all the rights, immunities, privileges and appurtenances thereto belonging, unto the said parties of the second part and unto their heirs and assigns forever; so that neither the said party of the first part nor her heirs nor any other persons or persons, for her or in her name or behalf, shall or will hereinafter claim or demand any right or title to the aforesaid premises or any parts thereof, but they and each of them shall, by these presents, be excluded and forever barred.

IN WITNESS WHEREOF, the said party of the first part has hereunto set her hand and seal the day and year above written.

Earlene Copher (Seal)

Signed, Sealed and Delivered in Presence of

Earlene Copher (Seal)

(Seal)

(Seal)

BUY 1233 16 649

MISSOURI ACKNOWLEDGMENT--UNMARRIED PERSON

STATE OF Missouri)
COUNTY OF Waggoner) ss. On this 22 day of March, 1980
Camp J. Bulger a Notary Public, personally appeared
Earlene Copher
the person described in and who executed the foregoing instrument, and acknowledges that she
free act and deed. And the said Earlene Copher
is to be single and unmarried.
IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my official seal at my
office in Cartersville the day and year last above written.
Camp J. Bulger
Notary Public in and for said County and State.
Camp J. Bulger

MISSOURI ACKNOWLEDGMENT--MAN AND WIFE

STATE OF _____)
COUNTY OF _____) ss. On this _____ day of _____, 19____
before me, _____ a Notary Public, personally appeared
and
his wife, to me known to be the persons described in and who executed the foregoing instrument, and acknowledged that they
executed the same as their free act and deed.
IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my official seal at my
office in _____ the day and year last above written.
My term expires _____, 19____ Notary Public in and for said County and State.

INDEXED 3437 COMPARED

Quit-Claim Deed

764

TO

Filed for record this 21 day
of April A.D. 1980
at 11 o'clock, 55 minutes, AM.
Recorded in Book _____ at Page _____
Walter Richardson
Recorder.
By _____ Deputy.
Recorder's Fee: 50¢ 12 pt. cash

Return to
Robert West
1009 S. 4th Ave
Okmulgee, Okla 74455

US EPA Region 7, Docket No.: CERCLA-07-2016-0011

Appendix F: Record of Decision (2004) and ROD Amendment (2013) and ESD

**EXPLANATION OF SIGNIFICANT DIFFERENCES
ORONOGO-DUENWEG MINING BELT SUPERFUND SITE
OPERABLE UNIT-1
May 2016**

INTRODUCTION AND STATEMENT OF PURPOSE

This Explanation of Significant Differences (ESD) is being issued for the Oronogo-Duenweg Mining Belt Superfund Site (the Site), Operable Unit-1 (OU-1), in Jasper County, Missouri. The selected alternative, or cleanup plan, was described in a Record of Decision (ROD) for the Site in September 2004, and ROD Amendment in September 2013. The purpose of this document is to provide an explanation of significant differences between the ROD and ROD Amendment for OU-1 of the Site, and the Remedial Action for the Site.

This ESD describes changes to the ROD. All work that was included in the ROD and Amendment will remain the same except for the following:

- Manufactured compost will be utilized to supplement the use of topsoil, which is difficult to obtain in the quantity required, for capping of mining waste repositories.
- Manufactured compost will be spread in some excavated and remediated areas to promote vegetative growth to help mitigate the severe erosion occurring in these areas. Promotion of better vegetative growth will reduce the amount of operation and maintenance on these eroding areas into the future.

This change represents a significant change in the selected remedy with respect to scope. The U.S. Environmental Protection Agency is issuing this ESD with support and concurrence from the Missouri Department of Natural Resources. The issuance of an ESD is required by the National Oil and Hazardous Substances Pollution Contingency Plan and Section 117 (c) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended, more commonly known as "Superfund".

This ESD, and supporting information, will be added to the administrative record for the site by means of an administrative record addendum. The availability of the addendum will be announced by public notices in local newspapers. The administrative record file and all associated addendums are available for public review during normal business hours at the EPA's Region 7 office at 11201 Renner Boulevard, Lenexa, Kansas, and at the site repositories located at the Joplin City Library at 300 North Main in Joplin, and the Webb City Library at 101 South Liberty in Webb City, Missouri.

SUMMARY OF SITE BACKGROUND

The Oronogo-Duenweg Mining Belt Superfund Site is located in Jasper County and portions of Newton County, Missouri. The Site is a concern because of mining wastes on the surface which constitute a significant source of heavy metals contamination with potential for exposure to people and environmental receptors. Past mining and milling practices resulted in the contamination of surface soil, sediments, surface water, and groundwater in the shallow aquifer with heavy metals, primarily lead, cadmium and zinc. The Site includes the mining wastes in and around 11 former mining areas, or



designated areas (DAs), located within about 270 square miles of Jasper and Newton counties. The DAs include Snap, Neck/Alba, Thoms, Joplin, Oronogo/Duenweg, Carl Junction, Klondike, Iron Gates, Iron Gates Extension, Belleville, and Waco.

Historically, approximately 160 million short tons of crude ore were mined in the DAs of which approximately 5 percent was recovered as zinc/lead concentrates, leaving an estimated 150 million short tons of discarded mill waste on the surface. Approximately 90 percent of this material has since been removed for various commercial purposes. During the early years of mining, lead concentrates were smelted in a large number of crude log furnaces. Advances in smelter technology and increasing specialization by operators led to centralization, and by 1873 there were only 17 lead smelters in the Joplin area. By 1894, the number had decreased to three, and was down to one by the 1920s. Most zinc concentrates were shipped to smelters located outside the district in areas where fossil fuel was abundant, as the smelting of zinc required considerably more heat than lead.

The EPA listed the Site on the National Priorities List (NPL) in 1990. The NPL is a national list of Superfund sites that prioritizes cleanups in order of the most serious contamination problems and greatest threats to human health and the environment. After listing, the agency divided the Site into four Operable Units (OUs) for cleanup activities because of the multimedia nature of contamination. The OUs include OU-1, Mining and Milling Waste; OU-2, Smelter Waste Residential Yards; OU-3, Mine Waste Residential Yards; and OU-4, Groundwater. The 2004 ROD and the ROD Amendment address OU-1 and include those areas in and around the DAs where mining, milling and smelter wastes are located.

SELECTED REMEDY

The engineered components of the selected remedy as specified in the 2004 ROD and Amended in 2013 are briefly summarized below.

Source Removal and Disposal in Subsidence Pits

Mining wastes and contaminated soils will be excavated and placed in mine subsidence pits located in proximity to the source material. Backfilling the pits would be accomplished by simply end-dumping and/or pushing the mill wastes into the pits with excavation equipment. To the extent possible, wastes will be placed at least a meter below the seasonal low static water level in the pits. Reducing repeated wetting and drying of the wastes as a result of seasonal water level fluctuations is considered important for arresting weathering, oxidation and acid generation processes, and preventing further leaching of metals from the wastes. Flooded pits that contain high quality habitat for fish and wildlife and contain low concentrations of metals in the water will not be used for disposal because they do not present a risk to human health or the environment.

Sediment Removal

Sediments in the intermittent tributaries flowing from the source areas to the Class P streams will be removed subsequent to the cleanup of the sources draining to the tributaries. Sediment basins and traps will be constructed at the mouths of the tributaries to be remediated to mitigate sediment transport to the Class P streams during the cleanup actions. Remediated tributaries will be restored by lining the

channels with clean gravel and stabilizing the banks with natural vegetation. Sediment removal actions in Class P streams would be limited to delta deposit built up at tributary mouths. Generally, all the sediments in the deltas exceed screening criteria for aquatic organisms. Therefore, all the sediment delta deposits at the mouths of the tributaries exposed above the waterline at low-flow conditions will be removed.

Recontour, Revegetate, Soil Amendments, Stabilization

A variety of drainage and erosion control measures will be implemented during and after excavation of the source materials to manage storm water runoff and reduce metal and sediment loadings to Class P streams and their tributaries. Excavated areas will be recontoured and revegetated following complete removal of the mill wastes in order to control runoff and prevent surface erosion. Excavated areas will be revegetated using native, warm-season grass, or other grass types, dependent on the wishes of the property owner. Stream channels and banks from which source materials have been removed would be stabilized through the use of appropriate restoration techniques, such as recontouring, regrading, revegetating, or installing erosion barriers, stone armor, or riprap. Natural vegetation, such as willows or cedar revetments, would be used to stabilize remediated channels instead of stone rip-rap, where practical.

Selection and Capping of Disposal Pits

Pits will be evaluated during the remedial action for their suitability as disposal sites. Pits directly connected to the surface water system, containing highly oxygenated water, or exhibiting high groundwater flux will preferably be excluded from consideration as disposal sites. Pits exhibiting low dissolved oxygen concentrations and low oxidation/reduction potential will be considered good candidates for disposal sites. The filled pits will be capped with geo-composite soil covers to nearly eliminate infiltration of oxygenated rainwater, thereby reducing the weathering of the disposed wastes.

Shaft Plugging

Surface water and sediment RAOs will be addressed through the source material and sediment removal options described above. Where practical, the groundwater RAO will be addressed by installing shaft plugs and diversion ditches to reduce the amount of surface water entering the mine workings. The purpose of these actions will be to reduce point and non-point groundwater discharge from mining-related sources to streams.

Thoms DA Open Mine Pits

The acidic overburden from the Wild Goose open pit mine in the Thoms DA will be excavated and disposed of underwater in the TH-12 pit. Other mill wastes from the Thoms DA will also be disposed of in this open pit, as well. Due to the size of the pit, however, there is not enough mill waste or overburden in the Thoms DA to completely fill the Wild Goose open pit TH-12. Therefore, the EPA will assess hauling wastes from other DAs to facilitate complete filling of the pit. Water displaced by the filling of the pit will be neutralized and treated with lime in a temporary mobile treatment plant to remove the cadmium, iron, lead, and zinc prior to discharging it to the nearby Center Creek tributary (CC Trib 6). An open limestone drain will be installed at the outlet of the pond to neutralize any subsequent

discharges that may occur following the remedial actions if the pit is only partially filled. Filling of the Wild Goose pit, with its current low pH waters, presents a special concern for subaqueous disposal of wastes. The acidic nature of these waters could mobilize metals and result in groundwater conditions not suitable for subaqueous disposal. The acidic overburden may need to be treated to reduce acidity prior to placing it into the pit with mill wastes.

The non-engineered components of the Selected Remedy as specified in the 2004 ROD are briefly summarized below.

Institutional Controls (ICs)

The selected alternative for OU-1 includes a site-wide building ordinance that was enacted by Jasper County, similar to the health ordinance prescribed in the OU-2/3 ROD. The county building ordinance covers all undeveloped areas within the Site that requires the builders of residential homes to obtain a permit for construction. Conditions of the permit require soil testing to determine the lead concentration of the soil in the yard area of the home. An occupancy permit is granted by the county if soil lead concentrations are below 400 ppm and cadmium concentrations are below 40 ppm. Builders are required to properly clean up soils exceeding these levels prior to receiving the occupancy permit.

The selected alternative prescribes disposal of mine and mill wastes in mine subsidence pits followed by capping of the wastes. All capped areas will require ICs to prevent disturbance of the cap thereby protecting the wastes. These ICs will consist of restrictions or easements placed on the property deeds for the areas where the disposal or containment occurs. The restriction will prevent the development on, and disturbance of, the caps placed over the wastes. Restrictive covenants may be entered into with owners of the disposal property for protection of the disposal and capped areas.

Health Education

The ROD for OU-2/3 required the implementation of a health education program in Jasper County to supplement the residential soil cleanup. The EPA has been funding the Jasper County Health Department to implement that health education program since 1996. Since human health exposure risks due to direct contact with source materials containing the metals contaminations are possible until completion of the mine and mill waste cleanup described in this ROD, the agency will continue to fund the health education program until the cleanup of OU-1 is complete. When the cleanup action is completed for OU-1, and at the completion of additional actions anticipated under OU-2/3 (which essentially means that Superfund Site sources for human exposure have been addressed), the health education program will no longer be funded by the EPA.

BASIS FOR THE SIGNIFICANT DIFFERENCES

The changes to the remedy documented in this ESD will allow continued successful remediation of the Site and reduce the overall cost of the project. Existing institutional controls and operation and maintenance requirements will support the long-term protectiveness of the remedy.

DESCRIPTION OF SIGNIFICANT DIFFERENCE OR NEW ALTERNATIVE

The EPA has determined that adequate sources and quantities of top soil are becoming difficult to obtain in Jasper County for use in capping the repositories where wastes are disposed. Over the next five years, the agency will be constructing two large repositories that will require approximately 100,000 cubic yards of topsoil for capping once the disposal is completed. In addition, to date the EPA has remediated more than 3,000 acres of mine scarred land in which mine wastes and contaminated soils were removed to the underlying clean clay. This substrate consists of rocky and relatively organic free clay which severely prohibits the re-establishment of vegetation on these lands. This has resulted in severe erosion requiring significant amounts of maintenance to prevent soil runoff. Much of these remediated areas require the placement of an organic rich soil or other amendment to provide a growth media for vegetation. It is estimated that several hundred thousand cubic yards of soil would be required to re-establish adequate growth in the remediated acres. The EPA has not been able to identify sources of topsoil within a reasonably close proximity to the site to meet the quantity needed for capping and erosion control without completely stripping hundreds of acres of valuable crop or pasture lands. Additionally, the cost of topsoil delivered and spread on the site is approximately \$12.50 per cubic yard which will result in an overall cost to the remedy of nearly \$4,000,000.

Therefore, the EPA has determined that an alternative to topsoil is required for use in capping and revegetation. The agency and others have performed past studies on the use of biosolids from public waste water treatment plant facilities for use in lieu of topsoil at the site. Those studies showed adequate sources are not available near the site, and trucking cost to bring in the materials is prohibitive. Local sources contain high levels of zinc which preclude their use in land application. A feasible alternative would be the use of manufactured compost utilizing local wastewater treatment plant sludge composted with sufficient amounts of wood chips and animal manure to reduce the zinc concentrations to acceptable levels for use in land application. This type of compost could be produced and could be readily available within the site and in continuing supply to meet the EPA's quantity needs for several years into future. The use of compost would not only preserve the valuable topsoil in Jasper County, increase the survivability of revegetated areas, but would eliminate the need for costly disposal of zinc contaminated sludge by local municipalities. Additionally, the agency anticipates the cost to produce compost could be as much as 50 percent less than the purchase of topsoil and could reduce the overall remedy cost by \$2,000,000 or more.

This ESD establishes the use and application of locally produced manufactured composts in accordance with the following priorities at this site: (1) for capping mine waste repositories in lieu of topsoil, (2) for the application of compost in areas with highly erodible slopes where remediation of mining wastes have occurred and will occur to reduce the potential of soil erosion, and (3) as necessary, in areas of mining waste excavation in accordance with the best professional judgment of the project manager. The main purpose for use of the manufactured composts during this remedial action are to supplement fertilizer in the capping of repositories and to fill or prevent erosion rills in excavated areas..

STATUTORY DETERMINATIONS

The original remedy selected in the 2004 ROD and 2013 ROD Amendment, modified by this ESD, is protective of human health and the environment, complies with federal and state requirements that are

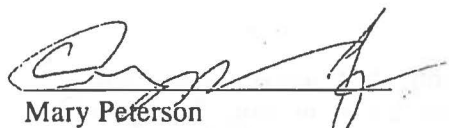
applicable or relevant and appropriate, utilizes permanent solutions to the maximum extent possible, and is cost efficient. The selected remedy meets the protectiveness requirements of CERCLA, section 121.

COMMUNITY INVOLVEMENT

CERCLA's public participation requirements, which are described at 40 CFR 300.435 (c)(2)(i), will be met through the issuance of this ESD, making this ESD available to the public in the administrative record, and publishing a notice of the availability of this ESD in a local newspaper.

The complete administrative record is located at the Joplin and Webb City public libraries (site repositories), and at the EPA office in Lenexa, Kansas. The public is encouraged to review the administrative record in order to gain a more comprehensive understanding of the site and the environmental activities that are planned or have been conducted.

SIGNATURE


Mary Peterson
Director, Superfund Division
U.S. EPA Region 7

5-5-14
Date

RECORD OF DECISION AMENDMENT PLAN

Oronogo-Duenweg Mining Belt Superfund Site Jasper County, Missouri

Mine and Mill Waste Operable Unit 1



Prepared by:

**U.S. Environmental Protection Agency
Region 7
11201 Renner Boulevard
Lenexa, Kansas 66219**

September 27, 2013

30285041



Superfund

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RECORD OF DECISION AMENDMENT DECLARATION

SITE NAME AND LOCATION

Oronogo-Duenweg Mining Belt Site, Operable Unit 1
Jasper County, Missouri

STATEMENT OF BASIS AND PURPOSE

The U.S. Environmental Protection Agency (EPA) has prepared this decision document to present the selected remedial action for mining and milling wastes at the Oronogo-Duenweg Mining Belt site (Site) located in Jasper County, Missouri. This decision was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and to the extent practicable, the National Contingency Plan (NCP). This decision is based on the Administrative Record for this Site. The Administrative Record file is located in the following information repositories:

- | | | | |
|----|--|----|--|
| 1. | Joplin Public Library
300 Main
Joplin, Missouri | 3. | U.S. Environmental Protection Agency
Region 7 Docket Room
11201 Renner Boulevard
Lenexa, Kansas |
| 2. | Webb City Public Library
101 South Liberty
Webb City, Missouri | | |

The EPA has coordinated selection of this remedial action with the Missouri Department of Natural Resources (MDNR). The state of Missouri concurs on the selected remedy.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this Record of Decision (ROD) Amendment, may present an imminent and substantial endangerment to public health, welfare or the environment.

DESCRIPTION OF THE REMEDY CHANGES

This ROD Amendment provides details concerning the changes made to the 2004 ROD for Operable Unit 1, which addressed the cleanup of mining and milling wastes, soil and selected sediments contaminated with metals from past mining activities at the Site. The cleanup action is one part of the EPA's overall efforts under Superfund to deal with environmental contamination resulting from historic lead and zinc mining, milling and smelting operations in Jasper County. The major changes to the 2004 remedy are:

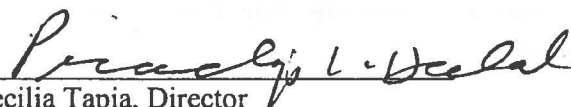
- Increase in the volume of on-site wastes and the associated increase in cost
- Construction of aboveground repositories
- Elimination of the use of biosolids and deep tilling

- Increase in the sediment cleanup levels based on site-specific toxicological studies
- Inclusion of contaminated soils in the tornado expedited debris removal (EDR) area in the OU-1 remedy

STATUTORY DETERMINATIONS

The selected remedy changes continue to be protective of human health and the environment; are expected to comply with chemical-, location- and action-specific federal and state requirements that are legally applicable or relevant and appropriate to the remedial action and are cost effective. These remedy changes utilize permanent solutions to the maximum extent practicable.

Because these remedy changes will result in hazardous substances remaining on the Site above health-based levels, a review will be conducted within five years to ensure that the remedy continues to provide adequate protection of human health and the environment.


Cecilia Tapia, Director
Superfund Division
U.S. EPA, Region 7

9/27/13
Date

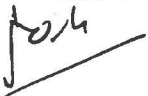


Table of Contents

<u>Section</u>	<u>Page</u>
1.0 Introduction and Purpose	1
2.0 Site History and Background	1
3.0 Site Remedy	3
3.1 Remedial Action Objectives	3
3.2 Engineered Cleanup Actions	5
3.3 Nonengineered Actions	8
4.0 Basis for Revision to the Selected Remedy	11
4.1 On-site Volume of Mining Wastes and Open Pit Space	11
4.2 Disposal in Open Pits Waiting Period	11
4.3 Biosolids Unavailable for Use as Soil Amendments	11
4.4 Sediment Action Level Studies Complete	11
5.0 Description of Remedy Changes	12
5.1 Volume and Cost	12
5.2 Construction of Repositories	12
5.3 Use of Biosolids and Deep Tilling	14
5.4 Sediment Cleanup Levels	14
5.5 Expedited Debris Removal Area	15
6.0 Summary of Proposed Remedy Changes	16
6.1 Costs	16
6.2 Aboveground Repositories	16
6.3 Biosolids and Deep Tilling Eliminated	16
6.4 Sediment Cleanup Action Level Established	16
6.5 EDR Area	17
7.0 Statutory Determination	17
7.1 Protection of Human Health and the Environment	17
7.2 Compliance with ARARs	18
7.3 Long- and Short-term Effectiveness	18
7.4 Preference for Treatment as a Principal Element	18
7.5 Implementability	18
7.6 Cost Effectiveness	18
8.0 State Concurrence	19
9.0 Public Participation	19

Tables

1	Summary of Changes	20
---	--------------------	----

Figures

1	Map of Designated Areas	21
2	Expedited Debris Removal Area	22

Attachments

1	Jasper County Health Ordinance	23
2	Jasper County Environmental Contamination Ordinance	28
	- Sampling Protocol/Fact Sheet	29
	- Environmental Contamination Ordinance Implementation Plan	31
3	Responsiveness Summary	33

1.0 Introduction and Purpose

This document has been developed by the U.S. Environmental Protection Agency, and presents the amendment to the Record of Decision (ROD) for Operable Unit 1 (OU-1) of the Oronogo-Duenweg Mining Belt Superfund site (Site) in Jasper County, Missouri. The OU-1 ROD was signed by the EPA on September 30, 2004, to address the remediation of metals-contaminated mining and milling wastes at this Site.

In compliance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) §117(c), 42 U.S.C. § 9617, and the National Contingency Plan (NCP) 40 CFR § 300.435(c)(2)(i) and 300.825(a)(2), the EPA and MDNR (the Agencies) have determined that certain remedy revisions fundamentally, and others significantly, change the remedy selected in the 2004 ROD. The EPA is therefore issuing this ROD Amendment. In general, fundamental changes in a remedy involve a change in scope or cost to the remedy, requiring a nine criteria analysis. Significant changes involve a change to a component of a remedy that does not fundamentally alter the cleanup approach. For a ROD Amendment, the EPA is required to describe to the public the nature of the fundamental changes in a proposed plan, summarize the information that led to making the changes, afford the public the opportunity to comment on the proposed changes and revise the remedy and affirm that the revised remedy complies with the NCP and the statutory requirements of CERCLA. For significant changes to the remedy, the EPA is required to make the significant differences and supporting information available to the public through issuance of an explanation of significant differences (ESD), which the EPA has done here through public notice and issuance of a proposed ROD amendment.

The EPA has coordinated the development of this amendment with the Missouri Department of Natural Resources (MDNR). The EPA is the lead agency and the MDNR is the support agency.

This ROD Amendment and supporting documents have been made part of the Administrative Record and are available for review during normal business hours at the following locations:

- | | | | |
|----|--|----|--|
| 3. | Joplin Public Library
300 Main
Joplin, Missouri | 3. | U.S. Environmental Protection Agency
Region 7 Docket Room
11201 Renner Boulevard
Lenexa, Kansas |
| 4. | Webb City Public Library
101 South Liberty
Webb City, Missouri | | |

2.0 Site History and Background

The Oronogo-Duenweg Mining Belt Superfund site is located in Jasper County and portions of Newton County, Missouri. The Site is a concern because of mining wastes on the surface which constitute a significant source of heavy-metals contamination with potential for exposure to people and environmental receptors. Past mining and milling practices resulted in the contamination of surface soil, sediments, surface water and groundwater in the shallow aquifer with heavy metals, primarily lead, cadmium and zinc. The Site includes the mining wastes in and around 11 former mining areas, or designated areas (DAs), located within about 270 square miles of Jasper and Newton counties. The DAs

include Snap, Neck/Alba, Thoms, Joplin, Oronogo-Duenweg, Carl Junction, Klondike, Iron Gates, Iron Gates Extension, Belleville and Waco. A map of the DAs is shown on Figure 1 in the 2004 ROD and is attached to this ROD Amendment.

Historically, approximately 160 million short tons of crude ore were mined in the DAs of which approximately 5 percent was recovered as zinc/lead concentrates, leaving an estimated 150 million short tons of discarded mill waste on the surface. Approximately 90 percent of this material has since been removed for various commercial purposes. During the early years of mining, lead concentrates were smelted in a large number of crude log furnaces. Advances in smelter technology and increasing specialization by operators led to centralization, and by 1873 there were only 17 lead smelters in the Joplin area. By 1894, the number had decreased to three, and was down to one by the 1920s. Most zinc concentrates were shipped to smelters located outside the district in areas where fossil fuel was abundant, as the smelting of zinc required considerably more heat than lead.

The EPA listed the Site on the National Priorities List (NPL) in 1990. The NPL is a national list of Superfund sites that prioritizes cleanups in order of the most serious contamination problems and greatest threats to human health and the environment. After listing, the EPA divided the Site into four Operable Units (OUs) for cleanup activities because of the multimedia nature of contamination. The OUs include OU-1, Mining and Milling Waste; OU-2, Smelter Waste Residential Yards; OU-3, Mine Waste Residential Yards; and OU-4, Groundwater. The 2004 ROD and this proposed ROD Amendment address OU-1 and include those areas in and around the DAs where mining, milling and smelter wastes are located.

A site-wide investigation was initiated in 1991, collecting data primarily on mined materials, soils, surface water, groundwater, terrestrial and aquatic biota, land use and demography, air quality and human food sources. The results of this sampling program were presented in the Remedial Investigation Report (RI) completed in 1995, and documented significant contamination levels in soil, surface water and groundwater as well as in mining wastes themselves. Contamination levels were found in all media at levels presenting an unacceptable risk to human health and environmental receptors. A detailed discussion of the Site characteristics, nature of the contamination and risk to people and the environment are found in the Administrative Record.

A feasibility study (FS) was completed in 2003. The FS combined the information about the nature and extent of contamination in and around the DAs described in the RI with the investigations characterizing and evaluating the DAs, and developed alternatives for remedial action for the entire Site. Additional studies were conducted by the EPA, MDNR and the potentially responsible parties (PRPs) to assist in developing and supporting the remedial alternatives in the FS.

The EPA issued the OU-1 Proposed Plan for public comment in July 2004, and completed the OU-1 ROD in September 2004 after holding a public meeting and receiving and addressing public comments on the Proposed Plan. The cleanup of mining and milling wastes under the ROD is necessary to mitigate the principal threat for OU-1 which is the risk to aquatic and terrestrial ecosystems from exposure to mill wastes, soils, sediments, surface water and groundwater. The main component of the remedy includes excavating and disposing of source materials in selected on-site mine subsidence pits suitable from an engineering perspective for subaqueous disposal. This same remedial component, excavation/disposal, is essential to provide long-term protection of human health from exposure to the mine and mill wastes.

3.0 Site Remedy

The 2004 ROD specified and described the selected remedy for OU-1. The remedial action selected is presented in the following sections.

3.1 Remedial Action Objectives

The media-specific remedial action objectives (RAOs) developed in the FS to address the Site risks and specified in the ROD for the selected remedy are presented and reprinted exactly below.

Source Material RAO

The source material RAO has been designed to address the potential ecological risks associated with direct exposure to contaminants of concern (COCs) in mine and mill wastes and in the affected soils surrounding the wastes. Terrestrial vertebrates, specifically vermivores whose diet consists of earthworms and other soil-dwelling invertebrates, are identified as the receptors of concern based on information from the baseline ecological risk assessment (BERA). Ecological risks associated with source material erosion (as sediment) and seepage/runoff are addressed in other RAOs.

Exposure routes consist of ingestion of earthworms and other invertebrates in source materials and affected media that provide suitable habitat for Site vermivores with levels greater than 41 mg/kg cadmium 804 mg/kg lead; or 6,424 mg/kg zinc. Based on this exposure scenario, the source material RAO is as follows:

- Mitigate risks to terrestrial vermivores from exposure to COCs from mine, mill and smelter wastes within the Site, such that the calculated toxicity quotients or hazard indexes are less than or equal to 1.0.

Sediment RAO

Sediments of concern at the Site consist of source materials that are eroded from source areas to water bodies, namely Class P streams (as defined under Missouri's water quality standards program) and their tributaries. Sediments represent a unique category of source materials that have been transported, or may be transported in the future, to aquatic environments where they potentially affect water quality and streambed substrate, thereby posing risks to aquatic biota. The exposure pathway of concern for the sediment RAO is the movement and redistribution of source materials that could result in exposure of aquatic biota to elevated COC concentrations. The COCs for sediments are cadmium, lead and zinc. The sediment RAO for OU-1 is as follows:

- Mitigate risks to aquatic biota in Class P streams and their tributaries where COC levels exceed federal aquatic life criteria (ALC) by controlling the transport of mine, mill and smelter wastes from source areas to waters of the state.

Surface Water RAOs

Two RAOs have been developed that address two different pathways of exposure to aquatic biota. The first exposure pathway of concern is the transport of COCs to Class P streams and their tributaries resulting from seepage and runoff (dissolved and particulate metals) from source materials. The second exposure pathway involves the transport of COCs to Class P streams and their tributaries resulting from mine pit and pond discharges. The criteria for Class P streams and their tributaries are the federal ALC, as calculated based on the hardness observed in the individual surface water bodies. The RAOs for OU-1 surface water are as follows:

- Mitigate exposure of aquatic biota to COCs released and transported from mine and mill wastes where applicable or relevant and appropriate requirements (ARARs) for surface water are exceeded in Class P streams and in tributaries.
- Mitigate exposure of aquatic biota to COCs released and transported from Site mine-related pits and ponds where surface water ARARs are exceeded in Class P streams and in tributaries.

Groundwater RAO

The groundwater RAO addresses exposure of aquatic biota to COCs in Class P streams that receive discharge from flowing mine openings (e.g., mine shafts, vents, subsidence pits, etc.). The contaminant criteria are federal ALC. The COCs for OU-1 groundwater are cadmium, lead, and zinc. The RAO for OU-1 groundwater is as follows:

- Mitigate exposure of aquatic biota to COCs in releases of groundwater from flowing mine shafts of the Site where surface water ARARs are exceeded in Class P streams and in tributaries.

The groundwater RAO for this OU is limited to protecting the surface water from groundwater impacts due to flowing mine shafts. The RAO of mitigating human health risks from exposure to the contaminated shallow aquifer was addressed in OU-4, Groundwater, which provides an alternate public water supply to residents and establishes ICs to mitigate the future risks of drilling new drinking water wells in the shallow aquifer. The Missouri Well Drillers law and regulations control shallow and deep aquifer well drilling in the Jasper and Newton County areas to reduce the risk to residents that might use the contaminated shallow aquifer. The ROD for OU-4 determined that it is technically impractical for the agency to remediate the shallow aquifer to achieve compliance with chemical-specific ARARs for drinking water sources. The EPA determined that it is not technically feasible from an engineering perspective to remediate groundwater because of the widespread nature of contamination throughout the shallow aquifer, karst conditions and interconnectedness of the mine workings within the shallow aquifer. Although contaminated groundwater seeps into surface waters and contributes some COCs, the groundwater RAO for this OU addresses only specific groundwater sources where remediation is technically feasible such as the flowing mine shafts because of the technical impracticability of cleaning up the entire shallow aquifer to meet maximum contaminant levels for drinking water.

3.2 Engineered Cleanup Actions

The engineered components of the selected remedy as specified in the 2004 ROD are presented and reprinted exactly below.

Source Removal and Disposal in Subsidence Pits

In- and near-stream barren chat, vegetated chat and tailings; barren chat, vegetated chat and tailings located in the flood plains and tributaries; upland chat and tailings exceeding terrestrial and human health action levels would be excavated and placed in mine subsidence pits located in proximity to the source material. Backfilling the pits would be accomplished by simply end-dumping and/or pushing the mill wastes into the pits with excavation equipment.

To the extent possible, tailings and chat would be placed at least a meter below the seasonal low static water level in the pits. Reducing repeated wetting and drying of the wastes as a result of seasonal water level fluctuations is considered important for arresting weathering, oxidation and acid generation processes, and preventing further leaching of metals from the wastes. Relatively inert materials such as development rock or low-concentration chat would be used to fill the zones where water levels may fluctuate. Flooded pits that contain high-quality habitat for fish and wildlife and contain low concentrations of metals in the water will not be used for disposal because they do not present a risk to human health or the environment. There appears to be sufficient pit space available on the Site to warrant saving good-quality habitat.

Upland Source Materials

Upland barren chat and tailings that do not exceed action levels established to protect terrestrial and human health would be left in place because they do not pose a risk to human health and the environment. Upland vegetated chat and transition zone soils that exceed human health and terrestrial cleanup criteria would be deep tilled to reduce metal concentrations and revegetated. Biosolids would be added to provide some treatment of the metals in these sources and to improve soil structure for plant growth.

Sediment Removal

Sediments in the intermittent tributaries flowing from the source areas to the Class P streams will be removed subsequent to the cleanup of the sources draining to the tributaries. The sediments will be removed to a depth where background metals concentrations or bedrock is encountered, whichever is shallower. Sediment basins and traps will be constructed at the mouths of the tributaries to be remediated to mitigate sediment transport to the Class P streams during the cleanup actions. Remediated tributaries will be restored by lining the channels with clean gravel and stabilizing the banks with natural vegetation.

Sediment removal actions in Class P streams would be limited to delta deposit built up at tributary mouths. Generally, all the sediments in the deltas exceed screening criteria for aquatic organisms. Therefore, all the sediment delta deposits at the mouths of the tributaries exposed above the waterline at low-flow conditions will be removed. Extensive removal is not anticipated under this alternative because the estimated volume of delta deposits is small based on the Site sediment surveys conducted jointly by the EPA, MDNR and NewFields in November

1999 and April 2003. The excavated sediments would be disposed of in subsidence pits with the other source materials. Removal of the delta deposit sediments will occur at each tributary at the completion of the removal of the sediment in the individual tributary. It is anticipated that all sediments from the tributaries draining source areas to the Class P stream will require complete removal up to the source areas. Once the tributaries have been cleaned of sediments, the channels will be restored to as near-natural condition as possible. This would include replacement of clean gravel in the channels and bank stabilization.

The ROD established numeric action levels for cleanup of the tributary sediments and delta deposits of 2 ppm cadmium, 70 ppm lead and 250 ppm zinc. These concentrations were derived from the average concentration of background designated soil values. The EPA also assessed screening values for sediments in the consensus-based threshold effects criteria (TEC) for freshwater developed by MacDonald et al. (2000). The MacDonald values were recommended as numeric sediment-quality criteria because TEC values are intended to predict the absence of toxicity in sediments. Although TEC values are often used for the purpose of ecological screening to determine contaminants of potential ecological concern, they also provide a reliable basis for classifying sediments as toxic or not toxic to sediment dwelling organisms. Comparing the threshold effects concentration to the probable effects concentration give a range of 1 to 5 ppm (average of 3) for cadmium, 32 to 128 ppm (average of 80) for lead and 121 to 459 ppm (average of 290) for zinc. The average background soil concentrations for the Site fall within this range of screening values and are slightly lower than the average recommended MacDonald values.

During implementation of the remedy, the EPA will initiate the surface water quality monitoring plan to assess the effectiveness of the source removal action on reducing surface water quality to meet federal ALC. If at the second five-year review after completion of the remedy (10 years or less), conducted as required for the Site, monitoring data indicated the federal ALC has not been achieved, the EPA will assess the feasibility of conducting additional actions. These may include the removal of sediments from the Class P streams, which is currently not part of the remedial actions selected in the ROD. Additional action may be taken under an amendment to the ROD, or as part of a new operable unit. If the assessment of data indicates the need for additional source material (i.e., mine waste or soil) removal is required, those additional actions would be conducted under an amendment to the ROD. Should the data indicate that sediment removal from the Class P streams is necessary to achieve the federal ALC, those actions would be conducted under a separate OU and ROD. Should the EPA determine that an additional OU and ROD for sediments is warranted, sediment removal activities would be conducted simultaneously with sediment actions in the Spring River drainage in Kansas and Oklahoma.

Recontour, Revegetate, Soil Amendments, Stabilization

A variety of drainage and erosion-control measures will be implemented during and after excavation of the source materials to manage storm water runoff and reduce metal and sediment loadings to Class P streams and their tributaries. Excavated areas will be recontoured and revegetated following complete removal of the mill wastes to control runoff and prevent surface erosion. Deep tilling would be performed to improve soil structure and moisture retention characteristics by blending the organic matter content of different soil horizons, as well as reducing contaminant concentrations, to reduce risks to human health and terrestrial biota and improve soil function. The soils would be amended with biosolids to supplement the soil organic

matter content and facilitate revegetation, which may also provide some treatment to any residual metals not excavated during subaqueous disposal. Excavated areas will be contoured to promote proper drainage, preventing ponding of water in the excavated areas. Excavated areas will be revegetated using native, warm-season grass or other grass types dependent on the wishes of the property owner. Stream channels and banks from which source materials have been removed would be stabilized through the use of appropriate restoration techniques such as recontouring, regrading, revegetating or installing erosion barriers, stone armor or riprap. Natural vegetation such as willows or cedar revetments would be used to stabilize remediated channels instead of stone rip-rap, where practical.

Selection and Capping of Disposal Pits

Pits will be evaluated during the remedial action for their suitability as disposal sites. Pits directly connected to the surface water system, containing highly oxygenated water or exhibiting high groundwater flux will preferably be excluded from consideration as disposal sites. Pits within ½ mile of Class P streams with exceedances of ALC will also be excluded, depending on the degree of karst development or mining-related conduit flow. Pits within one mile upgradient of shallow drinking-water wells that are still in use will be excluded from consideration for disposal. Pits exhibiting low dissolved oxygen concentrations and low oxidation/reduction potential will be considered good candidates for disposal sites. The filled pits will be capped with geocomposite soil covers to nearly eliminate infiltration of oxygenated rainwater, thereby reducing the weathering of the disposed wastes. Actions such as mounding the cover systems and diverting surface flows away from the capped pits will also be taken to reduce the infiltration of oxygenated water into the disposal pits. In- and near-stream transition zone soils exceeding the action level for human health and terrestrial risk or soils from beneath excavated chat piles will be excavated and used in the construction of the soil cover systems. To prevent damage to the cover systems due to consolidation and differential settling of the mill wastes placed in the pits, adequate time (six to twelve months), will be allowed for the mill wastes to consolidate in the subsidence pits prior to attempting to install the cover systems. Any subsidence that occurs during the consolidation period will be filled in with additional mill wastes or soils to provide positive slopes and adequate drainage for the cover system. Erosion-control measures will be installed at each filled pit to control runoff prior to the cap installation during the settling period. Only low-concentration mill waste or development rock will be used to fill settled areas in the pits after subsidence of initial materials disposed of prior to the cap installation. In addition, groundwater monitoring wells will be installed around the first few pits where disposal occurs to confirm the results of the Waco pilot study concerning the short-term and long-term release of metals. The monitoring data collected from the wells will be used to further define the appropriateness of various types of pits for disposal and refine disposal criteria. Monitoring will be conducted weekly for the first two months, monthly for months three through six, quarterly for the remainder of year one, then semiannually until the first five-year review.

Shaft Plugging

Surface water and sediment RAOs will be addressed through the source material and sediment-removal options described above. Where practical, the groundwater RAO will be addressed by installing shaft plugs and diversion ditches to reduce the amount of surface water entering the mine workings. The purpose of these actions will be to reduce point and nonpoint groundwater discharge from mining-related sources to streams.

Thoms DA Open Mine Pits

The acidic overburden from the Wild Goose open pit mine in the Thoms DA will be excavated and disposed of underwater in the TH-12 pit. Other mill wastes from the Thoms DA will also be disposed of in this open pit as well. Due to the size of the pit, however, there is not enough mill waste or overburden in the Thoms DA to completely fill the Wild Goose open pit TH-12. Therefore, the EPA will assess hauling wastes from other DAs to facilitate complete filling of the pit. Water displaced by the filling of the pit will be neutralized and treated with lime in a temporary mobile treatment plant to remove the cadmium, iron, lead and zinc prior to discharging it to the nearby Center Creek tributary (CC Trib 6). An open limestone drain will be installed at the outlet of the pond to neutralize any subsequent discharges that may occur following the remedial actions if the pit is only partially filled. Lands exposed by the excavation of the reactive overburden will be deep tilled, limed and amended with biosolids or other organic matter and revegetated the same as other excavated mill waste deposits.

Filling of the Wild Goose pit, with its current low pH waters, presents a special concern for subaqueous disposal of wastes. The acidic nature of these waters could mobilize metals and result in groundwater conditions not suitable for subaqueous disposal. The acidic overburden may need to be treated to reduce acidity prior to placing it into the pit with mill wastes. Only partially filling the pit will result in open water at the surface that could serve as a continual input of oxygenated water, thereby negating anaerobic conditions to stabilize metals. If open surface water is left in the pit, it could be an attractive nuisance and could harm wildlife, particularly waterfowl. This scenario of disposal needs to be fully studied and modeled to show if it is effective prior to implementing action at the pit. Pilot studies will be required to assess the effectiveness of treatment technologies prior to full implementation of the filling action. It is likely that the treatability and pilot study results will show that the pit can be filled without significant metals release, but that the pit should be completely filled and capped.

3.3 Nonengineered Actions

The nonengineered components of the Selected Remedy as specified in the 2004 ROD are presented exactly below.

Institutional Controls

The ROD for the smelter-affected and mining-affected residential yard soils in Jasper County (OU-2/3) prescribes institutional controls (ICs) to reduce future exposure of children to unacceptable concentrations of lead in soils in new residential construction in all undeveloped contaminated areas. Those ICs were envisioned to consist of a site-wide zoning ordinance that will control new development in mine-affected areas, building codes or health ordinances that will require remediation of soils exceeding the risk-based cleanup standards in new residential construction, and deed restrictions on excavated yard soil repository sites to protect them from human disturbance. The ICs are being considered and developed through a cooperative effort between the EPA, Jasper County and the city of Joplin, Missouri. However, to date, the implementing ordinances have not been enacted. Thus, the preferred alternative for OU-1

incorporates the ICs that were required under OU-2/3 and allows the County and cities greater flexibility in adopting such ICs in light of the more permanent and reliable proposed action in this ROD (i.e., disposal and containment of the source materials).

The selected alternative for OU-1 includes a site-wide building ordinance that would be enacted by Jasper County, similar to the health ordinance prescribed in the OU-2/3 ROD. The EPA has discussed this IC with Jasper County. The County would propose a building ordinance for all undeveloped areas within the Site that requires the builders of residential homes to obtain a permit for construction. Conditions of the permit would require soil testing to determine the lead concentration of the soil in the yard area of the home. The EPA will work with the County to develop appropriate sampling procedures to ensure the reliability of the results. An occupancy permit will only be granted by the County if soil lead concentrations are below 400 ppm and cadmium concentrations are below 40 ppm. Builders will be required to properly clean up soils exceeding these levels prior to receiving the occupancy permit. The EPA will provide funding to Jasper County to establish and implement the building permit ordinance. After the completion of the OU-1 cleanup, the surficial source materials (mine and milling wastes) will be contained in the subsidence pits. Thus, the building ordinance controlling residential development will no longer be required. The selected alternative does not require but tolerates a planned termination date for the County's building ordinance if the County prefers that the ordinance only be effective for a limited term. For example, the ordinance could terminate upon completion of the remedial action.

The selected alternative prescribes disposal of mine and mill wastes in mine subsidence pits followed by capping of the wastes. Some waste areas may be contained and capped in place with soils or biosolids. All capped areas and biosolids-treated areas will require ICs to prevent disturbance of the cap, thereby protecting the wastes. These ICs will likely consist of restrictions or easements placed on the property deeds for the areas where the disposal or containment occurs. The restriction will prevent the development on and disturbance of the caps placed over the wastes. Restrictive covenants may be entered into with owners of the disposal property for protection of the disposal and capped areas.

This ROD excludes chat recycling as a component of the selected alternative. The effective and more permanent engineering control components of the selected alternative eliminate the need for legal agreements to control recycling. Reducing risks to human health and the environment from chat recycling through legal agreements with individual owners/operators is administratively infeasible because of the large size of this Site, about 5,000 acres of mine waste piles and 500 owner/operators, and the far-reaching impact of such agreements (i.e., end uses, accumulation, speculation, storage, surface water protection and final closure). Moreover, the legal agreements would duplicate ARARs under the Clean Water Act (CWA) that regulate discharge of pollutants and contaminants into surface waters. If enforcement actions are needed to control surface water pollution from mine waste piles prior to completion of the engineering components selected in this ROD, the CWA may be used on a case-by-case basis to regulate surface water pollution caused by chat recycling.

Health Education

The ROD for OU-2/3 required the implementation of a health education program in Jasper County to supplement the residential soil cleanup. The EPA has been funding the Jasper County Health Department to implement that health education program since 1996. Since human health exposure risks due to direct contact with source materials containing the metals contaminations are possible until completion of the mine and mill waste cleanup described in this ROD Amendment, the EPA will continue to fund the health education program until the cleanup of OU-1 is complete. When the cleanup action is completed for OU-1, and at the completion of additional actions anticipated under OU-2/3 (which essentially means that Superfund Site sources for human exposure have been addressed), the health education program will no longer be funded by the EPA.

Stream Monitoring

One of the primary RAOs for the selected alternative for surface water is to reduce the exposure of aquatic organisms in the Class P streams to COCs where federal aquatic life criteria (ALC) are exceeded. The EPA believes the actions taken under the preferred alternative will reduce concentrations of metals in the Class P stream to less than federal ALC based on hardness. These actions include removal of all source material with erosion potential to the streams, tributary sediments and all sediment delta deposits above the low water line at the mouths of the tributaries' draining source areas into the Class P streams. During the remedial action for OU-1, the EPA will establish a water quality monitoring program for the Class P streams to assess the effectiveness of the remedial action on reducing metals loads. The EPA will collect monitoring data which will be used during the five-year review process, and will be collected and assessed at each review until the metals concentrations are in compliance with the federal ALC. Should the goal of achieving the federal ALC fail to be achieved within two five-year review periods (10 years) after completion of the remedial action, or if water quality standards established by states or tribes for downstream receiving surface waters show no improvement within this 10-year period, the EPA will assess the feasibility and practicality of conducting additional actions at the Site to further reduce the metals concentrations in the Class P streams. Should additional actions be required, the work may be conducted under an amendment to this ROD for OU-1, or if warranted by an extensive, basin-wide action, a new operable unit for sediment removal may be established to address the Class P streams at the Site.

Operation and Maintenance

An operation and maintenance (O&M) program will be established to maintain the caps on the disposal areas and to maintain other engineering components of the preferred alternative (e.g., areas of biosolids or soil application where wastes were left in place, groundwater monitoring and revegetated areas). The State will be responsible for the O&M beginning one year after the completion of the remedial action. If the local government enforces the ICs, the State remains responsible for O&M of such local government controls.

The State's O&M responsibilities will include a monitoring program to assess the effectiveness of the ICs. The monitoring program will provide annual reports to the EPA detailing the

development in areas of concern to protect engineering components. Monitoring requirements will be assessed during the five-year review process and may be modified or reduced, as appropriate, based on data collected as part of the reviews.

4.0 Basis for Revisions to the Selected Remedy

The following subsections discuss the changes to the 2004 ROD.

4.1 On-site Volume of Mining Wastes and Open Pit Space

The EPA began the remedial design for OU-1 cleanup in 2006 and the remedial action in 2007. During the design phase, two issues became apparent that are the basis for revising the 2004 selected remedy. First, the EPA determined during design activities that a significantly larger volume of mining waste is located on-site compared to the estimate in the 2004 ROD. Second, the EPA determined that on-site open pit space is insufficient for disposal and containment of all mining wastes located at the Site. These issues form the basis for two changes to the 2004 Selected Remedy: (1) because of the large increase in on-site mining wastes volume, open pit space for disposal is insufficient and no longer available; and (2) aboveground repositories are necessary for disposal and containment of a substantial volume of mining wastes.

4.2 Disposal in Open Pits Waiting Period

The 2004 Selected Remedy included a provision to prevent damage to the cover systems of mining wastes disposed of in on-site open pits. Due to consolidation and differential settling of the wastes after disposal in the pits, adequate time was to be allowed for wastes to consolidate in the subsidence pits prior to installing cover systems. During the last five years of construction activities, the EPA has determined that wastes disposed of in open pits have not shown any signs of settlement. Thus, a change to the 2004 Selected Remedy is necessary to remove the waiting period required before capping.

4.3 Biosolids Unavailable for Use as Soil Amendments

The 2004 ROD stated that the EPA would apply biosolids to excavated areas to add organic matter to the soil to improve growing conditions. However, the EPA has determined that sources of appropriate biosolids for use as soil amendments after excavation are not available near the Site.

4.4 Sediment Action Level Studies Complete

The 2004 ROD established numeric action levels for cleanup of the tributary sediments and delta deposits of 2 ppm cadmium, 70 ppm lead and 250 ppm zinc. As part of the OU-5 remedial investigation, the EPA contracted with the U.S. Geological Survey (USGS) to conduct a site-specific risk assessment for sediments in the perennial streams on the Site. This risk assessment developed site-specific toxicity values that are significantly higher than those specified in the 2004 ROD.

Each of these issues is discussed in detail in the following section, along with the proposed change to the 2004 ROD.

5.0 Description of Remedy Changes

The following subsections discuss in detail the changes to the OU-1 remedy.

5.1 Volume and Cost

Based on the OU-1 Feasibility Study prepared by the RPs in 1995, the 2004 ROD estimated that approximately 7.1 million cubic yards of contaminated source material exists on the Site on approximately 5,000 acres of land. The cost of the OU-1 selected remedy was \$58,543,000 as calculated from detailed cost estimates in the Feasibility Study. During the remedial design activities, the EPA obtained new information and now estimates that there are approximately 14 million cubic yards of contaminated source materials on the Site covering nearly 11,000 acres. In addition, the cost of various remedial action engineering components has increased significantly from the ROD estimates. The selected remedy was estimated to cost approximately \$8 per cubic yard for source materials remediation in 2004. Due to the additional acreage of mining wastes, fewer subsidence pits and additional repositories, the EPA now estimates costs of approximately \$12 per cubic yard. Based on known volumes and acreage, this will result in an estimated cost of approximately \$168 million not including the costs incurred by the responsible parties to remediate the areas of their responsibilities under the consent decree.

5.2 Construction of Repositories

Given the larger volume of waste now known to exist at the Site, sufficient pit space for subaqueous disposal of all on-site wastes is not available. The EPA is making use of all available pit space for disposal; however, aboveground repositories are required to be constructed in some areas of the Site where pits are small or do not exist. Through the design process, the EPA is continuing to develop innovative approaches for disposal locations that can be used for future redevelopment of the mined areas consistent with local land use plans. These include construction of repositories in road right-of-ways that are later paved by municipalities and turned into city streets; filling of an abandoned wastewater treatment lagoon that will become a new sports complex; and expanding the size of a pit-filled area to incorporate surrounding land allowing for the development of a new 40-acre commercial development site. Future repository sites will be designed with redevelopment of the area as the focus. The criteria for siting new aboveground repositories will be in compliance with the criteria presented in the 2004 ROD. Flooded pits that contain high-quality habitat for fish and wildlife with low concentrations of metals in the water will not be used for disposal because they do not present a risk to human health or the environment. In addition, pits located in close proximity to water supply wells or flowing streams where the pit may be hydraulically connected to the stream will not be utilized for disposal.

Long-term operation and maintenance (O&M) of the repository caps after completion of the remedial action would be more costly than estimated in the OU-1 ROD due to the increase in the number of aboveground repositories. The EPA estimates long-term annual O&M costs would be \$100,000.

During the remediation of residential yard soils under the OU-2 and OU-3 ROD, the EPA established a repository south of Carterville and west of Prosperity on 17th Street. This location

was used for disposal of all yard soil wastes from the remedial action. In addition, the repository has remained open and is available for use by local builders and developers for disposal of contaminated soil during the development of new residential properties, provided they comply with the Jasper County and city of Joplin's remediation ordinances. The requirement for a long-term, open repository is specified in the OU-2 and OU-3 ROD and is part of the ongoing ICs under that ROD. However, this repository is nearly filled to capacity and a new location is now required for ongoing residential soil disposal.

The EPA has identified the Beville-Chemical Plant Designated Area of the Site as the location for the new residential soil disposal repository. The specific property for the repository is located west of Malang Road and north of 7th Street on the Kansas state line. This property was formerly owned and operated by Farmland Industries (FI), which filed and completed federal bankruptcy reorganization. The property contains a large pile of waste gypsum (nearly 60 acres, known as the Gypstack). The gypsum waste was generated by FI during production of phosphoric acid at the plant located adjacent to the waste pile. Prior to FI operations, mining wastes were disposed of on this property, and subsequently FI disposed of its waste gypsum on top of the mining wastes. The waste gypsum contains high levels of phosphorous and nitrogen and low levels of radon. The mining wastes contain the COCs for this Site (lead, cadmium and zinc). Leachate from the waste gypsum exacerbates the release of heavy metals from the mining wastes into the environment. As described in the RI Report, Short Creek, downgradient of the FI property, is contaminated from the release of these COCs.

The Gypstack requires remediation. MDNR has undertaken oversight of certain activities for the Gypstack in accordance with its bankruptcy settlement with FI. For example, MDNR issued a Clean Water Act, National Pollutant Discharge Elimination System (NPDES) permit for operations at the Gypstack in 2008, NPDES Permit # MO-00533627. The permit is for zero discharge and requires collection and recirculation of leachate to a small pond on top of the Gypstack. In accordance with the OU-1 ROD, the remedial action for the Gypstack must be in accordance with the engineering control components for the OU-1 selected remedial action for capping of repositories (see section 3.2 above, Engineering Controls, Selection and Capping of Pits). This will include a geocomposite engineered cap with long-term O&M.

The EPA will use the Gypstack as a repository for mining wastes due to the lack of available subsidence pit open space in the Beville-Chemical DA. In addition, the Gypstack, due to its large size, is an appropriate location for the new long-term repository for disposal of contaminated residential yard soil, which will be addressed under this OU-1 ROD Amendment in accordance with Attachment 1, the Jasper County Health Ordinance. Mining wastes and contaminated yard soils would be placed on top of the Gypstack, raising its top elevation by up to 30 feet. Surface water and storm water runoff controls would be established during operations at the repository in accordance with ARARs. Capping of the Gypstack, mining wastes and contaminated yard soils will include a geocomposite engineered cover layer, which will be completed as the top of the Gypstack reaches maximum design elevation. Final closure of the Gypstack will be in accordance with ARARs.

The 2004 ROD specified that, to prevent damage to the cover systems due to consolidation and differential settling of the wastes placed in the pits, adequate time would be allowed for the mill wastes to consolidate in the subsidence pits prior to attempting to install the cover systems. During the construction activities conducted over the last five years, the EPA has monitored the

settlement of filled pits and has determined that wastes, even in subsidence pits over 100 feet deep, have not shown any settlement after being placed. Therefore, the requirement of allowing time (six to twelve months) for the wastes to consolidate in the subsidence pits prior to installing the cover systems is no longer required.

5.3 Use of Biosolids and Deep Tilling

The 2004 ROD specified incorporating biosolids into the excavated areas to supplement the soil's organic matter content and facilitate revegetation. Biosolids were also anticipated to provide some treatment to any residual metals remaining below the cleanup levels and not excavated during cleanup action. However, the EPA has been unable to locate local sources of appropriate biosolids for use on the Site. The sources located within a reasonable distance from the Site for economical hauling are either not of sufficient volume to accomplish the purpose, or they contain excessively high concentrations of zinc that prohibit their use on the Site. Further, all biosolids sources located near the Site are not composted, and, if placed on the Site, would create an extreme odor problem that would be unacceptable to surrounding residents. Therefore, the EPA is eliminating the requirement of using biosolids on the Site for soil amendment.

During the early phases of the remedial actions at OU-1, the EPA conducted a pilot study on deep tilling to assess the effectiveness of reducing metals contamination in thin deposits of upland source areas and transition soils and the associated costs with tilling methods. Upon completion of the study, deep tilling was determined to be ineffective at adequately reducing metals concentration within a reasonably low cost. A summary of this pilot study dated August 2013 is available in the Administrative Record. The rocky nature of the soil prevented adequate mixing of the soil and increased costs beyond that of normal excavation costs. Thus, the EPA has determined that instead of deep tilling, upland vegetative chat and transition soils will be excavated and removed along with the mine waste piles.

5.4 Sediment Cleanup Levels

The 2004 ROD established numeric action levels for cleanup of the tributary sediments and delta deposits of 2 ppm cadmium, 70 ppm lead and 250 ppm zinc. These concentrations were derived from the average concentration of background-designated soil values on the Site, along with the EPA's screening values for sediments in the consensus-based threshold effects criteria (TEC) for freshwater. The EPA began conducting investigation of the site streams and sediments throughout the Tri-State Mining District, including Kansas and Oklahoma, in 2006. As part of those studies, the EPA partnered with the U.S. Geological Survey (USGS) to conduct a district-wide ecological risk assessment and to establish site-specific sediment cleanup criteria. See the Development and Evaluation of Sediment and Pore-Water Toxicity Thresholds to Support Sediment Quality Assessments in the Tri-State Mining District (TSMD), Missouri, Oklahoma, and Kansas dated August 2008 in the Administrative Record. As a result, USGS developed toxicity values at which 10 percent of the organisms living in the streams would potentially show adverse effects (T₁₀), and at which 20 percent of the organisms living in the streams would potentially show adverse effects (T₂₀). The EPA is adopting the T₂₀ toxic effect value as the cleanup criteria for sediments in the intermittent tributaries at the Site. These values are protective for 80 percent of the aquatic organisms as shown in said USGS/EPA district-wide study.

5.5 Expedited Debris Removal Area

On May 22, 2011, an EF5 tornado struck the southern portion of the city of Joplin, Missouri, destroying approximately 7,000 homes and 3,000 businesses in an area where historic mining was conducted. A large portion of the area is underlain with mining wastes, and the tornado's path intersected a portion of the Iron Gates and Iron Gates Extension designated areas. This area has been designated the expedited debris removal (EDR) area by the city of Joplin, and is shown on the attached Figure 2.

Prior to the EF5 tornado, the EPA conducted soil sampling in the EDR area during implementation of OU-2 and OU-3, Smelter Affected and Mine Waste Affected Residential Yard Cleanups. All of the earlier sampling events in the EDR area at properties not addressed by the OU-2 or OU-3 actions did not find levels of lead or cadmium that required cleanup. After the removal of destroyed homes, structures and other tornado debris, significant quantities of mining wastes and contaminated soil have been found at the surface in residential neighborhoods.

The mining wastes and contaminated soil were discovered as a result of residential soils sampling conducted under an institutional control program and county ordinance developed by Jasper County to guide future development in mine waste areas. A copy of the ordinance is attached (see Attachment 2). The ordinance was developed under the 2004 ROD for OU-1 and requires sampling properties for lead prior to development of residential structures. It also prescribes the approach required to eliminate the unacceptable exposures to mining wastes and contaminated soils. The EPA has determined that the ordinance incorporates information and procedures from the Superfund Lead-Contaminated Residential Sites Handbook (OSWER 9285.7-50 August 2003). Therefore, the EPA is now including the Jasper County ordinance as the selected remedial action for cleanup of residential yard areas in the EDR area.

As described above, the OU-2 and OU-3 ROD for this Site also addressed cleanup of smelter, mining wastes and contaminated soil in residential yards. Those selected remedial actions are complete and remain protective as described in the five-year review reports, which are available in the Administrative Record. The EPA notes that the ROD for OU-2 and OU-3 will not be affected by this OU-1 ROD Amendment.

The EPA is reiterating with this ROD Amendment that OU-1 cleanup action levels for surface mining wastes are appropriate for protection of human health at the Site. The EPA has determined that the OU-1 cleanup action levels are also appropriate in the EDR area. In addition, the EPA is establishing that residential soils cleanup actions at the EDR area will differ from the selected remedial actions for OU-1 mine and mill waste cleanup. The cleanup in the EDR will be implemented on a property-by-property basis as decisions are made to reestablish residential uses for the parcels impacted by the tornado and in accordance with the county ordinance. Contaminated soils removed from residential properties in the EDR area will be disposed of at the Gypstack in the Belleville-Chemical DA.

6.0 Summary of Proposed Remedy Changes

6.1 Costs

Due to the known increases in volume of wastes, number of aboveground repositories and excavation costs since the 2004 ROD was prepared, the costs for remediating the wastes is now estimated to be \$168 million. In addition, the costs will increase by \$20 million due to the remediation of mine wastes and associated soils in the EDR DA. Thus, the ROD Amendment estimates the total costs for EPA for OU-1 remediation to be \$188 million. Long-term O&M is estimated to be approximately \$100,000 annually.

6.2 Aboveground Repositories

The EPA has determined that due to the increase in waste volumes and acreage identified at the Site, sufficient subsidence pit space to perform subaqueous disposal is not available. Waste will be disposed of in aboveground repositories in those areas where sufficient subsidence pit space is unavailable. In addition, the EPA has determined that the six to twelve month settlement time prior to installing caps over wastes placed in subsidence pits is not required.

The EPA has determined that the existing long-term, residential-yard contaminated soil repository has reached its full capacity. This repository was established during OU-2 and OU-3 response actions. Under OU-1, this repository was to remain open for use during implementation in accordance with local governmental controls established by the city of Joplin and Jasper County's ordinances. However, due to the need for additional capacity, it will be closed and a new long-term repository will be established located at the FI property west of Malang Road and north of 7th Street on the Missouri/Kansas state boundary. The EPA has determined that the Gypstack located within the Beville-Chemical Plant DA of the Site is an appropriate location for long-term disposal of mining wastes and contaminated residential soils from the EDR area and for other areas of new residential development provided such developments are permitted in accordance with the city of Joplin and Jasper County's environmental ordinances for residential construction.

6.3 Biosolids and Deep Tilling Eliminated

The EPA has determined that appropriate biosolids are not available for use in amending soils for organic content. Additionally, pilot studies on deep tilling showed that tilling and mixing of soils to reduce metals concentrations below action levels were ineffective. The use of biosolids and deep tilling at the Site has been eliminated from the remedy. Because biosolids and deep tilling are impractical and ineffective, upland source materials will be excavated, removed and disposed of with the other mining wastes in subsidence pits or aboveground repositories and excavated areas will be recontoured, regraded and seeded.

6.4 Sediment Cleanup Action Level Established

The EPA, in conjunction with USGS, has conducted site-specific toxicity studies for sediments at the Site and is now selecting the tributary sediment cleanup values of 219 ppm lead; 2,949 ppm zinc; and 17 ppm cadmium.

6.5 EDR Area

The EPA is including the EDR area in the OU-1 selected remedial action, which includes the mining wastes located in residential areas of the site exposed after the Joplin EF5 tornado in May 2011. Cleanup of the residential yards within the EDR area will be in accordance with the methodologies established under the Jasper County ordinance.

None of these proposed changes alter or affect the RAO presented in the 2004 OU-1 ROD, or change how the remedy meets the statutory requirements discussed in the following section. See the attached Table1 for a summary of the changes to the remedy comparing the 2004 ROD with the ROD Amendment.

7.0 Statutory Determination

Remedy changes outlined in this ROD Amendment will continue to meet the statutory requirements of CERCLA section 121, 42 U.S.C. § 9621 and the NCP. The remedy changes are protective of human health and the environment, comply with ARARs, are cost effective and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. The following sections discuss how the changes to the remedy described in this ROD Amendment meet these statutory requirements.

7.1 Protection of Human Health and the Environment

The changes will continue to protect human health and the environment by achieving the RAO through a combination of engineering measures and ICs. Existing terrestrial and aquatic risks from exposure to metals contaminated source materials will be mitigated by continued removal and disposal of the source materials in mine subsidence pits or aboveground repositories. The new selected action levels for sediment cleanup are protective of aquatic life as shown in on-site studies conducted by USGS. Future risks to human health will be reduced by source removal to include the EDR area that will be remediated at OU-1 cleanup action levels consistent with the Jasper County ordinance. Continued implementation of ICs will ensure proper construction and permitting of new residential dwellings in contaminated areas. Construction of the new residential soil repository will ensure that residential development will be consistent with these established ICs for the duration of the remedial action.

The use of biosolids and deep tilling were specified in the 2004 ROD for addressing upland vegetated chat and transition zone soil for protection of human health and the environment. Instead, these source materials will be excavated and removed to repositories within the Site. This change in the remedial action is a more protective engineering control than stabilization in place with biosolids and deep tilling because wastes will be contained in repositories with land use controls. In addition, eliminating the use of biosolids as soil amendments does not compromise the protectiveness of the remedy. Instead, the excavation, recontouring, regrading and vegetation are sufficient and more acceptable to the local community due to the extreme odor expected from uncomposted biosolids.

7.2 Compliance with ARARs

Compliance with ARARs is a requirement of the selected remedy unless waiver of an ARAR is justified. The remedy changes are expected to continue to comply with all ARARs identified in the 2004 ROD.

7.3 Long- and Short-term Effectiveness

There are no long-term, adverse, cross-media impacts expected from the remedy changes. In addition, there are no short-term threats associated with implementation of the remedy changes that cannot be readily controlled. The potential short-term risks associated with settlement of mining waste disposed of in subsidence pits prior to installing permanent repository caps no longer requires a waiting period. During remedial design/remedial action (RD/RA) implementation, the EPA has demonstrated that potential short-term risk due to settlement of the wastes is nonexistent.

7.4 Preference for Treatment as a Principal Element

The changes represent the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner for this remedial action. Disposal of the wastes in subsidence pits and aboveground repositories followed by capping is a permanent solution for addressing the wastes to the maximum extent practicable.

The EPA has not been able to verify the potential for treatment of the mining waste by deep tilling and application of biosolids during RD/RA because of the lack of available biosolids and practical difficulty with deep tilling. In addition, containment in repositories or subsidence pits of upland sources of mining wastes rather than deep tilling and biosolids meets the regulatory preference for more permanent remedies because of the land use controls associated with the capped areas.

7.5 Implementability

All of the changes are fully implementable. None of the changes detract from the implementability of the remedy. However, by eliminating biosolids and deep tilling, the remedy may be more implementable. The EPA will not use biosolids in excavated areas because of the severe odor problems, which could be extremely unacceptable to the local community. By not using deep tilling equipment, the remedy is more implementable because such equipment is prone to malfunction in the rocky, clay soils found at the Site. Instead, the EPA will continue recontouring, regrading and seeding excavated areas which are functioning well and are fully implementable.

7.6 Cost Effectiveness

The changes are cost effective, including the additional costs associated with the increase in volume and acreage of wastes, the increased number of aboveground repositories, plus the added cost for addressing contaminated residential properties in the EDR area. The cost of remediating mining wastes has increased to \$12 per cubic yard, which is only a \$4 increase from the 2004 cost estimate of \$8 even though the volume has doubled from 7 to 14 million cubic yards and the

acreage more than doubled from 5,000 to 11,000 acres. The changes provide overall effectiveness proportionate to the per-unit cost increase. The changes will continue to achieve the remedial action objectives and cost effectively reduce unacceptable risks to human health and the environment. The new estimated cost for the Site for the EPA's portion of the remedy is estimated at \$188 million, plus an estimated \$100,000 annually for O&M.

8.0 State Concurrence

The EPA has consulted with MDNR on the changes in the remedy in this ROD Amendment. MDNR agrees and concurs with the proposed changes.

9.0 Public Participation

The EPA issued the Proposed Plan for the ROD Amendment for OU-1 on August 7, 2013, and provided a 30-day review and comment period which closed on September 6, 2013. A public meeting to present the proposed plan and receive comments was held on August 15, 2013, at the Phelps Theater located in the Billingsly Student Center of Missouri Southern State University, 3950 East Newman Road, Joplin, Missouri 64801. The EPA did not receive any comments to the proposed amendment that resulted in any changes to this ROD. The significant comments received from the public are included with this ROD Amendment as Attachment 3. A copy of the transcript from the public meeting and all written comments received during the comment period can be found in the Administrative Record.

Table 1. Comparison of OU-1 ROD with changes to the remedy in Proposed ROD Amendment

REMEDIAL ACTION COMPONENT	OU-1 RECORD OF DECISION 2004, SELECTED REMEDIAL ACTIONS	OU-1 RECORD OF DECISION AMENDMENT 2013, PROPOSED CHANGES
Aboveground waste repositories	<p>Selected Remedy – use aboveground repositories only when nearby pit space unavailable; expectation is that will be rare occasion (public comment)</p> <p>Alternatives 5(a) and 5(b) in FS considered aboveground waste repositories</p>	<p>Use Alternative 5(a) criteria for design of numerous aboveground repositories</p> <p>New long-term repository location selected at the Gypstack in the Beville-Chemical DA</p>
Biosolids and deep tilling	<p>Selected Remedy – use biosolids and deep tilling for footprint of waste piles after excavation</p> <p>Upland source materials – deep tilling and biosolids are sole remedy (no excavation/no removal)</p>	<p>No biosolids and no deep tilling anywhere on the Site</p> <p>Excavation and removal now includes all upland source material areas</p>
Sediment cleanup action levels	Alternative 4 – use EPA national screening values and site background concentrations for action levels in sediments	Use new site-specific sediment cleanup action levels developed by USGS/EPA
Gypsum Waste Pile	Alternative 4 – cap in place	New repository for short- and long-term residential soils excavation (replace OU-2 repository)
Site map and DAs	Cleanup of mining wastes within the Designated Areas	Cleanup of mining wastes in DA and the EDR area as shown in the attached Fig. 1.
Cleanup of mining wastes in EDR area	<p>Mining waste cleanup action levels – Excavate, place barriers as needed, dispose of wastes in new residential soil repository, clean fill to restore grade, issue building permit (IC)</p>	The EDR cleanup will be in accordance with the Jasper County ordinance (attached). Identifies EDR area where this remedial action component is available within the Site

Figure 1. Map of Designated Areas

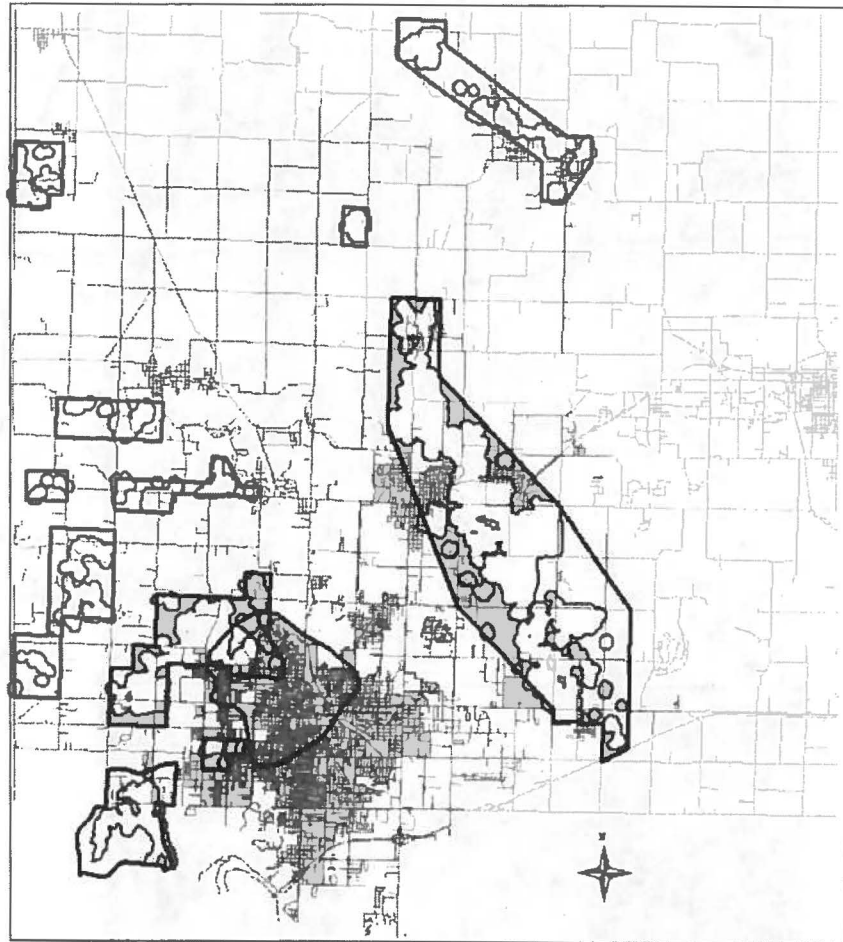
Jasper County

Mine Waste Areas and Smelter Zone

Mine Waste
Designated Area

Mine Waste

Smelter Zone



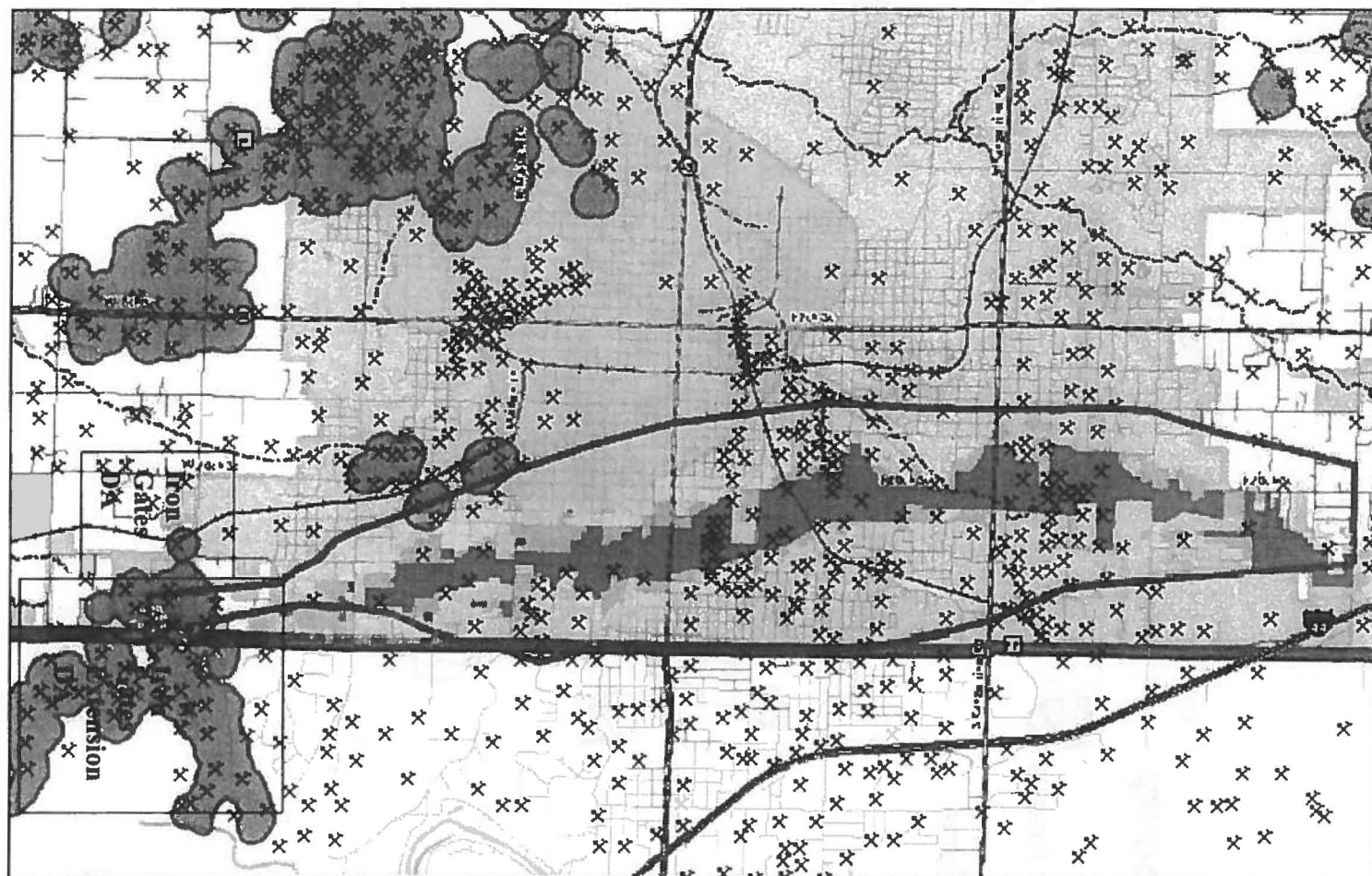


Figure 2. Location of the EDR



43 1-23 7-101 3
9-10-2008 10:10:10

Date: 8/4/2011

Time: 11:26:03 AM

Path: C:\9 rophox\gis\mines_mine_waste.mxd

NGA Assessment - May 31, 2011

CATASTROPHIC
EXTENSIVE
MODERATE
LIMITED

Inventory of Mines Occurrences Prospects

Tomado_Path
Mine Waste Area
Smelter



1 inch = 0.8 miles



Public Health
PREVENT. PROMOTE. PROTECT.

ATTACHMENT 1
Jasper County Health Ordinance

ENVIRONMENTAL CONTAMINATION ORDINANCE

**AN ORDINANCE ESTABLISHING PUBLIC HEALTH PROTECTION RELATED TO
LEAD, CADMIUM, TRICHLORO-ETHYLENE AND OTHER IDENTIFIED CONTAMINANTS**

SECTION 1. PURPOSE. The purpose of this ordinance is to provide for regulation of use, and mandatory testing of soil on designated properties located within the County. Certain Regulated Contaminants, as herein defined, have been identified in soil and in groundwater on both residential and commercial properties within the County. Most, if not all of these residential properties known to have been contaminated have been remediated to site-specific standards. Very few commercial properties have been remediated. New residential construction continues in areas of possible contamination. Regulated Contaminants pose a real threat to the health and well-being of individuals who are exposed to soil and water having elevated levels of the contaminants. In particular, children are at risk from long-term exposure to such Regulated Contaminants causing brain dysfunction and possible death. The County has identified certain areas where the Regulated Contaminants exceed allowable levels in residential yard soil or in groundwater. Such areas have been identified by the U.S. Environmental Protection Agency (EPA) and Missouri Department of Natural Resources (MDNR). This statute is intended to protect the general health of citizens, particularly children, from unnecessary exposure to contamination.

SECTION II. AUTHORITY. This ordinance is enacted pursuant to Section 192.300, R.S.Mo., and is not in conflict with any rules or regulations authorized by the State Department of Health & Senior Services.

SECTION III. ADOPTION OF RULES AND AMENDMENTS. The Jasper County Health Department shall promulgate rules to require testing of soil and groundwater in private wells, which can be more restrictive than state guidelines per R.S.Mo. § 192.290.

SECTION IV. APPLICABILITY. For the purposes of well testing requirements these regulations apply to all real property in the County. For soil testing requirements these regulations apply to the Superfund designated areas that generally include properties from Kansas State Line on the West to County Road 170 on the East and Newton County Line on the South to Highway M on the North. For soil testing, areas within these boundaries that are known to be non-contaminated will be exempted from the requirements of this ordinance. These areas will be designated using existing EPA and MDNR testing data and supplemented with local testing data. These areas will be reviewed annually as EPA/MDNR continue cleanup in the county. Maps depicting these potential contamination areas will be publicly available and updated annually.

Applicability of this ordinance will cease 6 months after completion by the EPA of Operable Unit 1 remediation project, which includes remediation of all lead mining and milling wastes and soil that exceed concentrations constituting a risk to residents.

SECTION V. DEFINITIONS. The following words and phrases used within this Ordinance have the following meanings:

- 5.01 Department: The County Health Department.
- 5.02 Commission: The County Commission.
- 5.03 County: Jasper, County, Missouri, a first class county.
- 5.04 The Health Officer: The Administrator of the County Health Department or an authorized representative.
- 5.05 Contaminated Soil: Soil having concentrations of Regulated Contaminants which exceed allowable levels established by the EPA, MDNR, or the State or County Department of Health.
- 5.06 Person: An individual, corporation or other legal entity.
- 5.07 Stop Order: A written order issued by the County Health Officer, or a designated representative, to stop all construction, installation, modification or occupation of any dwelling, child occupied facility or recreation area in areas of known contamination if in violation of this ordinance.
- 5.08 Required Soil Testing: Soil tests which conform to the requirements of the EPA and MDNR for the presence of Regulated Contaminants.
- 5.09 Required Water Well Testing: Water quality tests which conform to the requirements of the EPA and MDNR for water quality testing for Regulated Contaminants.
- 5.10 Regulated Contaminants: Those contaminants in the soil or water well which are regulated by federal, state or local laws and those contaminants which the EPA or MDNR finds may be hazardous to public health. Contaminants shall specifically include: Lead, Cadmium, Arsenic, Trichloroethylene ("TCE"), and any other heavy metal, organic solvent which is known to be, or suspected to be, present in County soils or water wells and which may cause harm to human health and well-being.
- 5.11 Qualified Testing Lab: Any testing facility which has been approved by the County, the EPA or MDNR as qualified to test for the Regulated Contaminants.
- 5.12 Soil Barriers: Any artificial or man-made structure, marker or indicator which has been placed in the soil for the purpose of notifying a Person of the presence of Regulated Contaminants.
- 5.13 Water Well: Any Domestic Well, High Yield Well or Multiple Family Well, as defined at 10 CSR 23-1.030, or converted Test Wells authorized under 10 CSR 23-6.020. Water Wells do not include public drinking water systems, or private lines accessing public drinking water systems which are regulated pursuant to 10 CRS 60-1.010.
- 5.14 Dwelling: either:
 - (a) A dwelling, including attached structures such as porches and stoops; or
 - (b) A dwelling unit in a structure that contains more than one separate residential dwelling unit and in which each such unit is used or occupied or intended to be used or occupied, in whole or in part, as the home or residence of one or more persons.
- 5.15 Child Occupied Facility: A building or portion thereof visited regularly by the same child who is six or fewer years of age including, but not limited to, day care centers, preschools and kindergarten classrooms. For the purposes of this subdivision, "visited regularly" means a minimum of two visits on different days within any week, provided that each visit lasts at least three hours and the combined weekly visits last at least six hours and the combined annual visits last at least sixty hours.

- 5.16 Recreational Area: Areas such as parks or ball fields where children are likely to congregate. This includes the portions of commercial or industrial properties that offer recreation areas where children are likely to congregate.

SECTION VI. PROHIBITIONS. No person shall:

- 6.01 Construct a dwelling or dwelling unit or other child occupied facility or recreational area as defined in this ordinance without first determining whether the property upon which the activity is to occur is property which has previously been identified as having soil contamination or which has been partially remediated for any Regulated Soil Contaminant.
- 6.02 Remove soil/mining waste from any contaminated mining site or chat pile for use in violation of EPA/MDNR standards for use as identified in EPA Mine Waste Fact Sheet dated February 2003 and other relevant documents.
- 6.03 Sell, assign, give or otherwise transfer real property without providing written notice to the buyer, assignee or transferee of the presence and concentration of Regulated Contaminants in the soil or groundwater if testing has occurred.
- 6.04 Sell, assign, give or otherwise transfer real property with a water well as defined herein without first conducting Required Testing for groundwater, and providing written results from a qualified testing lab to the Department and to the buyer, assignee or the transferee.
- 6.05 Falsify, tamper with, alter, purify or cause any activity to occur which will materially affect test samples nor falsify, tamper with or alter soil or water test results.
- 6.06 Knowingly withhold any information from the Department regarding soil or water test sampling or test results.
- 6.07 Inhabit a new structure before properly abating all identified soil hazards in accordance with EPA standards as identified in EPA document Superfund Lead Contaminated Residential Sites Handbook, August 2003, Directive # OSWER 9285.7-50 and summarized in Attachment A of this ordinance.

SECTION VII. PERMITS.

- 7.01 Building Permit: any person wishing to establish a dwelling, child occupied facility or recreation area on property within Jasper County shall apply to the County for a Building Permit except for property within political jurisdictions which issue building permits with the minimum requirements of all State and County requirements for the issuing of building permits. A permit will be issued when all county offices which govern property use have approved the permit application.
- 7.02 The Department shall provide to the applicant the information necessary to perform Required Testing of the soil and/or water prior to disturbance, including the contaminants for which testing is required, a detailed description of the method of acquiring and shipping soil samples, a list of approved Testing Labs, information pertaining to the possible human health hazards of Regulated Contaminants in soil or water. Additionally, requirements for remediation of contaminated soils in accordance with EPA guidelines will be provided by the County.

SECTION VIII. POWERS AND AUTHORITY OF INSPECTORS, AND INSPECTION PROVISIONS.

- 8.01 The Department reserves the right to establish and modify inspection procedures and standards for construction as necessary due to changes in Missouri statutes, rules, regulations best practices, manufacturers' recommendations and precedence.
- 8.02 The Department, Health Officer or a representative of the Health Officer shall be permitted to enter all properties for the purposes of inspection, observation, measurement, sampling and testing in accordance with the provisions of this ordinance. This shall include facilities permitted by another government entity. The Department has the right to enter property at any reasonable time if there is the suspicion of a violation of this ordinance.
- 8.03 Any person conducting, or having conducted on their behalf, any Required Testing as defined in this ordinance shall provide the test results to the Department of Health within five (5) days of receiving the test results. If the Department of Health reasonably determines that a health hazard exists, based on the provided test results, the Department shall have the right to conduct additional testing. Further, the Department shall have the responsibility as required by law to provide to the public any soil or water test results in their possession upon request.

SECTION IX. ENFORCEMENT

- 9.01 Any person found to be violating any provision of this ordinance in allowing the violation on their property shall be served by the Department with a written notice and/or Stop Order, stating the nature of the violation and providing a reasonable time limit for the satisfactory correction thereof. The offender shall, within the period of time stated in such notice, permanently cease all violation.
- 9.02 If violations of this ordinance continues the Department may require closure of any property which the Department believes may present a health hazard until such time as Required Testing may be performed to determine the presence of Regulated Contaminants. The Department may suspend or revoke any permits, including building permits, issued to any person violating this Ordinance until such time that the person complies with the Ordinance. All violations must be corrected before a permit can be issued or reinstated.
- 9.03 Any person who continues any violation beyond the time limit provided for in Section 9.01 may be charged with a class A misdemeanor and upon conviction thereof shall be fined as otherwise provided by law. Each day in which any violation continues shall be deemed a separate offense.
- 9.04 Any person violating any of the provisions of this ordinance or allowing violation(s) on their property shall be liable to the County for expenses, loss or damage incurred by reason such violation.

SECTION X. APPEALS.

- 10.01 Any person aggrieved by any decision of the County Health Officer or Department may appeal to the Appeals Board by filing a written application with the County Health

Officer within thirty (30) days after being notified of the decision which is the subject of the appeal.

- 10.02 The Appeals Board shall schedule a hearing on appeal, and shall give the person notice of the date of hearing at least ten (10) days prior to the hearing date and give the person reasonable opportunity to be heard.
- 10.03 Appeal hearings to the Appeal Board shall be conducted in accordance with the Commission's adopted rules and procedures. The Appeal Board shall consist of one County Commissioner, the Administrator, one Environmental Health Specialist, one soil scientist and one Citizen at Large. The Commissioner shall chair the board. The Administrator shall schedule the board hearings and determine the personnel makeup on the board. The decision of the Appeal Board is final unless overruled by a court of law. If the ruling of the Appeal Board is taken to court and the ruling prevails, any and all legal costs and personnel costs shall be paid by the Appellant.

SECTION XI. SEVERABILITY

- 11.01 If any article, chapter, section, clause or phrase of this regulation is, for any reason, held to be invalid by any court of competent jurisdiction, such decision shall not affect the remaining portions of this regulation.
- 11.02 No statement contained in this article shall be construed to interfere with any additional requirements that may be imposed by the Department.

ATTACHMENT 2
Jasper County Environmental Contamination Ordinance

- Jasper County Health Ordinance Sampling Protocol/Remediation Fact Sheet
- Environmental Contamination Ordinance Implementation Plan

Jasper County Health Ordinance Sampling Protocol/Remediation Fact Sheet

The following presents the approach for assessing soil contamination at new residential construction in Jasper County, MO.

Prior to Sampling

- Prior to sampling the XRF Spectrometer is standardized to manufacturer accepted standards to ensure accurate sampling.

Sample Vacant Lots Prior to Regulated Construction Activities

- Sample throughout the lot as described below to determine lead concentrations
- Number of required samples determined based on lot size. Collect at least one sample (0-1") in each quarter of yard area as defined in Diagram 1. On large lots, if visual observations indicate prior uses of property that may have influenced the lead and/or cadmium contamination levels, additional sampling should be performed to adequately characterize the site.
- Each sample shall consist of a 5 aliquot composite. Sample aliquots shall be equal spaced and collected in a "dice" pattern (see Diagram 1).
- Collect one sample at each of the following depths: 0"-1", 1"-12", and 12"-24". Testing excavation (e.g., septic system soil profile pit or construction excavation) pits may substitute for core sampling.
- If depth sampling indicates contamination, further depth sampling will be required.

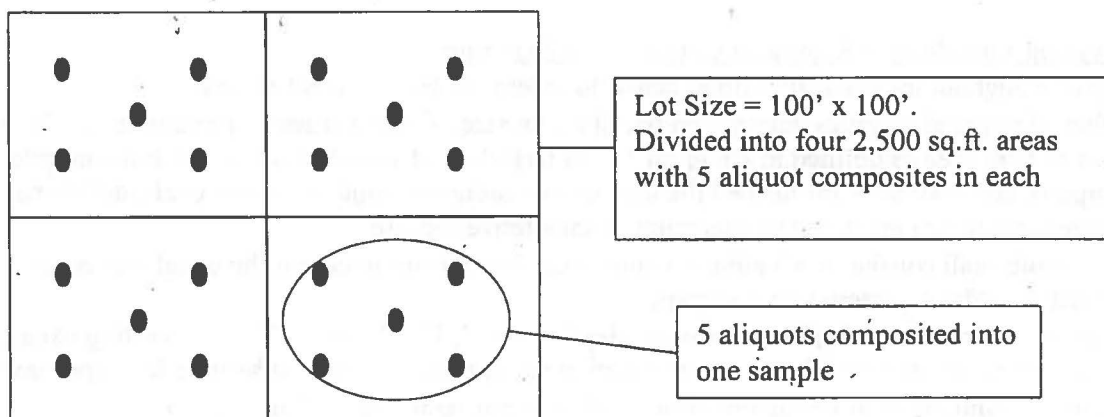
Sample Collection

- Collect approx. 4 oz. Soil from 5 distinct locations with clean implement and composite into clean container. Mix soil thoroughly. Sieve the sample through a #20 (850 micron) screen. Retain 4 oz. of soil for analysis. Depth samples will be mixed similarly before testing.
- Analyze at certified lab or with calibrated XRF.

Cleanup Requirements

- Surface soils with lead concentrations greater than 400 parts per million (ppm), and/or cadmium concentrations greater than 75 ppm must be remediated either by excavating and removing or covering with clean soil.
- Soils with lead concentrations greater than 400 ppm and less than 800 ppm, and/or cadmium concentrations greater than 75 ppm and less than 120 ppm shall be covered with a minimum of 6 inches of clean soil.
- Soils with lead concentrations greater than or equal to 800 ppm and less than 1,500 ppm, or cadmium greater than or equal to 120 ppm and less than 190 ppm shall be covered with a minimum of 12 inches of clean soil.
- Soils with lead concentrations greater than or equal to 1,500 ppm, or cadmium greater than or equal to 190 ppm shall be covered with a minimum 18 inches of soil.
- Excavated soils contaminated with lead must be disposed of in a facility approved by the County Health Department.
- Back soil or cover soil must be certified to contain less than 100 ppm lead.

Diagram 1



Environmental Contamination Ordinance Implementation Plan

The Jasper County Environmental Contamination Ordinance has two requirements that will require ongoing enforcement activities. The first is the soil contamination issue and the second is the issue of well water contamination. The soil contamination portion will impact the municipalities within the county the most and will be addressed first in this document.

Soil Contamination

- The county health department will provide all municipalities with copies of GIS maps which outline the areas of their jurisdiction that may be contaminated with mining waste or due to smelter activities. These maps will be updated as testing indicates that areas are free of contamination, at least annually.
- When individuals request building permits for new construction, either from the municipality or the county, the maps will be consulted. If it is determined that the property is in an area of concern the reviewer will request clearance from the county lead program staff prior to issuing a permit.
- Lead program staff will conduct an assessment of the property to determine the presence of contaminants within two working days of notification. If contamination levels exceed the action levels set by EPA, the county lead program personnel will contact the builder and initiate discussion regarding development of a remediation plan consistent with EPA guidance described in the fact sheet which accompanies the ordinance. If soil contamination does not exceed the EPA action level, notification will be provided to the permitting agency recommending that the permit be issued.
- If the soil conditions require a remediation plan, one will be developed by the builder which is consistent with requirements and will be approved by the health department lead program. The health department will then notify the permitting agency that the plans are approved contingent upon incorporation of the remediation into the building plan. It is anticipated that the permit will then be approved.
- If a remediation plan is required, a final inspection will be conducted by the health department lead program to assure that adequate remediation has occurred prior to occupancy of the dwelling. The permitting agency will be notified regarding the results of the final inspection. If the permitting agency requires an occupancy permit prior to habitation, it is anticipated that it will not be issued prior to receipt of a final inspection report indicating that adequate remediation has occurred. If the permitting agency does not have an occupancy permit system, the county will enforce its ordinance in restricting occupancy prior to remediation completion.

Water Contamination

- The water contamination segment of this ordinance relates only to private water wells. The MDNR already requires all new wells drilled in Jasper County to be tested for metals contamination prior to issuance of a new well certificate. MDNR and the Jasper County Health Department maintain a list of certified well testers who are qualified to conduct this task.

- This ordinance requires that all existing wells be tested for metals (Especially lead and cadmium) when property is transferred or sold. A list of certified testers is available.
- Additionally, the ordinance requires that the test results be provided to the Jasper County Health Department and to the purchaser of the property.

ATTACHMENT 3

Responsiveness Summary

The following presents the significant questions received by the U.S. Environmental Protection Agency at the public meeting held the evening of August 15, 2013. The questions have been paraphrased for conciseness. The full transcript of the meeting can be found in the Administrative Record.

Question: Considering the sizes of the pits that have been filled, and that only half of the wastes have been disposed, I assume the above ground repository EPA builds is going to be huge.

Answer: There is a tremendous amount of space still available in the Oronogo Circle and the King Jack Park pit for disposal. Numerous smaller pits and shafts still exist on-site for subaqueous disposal, some of which are two to three hundred feet deep, and will take tens of thousands of cubic yards of mining waste. The EPA is still placing as much wastes as possible underground. The ROD Amendment also calls for using the Gypstack on the west side of the site as a repository. This area is over 60 acres in size and will hold over a million cubic yards if only placed 10 feet thick across the surface of the pile. In other areas of the Site where pits are not available for disposal, the EPA will design each repository with anticipated future use in mind so the property may be developed for nonresidential use in the future.

Question: It was stated that that the disking or deep tilling process didn't work, so the new plan is to do away with that process. What process will take the place of tilling?

Answer: The EPA believed it could save excavation and disposal costs in some areas by deep tilling the soils and by mixing the contaminants with underlying clean soil to achieve action levels. Studies conducted showed this is not the case, so the EPA will now excavate and remove all wastes and soil that exceed the terrestrial action levels.

Question: The 2004 ROD specified a stream sediment action level of two part per million cadmium, seventy part per million lead, and two hundred and fifty parts per million of zinc. Now EPA is proposing to increase those levels to be seventeen per million cadmium, two hundred and nineteen per million lead, and two thousand nine hundred and forty-nine per million of zinc. If cadmium is supposed to start causing cancer at five per million, and lead is at eighty per million where we start getting a lot of health problems, are you suggesting that we will be exposed to even more, or higher levels of those toxins?

Answer: The numbers established in the 2004 ROD were derived from a variety of different studies that are done throughout the country and published in the literature. Some of the studies include coldwater species, like trout, that are extremely sensitive to metals. The EPA and USGS conducted studies using stream sediments collected from Jasper and Newton Counties in Missouri; Cherokee County, Kansas; and Ottawa County, Oklahoma. The studies were conducted by exposing aquatic organisms to the Site sediments and measuring growth, health effects and mortality. During these studies, organisms were exposed to different concentrations of metals, from very low to high concentrations, and determining the contaminant levels below which no unacceptable response could be measured. The sediment action levels presented in the ROD Amendment represent these values.

Question: Is it not correct that different organisms or different animals react differently? For example, the fish tested may not be affected, but is it possible that it will affect humans, or deer, or raccoons, or birds, and other organisms that would be exposed to those contaminants?

Answer: The EPA and the Missouri Department of Health conducted both an ecological risk assessment and human health risk assessment for the site. Those assessments determined that people swimming or recreating in Site streams were not at any significant risk. Nor were any significant risk identified for animals using the streams. Aquatic organisms are much more sensitive to the sediments and the surface water than people are, thus the proposed sediment action levels are much lower than the terrestrial action levels for soil.

The following presents comments received by EPA via mail and email during the comment period. The letters can be found in the Administrative Record.

The city of Joplin stated they support EPA for all proposed changes and specifically the continued funding of soil cleanup in the tornado devastation area.

The Environmental Task Force of Jasper and Newton Counties stated they concur with the recommendations in the Proposed ROD Amendment.

The Missouri Department of Health and Senior Services (MDHSS) stated they believe the sediment action level for cadmium should not exceed 5 parts per million (ppm) based on the Agency for Toxic Substances and Disease Registry's recommended level for protectiveness of children from soil. The EPA does not agree that 5 ppm cadmium, based on soil in residential yards, is appropriate for stream sediments for protection of children, since the sediments are submerged under water and young children would only be exposed on an infrequent recreational basis. Soil adhering to a child's hand (which is the exposure pathway to ingestion) in submerged sediments would likely be washed off upon removing them from the water. The EPA believes 17 ppm cadmium in stream sediments is protective of human health. The cadmium action level for human exposure (children in a residential setting) established in the OU 2 and 3 ROD is 75 ppm in the yard soil and 25 ppm in existing gardens. These values were based on the site-specific Human Health Risk Assessment. MDHSS was involved in reviewing and developing that risk assessment as well as the OU 2 and 3 ROD. Further, the Jasper County Health Ordinance specifies the action level for cadmium at 75 ppm in residential soils. The EPA understands that MDHSS was involved in development of the County's action level of 75 ppm, and the EPA risk assessor concurred with the value. Therefore, the sediment action level of 17 ppm cadmium is 4.4 times lower than the cadmium level agreed on for the Site by the agencies for protection of young children.

An email from an individual dated August 26, 2013, stated that the sediment action levels should not be changed and that the EPA should explain the design requirements for the mining waste repositories. The EPA believes, as explained above, that the new sediment action levels are protective of aquatic life and human health. The EPA has defined the design for repositories in the ROD issued in 2004, which includes capping and long-term O&M (see Sections 3.2 and 3.3 above in this ROD Amendment).

EPA/ROD/R07-04/656
2004

EPA Superfund
Record of Decision:

ORONOGO-DUENWEG MINING BELT

EPA ID: MOD980686281

OU 01

JOPLIN, MO

09/30/2004

RECORD OF DECISION DECLARATION

SITE NAME AND LOCATION

Oronogo/Duenweg Mining Belt Site, Operable Unit 1
Jasper County, Missouri

STATEMENT OF BASIS AND PURPOSE

The U.S. Environmental Protection Agency (EPA) has prepared this decision document to present the selected remedial action for mining and milling wastes at the Oronogo/Duenweg Mining Belt Site (Site) located in Jasper County, Missouri. This decision was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and to the extent practicable, the National Contingency Plan (NCP). This decision is based on the Administrative Record for this Site. The Administrative Record file is located in the following information repositories:

- | | |
|---|---|
| 1. Joplin Public Library
300 Main
Joplin, Missouri | 3. Carl Junction City Hall
105 North Main
Carl Junction, Missouri |
| 2. Webb City Public Library
101 South Liberty
Webb City, Missouri | 4. U. S. Environmental Protection Agency
901 North 5 th Street
Kansas City, Kansas |

The EPA has coordinated selection of this remedial action with the Missouri Department of Natural Resources (MDNR). The state of Missouri concurs on the selected remedy.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

This selected remedy deals with the cleanup of mining and milling wastes, soil, and selected sediments contaminated with metals from past mining activities at the Site. This cleanup action is one part of the EPA's overall efforts under Superfund to deal with environmental contamination resulting from historic lead and zinc mining, milling, and smelting operations in Jasper County. Cleanup activities of metals contaminated residential yards and

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SUPERFUND RECORDS

individual private water wells have already been implemented, and are nearly complete. This phased approach to the cleanup is being used for this Site in order to clean up the contamination which poses the greatest health threat first. The EPA believes that the selected remedy is consistent with previous cleanups that conducted at the Site.

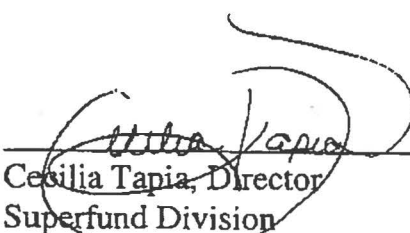
The major components of the selected remedy are:

- Removal of mine/mill wastes, contaminated soil, and selected stream sediments
- Subaqueous disposal of excavated source material in mine subsidence pits
- Recontouring and revegetating excavated areas
- Plugging of selected mine shafts and surface water diversion from mine openings
- A monitoring program for assessing the effect of cleanup on Site streams
- Continuation of the Health Education Program established under OU 2/3
- Institutional controls to regulate future residential development in contaminated areas and the use of the disposal areas

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, is expected to comply with chemical-, location-, and action-specific federal and state requirements that are legally applicable or relevant and appropriate to the remedial, action, and is cost-effective. This remedy utilizes permanent solutions to the maximum extent practicable. Natural treatment of waste will occur after disposal to reduce the mobility of the metals contamination in the wastes.

Because this remedy will result in hazardous substances remaining on the Site above health-based levels, a review will be conducted within five years to ensure that the remedy continues to provide adequate protection of human health and the environment.


Cecilia Tapia, Director
Superfund Division
U.S. EPA, Region 7

5/30/04
Date

Record of Decision

ORONOGO-DUENWEG MINING BELT SITE JASPER COUNTY SUPERFUND SITE JASPER COUNTY, MISSOURI

MINE AND MILL WASTE OPERABLE UNIT 1

Prepared by:

**U.S. Environmental Protection Agency
Region VII
901 North 5th Street
Kansas City, Kansas 66101**

September 2004

Table of Contents

Section	Page
1.0 Introduction	1
2.0 Purpose of the Record of Decision.....	1
3.0 Community Participation.....	1
4.0 Site Background Information.....	2
5.0 Scope and Role of the Cleanup Action.....	3
6.0 Site Characteristics	5
7.0 Current and Potential Future Site Use	6
8.0 Summary of Site Risks	
8.1 Human Health Risk Assessment.....	7
8.2 Ecological Risk Assessment	8
9.0 Remedial Action Objectives.....	9
9.1 Source Material RAO.....	9
9.2 Sediment RAO	9
9.3 Surface Water RAOs	10
9.4 Groundwater RAO	10
10.0 Development of Cleanup Levels	11
11.0 Summary of Cleanup Alternatives Evaluated.....	12
11.1 Remedial Alternatives	12
11.2 Source Material Institutional Controls.....	14

12.0	Analysis of the Alternatives	15
12.1	Threshold Criteria.....	15
12.1.1	Overall Protection of Human Health and the Environment	15
12.1.2	Compliance with ARARs	17
12.2	Balancing Criteria.....	19
12.2.1	Long-Term Effectiveness	19
12.2.2	Short-Term Effectiveness.....	21
12.2.3	Reduction of Toxicity, Mobility, or Volume	22
	Through Treatment	
12.2.4	Implementability.....	22
12.2.5	Cost Effectiveness	23
12.3	Modifying Criteria.....	24
13.0	Selected Alternative	24
13.1	Selected Alternative Rationale.....	24
13.2	Detailed Description of the Selected Alternative	25
13.2.1	Engineered Cleanup Actions	26
13.2.2	Institutional Controls.....	30
13.2.3	Health Education	31
13.2.4	Stream Monitoring	31
13.2.5	Operation and Maintenance	32
14.0	Statutory Determination.....	32
14.1	Protection of Human Health and the Environment	32
14.2	Attainment of ARARs	33
14.2.1	Chemical-Specific ARARs	33
14.2.2	Action-Specific ARARs	33
14.2.3	Location-Specific ARARs	33
14.3	Cost Effectiveness	34
14.4	Utilization of Permanent Solutions and Alternative Treatment	34
14.5	Preference for Treatment as a principal Element	34
15.0	Documentation of Significant Changes	

Appendix A: Responsiveness Summary

List of Figures and Tables

Figures

1. Jasper County Superfund Site (Designated Areas)

Tables

1. Summary of Estimated Quantities of Source Materials and Affected Media
2. Comparative Analysis of Remedial Alternatives with Respect to Overall Protection of Human Health and the Environment.
3. Comparative Analysis of Remedial Alternatives with Respect to Compliance with ARARs.
4. Federal and State Chemical-Specific ARARs.
5. Federal and State Action-Specific ARARs.
6. Federal, State, and Local Location-Specific ARARs.
7. Comparative Analysis of Remedial Alternatives with Respect to Long-Term Effectiveness and Permanence.
8. Comparative Analysis of Remedial Alternatives with Respect to Short-Term Effectiveness.
9. Comparative Analysis of Remedial Alternatives with Respect to Reduction of Toxicity, Mobility, or Volume through Treatment.
10. Comparative Analysis of Remedial Alternatives with Respect to Implementability
11. Comparative Analysis of Remedial Alternatives with Respect to Cost.
12. Detailed Cost Estimate of Alternative 4.

1.0 Introduction

This Record of Decision (ROD) has been developed by the United States Environmental Protection Agency (EPA) to address the mine and mill waste in Operable Unit 1(OU-1) of the Oronogo-Duenweg Mining Belt site (also known as the Jasper County Superfund site) located in Jasper County and portions of Newton County, Missouri. This ROD is published in accordance with the requirements of Section 117 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, also referred to as the Superfund Law), 42 U.S.C. §9617.

The EPA has coordinated the development of this ROD with the Missouri Department of Natural Resources (MDNR). The EPA is the lead agency and the MDNR is the support agency.

2.0 Purpose of the Record of Decision

The primary purpose of the ROD is to document the cleanup alternative selected by the EPA to address the metals contamination from past mining and milling operations at this site. The cleanup alternative presented in this ROD was selected by the EPA after review and assessment of comments received during the public comment period. Documents supporting this decision are included in the Administrative Record (AR). This ROD and supporting documents in the AR are available for review during normal business hours at the following locations:

- | | |
|---|--|
| 1. Joplin Public Library
300 Main
Joplin, Missouri | 3. Carl Junction City Hall
105 North Main
Carl Junction, Missouri |
| 2. Webb City Public Library
101 South Liberty
Webb City, Missouri | 4. U.S. Environmental Protection Agency
Region VII Docket Room
901 North 5th Street
Kansas City, Kansas |

3.0 Community Participation

The EPA issued the Proposed Plan for OU-1 on July 19, 2004, and provided a 30-day review and comment period opening on July 19, 2004, and closing on August 19, 2004. A public meeting to present the plan and receive comments was held August 3, 2004, in Matthews Hall at the Missouri Southern State University in Joplin, Missouri, from 7:00 pm to 8:30 pm. Included in this ROD is a responsiveness summary that addresses in writing the significant comments the EPA received from the public during the comment period.

4.0 Site Background Information

The Oronogo-Duenweg Mining Belt site (Site) is located in Jasper County and portions of Newton County, Missouri. The Site is a concern because of mining wastes on the surface which constituted a significant source of heavy metals contamination with potential for exposure to people and environmental receptors. Past mining and milling practices resulted in the contamination of surface soil, sediments, surface water, and groundwater in the shallow aquifer. The primary contaminants of concern are lead, cadmium, and zinc. The EPA listed the Site on the National Priorities List (NPL) in 1990. The NPL is a national list of superfund sites that prioritizes cleanups in order of the most serious contamination problems and greatest threats to human health and the environment. The Site includes the mining wastes in and around 11 former mining areas, or designated areas (DAs), located within about 270 square miles of Jasper and Newton Counties. The DAs include Snap, Neck/Alba, Thorns, Joplin, Oronogo/Duenweg, Carl Junction, Klondike, Iron Gates, Iron Gates Extension, Belleville, and Waco. A map of the DAs is shown on Figure 1.

The Site is part of the Tri-State Mining District, which encompasses approximately 2,500 square-miles in Missouri, Kansas, and Oklahoma. The district's historic lead and zinc production ranks as one of the highest in the world, with total ore production estimated to have been slightly more than 0.5 billion short tons. The Missouri portion of the district accounted for approximately 0.2 billion short tons of the ore production, of which approximately 80 percent was derived from Jasper County. Mining in the Site was conducted from about 1848 to 1968. The majority of the mining was by underground methods where the mined ore was hoisted from the underground workings and was treated at mills on the surface. At the mills, the crude ore was crushed and sized to minus 5/8 inch, and then concentrated using gravity separation processes, or froth-flotation after about 1920.

During the early years of mining, lead concentrates were smelted in a large number of crude log furnaces. Advances in smelter technology and increasing specialization by operators led to centralization, and by 1873 there were only 17 lead smelters in the Joplin area. By 1894, the number had decreased to three, and to one by the 1920s. Most zinc concentrates were shipped to smelters located outside the district in areas where fossil fuel was abundant, as the smelting of zinc required considerably more heat than lead.

Approximately 160 million short tons of crude ore were mined in the DAs of which approximately 5 percent was recovered as zinc/lead concentrates, leaving an estimated 150 million short tons of discarded mill waste on the surface. Approximately 93 percent of this material has since been removed for various commercial purposes. Volume estimates prepared during the 1992 Remedial Investigation (RI) of the mine and mill waste remaining on site are indicated in Table 1.

5.0 Scope and Role of the Cleanup Action

As mentioned in the previous section, the investigation and study of the Site includes the mining wastes in and around 11 former mining areas or DAs located within about 270 square miles of Jasper and Newton Counties. The EPA divided the Site into four Operable Units (OUs) for cleanup activities because of the multi-media nature of contamination. The OUs include OU-1, Mining and Milling Waste; OU-2, Smelter Waste Residential Yards; OU-3, Mine Waste Residential Yards; and OU-4, Groundwater. This ROD addresses OU-1 and includes those areas in and around the DAs where mining, milling, and smelter wastes are located.

A Site-wide investigation was conducted February-September 1993, collecting data primarily on mined materials, soils, surface water, groundwater, terrestrial and aquatic biota, land use and demography, air quality, and human food sources. The results of this sampling program were documented in the Site Characterization Memorandum. The RI, with expanded sections on surface water, groundwater, fate, and transport, was completed in 1995.

In 1993, the EPA commissioned CDM Federal Programs Corporation (CDM) to conduct site investigations and characterization of the Iron Gates, Belleville, and Klondike DAs. This investigation is reported in the Site Characterization Report. In December 1994, CDM was directed to investigate a fourth DA, the Iron Gates Extension. This DA is located north of Shoal Creek in Jasper and Newton Counties (Figure 1-1). The results of this investigation are reported in an Addendum to the Site Characterization Report. CDM's approach, as directed by the EPA, was to be patterned on the previously approved sampling and analysis plan used for the other seven DAs. Their investigative approach for the DAs was documented in a 1993 Sampling and Analysis Plan.

A Feasibility Study (FS) was completed in 2003. The FS combines the information about the nature and extent of contamination in and around the DAs described in the Site Characterization Reports and the investigations characterizing and evaluating the DAs. The FS developed alternatives for remedial action for the entire Site. Additional studies have been conducted by the EPA, the MDNR, and the Potentially Responsible Parties (PRPs) to assist in developing and supporting the alternatives in the FS. The EPA and the PRPs conducted a sub-aqueous disposal pilot study in which approximately 58,000 cubic yards of tailings were disposed in a mine pit near Waco. This study showed an initial release of metals into the groundwater and within a short time later the metals concentrations became stable. In addition, metals were not significantly leached out of the tailings because they were disposed under water and capped. The MDNR performed a similar study near Webb City by filling a mine shaft with bedrock materials. Results from that study were similar to the Waco study. The EPA and the MDNR have performed several studies to assess the effectiveness of biosolids application on mining wastes in the Oronogo and Cartersville areas. These studies have shown that biosolids application is effective at reducing metals toxicity and promoting plant growth. These studies are all included in the AR for the Site.

This ROD for OU-1, Mining and Milling Waste, is consistent with previous EPA decisions for this Site. OU-1 was initially established to address the ecological and human health risks associated with mining, milling, and smelter wastes in the nonresidential areas. Subsequently, other OUs were established to address the human health risks associated with drinking water sources and residential soils. The EPA prioritizes response actions based on the need to address human health risks first.

In July 2000, the EPA issued an Engineering Evaluation/Cost Analysis (EE/CA) to initiate cleanup actions for a portion of OU-1 in the Oronogo-Duenweg DA of the Site. The Missouri Department of Transportation (MDOT) informed the EPA of plans to construct a portion of Highway 249 through mining waste areas in that part of the Site. The EPA coordinated with MDOT on the plans and alignment of the route. Subsequently, the EE/CA was issued and this decision specifies to use approximately 600,000 cubic yards of mining waste for construction of the highway. Portions of the highway are complete and MDOT is awaiting federal and state highway funds to complete the project.

The EPA has already initiated or completed a series of remedial actions to address human health risks at this Site, as follows: OU-4, Groundwater, which provides a public water supply to replace private shallow aquifer drinking water wells; and OU-2/3, Residential Yards, which removed lead and cadmium contamination from about 2,600 residential yards. These OUs include institutional controls (ICs) to protect future residents. For example, OU-4 restricts future access to the shallow contaminated groundwater. The RODs for these OUs are available in the AR repositories for the Site.

The EPA's current priority under this ROD is to address the risks posed by mine and mill wastes. OU-1 is focused primarily on mitigating risks to aquatic and terrestrial life. Secondly, OU-1 contains engineering controls to protect future human health. This ROD addresses risks to future residents through reliable and permanent engineering controls that significantly reduce the need for ICs that have been administratively difficult to implement, but were required under OU-2/3. In addition, this ROD establishes cleanup action levels that protect terrestrial life and human health from risks of exposure to metals contamination in mine and mill wastes.

The cleanup of mining and milling wastes under this ROD is needed to mitigate the principal threat for OU-1, which is the risks to aquatic and terrestrial ecosystems from exposures to mill wastes, soils, sediments, surface water and groundwater. The main component is to excavate and dispose of source materials in selected on-site mine subsidence pits that are suitable from an engineering perspective for subaqueous disposal. This same remedial component, excavation/disposal, is essential to provide long-term protection of human health from exposure to the mine and mill wastes. The selected remedy for OU-1 will significantly enhance the effectiveness of earlier OU remedies which relied on ICs to protect future residential development in mine and mill waste areas.

6.0 Site Characteristics

The Site is located in and around Joplin in southwest Missouri. Approximately 90,000 people live in the area. The climate is continental with moderate winters and long, hot summers. The annual precipitation is about 40 inches. All watersheds of the Site are within the Spring River drainage basin, a 2,600 square-mile basin in southwest Missouri, southeast Kansas, and northeast Oklahoma. The principal tributaries of the Spring River in the Site are the North Fork of the Spring River, Center Creek, Turkey Creek, Short Creek, and Shoal Creek which are typical Ozark streams where base flows are sustained by springs from limestone in the headwater areas.

Water quality in the Spring River and its tributaries is influenced by runoff and seepage from mill waste, sediment migration from mining source areas into the streams, runoff from agricultural and urban areas, and wastewater discharge. Surface water chemistry is influenced by groundwater from non-point and point sources, mine shafts, and mine subsidence pits. Water quality in the Spring River and its tributaries is regulated by the state of Missouri for various beneficial uses: 1) livestock watering, 2) irrigation, 3) protection of aquatic life, 4) drinking water supply, 5) whole body contact, 6) boating, and 7) industrial water supply.

All of the streams at the Site are impacted from the former mining activity, and exceed federal water quality criteria in many reaches. Site streams and tributaries drain into the Spring River. The Spring River flows southwest into Kansas and continues south into Oklahoma. Metal concentrations exceed Federal aquatic life criteria (ALCs) as they cross the state line into Kansas. Additionally, sediments in the streams down stream of mining impacted areas contain elevated metal concentrations.

Two major aquifers underlie the Site, the Mississippian age Springfield Plateau aquifer and the deeper Ozark aquifer. The two aquifers consist of fractured and karst limestone (upper aquifer) and dolomites (lower aquifer), with the addition of the Gunter Member sandstone in the deep aquifer, and are separated by a sequence of shale and limestone that yields little or no water to wells. This sequence of shale and limestone acts as an impermeable confining layer or semi-confining layer between the two aquifers. The shallow aquifer generally exhibits unconfined or water-table conditions except where Pennsylvanian age shale is present above the limestone. The shallow aquifer hosts the lead-zinc ores. Many private wells tap the shallow aquifer for drinking water and are contaminated with cadmium, lead, and zinc. While most public water supplies are drawn from the deep aquifer, and the city of Joplin uses Shoal Creek for a portion of its water supply.

Two types of wastes were generated during the past milling activities; coarser grained chat and fine-grained tailings. Chat and tailings from the Site contain various levels of lead, cadmium, and zinc, depending on the DA. Chat is a waste product from a tabling and jigging gravity separation process. Chat is composed of gravel-, sand-, and silt-sized siliceous chert and limestone fragments. It is relatively free draining with low moisture content between 3 to 6 percent at depth and lower near the surface, as would be expected from coarse-grained crushed rock. Approximately 5,000,000 cubic yards of chat are located in the Site.

Chat in Jasper County is, and has been, an important source of aggregate and is quarried from the piles as an unprocessed, pit-run material; or in some cases, it is washed and screened for sale as a specifically sized aggregate. Most chat is currently used as aggregate in asphalt and in various types of bituminous overlays, slurry seals, and seal coats for roads. Large volumes have been used in the construction of roads and highways, as the primary aggregate or as the base-coarse material. Some chat is used in the construction of parking lots and driveways in residential settings. The EPA discourages this particular use because of the possible human exposure to heavy metals contained in chat in residential or high-child use settings. Because of its extensive use in all types of road construction, the primary consumers of chat are county and state departments of transportation. The EPA has issued a widely circulated Fact Sheet, dated July 1995 and updated in February 2003, on the use and misuses of mine waste. This fact sheet states that use of chat in unconfined situations presents a risk of exposure to both people and the environment.

Three different types of fine-grained tailings, referred to collectively as tailings, were identified from review of mill and chat processing operations: 1) fines from the gravity separation process, 2) fines from the use of the froth flotation beneficiation process (after about 1920), and 3) fines produced from the washing and screening of chat for use as an aggregate. Tailings are typically 30-60 percent silt-sized, the remainder being fine to medium-sized sand. Due to finer grain size, tailings hold more moisture (20 to 30 percent) than chat. Metal content varies by DA, primarily due to the type of tailings that are present. However, metals concentrations in tailings are in general significantly higher than in chat. It is estimated that there are 363,791 cubic yards of tailings in the Site. Unlike chat, tailings are not generally used as aggregate; thus the volumes, estimated in 1995, are believed to be relatively accurate. However, the estimated volume may be low as some tailings are covered by chat, and these deposits are only discovered when the chat is removed. No tailings were identified in the Klondike, Belleville, Iron Gates, or Iron Gates Extension DAs.

7.0 Current and Potential Future Site Use

Land use in Jasper County is dominated by agriculture, with about 45 percent of the total acreage in row crops or grass pasture. Residential, urban, and commercial/industrial areas combined cover about 30 percent of the DA acreage. Uncultivated land is present along the creeks and river channels that frequently flood, along active and inactive railroad right-of-ways, and in mined areas. Deciduous woodlands generally dominate the uncultivated land.

The area around Joplin and the surrounding communities has, for the past several years, been experiencing tremendous growth and expansion. Vacant uncontaminated land, particularly in the Webb City area, is beginning to become scarce. The EPA has worked with four separate developers to ensure adequate steps are taken prior to residential construction to protect human health. The local county officials are reluctant to establish ICs to control development in this rural community. During 2004 alone, the EPA oversaw remedial actions by developers of eight multi-unit apartment buildings and about 100 single family homes on mine and mill waste contaminated lands. As uncontaminated properties become more and more scarce, development of mine and mill waste contaminated lands will increase.

The local leaders have developed a master plan for some portions of the county and the EPA addresses these planning efforts in this ROD. The "Jasper County, Missouri Route 249 Redevelopment Plan" anticipates controlled development in the corridor of the new Highway 249 presently under construction. This ROD adopts the master plan as an IC which addresses future human health risks by limiting residential developments to areas outside the highway corridor.

8.0 Summary of Site Risks

In general, the EPA has determined that the principal threat for OU-1 is the ecological risk to aquatic biota caused by surface water containing the contaminants of concern (COCs) in concentrations exceeding ALCs and potential risks to terrestrial vermivores that may be caused by ingesting metals from soils exceeding threshold criteria. Additionally, as stated in the previous section, developers continue to construct residential housing on contaminated land which, if not conducted properly by removing or covering contaminated soil, will result in unacceptable risk to people moving into these areas.

The purpose of this ROD, therefore, is to document the EPA's selected remedial actions to mitigate the unacceptable human and ecological risks. The objective is to achieve significant reductions in COC loadings to surface waters, reduce risks to terrestrial vermivores. Moreover, the objective is to rely on the engineering control components of this ROD to permanently protect future residents from the human health risks of exposure to mining and milling wastes. The actions presented in this ROD will help eliminate the need for ICs that have been required, but have been difficult for the EPA to establish and implement. The EPA has determined, as lead agency, that the selected remedy in this ROD is necessary to protect public health or welfare and the environment from actual or threatened releases of hazardous substances into the environment.

8.1 Human Health Risk Assessment

The EPA prepared a baseline risk assessment for human health in 1995. The risk assessment addresses exposure and metals toxicity, and summarizes both quantitative and qualitative risk. Estimated metal intakes were compared to toxicity values in order to characterize non-carcinogenic effects. For estimating carcinogenic effects, estimated intakes and chemical-specific dose-response data were used to calculate the probabilities of an individual developing cancer over a lifetime. Exposures to lead were assessed separately, through the use of the Integrated Exposure Uptake Biokinetic Model (IEUBK). The risk assessment identified potential health risks for children who live on and near mill wastes, particularly those who also consume backyard garden produce. Exposure to cadmium and lead in soils, mill wastes, and garden produce accounted for most of the numeric calculated health risk. The assessment showed an unacceptable risk for people living on soils or mine waste with lead levels exceeding 800 ppm lead or 75 ppm cadmium. Remedial actions taken under OU-2/3 have addressed the current risk.

The risk assessment identified a future risk for people building new homes on mining waste areas where surface soil or the mining wastes that contain COCs that exceed the action levels. The ROD for OU-2/3 includes ICs to reduce the future risk, and specify that the local government should establish an environmental health ordinance to control residential development on undeveloped lands with mining and milling waste. The EPA has worked with the local government and encouraged development of such ordinances; however, no ordinances have been established. Since the RODs were issued in 1998, many residential developments have been built at the Site without protective ICs. The EPA has provided assistance to developers and oversight of construction in some developments to reduce human health risks. This ROD provides cleanup levels for contaminated soil and mine and mill waste to reduce the reliance on ICs.

8.2 Ecological Risk Assessment

The Baseline Ecological Risk Assessment (BERA) evaluated risk to aquatic and terrestrial systems in the Site. The BERA addresses risks to aquatic vegetation, aquatic invertebrates, and fish by comparing the maximum measured concentrations of cadmium, lead, and zinc to water quality criteria and standards and conservative toxicity criteria. As evaluated in the BERA, maximum dissolved COC concentrations in surface water exceed Missouri's Aquatic Life Criteria (ALCs) and the Federal Ambient Water Quality Criteria (WQC), and the maximum concentration of COCs in some stream and pond sediments exceed low and severe effect sediment toxicity criteria. Maximum dissolved COC concentrations in some streams and ponds exceed aquatic vegetation toxicity values.

Risks to soil function were addressed in the BERA by comparing soil COC concentrations to toxicity benchmarks from the literature for plants, earthworms, and soil microflora. Comparisons to phytotoxicity reference values indicate that most mine-impacted soils contain COCs at concentrations that could be expected to adversely affect plant growth.

Comparisons to conservative earthworm toxicity benchmarks in the BERA indicated that both mining-related and non-mining related soils contain COCs at concentrations that could be expected to adversely affect earthworm populations. A site-specific study compared soil and earthworm body-burden COC concentrations to a range of sub-lethal and lethal toxicity values. Some soil COC concentrations exceeded the toxicity benchmarks.

The BERA evaluated risk to terrestrial receptors by modeling exposures to specific feeding guilds within the terrestrial environment. Risks to terrestrial vertebrate populations and communities were evaluated by comparing the average daily dose to selected toxicity reference values. An addendum to the final BERA reevaluated risks to terrestrial vermivores and concluded that terrestrial vertebrates that consume earthworms in soils with elevated COC concentrations may experience adverse chronic effects.

A technical memorandum "Risk Management Considerations for Terrestrial Vermivores" identified risk management strategies and described how risk-based cadmium, lead, and zinc threshold criteria were developed. These criteria establish a level of protectiveness that will mitigate risks to terrestrial vertebrates as follows: lead at 804 ppm, cadmium at 41 ppm, and zinc at 6,424 ppm. In summary, the BERA and addendum, other studies, and technical memorandum indicate that ecological risk management at the Jasper County Site is driven by 1) exposure of aquatic biota to surface waters that contain cadmium, lead, and/or zinc concentrations that exceed ALCs and 2) exposure of terrestrial vermivores to earthworms in soils that exceed risk-based threshold criteria established for the Site. The actions evaluated in the FS do not address risk to terrestrial invertebrate populations or plants.

9.0 Remedial Action Objectives

The media-specific remedial action objectives (RAOs), developed in the FS to address the Site risks, are discussed in the following Sections:

9.1 Source Material RAO

The source material RAO has been designed to address the potential ecological risks associated with direct exposure to COCs in mine and mill wastes, and in the affected soils surrounding the wastes. Terrestrial vertebrates, specifically vermivores whose diet consists of earthworms and other soil-dwelling invertebrates, are identified as the receptors of concern based on information from the BERA. Ecological risks associated with source material erosion (as sediment) and seepage/runoff are addressed in other RAOs.

Exposure routes consist of ingestion of earthworms and other invertebrates in source materials and affected media with greater than 41 mg/kg cadmium, 804 mg/kg lead, or 6,424 mg/kg zinc that provide suitable habitat for site vermivores. Based on this exposure scenario, the source material RAO is as follows:

- Mitigate risks to terrestrial vermivores from exposure to COCs from mine, mill, and smelter wastes within the Site, such that the calculated toxicity quotients or hazard indexes are less than or equal to 1.0.

9.2 Sediment RAO

Sediments of concern in the Site consist of source materials that are eroded from source areas to waters bodies; Class P streams (as defined under Missouri's water quality standards program), and their tributaries. Sediments represent a unique category of source materials that have been transported, or may be transported in the future, to aquatic environments where they potentially affect water quality and streambed substrate, thereby posing risks to aquatic biota. The exposure pathway of concern for the sediment RAO is the movement and

redistribution of source materials that could result in exposure of aquatic biota to elevated COC concentrations. The COCs for sediments are cadmium, lead, and zinc. The sediment RAO for OU-1 is as follows:

- Mitigate risks to aquatic biota in Class P streams and their tributaries exceeding Federal ALCs for the COCs by controlling the transport of mine, mill, and smelter wastes from source areas to waters of the state.

9.3 Surface Water RAOs

Two RAOs have been developed that address two different pathways of exposure to aquatic biota. The first exposure pathway of concern is the transport of COCs to Class P streams and their tributaries resulting from seepage and runoff (dissolved and particulate metals) from source materials. The second exposure pathway involves the transport of COCs to Class P streams and their tributaries resulting from mine pit and pond discharges. The criteria for Class P streams and their tributaries are the Federal ALCs, as calculated based on the hardness observed in the individual surface water bodies. The RAOs for OU-1 surface water are as follows:

- Mitigate exposure of aquatic biota to COCs released and transported from mine and mill wastes where surface water applicable or relevant and appropriate requirements (ARARs) are exceeded in Class P streams and in tributaries.
- Mitigate exposure of aquatic biota to COCs released and transported from Site mine-related pits and ponds where surface water ARARs are exceeded in Class P streams and in tributaries.

9.4 Groundwater RAO

The groundwater RAO addresses exposure of aquatic biota to COCs in Class P streams that receive discharge from flowing mine openings (e.g., mine shafts, vents, subsidence pits, etc.). The contaminant criteria are Federal ALCs. The COCs for OU-1 groundwater are cadmium, lead, and zinc. The RAO for OU-1 groundwater is as follows:

- Mitigate exposure of aquatic biota to COCs in releases of groundwater from flowing mine shafts of the Site where surface water ARARs are exceeded in Class P streams and in tributaries.

The groundwater RAO for this OU is limited to protecting the surface water from groundwater impacts due to flowing mine shafts. The RAO of mitigating human health risks from exposure to the contaminated shallow aquifer was addressed in OU-4, Groundwater, which provides an alternate public water supply to residents and establishes

ICs to mitigate the future risks of drilling new drinking water wells in the shallow aquifer. The Missouri Well Drillers law and regulations control shallow and deep aquifer well drilling in the Jasper and Newton County areas to reduce the risk that residents might use the contaminated shallow aquifer. The ROD for OU-4 determined that it is technically impractical for the Agency to remediate the shallow aquifer to achieve compliance with chemical-specific ARARs for drinking water sources. The EPA determined that it is not technically feasible from an engineering perspective to remediate groundwater because of the wide spread nature of contamination throughout the shallow aquifer, karst conditions, and interconnectedness of the mine workings within the shallow aquifer. Although contaminated groundwater seeps into surface waters and contributes some contaminants of concern, the groundwater RAO for this OU addresses only specific groundwater source where remediation is technically feasible, such as the flowing mine shafts, because of the technical impracticability of cleaning up the entire shallow aquifer to meet maximum contaminant levels for drinking water.

10.0 Development of Cleanup Levels

Cleanup criteria to protect terrestrial organisms were developed during the Remedial Investigation/Feasibility Study process as documented in the technical memorandum “Risk Management Considerations for Terrestrial Vermivores”. Based on the findings in that document, the EPA is selecting cleanup criteria to protect the terrestrial environment of 800 ppm lead, 40 ppm cadmium, and 6,400 ppm zinc.

The ROD for OU 2/3 established action levels for protection of human health at 800 ppm lead, and 75 ppm cadmium (25 ppm cadmium in existing gardens). No zinc level was established because zinc in soil has not been determined to cause a risk to people. The action levels were based on discrete samples collected in individual residential yards, where the highest recorded discrete sample was used to trigger a cleanup action for the yard. Once an action was triggered in a yard, all soil exceeding 500 ppm lead was removed to a maximum depth of 12 inches. Analyses performed by the EPA of the more than 50,000 samples collected during the OU 2/3 action indicates that the single highest sample for a yard of 800 ppm lead, generally translated to a yard average lead concentration of 400 ppm. OU 2/3 actions, as stated, were triggered based on single highest sample results. Subsequently, the EPA has released new guidance stating that residential cleanup actions should be based on yard average concentrations. Using the yard average method of determining cleanup action generally results in lower action levels than using the single highest value, or “hot spot” method to achieve equal protectiveness. Additionally, the EPA guidance established 400 ppm lead as a screening level for site, below which cleanup actions are generally not warranted. The 400 ppm lead value established in the EPA guidance is considered to be protective of young children. Therefore, the EPA has determined that protection of human health at this Site requires the cleanup of source materials at action levels of, at least, 400 ppm lead and 75 ppm cadmium.

Obviously, the human health and terrestrial criteria differ with respect to cleanup levels. Therefore, the selected remedy uses the most conservative value between the two sets of criteria as the overall action levels for the Site to protect both future human health and the terrestrial environment. The action levels for source materials and contaminated soils will be 400 ppm lead, 40 ppm cadmium, and 6,400 ppm zinc.

Numeric action levels for source material for protection of the aquatic environment are not being established in this ROD. Aquatic sediment criteria are generally much lower than the concentrations found in the Site source materials. Any source material eroding into streams is considered to create unacceptable risk to aquatic organisms. Therefore, action criteria for source material to protect the aquatic environment are strictly visual, in that any source material eroding, or with high potential to erode to streams and their tributaries will be removed and disposed.

11.0 Summary of Alternative Cleanup Plans Evaluated

The EPA developed and evaluated six alternatives during the FS. The no action alternative also was evaluated, however, the EPA believes that the no action alternative is not protective of ecological health and does not consider it a viable option. The no action alternative and the five action alternatives are described below. Additionally, each of the alternatives will require, to varying degrees, ICs to protect and augment the remedy. The types of ICs that may be included with the remedies are described at the end of this section.

11.1 Remedial Alternatives

The following six remedial alternatives were developed in the FS

Alternative 1: No Further Action – This alternative prescribes no new remedial actions but recognizes and takes into consideration the engineering actions, rules, regulations, ICs, and cultural and land use practices that are currently ongoing or are planned to be performed or implemented, such as the removal and remediation actions and ICs being implemented under OU-2/3, OU-4, the Highway 249 project conducted by the MDOT, and ongoing chat recycling. Cost of this alternative is estimated at \$291,000 for continuation of the ICs for 30 years. Waste reduction or containment would be zero.

Alternative 2: Source Consolidation, In-Place Containment through Revegetation Using Biosolids, and Recycling – This alternative is a comprehensive alternative that pairs early response actions with long-term containment and on-going recycling. The initial response actions would remove source materials from the floodplains and tributary channels and consolidate these materials in on-site 'waste containment cells. Long-term actions include the use of biosolids to treat, revegetate, and stabilize the consolidated mill wastes, as well as the unconsolidated upland mill waste deposits that remain on site. These long-term treatment and containment actions are designed to reduce metal loadings to surface water, sediment transport, and risks to terrestrial vermivores. This alternative recognizes chat recycling as an ongoing

cultural practice and, by establishing ICs, addresses the inadequacies of current uncontrolled recycling to eventually diminish the amount of untreated and un-contained mill wastes that are subject to runoff and erosion and addresses all chat after 30 years. ICs are designed to regulate chat recycling, end uses for recycled chat, and post-recycling land remediation. Cost of this alternative is estimated at \$44,312,000 for remedial action and continuation of the ICs with annual operation and maintenance (O&M) of \$101,000. Waste reduction or containment would be 84 percent.

Alternative 3: Source Consolidation, In-Place Containment Using Simple Soil Covers, Revegetation, and Recycling – The initial response actions are essentially the same under this alternative as under Alternative 2. However, instead of using biosolids applications, this alternative reduces the timeframe to 12 years for remedial actions by using simple vegetated soil covers to contain the consolidated mill wastes, as well as unconsolidated upland mill waste deposits remaining on site. Under this alternative, chat recycling is recognized as an ongoing practice that reduces the volume of mill wastes subject to runoff and erosion and addresses all chat after remediation of other source materials. ICs for chat recycling are the same as Alternative 2. Cost of this alternative is estimated at \$77,112,000 for remedial action and continuation of the ICs with annual O&M of \$83,600. Waste reduction or containment would be 80 percent.

Alternative 4: Source Removal and Disposal in On-Site Subsidence Pits – This alternative emphasizes the excavation and disposal of source materials in selected on-site subsidence pits that provide a suitable environment for subaqueous mill waste disposal. This alternative prescribes the excavation and disposal of more source materials than either Alternatives 2 or 3, and retains limited opportunities for ongoing chat recycling with the same ICs. The time-frame needed to excavate and dispose of source materials in subsidence pits is estimated at five years. Cost of this alternative is estimated at \$58,543,000 for remedial action and continuation of the ICs with annual O&M of \$22,500. Waste reduction or containment would be 90 percent.

Alternative 5a: Source Removal and On-Site Disposal in Aboveground Repositories – Alternative 5a prescribes the same degree of excavation and disposal as Alternative 4. However, instead of disposing of the mill wastes in on-site subsidence pits, the wastes are consolidated and disposed in aboveground repositories with geo-composite soil covers designed to nearly eliminate infiltration and seepage. As under Alternative 4, opportunities for ongoing chat recycling are included. Cost of this alternative is estimated at \$93,707,000 for remedial action and continuation of the ICs with annual O&M of \$137,000. Waste reduction or containment would be 90 percent.

Alternative 5b: Source Removal and On-Site Disposal in Centralized, Aboveground Repositories and Limited Water Treatment – This alternative is called Alternative 5b because it shares similarities with Alternative 5a in terms of its reliance on excavation and disposal of mill wastes in on-site aboveground repositories. However, this alternative is more aggressive in

the amount of mill wastes that are disposed and in the degree of consolidation through the use of centralized repositories. In addition, Alternative 5b couples on-site disposal with passive anaerobic treatment systems to treat the discharges from selected mine openings. Cost of this alternative is estimated at \$81,296,000 for remedial action and continuation of the ICs with annual O&M of \$102,000. Waste reduction or containment would be 100 percent.

11.2 Source Material Institutional Controls

This section provides information on ICs that were developed to augment the alternative cleanup plans evaluated in the FS. Selected ICs are included in this ROD to enhance and protect the engineering controls in the selected alternative (described in Section 13). ICs are defined as non-engineered access or land use restrictions designed to reduce or prevent residual human health or ecological risks that may remain following the implementation of engineered remedial actions at CERCLA sites. ICs may be useful for controlling human and environmental exposures and improving long-term protectiveness of engineering controls.

The active cleanup plans, Alternatives 2, 3, 4, 5a and 5b, evaluated in the FS include an IC to reduce the exposure risks to human health and the environment from chat recycling activities. The IC considered was to enter into legal agreements with individual owners/operators of chat recycling operations. This IC was developed to regulate chat recycling, end uses for recycled chat, and post-recycling land remediation, and is described in detail in the FS under Alternative 2.

Two general types of ICs were considered in the FS and are proposed to supplement the engineering components of the preferred alternative. In general, the ICs proposed for the preferred alternative should be adopted by a governing body and can be subject to amendment in the future. However, some of the proposed ICs can be established by land use controls under state property laws. The two types of ICs proposed to control source materials that would be disposed or capped on site under the preferred alternative are land use restrictions and access control, and land use regulations and health codes to protect human health.

12.0 Summary of the Comparative Analysis of Alternatives

The National Contingency Plan (NCP), 40 CFR Section 300, requires the EPA to evaluate remedial alternatives against nine criteria to determine which alternative is preferred. The EPA performs this analysis during the FS. The detailed analysis in the FS Report provides an in-depth analysis of the six alternatives compared against the nine criteria. An alternative must satisfy all nine criteria before it can be selected. The first step is to meet the threshold criteria, which are overall protection of public health and the environment and compliance with ARARs. In general, alternatives that do not satisfy these two criteria are rejected.

The second step is to compare the alternatives against a set of balancing criteria. The NCP establishes five balancing criteria which include long-term effectiveness and permanence; reduction in toxicity, mobility, or volume achieved through treatment; implementability; short-term effectiveness; and cost. The third and final step is to evaluate the alternatives on the basis of modifying criteria, which are state and community acceptance.

12.1 Threshold Criteria

The following presents a brief description of how the alternatives satisfy the threshold criteria of overall protection of public health and the environment and compliance with ARARs.

12.1.1 Overall Protection of Human Health and the Environment

This criterion provides an overall assessment of whether an alternative meets the requirement that it is protective of human health and the environment. The overall assessment of protection is based on a composite of factors from other criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs. A comparative analysis of the remedial alternatives with respect to the overall protection of human health and the environment is given in Table 2.

Alternatives 2, 3, 4, 5a, and 5b will protect the environment to varying degrees. Because of the continued risks to aquatic and terrestrial biota, Alternative 1 (No Further Action) is not considered protective of the environment. None of the RAOs identified for OU-1 are consistently met under this alternative. Some or all of the residual wastes will exceed the threshold criteria for vermivores and continue to pose wildlife exposure issues for an indefinite time period.

Alternative 2 provides protection of the aquatic environment through early response actions coupled with interim and long-term actions, such as long-term recycling, designed to address the surface water and sediment RAOs. The surface water RAOs may not be met in all Class P streams all the time because the long-term surface water actions prescribed under Alternative 2 may not be completely effective or reliable in meeting ALCs under all flow conditions. Alternative 2 may not be fully protective of aquatic life in the unclassified tributaries in the near future because the federal chronic ALCs would continue to be exceeded under most flow conditions and the surface water RAOs would fail to be achieved. However, Alternative 2 would likely achieve protectiveness in the tributaries over a very long time frame, i.e., centuries. Although the main actions addressing surface water would occur within the first few years, the time frame for full implementation of the surface water actions is very long, on the order of 30 years. The time estimated to complete Alternative 2 is based on estimated availability of

biosolids from known sources of wastewater treatment plant sludges. If sources of supplies for biosolids included additional wastewater treatment plants, composted poultry or other animal waste, the time frame could be significantly shortened.

Alternative 2 addresses the source material RAO primarily by deep tilling vegetated chat and transition zone soils to reduce metals concentrations below the threshold criteria for vermivores, and might provide a treatment effect to reduce toxicity of the residual metals. With regard to vegetated chat and transition soils, risks to terrestrial vermivores, such as the short-tailed shrew and American Woodcock are low. However, Alternative 2 also relies heavily on ICs, for at least 30 years, to control chat recycling, which offers significantly less permanent and less effective overall protection of human health and the environment compared to the active engineering controls in Alternative 4, which may permanently contain source materials. Although the ICs described in the 1998 Selected Remedy for OU-2/3 provide limited protection for residential development, these controls are not effective unless the local government enacts land use controls, which has not occurred. Thus, Alternatives 2 and 3 rely on IC components to reduce risk from recycling chat and are not as protective as Alternatives 4, 5(a) and 5(b), that use engineering controls to contain source materials.

The groundwater RAO is addressed under Alternative 2 by engineering actions designed to reduce the amount of surface water captured by open mine shafts. These actions include plugging selected mine shafts and diverting surface flows away from open shafts, collapsed shafts, subsidence pits, and other features that connect the surface water regimes to the shallow aquifer.

Alternative 3 relies on early response actions with long-term containment and on-going recycling. It would be protective of aquatic resources by addressing the principal surface water threats in the Site through the initial source consolidation actions aimed at addressing surface water and sediment RAOs. However, like Alternative 2, Alternative 3 may not be fully protective of aquatic life in the tributaries in the near term because the federal chronic ALCs would continue to be exceeded under some flow conditions and the surface water RAOs would fail to be met. Alternative 3 would likely achieve protectiveness in the tributaries over a very long time frame, i.e., centuries. The use of simple soil covers would allow an aggressive schedule for addressing the RAOs (12 years). The source materials RAOs are addressed under Alternative 3 by consolidating and capping tailings, barren chat, in- and near-stream vegetated chat, and vegetated chat sediment sources with simple soil covers. In addition, upland vegetated chat and transition zone soils are deep tilled to reduce metal concentrations below threshold criteria for terrestrial vermivores. These engineering actions are expected to achieve the source material RAOs at full implementation.

In Alternative 3 the groundwater RAO is addressed by engineering actions designed to reduce the amount of surface water captured by open mine shafts, such as plugging certain selected mine shafts and diverting surface flows away from open shafts and subsidence pits.

These actions are deemed adequate for addressing the groundwater RAO by further reducing metal loads to surface waters, although groundwater discharge to surface water does not drive ALC exceedances under current conditions.

Alternative 4 would be protective of human health and the environment by nearly eliminating the transport and exposure pathways associated with surficial mill waste deposits. Alternative 4 is expected to be capable of achieving the metal loading reductions needed to meet the surface water RAOs in the Class P streams soon after completion of the remedial actions and in the tributaries in a relatively short time frame thereafter, i.e., decades. Therefore, Alternative 4 would meet the surface water RAOs and be protective of aquatic life. Modeling and demonstration project results indicate that disposing of mill wastes in subsidence pits may result in a short-term local release of metals to groundwater. However, the release of metals was observed to be temporary, local in nature, and is expected to have a minor impact on surface water quality. In the long term, groundwater quality is expected to improve relative to current conditions because the flux of atmospheric oxygen and oxygenated surface water into the mine workings will be locally reduced. Hence, the groundwater RAO is expected to be addressed through long-term and permanent improvement in groundwater quality.

Alternative 5a will be protective of human health and the environment. The source materials, surface water, and sediment RAOs would be achieved in an aggressive timeframe, approximately seven years. Compared with current conditions, aboveground disposal of source materials will significantly reduce surface water loadings from mining related sources because surface runoff and sediment transport to Class P streams and their tributaries are nearly eliminated. Therefore, Alternative 5a would be protective of aquatic life.

Alternative 5b would be fully protective of human health and the environment because all source materials would be effectively isolated from human and environmental receptors and prevented from interacting with other media. Source material, surface water, and sediment RAOs would be achieved in a relatively short timeframe (five years). Metal loadings to Class P streams and their tributaries are expected to be nearly eliminated by excavating all source materials and sediments containing mill wastes, disposing of the wastes in secure, aboveground repositories, and reclaiming the excavated areas. Therefore, Alternative 5b would be protective of aquatic life.

12.1.2 Compliance With ARARs

This criterion is used to decide how each alternative meets federal and state ARARs, as defined in CERCLA Section 121. Compliance is judged with respect to chemical-specific, action-specific, and location-specific ARARs as well as appropriate criteria, advisories and guidance to be considered (TBCs). A list of ARARs identified for each alternative is in the FS report. A comparative analysis of remedial alternatives with respect to compliance with ARARs is given in Table 3.

Chemical-Specific ARARs

A list of federal and state chemical-specific ARARs is given in Table 4. A principle risk addressed in this ROD is the exposure of aquatic life from contaminants of concern in surface waters. The principle chemical-specific ARARs that the preferred alternative must comply with are the standards and criteria established under the CWA for protection of aquatic life. These standards are established by the EPA and state and tribal governments pursuant to CWA regulations at 40 CFR Part 131.

The identification of chemical-specific ARARs for surface water in the Jasper County Site is complex because divergent federal and state water quality standards and criteria exist, the existing state criteria are currently being reevaluated, and opportunities exist for developing site-specific criteria. The EPA does not consider the current Missouri WQC to be protective of aquatic life, for example, in the unclassified streams, such as the tributaries to designated perennial (Class P) streams. To address the EPA's concerns about the possible lack of state-wide protectiveness, Missouri's Water Pollution Control Program is currently in the process of revising the state's WQC. Preliminary work performed by the state indicates Missouri's revised WQC will likely be similar to current Federal standards. Although Missouri's WQC may be relevant and appropriate chemical-specific requirements for surface waters within the Jasper County Site, presently, the federal criteria are more stringent and more protective. Thus, the remedial alternatives must comply with the federal criteria under CWA regulations. When Missouri's revised WQC are promulgated, it is anticipated that the EPA will consider them to be protective, and they may become the relevant and appropriate requirements in the future as the EPA conducts five-year reviews of the remedy selected for OU-1.

In addition, the federal chronic ALCs are also considered relevant and appropriate requirements for Class P streams within the Jasper County Site because the Class P streams identified as part of the remedial actions flow into Kansas, and Kansas has adopted the federal chronic ALCs for the streams into which the Site's Class P streams flow. In the Class P streams and their tributaries, the federal chronic ALCs are considered relevant and appropriate for purposes of the comparative analysis of compliance with ARARs.

Alternative 1, the No Further action alternative, represents a continuation of current conditions. Under current conditions, periodic exceedances of surface water ARARs are expected to occur in Class P streams and more commonly in their tributaries. Although surface water quality is expected to gradually improve due to the continued reduction in chat volumes through recycling, Alternative 1 is not expected to consistently comply with the surface water ARARs.

Alternatives 2 and 3 may not be capable of achieving the greater than 90 percent reductions in zinc loads needed to comply with federal ALCs in all Class P stream segments and their tributaries under all flow conditions. Chemical-specific ARARs for surface water are

expected to be consistently met by Alternatives 4, 5a, and 5b. In addition, Alternatives 4, 5a, and 5b will result in compliance with the surface water ARARs in a relatively short timeframe, 5 to 7 years. However, monitoring of Alternative 4 will be necessary to assess any short-term increase in metal concentrations in surface water or drinking water wells.

Action-Specific ARARs

All of the candidate alternatives are equally capable of meeting the action-specific ARARs identified for the individual alternatives. A list of federal and state action-specific ARARs is given in Table 5.

Location-Specific ARARs

All of the candidate alternatives are equally capable of meeting the location-specific ARARs identified for the individual alternatives. A list of federal, state, and local location-specific ARARs is given in Table 6.

To Be Considered

Alternatives 1 and 2 are not expected to comply with the threshold criteria for terrestrial vermivores, as vegetated mill wastes will be left on site that will likely exceed the criteria. Under Alternative 2, biosolids applications alone, without deep tilling or soil amendment, are not expected to reduce total metals levels below the threshold criteria. All other alternatives are expected to comply with the total metal-based criteria.

The EPA's probable effect concentrations and equilibrium partitioning sediment guidelines are identified in Table 4 as chemical-specific TBCs for Site sediments. It is uncertain if these TBCs would be achieved under any of the candidate alternatives. However, with time, the COC concentrations in sediments should approach background levels under all the action alternatives.

12.2 Balancing Criteria

The following presents a brief description of how the alternatives developed in the FS satisfy the balancing criteria.

12.2.1 Long-Term Effectiveness

This criterion addresses the results of a cleanup action in terms of the risk remaining at the Site after the goals of the cleanup have been met. The primary focus of this evaluation is to determine the extent and effectiveness of the controls that may be required to

manage the risk posed by treatment residuals and/or untreated wastes. A comparative analysis of remedial alternatives with respect to long-term effectiveness and permanence is given in Table 7.

Magnitude of Residual Risks

The volume and acreage of mill waste left on Site and the engineering controls prescribed for stabilizing or containing the wastes at full implementation provides a means of comparing the magnitude of residual risks under each of the remedial alternatives. Alternative 1 provides no engineering controls to manage the residual risks associated with approximately 5,000 acres of land affected by mill wastes. Under Alternative 1, residual risks to terrestrial vermivores and aquatic biota would remain at or near current levels; Alternative 2 would result in less affected lands and would manage the residual risks. Of the action alternatives, Alternative 3 would result in the greatest land area affected by mill waste and the residual risks would be the highest of the action Alternatives. The magnitude of residual risks is potentially low under Alternative 4 because source materials are permanently disposed underground. The footprints of the filled subsidence pits, and the biosolids treated areas will require long-term protection to manage residual risks. Groundwater monitoring is also necessary for managing and assessing residual risks over time. The residual risks under Alternative 5a would be essentially the same as under Alternative 4, except that the area occupied by permanent waste repositories is larger under Alternative 5a, and Alternative 4 requires groundwater monitoring. Under Alternative 5b even less affected lands would remain. Based on the above evaluation, the magnitude of residual risks is lowest under Alternatives 4, 5a, and 5b.

Adequacy and Reliability of Engineering Controls

The comparison of alternatives with respect to the adequacy and reliability of controls is based on a variety of factors, such as treatability testing results, technology literature reviews, modeling results, and engineering judgement.

Under Alternative 1, mill wastes are left on Site with no vegetation or engineered cover systems. Leaving source materials uncovered and unvegetated is not adequate or reliable for preventing risks to aquatic life. Alternative 1 does not address risks to terrestrial vermivores because a large volume of wastes will remain that exceed the threshold criteria for vermivores.

Direct vegetation, as prescribed under Alternative 2, may be only partially adequate for reducing seepage and metal loadings to surface water, even though the use of biosolids provides a treatment effect on the metals in the wastes. From an engineering perspective, the direct revegetation of source materials prescribed under Alternative 2 is considered the least permanent or reliable of the cover systems proposed under the action alternatives.

The simple soil covers prescribed under Alternative 3 more adequately and reliably reduce infiltration and seepage. Although Alternative 3 is an improvement over Alternatives 2, Alternative 3 is only partially adequate for reducing seepage, metal loadings to surface water, and risks to aquatic life. Alternative 3 is adequate and reliable for addressing risks to terrestrial vermivores.

Excavation of source materials and disposal in subsidence pits, as described under Alternative 4, represents the most permanent and reliable method of meeting the RAOs pending successful monitoring of groundwater over time. This alternative permanently contains the source materials in pits which prevents direct contact exposures for terrestrial life and humans, and significantly reduces the need to rely on previously planned, but less reliable, ICs to reduce human health risks from direct contact with the source materials. By removing the source materials from the flood plains and erodible areas and containing it in disposal pits, Alternative 4 permanently eliminates runoff and infiltration due to the source material waste piles from contaminating surface waters.

Alternatives 5a and 5b are highly effective known technologies. Alternative 4 is somewhat more reliable and permanent because source materials are disposed underground, instead of aboveground. Although the prescribed repositories in 5a and 5b are secure, they would require perpetual maintenance and ICs to prevent disturbance over a larger area compared to the maintenance that will be required by Alternative 4, due to the type of waste caps involved and the acres of disposal area.

12.2.2 Short-Term Effectiveness

This criterion addresses the effects of the alternative during the construction until the cleanup is completed and the selected level of protection has been achieved. A comparative analysis of remedial alternatives with respect to short-term effectiveness is given in Table 8.

Risks to the Local Communities and Workers

Potential risks to local communities during remedial actions are similar under all candidate alternatives. The conventional risks posed by earthmoving and construction activities are readily mitigated through engineering controls, safety training, and public involvement efforts. Potential risk to workers during remedial actions is similar under all of the action alternatives.

Potential Environmental Impacts

The implementation of the action alternatives may result in environmental impacts, including potential nitrogen and phosphorus loading to surface water, depletion of non-renewable soil resources, and degradation of riparian and aquatic habitat.

Improper or excessive biosolids applications could result in impacts to surface waters caused by increased nitrogen and phosphorus. Alternatives 2 and 3 rely most heavily on biosolids applications to achieve the RAOs, and the potential environmental impacts are a particular concern under these two alternatives. Under Alternative 3, several hundred acres of mill waste will be capped with soils. Alternative 4 also relies on biosolids application, but to a much lesser degree than Alternatives 2 and 3. During the early stages of revegetation, these capped areas will be susceptible to erosion. Local streams could receive elevated sediment loads during rainfall events.

The depletion of non-renewable soil resources is a potential environmental concern. Alternative 2 relies on borrow soil the least. Alternatives 4 and 5b rely on borrow soils much less than Alternatives 3 and 5a, and soil depletion is not expected to result in significant environmental impacts under Alternatives 4 and 5b.

Placement of mining wastes in the pits under Alternative 4 could result in short-term increases in metals concentrations to groundwater which may threaten nearby wells and surface waters if disposal pits are located near water wells or surface waters. Locating pits in these areas will be avoided to the extent practical and monitoring groundwater chemistry will identify increases in metals concentrations.

Removing sediments from stream channels, riparian areas, and wetlands may damage sensitive aquatic ecosystems. Proper timing of sediment removal activities will minimize this damage. These environmental risks are similar under each alternative except Alternative 1, which does not involve sediment excavation.

Based on the above evaluation, the actions prescribed under Alternatives 4 and 5b have the least potential for environmental impacts.

Time Until RAOs Are Achieved

Alternative 2 requires significantly longer time to implement than other alternatives due to the limited supply of biosolids available within a reasonable distance from the Site. If additional sources of biosolids, such as poultry litter, are available, the time frame required to implement Alternative 2 could be shortened. The timeframe required to implement Alternative 3 is intermediate between Alternative 2 and Alternatives 4, 5a, and 5b. At full

implementation, the surface water and source material RAOs may not be fully achieved under Alternatives 1, 2 and 3. RAOs are achieved under Alternatives 4, 5a, and 5b in approximately the same time frame, between 5 to 7 years.

12.2.3 Reduction of Toxicity, Mobility, or Volume Through Treatment

This criterion addresses the statutory preference for selecting remedial actions that employ treatment technologies that permanently and significantly reduce toxicity, mobility or volume (TMV) of the contaminants. A comparative analysis of remedial alternatives with respect to reduction of toxicity, mobility, or volume through treatment is given in Table 9.

Alternatives 2, 4, and 5b are the alternatives expected to achieve TMV reduction. Alternative 2 incorporates application of biosolids, which may provide some treatment and stabilization of the metals. Under Alternative 4, subaqueous mill waste disposal is expected to result in remineralization of metal oxides as insoluble sulfides, thereby reducing the mobility of the metals. This method of treatment would be permanent and irreversible unless the mill wastes were removed from subsidence pits and exposed to oxidizing conditions. Under Alternative 5b, the only treatment occurs in passive anaerobic wetland treatment systems as sulfate-reducing bacteria remineralize metal oxides to insoluble sulfide forms, thereby reducing metals mobility. The concentration of metal in the waters treated by the passive anaerobic treatment systems is minor compared to the metal contained within source materials, thus treatment volumes under Alternative 5b are considered negligible.

12.2.4 Implementability

This criterion addresses the technical and administrative feasibility of implementing a cleanup and the availability of various services and materials required during its implementation. All the alternatives are readily constructable. However, the passive anaerobic treatment systems prescribed under Alternative 5b are innovative and few large-scale systems have been constructed. A comparative analysis of remedial alternatives with respect to implementability is given in Table 10.

The implementation of all the action alternatives will require varying degrees of coordination between the EPA, state and local agencies, landowners, and chat recyclers. Under any circumstance, administrative implementability is expected to be complicated by the fact that none of the parties that would be implementing the remediation own the lands that would be involved in the remedy.

Alternative 1 requires no materials to implement. The availability of biosolids and borrow soils affects the implementability of the action alternatives. Because of the limited supply of biosolids available within a reasonable distance from the Site, the timeframe for implementing Alternative 2 depends on the amount of biosolids used. The timeframe for

implementing Alternative 2 may be relatively long (up to 30 years) due to the large volume of biosolids needed to implement the alternative and the availability of the biosolids. However, the use of poultry litter or other biosolid sources may shorten this timeframe. Alternative 3 relies less on biosolids applications and can, therefore, be implemented in a shorter timeframe (12 years). The timeframes for Alternative 4 (7 years), 5a (7 years), and 5b (5 years) are not dependent on biosolids applications because these alternatives use significantly less biosolids than Alternatives 2 and 3.

Alternative 2 uses no borrow soils. However, when simple soil covers are prescribed instead of biosolids applications under Alternative 3, a very large amount of borrow soil is used to accomplish approximately the same level of waste containment. The extremely large volume of soil needed to implement Alternative 3 may preclude its selection as a preferred alternative because the non-renewable soil resources of Jasper County may be depleted.

Alternatives relying on ICs to regulate chat recycling are not readily implementable. The administrative inefficiencies in developing and implementing legal agreements may preclude selection of such ICs as a component of the preferred alternative because of the required level of coordination with chat owners/operators and the required operation and maintenance of chat recycling which state and local officials would need to perform.

12.2.5 Cost Effectiveness

This criterion addresses the direct and indirect capital cost of the remedy. Operation and maintenance costs incurred over the life of the project, as well as present worth costs, are also evaluated. This comparison of costs among alternatives is presented in Table 11.

Alternative 4 is considered the most cost-effective alternative. Although the cost of Alternative 2 is less than Alternative 4, Alternative 2 is considered less effective and may not meet the RAOs. The significant increase in costs for Alternative 3 is not justified since Alternative 3 is considered less protective than Alternative 4. Alternative 5a and 5b are both effective but are significantly more costly than Alternative 4.

12.3 Modifying Criteria

The two modifying criteria of community and state acceptance are intended to assess the views of both groups regarding various cleanup approaches. The EPA has held numerous meetings with the MDNR and the Jasper County Citizen's Task Force to discuss the effectiveness of sub-aqueous disposal. The EPA held a public meeting and opened a comment period to assess the public's opinion and preference for a remedy. Comments received from the public indicate that the community fully supports Alternative 4 as the preferred alternative. MDNR supports the modified Alternative 4 as the Selected Remedy as presented in this ROD.

13.0 Selected Alternative

This section presents the detailed description of the EPA's selected alternative, which is Alternative 4 in the FS, with the exception that the EPA has modified the alternative slightly by eliminating the chat recycling ICs, and revising the action levels based on comments received from the public. Alternative 4 is a remedial alternative based on excavating and disposing of source materials in on-site subsidence pits for addressing the principal threats, i.e., risks to aquatic biota caused by surface water containing COCs in concentrations exceeding ALCs, potential risks to terrestrial vermivores that may be caused by ingesting metals from soils exceeding threshold criteria, and exposure of people to metals-contaminated soil and mine wastes. This alternative relies on excavation and on-site disposal and prescribes a high degree of mine and mill waste consolidation to address the RAOs. In addition, the timeframe for this alternative is aggressive because the schedule is not dependent on the availability of biosolids or the time required to construct simple soil covers on numerous waste containment cells. Detailed costs associated with the implementation of Alternative 4 are presented Table 12. The total cost estimated for this Alternative is \$58,543,332 for construction, with an estimated annual operation and maintenance cost of \$22,500.

The detailed description of Alternative 4 is presented in the following subsections.

13.1 Selected Alternative Rationale

Alternative 4 relies on the disposal of source materials in on-site subsidence pits to achieve significant reductions in COC loadings to surface waters, as well as reducing risks to terrestrial vermivores, and to people who may move into residences constructed in contaminated areas. In contrast to the current situation in which mill wastes have been placed aboveground and are exposed to erosion and natural weathering forces, Alternative 4 takes advantage of the naturally-occurring geochemical conditions underground, especially in flooded mine workings, to arrest the natural weathering processes and create favorable conditions for the formation of relatively insoluble mineral assemblages. A short-term release of metals to groundwater after placing the mill wastes in the subsidence pits is expected. However, the impacts to surface waters should be localized and the affect on surface water metal loading relatively minor when compared to the significant role played by surficial waste deposits as a metals source during high-flow conditions.

A growing body of engineering experience and scientific investigation points to underground or underwater (subaqueous) disposal of mining and milling wastes as a cost-effective and environmentally safe disposal method. The results of batch leach tests of Galena, Kansas area mine wastes were used to model the subaqueous disposal of mill wastes. The report concluded that placing mill waste underground in subsidence pits can significantly reduce the transport of metals from the wastes to surface waters. Recent site-specific work performed by MDNR in the Logan Uplands area of the Oronogo/Duenweg DA supports the conclusion that

subaqueous disposal of mineralized waste rock does not adversely affect groundwater quality. To further evaluate and document the effects of this alternative, a subsidence pit demonstration project was initiated in the Waco DA in July 2001. This demonstration project was designed to evaluate the possible changes in local groundwater chemistry and surface water quality near the demonstration disposal pit and confirm that disposal of mill wastes in subsidence pits in general would have no long-term adverse impacts on groundwater or surface water. The demonstration was completed in the spring of 2003. The study showed that filling a pit with approximately 60,000 cubic yards of tailings with high concentrations of zinc did not result in a long-term increase in zinc concentrations in the groundwater.

Filling open subsidence pits should also reduce the influx of oxygen into the shallow aquifer. Reducing the oxygen flux into the shallow aquifer will improve groundwater quality by reducing the oxidation of pyrite and other sulfide minerals remaining in the underground workings. The rationale for developing an alternative based on subsidence pit disposal is based on these findings and conclusions. An incidental benefit of this alternative would be the stabilizing effect that backfilling would have on mine collapse features in the Site. Filling selected subsidence pits would address potential human health risks associated with the physical hazards posed by open pits, as well as eliminate some nuisance trash pits in the area.

Due to the extremely complex and varied nature of the site and the innovative nature of the preferred alternative, a flexible approach with respect to applying technologies from other alternatives may be necessary during implementation. In other words, components of other alternatives in the FS, such as biosolid treatment and capping of certain source materials may be necessary as conditions warrant. Where wastes are remotely located from disposal pits, or where removal of wastes from deep, depressions would result in excessively deep excavation and water ponding, capping of the wastes with simple soil covers will be used to encapsulate the wastes in place.

13.2 Detailed Description of the Selected Remedy

The following section provides a detailed description of the EPA's preferred remedy for cleanup of the source material on the site.

13.2.1 Engineered Cleanup Actions

Specific actions implemented under Alternative 4 include the engineering components described in the FS with respect to remediation of the source materials. As noted above, the preferred alternative is slightly modified from the description of Alternative 4 in the FS with respect to the ICs discussed in Section 13.2.2 because chat recycling is eliminated as a component of this ROD, and the selected action levels for the Site. The specific actions of the selected alternative include the actions listed below. The order of priority for cleanup of the source materials will be to address the wastes located in close proximity residential areas,

followed by cleanup of wastes that present the highest risk to aquatic life. Waste areas that do not present significant human health or aquatic risk, but present risk to the terrestrial environment will be cleaned up as the last priority.

Source Removal and Disposal in Subsidence Pits

In- and near-stream barren chat, vegetated chat, and tailings; barren chat, vegetated chat, and tailings located in the flood plains and tributaries; upland chat and tailings exceeding terrestrial and human health action levels would be excavated and placed in mine subsidence pits located in proximity to the source material. Backfilling the pits would be accomplished by simply end-dumping and/or pushing the mill wastes into the pits with excavation equipment.

To the extent possible, tailings and chat would be placed at least a meter below the seasonal low static water level in the pits. Reducing repeated wetting and drying of the wastes as a result of seasonal water level fluctuations is considered important for arresting weathering, oxidation, and acid generation processes, and preventing further leaching of metals from the wastes. Relatively inert materials, such as development rock or low-concentration chat would be used to fill the zones where water levels may fluctuate. Flooded pits that contain high quality habitat for fish and wildlife, and contain low concentrations of metals in the water will not be used for disposal because they do not present a risk to human health or the environment. There appears to be sufficient pit space available on the Site to warrant saving good quality habitat.

Upland Source Materials

Upland barren chat and tailings that do not exceed action levels established to protect terrestrial and human health would be left in place because they do not pose a risk to human health and the environment. Upland vegetated chat and transition zone soils that exceed human health and terrestrial cleanup criteria would be deep tilled to reduce metal concentrations and revegetated. Biosolids would be added to provide some treatment of the metals in these sources, and to improve soil structure for plant growth.

Sediment Removal

Sediments in the intermittent tributaries flowing from the sources areas to the Class P streams will be removed subsequent to the cleanup of the sources draining to the tributaries. The sediments will be removed to a depth where background metals concentrations or bedrock is encountered, which ever is shallower. Sediment basins and traps will be constructed at the mouths of the tributaries to be remediated to mitigate sediment transport to the Class P streams during the cleanup actions. Remediated tributaries will be restored by lining the channels with clean gravel and stabilizing the banks with natural vegetation.

Sediment removal actions in Class P streams would be limited to delta deposit built up at tributary mouths. Generally, all the sediments in the deltas exceed screening criteria for aquatic organisms. Therefore, all the sediment delta deposits at the mouths of the tributaries exposed

above the waterline at low-flow conditions will be removed. Extensive removal is not anticipated under this alternative because the estimated volume of delta deposits is small based the site sediment surveys conducted jointly by the EPA, the MDNR, and NewFields in November 1999 and April 2003. The excavated sediments would be disposed in subsidence pits with the other source materials. Removal of the delta deposit sediments will occur at each tributary at the completion of the removal of the sediment in the individual tributary. It is anticipated that all sediments from the tributaries draining source areas to the Class P stream will require complete removal up to the source areas. Once the tributaries have been cleaned of sediments, the channels will be restored to as near natural condition as possible. This would include replacement of clean gravel in the channels and bank stabilization.

This ROD is establishing numeric action levels for cleanup of the tributary sediments and delta deposits of 2 ppm cadmium, 70 ppm lead, and 250 ppm zinc. These concentrations were derived from the average concentration of background designated soil values. The EPA also assessed screening values for sediments in the consensus-based Threshold Effects Criteria (TEC) for freshwater, developed by MacDonald et al. (2000). The MacDonald values are recommended as numeric sediment quality criteria because TEC values are intended to predict the absence of toxicity in sediments. Although TEC values are often used for the purpose of ecological screening to determine contaminants of potential ecological concern, they also provide a reliable basis for classifying sediments as toxic or not toxic to sediment dwelling organisms. Comparing the threshold effects concentration to the probable effects concentration give a range of 1 to 5 ppm (average of 3) for cadmium, 32 to 128 ppm (average of 80) for lead, and 121 to 459 ppm (average of 290) for zinc. The average background soil concentrations for the Site fall within this range of screening values, and are slightly lower than the average recommended MacDonald values.

During implementation of the remedy, the EPA will initiate the surface water quality monitoring plan to assess the effectiveness of the source removal action on reducing surface water quality to meet Federal ALC. If at the second Five Year Review after completion of the remedy (10 years or less), conducted as required for the Site, monitoring data indicated the Federal ALC has not been achieved, the EPA will assess the feasibility of conducting additional actions. These may include the removal of sediments from the Class P streams, which is currently not part of the remedial actions selected in the ROD. Additional action may be taken under an amendment to this ROD, or as part of a new operable unit. If the assessment of data indicates the need for additional source material (i.e. mine waste or soil) removal is required, those additional actions would be conducted under an amendment to this ROD. Should the data indicate that sediment removal from the Class P streams is necessary to achieve the federal ALC, those actions would be conducted under a separate OU and ROD. Should the EPA determine that an additional OU and ROD for sediments is warranted, sediment removal activities would be conducted simultaneously with sediment actions in the Spring River drainage in Kansas and Oklahoma.

Recontour, Revegetate, Soil Amendments, Stabilization

A variety of drainage and erosion control measures will be implemented during and after excavation of the source materials to manage storm water runoff and reduce metal and sediment loadings to Class P streams and their tributaries. Excavated areas will be recontoured and revegetated following complete removal of the mill wastes in order to control runoff and prevent surface erosion. Deep tilling would be performed to improve soil structure and moisture retention characteristics by blending the organic matter content of different soil horizons, as well as reducing contaminant concentrations, to reduce risks to human health and terrestrial biota, and improve soil function. The soils would be amended with biosolids to supplement the soil organic matter content and facilitate revegetation, which may also provide some treatment to any residual metals not excavated during subaqueous disposal. Excavated areas will be contoured to promote proper drainage, preventing ponding of water in the excavated areas. Excavated areas will be revegetated using native, warm-season grass, or other grass types, dependent on the wishes of the property owner. Stream channels and banks from which source materials have been removed would be stabilized through the use of appropriate restoration techniques, such as recontouring, regrading, revegetating, or installing erosion barriers, stone armor, or riprap. Natural vegetation, such as willows or cedar revetments, would be used to stabilize remediated channels instead of stone rip-rap, where practical.

Selection and Capping of Disposal Pits

Pits will be evaluated during the remedial action for their suitability as disposal sites. Pits directly connected to the surface water system, containing highly oxygenated water, or exhibiting high groundwater flux will preferably be excluded from consideration as disposal sites. Pits within ½ mile of Class P streams with exceedances of ALCs will also be excluded depending on the degree of karst development or mining-related conduit flow. Pits within one-mile upgradient of shallow drinking water wells that are still in use will be excluded from consideration for disposal. Pits exhibiting low dissolved oxygen concentrations and low oxidation/reduction potential will be considered good candidates for disposal sites. The filled pits will be capped with geo-composite soil covers to nearly eliminate infiltration of oxygenated rainwater, thereby reducing the weathering of the disposed wastes. Actions, such as mounding the cover systems and diverting surface flows away from the capped pits will also be taken to reduce the infiltration of oxygenated water into the disposal pits. In- and near-stream transition zone soils exceeding the action level for human health and terrestrial risk or soils from beneath excavated chat piles will be excavated and used in the construction of the soil cover systems. To prevent damage to the cover systems due to consolidation and differential settling of the mill wastes placed in the pits, adequate time (six to twelve months), will be allowed for the mill wastes to consolidate in the subsidence pits prior to attempting to install the cover systems. Any subsidence that occurs during the consolidation period will be filled in with additional mill wastes or soils to provide positive slopes and adequate drainage for the cover system. Erosion control measures will be installed at each filled pit to control runoff prior to the cap installation during the settling period. Only low-concentration mill waste or development rock will be used to fill settled areas in the pits after subsidence of initial materials disposed prior to the cap installation.

In addition, groundwater monitoring wells will be installed around the first few pits where disposal occurs to confirm the results of the Waco pilot study concerning the short-term and long-term release of metals. The monitoring data collected from the wells will be used to further define the appropriateness of various types of pits for disposal, and refine disposal criteria. Monitoring will be conducted weekly for the first two months, monthly for months three through six, quarterly for the remainder of year one, then semi-annually until the first Five Year Review.

Shaft Plugging

Surface water and sediment RAOs will be addressed through the source material and sediment removal options described above. Where practical, the groundwater RAO will be addressed by installing shaft plugs and diversion ditches to reduce the amount of surface water entering the mine workings. The purpose of these actions will be to reduce point and non-point groundwater discharge from mining-related sources to streams.

Thorns DA Open Mine Pits

The acidic overburden from the Wild Goose open pit mine in the Thorns DA will be excavated and disposed underwater in the TH-12 pit. Other mill wastes from the Thorns DA will also be disposed in this open pit, as well. Due to the size of the pit, however, there is not enough mill waste or overburden in the Thorns DA to completely fill the Wild Goose open pit TH-12. Therefore, the EPA Will assess hauling wastes from other DAs to facilitate complete filling of the pit. Water displaced by the filling of the pit will be neutralized and treated with lime in a temporary mobile treatment plant to remove the cadmium, iron, lead, and zinc prior to discharging it to the nearby Center Creek tributary (CC Trib 6). An open limestone drain will be installed at the outlet of the pond to neutralize any subsequent discharges that may occur following the remedial actions, if the pit is only partially filled. Lands exposed by the excavation of the reactive overburden will be deep tilled, limed, and amended with biosolids or other organic matter and revegetated the same as other excavated mill waste deposits.

Filling of the Wild Goose pit, with its current low pH waters, presents a special concern for subaqueous disposal of wastes. The acidic nature of these waters could mobilize metals and result in groundwater conditions not suitable for subaqueous disposal. The acidic overburden may need to be treated to reduce acidity prior to placing it into the pit with mill wastes. Only partially filling the pit will result in open water at the surface that could serve as a continual input of oxygenated water, thereby negating anaerobic conditions to stabilize metals. If open surface water is left in the pit, it could be an attractive nuisance and could harm wildlife, particularly waterfowl. This scenario of disposal needs to be fully studied and modeled to show if it is effective prior to implementing action at the pit. Pilot studies will be required to assess the effectiveness of treatment technologies prior to full implementation of the filling action. It is likely, that is the treatability and pilot study results will show that the pit can be filled without significant metals release, but that the pit should be completely filled and capped.

13.2.2 Institutional Controls

The ROD for the smelter-affected and mining-affected residential yard soils in Jasper County (OU-2/3) prescribes ICs to reduce future exposure of children to unacceptable concentrations of lead in soils in new residential construction in all undeveloped contaminated areas. Those ICs were envisioned to consist of a Site-wide zoning ordinance that will control new development in mine-affected areas, building codes or health ordinances that will require remediation of soils exceeding the risk-based clean-up standards in new residential construction, and deed restrictions on excavated yard soil repository sites to protect them from human disturbance. The ICs are being considered and developed through a cooperative effort between the EPA, Jasper County, and the city of Joplin, Missouri. However, to date, the implementing ordinances have not been enacted. Thus, the preferred alternative for OU-1 incorporates the ICs that were required under OU-2/3 and allows the county and cities greater flexibility in adopting such ICs in light of the more permanent and reliable proposed action in this ROD, i.e., disposal and containment of the source materials.

The selected alternative for OU-1 includes a site-wide building ordinance that would be enacted by Jasper County, similar to the health ordinance prescribed in the OU-2/3 ROD. The EPA has discussed this IC with Jasper County. The county would propose a building ordinance for all undeveloped areas within the site that requires the builders of residential homes to obtain a permit for construction. Conditions of the permit would require soil testing to determine the lead concentration of the soil in the yard area of the home. The EPA will work with the county to develop appropriate sampling procedures to ensure the reliability of the results. An occupancy permit will only be granted by the county if soil lead concentrations are below 400 ppm and cadmium will be below 75 ppm. Builders will be required to properly cleanup soils exceeding these levels prior to receiving the occupancy permit. The EPA will provide funding to Jasper County to establish and implement the building permit ordinance. After the completion of the OU-1 cleanup, the surficial source materials (mine and milling wastes) will be contained in the subsidence pits. Thus, the building ordinance controlling residential development will no longer be required. The selected alternative does not require, but tolerates a planned termination date for the county building ordinance if the county prefers that the ordinance only be effective for a limited term. For example, the ordinance could terminate upon completion of the remedial action.

The selected alternative prescribes disposal of mine and mill wastes in mine subsidence pits followed by capping of the wastes. Some waste areas may be contained and capped in place with soils or biosolids. All capped areas and biosolids treated areas will require ICs to prevent disturbance of the cap thereby protecting the wastes. These ICs will likely consist of restrictions or easements placed on the property deeds for the areas where the disposal or containment occurs. The restriction will prevent the development on, and disturbance of, the caps placed over the wastes. Restrictive covenants may be entered into with owners of the disposal property for protection of the disposal and capped areas.

This ROD excludes chat recycling as a component of the Selected Alternative. The effective and more permanent engineering control components of the selected alternative eliminate the need for legal agreements to control recycling. Reducing risks to human health and the environment from chat recycling through legal agreements with individual owners/operators is administratively infeasible because of the large size of this Site, about 5,000 acres of mine waste piles and 500 owner/operators, and the far-reaching impact of such agreements, i.e., end uses, accumulation, speculation, storage, surface water protection, and final closure. Moreover, the legal agreements would duplicate ARARs under the Clean Water Act (CWA) that regulate discharge of pollutants and contaminants into surface waters. If enforcement actions are needed to control surface water pollution from mine waste piles prior to completion of the engineering components selected in this ROD, the CWA may be used on a case-by-case basis to regulate surface water pollution caused by chat recycling.

13.2.3 Health Education

The ROD for OU-2/3 required the implementation of a health education program in Jasper County to supplement the residential soil cleanup. The EPA has been funding the Jasper County Health Department to implement that health education program since 1996. Since human health exposure risks due to direct contact with source materials containing the metals contamination is possible until completion of the mine and mill waste cleanup described in this ROD, the EPA will continue to fund the health education program until the cleanup of OU-1 is complete. When the cleanup action is completed for OU-1, and at the completion of additional actions anticipated under OU-2/3, which essentially means that Superfund Site sources for human exposure have been addressed, the health education program will no longer be funded by the EPA.

13.2.4 Stream Monitoring

One of the primary RAOs for the selected alternative for surface water is to reduce the exposure of aquatic organisms in the Class P streams to COCs where federal ALC are exceeded. The EPA believes the actions taken under the preferred alternative will reduce concentrations of metals in the Class P stream to less than federal ALC based on hardness. These actions include removal of all source material with erosion potential to the streams, tributary sediments, and all sediment delta deposits above the low water line at the mouths of the tributaries draining source areas into the Class P streams. During the remedial action for OU-1, the EPA will establish a water quality monitoring program for the Class P streams to assess the effectiveness of the remedial action on reducing metals loads. The EPA will collect monitoring data which will be used during the five-year review process, and will be collected and assessed at each review until the metals concentrations are in compliance with the ALC. Should the goal of achieving the ALC fail to be achieved within two Five-Year Review periods (10 years) after completion of the remedial action, or if water quality standards established by states or tribes for downstream receiving surface waters show no improvement within this 10-year period, the EPA will assess the feasibility and practicality of conducting additional actions at the Site to further reduce the metals concentrations in the Class P streams. Should additional actions be required,

the work may be conducted under an amendment to this ROD for OU-1, or if warranted by extensive basis-wide action, a new operable unit for sediment removal may be established to address the Class P streams at the Site.

13.2.5 Operation and Maintenance

An O&M program will be established to maintain the caps on the disposal areas and to maintain other engineering components of the preferred alternative, e.g., areas of biosolids or soil application where wastes were left in place, groundwater monitoring, and revegetated areas. The state will be responsible for the O&M beginning one year after the completion of the remedial action. If the local government enforces the ICs, the state remains responsible for O&M of such local government controls.

The state's O&M responsibilities will include a monitoring program to assess the effectiveness of the ICs. The monitoring program will provide annual reports to the EPA detailing the development in areas of concern to protect engineering components. Monitoring requirements will be assessed during the five-year review process and may be modified or reduced as appropriate based on data collected as part of the reviews.

14.0 Statutory Determination

Under its legal authority, the EPA's primary responsibility at Superfund sites is to undertake remedial actions that achieve adequate protection of human health and the environment. In addition, Section 121 of CERCLA establishes several other statutory requirements and preferences. These specify that when complete, the selected remedial action for this Site must comply with applicable or relevant and appropriate environmental standards established under federal and state environmental laws, unless a statutory waiver is justified. The selected remedy also must be cost effective and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Finally, the statute includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as their principal element. The following sections discuss how the selected remedy meets these statutory requirements.

14.1 Protection of Human Health and the Environment

The selected remedy will protect human health and the environment by achieving the Remedial Action Objective through a combination of engineering measures and institutional controls. Existing terrestrial and aquatic risks from exposure to metals contaminated source materials will be mitigated by removal and disposal of the source materials in mine subsidence pits. Future risks to human health will be reduced by source removal and implementation of institutional controls that will ensure proper construction of residential dwellings in contaminated areas.

There are no short-term threats associated with implementation of the remedy that cannot be readily controlled. In addition, no long-term adverse cross-media impacts are expected from the remedy.

14.2 Attainment ARARs

Compliance with ARARs is required of the selected remedy unless a waiver of an ARAR is justified. The selected remedy is expected to comply with all ARARs, presented in the attached tables. ARARs for the selected remedy are identified and categorized as either “Applicable” or “Relevant and Appropriate” in Table 4 through 6. These tables also describe the requirements for each ARAR.

14.2.1 Chemical-Specific ARARs

The chemical-specific ARARs are presented in Table 4. The selected remedy is expected to comply with all identified requirements through excavation and disposal of the source materials and selected sediments.

14.2.2 Action-Specific ARARs

The action-specific ARARs are based on activities and technologies to be implemented at the site. The excavation and disposal activities undertaken by the selected remedy will attain the action-specific ARARs identified in Table 5.

14.2.3 Location-Specific ARARs

Compliance with location- and action-specific ARARs will be addressed during the remedial design of selected remedy which requires excavation and disposal of metals contaminated source materials. However, no remedial design problems resulting in noncompliance are anticipated.

The location-specific ARARs that will be attained by this remedial action are based on the location of the Site and the effect of the hazardous substances on the environment. The response actions undertaken by the selected remedy will attain the location-specific ARARs for historic preservation, archeological areas, and endangered species. These location specific ARARs are identified in Table 6.

14.3 Cost-Effectiveness

The selected remedy is cost-effective because it will provide overall effectiveness proportional to its costs. The selected remedy will achieve the remedial action objective, and thus effectively reduce unacceptable risks to human health and the environment, at an estimated cost of \$58,543,000 million. The selected remedy is the least expensive remedy that is fully

protective of human health and the environment, and is selected because it is the most protective, reliable, and permanent of the alternatives considered, and is the alternative preferred by the public.

14.4 Utilization of Permanent Solutions and Alternative Treatment Technology to the Maximum Extent Practicable

The selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner for this remedial action. Disposal of the wastes in subsidence pits, as opposed to surface disposal and capping, provides the most permanent disposal of the identified remedial actions. The other actions which are part of the selected remedy, institutional controls and monitoring, are not as permanent as the engineering actions, but will still provide a high degree of long-term effectiveness.

The selected remedy provides the best balance among the alternatives evaluated with respect to the evaluation criteria. The EPA relied strongly on the issue of permanence and reliability, as well as community acceptance, in selection of the remedy. The selected remedy best meets the statutory requirement to utilize permanent solutions to the maximum extent practicable.

14.5 Preference for Treatment as a Principal Element

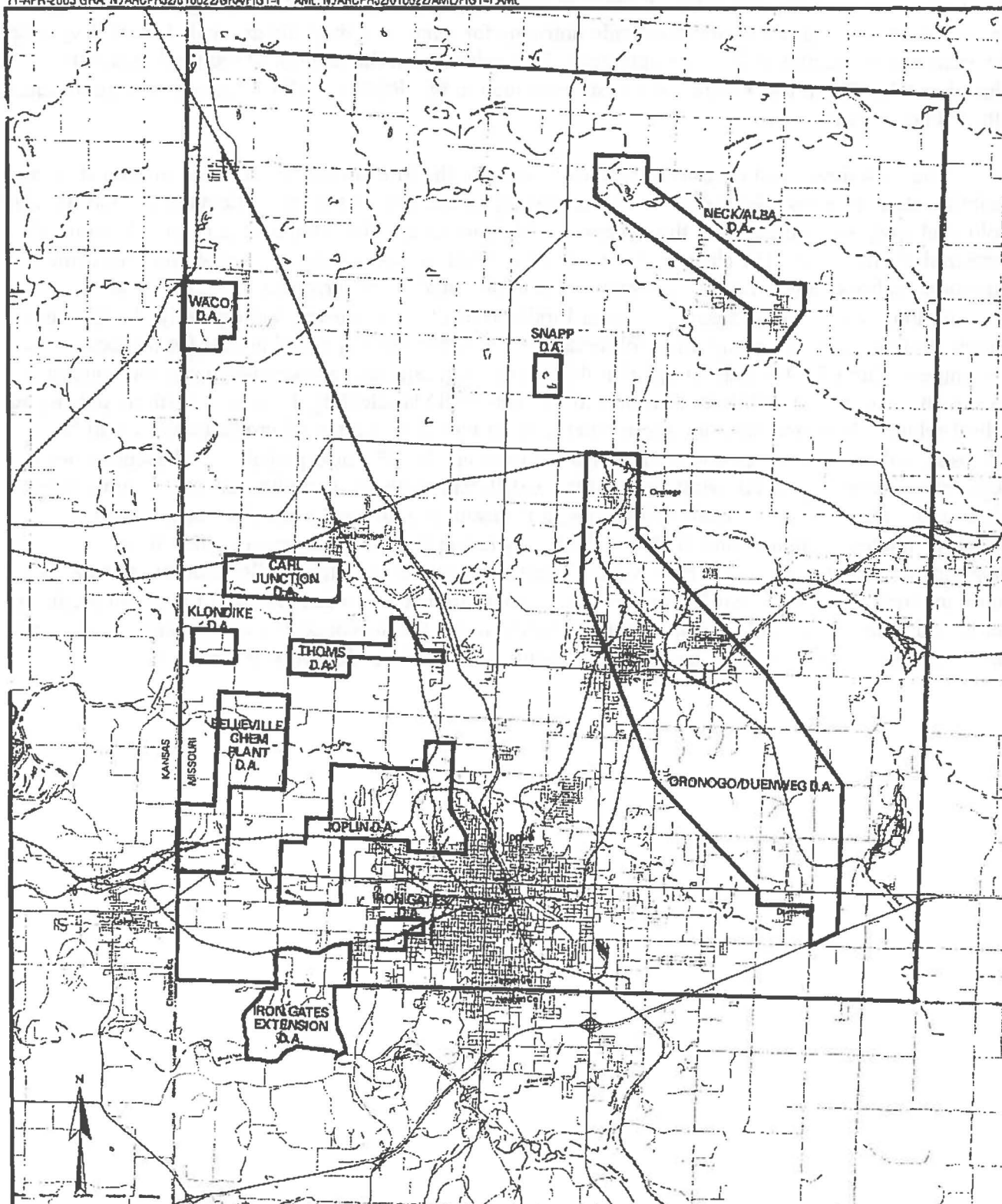
The selected remedy effectively reduces risks through a combination of engineering and institutional controls, and includes treatment technology to the maximum extent possible. Subaqueous disposal of source materials is expected to create anaerobic conditions in the subsurface which will reduce the solubility of metals in the wastes, limiting their migration.

15.0 Documentation of Significant Changes

This Record of Decision is essentially the same as presented in the Proposed Plan released for OU 1 in July, 2004, with the exception of the action levels specified for cleanup, and the cost of institutional controls. The Proposed Plan presented action levels of 800 ppm lead, 40 ppm cadmium, and 6,400 ppm zinc to protect the terrestrial environment. Local health officials requested the EPA to lower the action level for lead to 400 ppm. This request was made due to the fact that the county is anticipating establishing a building ordinance for residential construction in contaminated areas that would require soil in yards to be less than 400 ppm lead. The health officials noted that unless the Site sources were remediated to less than 400 ppm lead, the building ordinance, health education, and funding support for both would be required in perpetuity. The cost estimate prepared for Alternative 4, the selected remedy, in the FS assumed all upland chat and tailings will exceed the terrestrial action level for lead of 800 ppm. Lowering the action level for lead from 800 ppm to 400 ppm to provide additional protection for future human health did not increase cost to remove and dispose chat and tailings. The amount of transition zone soil requiring removal by lowering the action levels resulted in an additional 300 acres and increased costs by approximately \$1,091,000. Additionally, the EPA inadvertently left out the appropriate cost of institutional controls from the Proposed Plan. Costs for the ICs increased the Site costs by \$1,600,000. However, the EPA believes the Proposed Plan over

estimated the amount of biosolids required to complete the remedial action. The FS assumed 50 tons per acre of biosolids would be placed in all cleanup areas after excavation. The EPA believes 10 tons per acre is a more reasonable amount to provide nutrients for plant growth in the excavated areas. Vegetated chat areas will be treated with 75 tons per acre. This reduction in the amount of required biosolids reduced cost by \$4 million. Overall, the costs presented in this ROD are \$3.1 million less than presented in the Proposed Plan.

The EPA developed terrestrial cleanup criteria for the Site during the remedial investigation and feasibility study process. These numbers were developed and selected in the "Addendum to the Baseline Ecological Risk Assessment" and the "Technical Memorandum: Risk Management Considerations for Terrestrial Vermivores". The cleanup criteria were derived by calculating soil concentrations, using a regression analysis between soil concentrations and measured earthworm and soil invertebrate concentrations, which would result in a hazard index (HI) of 1 for shrews. Subsequently, the EPA has reassessed these numbers, using different methods, to confirm their appropriateness for protecting the environment. The EPA has determined that the soil cleanup criteria, as developed using the regression analysis, may result in an HI between one and 10. This ROD is selecting the cleanup criteria developed in the Technical Memorandum and these criteria along with the fact that all erodable waste will be addressed, will provide for a protective remedy. However, the EPA acknowledges the uncertainties in accurately determining an HI using either of these different methods, including the regression analysis calculations. The EPA understands that the Natural Resource Trustees for the Site are conducting additional studies, including bird studies, which may refine the risk to the environment from contaminated soil. The EPA will review and assess these studies, and may collect additional data, at a minimum during the Five-Year Review process, to determine the protectiveness of the cleanup criteria established in this ROD. Additional cleanup action to lower metals concentrations in mine waste areas may be conducted, if warranted, based on the results of these Five-Year Reviews analyses.



EXPLANATION	
---	Stream or River
---	Site Boundary
---	Designated Area
---	Roads

MFG, Inc.
consulting scientists and engineers

SCALE IN FEET



FEASIBILITY STUDY
Mine and Mill Waste Operable Unit

FIGURE 1-1
JASPER COUNTY SITE MAP

PROJECT: 010022.4
DATE: APR 11, 2003
REV: 0
BY: MCP
CHECKED:

Table 1 Summary of Estimated Quantities of Source Materials and Affected Media

Designated Area	Units	Belleville	Carl Junction	Iron Gates	Iron Gates Extension	Joplin	Klondike	Neck/Alba	Oronogo-Duenweg	Snap	Thoms	Waco	Total
Source Material Categories													
In/Near Stream Barren Chat	Cu.Yds. Acres	95,699 14.8	4,646 2.9				1,703 0.5	21,209 8.2	287,063 186.9				410,319 Cu.Yds. 213.3 Acres
In/Near Stream Vegetated Chat	Cu.Yds. Acres		8,574 5.3					30,302 36.6	114,035 141.4		467 0.6		153,378 Cu.Yds. 183.8 Acres
In/Near Stream Tailings	Cu.Yds. Acres							31,222 20.5	28,322 21.8				59,544 Cu.Yds. 42 Acres
Barren Chat Sediment Sources	Cu.Yds. Acres	158,885 28.8			506,526 78.5	133,411 100.8	15,552 2.4		919,915 438.9		2,491 3.1	3,662 2.3	1,740,442 Cu.Yds. 655 Acres
Vegetated Chat Sediment Sources	Cu.Yds. Acres					33,634 51.0		6,068 5.2	34,193 42.5			26,103 21.3	99,998 Cu.Yds. 120 Acres
Tailings Sediment Sources	Cu.Yds. Acres					5,554.00 5.2			60,821.00 48.4	19,872 8.2	3,651 2.3		89,898 Cu.Yds. 64 Acres
Upland Barren Chat	Cu.Yds. Acres	189,831 30.0	75,123 24.0		68,583 10.6	384,719 153.1	1,775 0.3	181,948 59.9	1,247,783 894.8	8,103 1.8	4,875 1.9	5,585 4.8	2,168,326 Cu.Yds. 1,181 Acres
Upland Vegetated Chat	Cu.Yds. Acres		20,212 7.7			142,366 163.8		46,148 51.5	268,053 297.1	8456 8	18,144 18.6	124,305 72.9	625,684 Cu.Yds. 817.7 Acres
Upland Tailings	Cu.Yds. Acres		28,217 9.2			24,031 13.5		12,244 13.4	42,693 91.8	44,008 23.1	22,315 5.5	1,465 1.0	174,873 Cu.Yds. 157.5 Acres
Acidic Overburden	Cu.Yds. Acres										335,661 39.0		335,661 Cu.Yds. 39.0 Acres
Sediment Categories													
Stream Sediments	Cu.Yds. Lin. Ft.	3,703 2,500			2,135 4,239	702 2,310	448 2,420		1,912 8,990				8,900 Cu.Yds. 20,459 Lin. Ft.
Soil Categories													
In/Near Stream Transition Zone Soil	Cu.Yds. Acres	128,744 79.8	6,615 4.1		159,075 98.6	96,961 60.1	16,133 10.0	8,228 5.1	350,093 217.0	-	13,713 8.5	13,552 8.4	783,115 Cu.Yds. 491.6 Acres
Upland Transition Zone Soils	Cu.Yds. Acres	97,123 60.20	104,705 64.90	8,067 5.00	21,619 13.40	275,719 170.90	1,613 1.00	74,052 45.90	526,592 326.40	-	26,820 16.50	20,328 12.60	1,156,437 Cu.Yds. 716.8 Acres

Total	Cu.Yds.	Acres
Total Barren Chat	4,319,087	2,049
Total Vegetated Chat	879,060	922
Total Tailings	324,315	264
Total Sediments	8,900	-
Total Mill Wastes	5,531,362	3,235
Total Mill Wastes	5,531,362	3,235
Total Transition Zone Soils	1,949,552	1,208
Total Overburden	335,661	39.0
Total	7,816,575	4,482

**Table 2 Comparative Analysis of Remedial Alternatives with Respect to
Overall Protection of Human Health and the Environment
Jasper County, Missouri**

Criterion	<u>Alternative 1</u> No Further Action	<u>Alternative 2</u> Source Consolidation, In-Place Containment through Revegetation Using Biosolids, and Recycling	<u>Alternative 3</u> Source Consolidation, In-Place Containment Using Simple Soil Covers, Revegetation, and Recycling	<u>Alternative 4</u> Source Removal and Subsidence Pit Disposal	<u>Alternative 5a</u> Source Removal and On-Site Aboveground Disposal	<u>Alternative 5b</u> Source Removal, On - Site Aboveground Disposal, and Water Treatment
How the Alternative Enhances Human Health Protection	<p>Alternative 1 does not enhance human health protection measures already being implemented under OU-2, OU-3 and OU-4.</p> <p>Alternative 1 relies more on institutional controls to manage residual human health risks than any other alternative.</p>	<p>Alternative 2 enhances the human health protections being implemented under OU-2, 3, and 4, by removing more than 75% of the mill waste through recycling. However, direct revegetation of mill wastes is the least protective containment option of any action alternative.</p> <p>Alternative 2 requires an estimated 30 years to achieve the predicted enhancements of human health protections.</p>	<p>Alternative 3 enhances the human health protections already being implemented by capping mill waste with soil covers. These covers would be protective of human health. However, this alternative results in the largest land area occupied by mill wastes and subject to institutional controls of any of the action alternatives.</p> <p>Alternative 3 requires an estimated 12 years to achieve the predicted enhancements of human health protections.</p>	<p>The disposal and capping method prescribed under Alternative 4 would be fully protective of human health. Only 710 acres would be subject to institutional controls needed for long-term protection of remedial facilities.</p> <p>Alternative 4 requires an estimated 7 years to achieve the predicted enhancements of human health protections.</p>	<p>The disposal and capping method prescribed under Alternative 5a would be fully protective of human health. However, more mill waste remains on the land surface than any other alternative, except 5b. Approximately 1080 acres would be subject to institutional controls needed for long-term protection of remedial facilities.</p> <p>Alternative 5a requires an estimated 7 years to achieve the predicted enhancements of human health protections.</p>	<p>The disposal and capping method prescribed under Alternative 5b would be fully protective of human health. However, more mill waste remains on the land surface than any other alternative. Approximately 280 acres would be subject to institutional controls needed for long-term protection of remedial facilities.</p> <p>The level of enhancements of human health protections is achieved in the shortest timeframe, 5 years.</p>
How the Alternative Provides Environmental Protection	<p>Source materials RAOs are not met because large areas remain affected by mill wastes exceeding the RBCs. Risks to terrestrial vermivores may actually</p>	<p>Source materials exceeding RBCs remain on Site under Alternative 2. The source material RAO may not be fully met if biosolids applications prove ineffective in</p>	<p>The source material RAO is expected to be met under Alternative 3.</p> <p>Alternative 3 would probably not be capable of achieving the 90-95%</p>	<p>Source material RAOs are met under Alternative 4, the same as Alternatives 3, 5a, and 5b.</p> <p>Surface water RAOs and</p>	<p>The source material and surface water RAOs are met under all conditions, the same as under Alternatives 3, 4, and 5b. Residual risks to terrestrial vermivores and</p>	<p>The source material, surface water, and groundwater RAOs are met under all conditions, the same as under Alternatives 3, 4 and 5a.</p>

**Table 2 Comparative Analysis of Remedial Alternatives with Respect to
Overall Protection of Human Health and the Environment
Jasper County, Missouri**

Criterion	<u>Alternative 1</u> No Further Action	<u>Alternative 2</u> Source Consolidation, In-Place Containment through Revegetation Using Biosolids, and Recycling	<u>Alternative 3</u> Source Consolidation, In-Place Containment Using Simple Soil Covers, Revegetation, and Re cycling	<u>Alternative 4</u> Source Removal and Subsidence Pit Disposal	<u>Alternative 5a</u> Source Removal and On-Site Aboveground Disposal	<u>Alternative 5b</u> Source Removal, On - Site Aboveground Disposal, and Water Treatment
	<p>increase as more excavated barren chat areas become vegetated.</p> <p>Alternative 1 would not be capable of achieving the metal loading reductions needed to meet the surface water RAOs.</p> <p>No measures are taken to address the groundwater RAO. However, under all alternatives, the groundwater RAO may be met under current conditions despite the absence of remedial measures.</p>	<p>reducing metals bioavailability. Residual risks to vermivores are higher than other action alternatives.</p> <p>Alternative 2 would probably not be capable of achieving the 90-95% metal loading reductions needed to meet the surface water RAOs in all Class P streams and tributaries under all flow conditions.</p> <p>Direct revegetation of mill wastes using biosolids is expected to be the least adequate, permanent or reliable of any of the prescribed containment options. However, chat recycling is considered highly permanent and reliable and meets the objectives of treatment</p>	<p>metal loading reductions needed to meet the surface water RAOs in all Class P streams under all flow conditions.</p> <p>Simple soil covers are considered more permanent than direct revegetation, but less adequate or reliable than subsidence pit disposal or the engineered repositories prescribed under Alternatives 4, 5a, or 5b.</p> <p>The groundwater RAO is achieved, the same as all other alternatives. The same groundwater actions are prescribed as Alternatives 2, 4, and 5a.</p> <p>Alternative 3 requires 12 years to attain the predicted level of RAOs achievement.</p>	<p>ARARs are expected to be consistently achieved. Residual risks to aquatic life are lower than Alternatives 1, 2, or 3.</p> <p>Subsidence pit disposal is expected to be the most permanent and reliable disposal option of any prescribed.</p> <p>The groundwater RAO is achieved, the same as all other alternatives.</p> <p>RAOs are expected to be met under Alternative 4 in approximately 7 years.</p>	<p>aquatic life are lower than Alternatives 1, 2, or 3 but the same as Alternatives 4 and 5b.</p> <p>The groundwater RAO is achieved, the same as all other action alternatives.</p> <p>The engineered repositories prescribed under Alternative 5a are adequate and reliable, but are considered somewhat less permanent than subsidence pit disposal.</p> <p>RAOs are expected to be met under Alternative 5a in approximately 7 years.</p>	<p>The engineered repositories prescribed under Alternative 5b are adequate and reliable, but are considered somewhat less permanent than subsidence pit disposal.</p> <p>RAOs are expected to be met under Alternative 5b in approximately 5 years.</p>

**Table 2 Comparative Analysis of Remedial Alternatives with Respect to
Overall Protection of Human Health and the Environment
Jasper County, Missouri**

Criterion	<u>Alternative 1</u> No Further Action	<u>Alternative 2</u> Source Consolidation, In-Place Containment through Revegetation Using Biosolids, and Recycling	<u>Alternative 3</u> Source Consolidation, In-Place Containment Using Simple Soil Covers, Revegetation, and Recycling	<u>Alternative 4</u> Source Removal and Subsidence Pit Disposal	<u>Alternative 5a</u> Source Removal and On-Site Aboveground Disposal	<u>Alternative 5b</u> Source Removal, On - Site Aboveground Disposal, and Water Treatment
How the Alternative Provides Environmental Protection (continued)		<p>Although the groundwater RAO may be met under current conditions, shaft plugs and diversion ditches are implemented to further reduce groundwater loadings to surface water.</p> <p>Alternative 2 requires 30 years to attain the predicted level of RAOs achievement.</p>				

**Table 3 Comparative Analysis of Remedial Alternatives with
Respect to Compliance with ARARs
Jasper County, Missouri**

Criterion	<u>Alternative 1</u> No Further Action	<u>Alternative 2</u> Source Consolidation, In-Place Containment through Revegetation Using Biosolids, and Recycling	<u>Alternative 3</u> Source Consolidation, In-Place Containment Using Simple Soil Covers, Revegetation, and Recycling	<u>Alternative 4</u> Source Removal and Subsidence Pit Disposal	<u>Alternative 5a</u> Source Removal and On-Site Aboveground Disposal	<u>Alternative 5b</u> Source Removal, On- Site Aboveground Disposal, and Water Treatment
Compliance with Chemical-Specific ARARs	Under Alternative 1, exceedances of chemical-specific ARARs are expected to occur in Class P stream and regularly in some tributaries and miner's ditches during high flow conditions.	Alternative 2 would probably not be capable of achieving the 90-95% metal loading reductions needed to meet Federal chronic ALCs in all Class P streams under all flow conditions and would likely not meet ALCs in the tributaries or miner's ditches.	Same as Alternative 2.	Federal chronic ALCs are met in their respective Class P streams under all flow conditions.	Same as Alternative 4.	Same as Alternatives 4 and 5a.
Compliance with Action-Specific ARARs	Uncontrolled chat recycling does not comply with applicable storm water regulations that are identified as action-specific ARARs for this alternative. No other action-specific ARARs are identified for Alternative 1.	Potential action-specific ARARs identified under Alternative 2 include: Storm water regulations for chat recycling, requirements of 40 CFR Part 503 for biosolids applications, Federal and State NPDES storm water requirements, and the dredge and fill requirements of Section 404 of the CWA for excavating mill wastes and sediments from stream channels, and the NAAQS under the CAA.	Same as Alternative 2.	Dredge and fill requirements of Section 404 of the CWA, requirements of 40 CFR Part 503 for biosolids applications, Federal and State NPDES storm water requirements, and the NAAQS under the CAA are the only potential action-specific ARARs identified for Alternative 4. The Federal and State UIC regulations do not apply if only pits wider than they are deep are used for disposal sites.	Dredge and fill requirements of Section 404 of the CWA, requirements of 40 CFR Part 503 for biosolids applications, Federal and State NPDES storm water requirements, and the NAAQS under the CAA are the only potential action-specific ARARs identified for Alternatives 5a. Alternative 5a would comply with the potential action-specific ARARs identified for this alternative.	Same as Alternative 5a with the exception of the need for the requirements of 40 CFR Part 503 for biosolids applications.

**Table 3 Comparative Analysis of Remedial Alternatives with
Respect to Compliance with ARARs
Jasper County, Missouri**

Criterion	<u>Alternative 1</u> No Further Action	<u>Alternative 2</u> Source Consolidation, In-Place Containment through Revegetation Using Biosolids, and Recycling	<u>Alternative 3</u> Source Consolidation, In-Place Containment Using Simple Soil Covers, Revegetation, and Recycling	<u>Alternative 4</u> Source Removal and Subsidence Pit Disposal	<u>Alternative 5a</u> Source Removal and On-Site Aboveground Disposal	<u>Alternative 5b</u> Source Removal, On - Site Aboveground Disposal, and Water Treatment
		Alternative 2 would comply with these potential action-specific ARARs.		Alternative 4 would comply with the potential action-specific ARARs identified for this alternative.		
Compliance with Location-Specific ARARs	Alternative 1 complies with location specific ARARs.	Alternative 2 complies with location specific ARARs.	Same as Alternative 2.	Actions proposed under Alternative 4 comply with location-specific ARARs provided pits containing aquatic habitat are not used as disposal sites to assure compliance with habitat and wetland protection requirements.	Alternative 5a complies with location specific ARARs.	Same as Alternative 5a.
Compliance with Other Criteria, Advisories, and Guidance (TBCs)	Chat recycling may not always comply with guidance on appropriate chat uses to prevent risks to human health contained in EPA Region VII's Mine Waste Fact Sheet.	In contrast to Alternative 1, the controlled chat recycling prescribed under Alternative 2 is more likely to comply with EPA's guidance on appropriate chat uses to prevent risks to human health.	Same as Alternative 2.	The RCRA CAMU rule and the state and federal UIC regulations are ARARs if the pits meet the definition of a well or hazardous wastes or contaminated liquids are disposed. Otherwise, the UIC is a TBC. Alternative 4 would comply with the pertinent substantive guidance provided by these TBCs.	The RCRA CAMU rule is an action-specific TBCs for this alternative. Alternative 5a would comply with the pertinent substantive guidance provided by this TBC.	Same as Alternative 5a.

**Table 4 Federal and State Chemical-Specific ARARs
and Guidance to be Considered**

Standard, Requirement, Criteria, or Limitation	Citation	Description	I ARARs	To Be Considered
AIR				
FEDERAL REQUIREMENTS				
Clean Air Act – National Primary and Secondary Ambient Air Quality Standards	42 USC Secs. 7401 – 7671 40 CFR Part 50	The Clean Air Act and implementing regulations define air quality criteria for protecting human health, including standards for particulate matter and lead.	X	
STATE REQUIREMENTS				
Missouri Air Conservation Law	RSMo 643 10 CSR 10	Set ambient air quality standards for a variety of constituents, including particulate matter and lead.	X	
GROUNDWATER				
FEDERAL REQUIREMENTS				
Federal Safe Drinking Water Act – National Primary and Secondary Standards	40 CFR Parts 141 and 143	Establishes primary maximum contaminant levels (MCLs) and MCL goals (MCLGs) that are health-based standards for public drinking water systems, as well as secondary MCLs and MCLGs that are standards for constituents that affect only the aesthetic qualities of drinking water. According to the NCP, MCLs and MCLGs are ARARs for groundwater at Superfund sites.	X	
Technical Impracticability Waiver for Groundwater ARARs – Jasper County Site	Region VII EPA Record of Decision for the Groundwater Operable Unit (OU-4) of the Jasper County, Missouri Superfund Site, July 29, 1998.	This document established the technical impracticability (TI) of restoring the shallow groundwater aquifer in mined areas of the Jasper County site. The TI waiver determined that aquifer restoration was impracticable based on the large size and heterogeneous nature of the aquifer, lack of effective pumping and treatment technology, and the inordinate costs associated with groundwater treatment.		X
STATE REQUIREMENTS				
Missouri Safe Drinking Water Act	RSMo 640.100 – 140 10 CSR 60	Contains MCLs and monitoring requirements for drinking water supplies.	X	

**Table 4 Federal and State Chemical-Specific ARARs
and Guidance to be Considered**

Standard, Requirement, Criteria, or Limitation	Citation	Description	I ARARs	To Be Considered
SOURCE MATERIALS AND SOILS				
FEDERAL REQUIREMENTS				
Risk Management Considerations for Terrestrial Vermivores	NewFields and Black & Veatch 2001	Establishes site specific criteria for preventing risks to terrestrial vermivores. Source materials and soil criteria for vermivores include cadmium: 41 mg/kg; lead: 804 mg/kg; and zinc: 6,424 mg/kg. These criteria are not legal or regulatory standards but should be considered during alternative evaluation.		X
Baseline Ecological Risk Assessment for the Jasper County Superfund Site, Jasper County, Missouri.	Black and Veatch 1998	The BERA provides a screening level evaluation of potential risks to ecological receptors in the Site. The BERA identified the potential exposure pathways addressed in the Risk Management Considerations document cited above.		X
Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities.	OSWER Directive No. 9355.4-12, July 14, 1994	Recommends a screening level of 400 ppm for lead in residential soils. Describes methodology for developing site-specific preliminary remediation goals. Describes a plan for soil lead cleanup at sites with multiple sources of lead. This directive provides guidance for evaluating the extent to which proposed remedial actions might enhance protection of human health.		X
Soil Screening Guidance	OSWER Directive 9355.4-23, July 1996 EPA/540/R-961108 and 128	Recommends the development of site-specific soil screening levels. Provides general screening levels below which areas are determined to be adequate and do not need further assessment. Further evaluation of risks is recommended for areas above the screening levels.		X
STATE REQUIREMENTS				
Cleanup Levels for Missouri (CALM) Guidance	Missouri Department of Natural Resources' Cleanup Levels for Missouri Guidance, September 2001	The Cleanup Levels for Missouri (CALM) guidance document outlines a process for determining cleanup goals at sites with known or suspected hazardous substance contamination. MDNR and the Missouri Department of Health and Senior Services established CALM as a risk-based approach that takes into account land use (industrial, commercial, and unrestricted/residential), with three key tables listing soil and groundwater cleanup standards. These are not ARARs but may be TBCs.		X

**Table 4 Federal and State Chemical-Specific ARARs
and Guidance to be Considered**

Standard, Requirement, Criteria, or Limitation	Citation	Description	I ARARs	To Be Considered
SURFACE WATER				
FEDERAL REQUIREMENTS				
Clean Water Act – Water Quality Standards, Chronic Aquatic Life Criteria	40 CFR Sec. 131	Although the Federal chronic ALCs are not applicable, they are relevant and appropriate requirements for the perennial (Class P) streams and their tributaries for this Site because they are more stringent than the Missouri Water Quality Standards (WQS). The Federal ALCs for the COCs are based on the site-specific hardness of the surface water body. Therefore, the ALCs vary from stream to stream according to the hardness. Table 3-1 in the FS summarizes the Federal chronic ALCs for specific Class P streams within the Site. Tributaries to Class P streams would have hardness values determined during remedial design work.	X	
STATE REQUIREMENTS				
Missouri Clean Water Law– Water Quality Standards	RSMo 644.006 – 564 10 CSR 20-7.031	The Federal chronic ALCs are more stringent than the WQS established by Missouri under this law. Missouri is currently revising its WQS for streams and tributaries located within the Site. In the event that Missouri's new WQS are approved by EPA and no longer less stringent than the Federal ALCs, the WQS may become ARARs for the Site if they are adopted prior to ROD issuance. In assessing the remedy at the five-year reviews, the EPA will consider new information, such as new State WQS or site-specific standards in determining the protectiveness of the remedy.	X	
Missouri Clean Water Law– TMDL Regulations	Pending	Under this program, the State designates beneficial uses for waters of the state and to takes steps to determine if the uses are attainable and what the total maximum daily loads (TMDLs) should be to protect the designated uses. The TMDLs would be applicable to point discharges from abandoned mined lands, as well as active chat quarrying operations. The state TMDLs are currently not ARARs. However, Missouri and EPA are currently gathering supporting information for future implementation of a state TMDL program, and the TMDLs promulgated under this program could become ARARs when this program is formally implemented.		X

**Table 4 Federal and State Chemical-Specific ARARs
and Guidance to be Considered**

Standard, Requirement, Criteria, or Limitation	Citation	Description	I ARARs	To Be Considered
SEDIMENT				
Probable Effect Concentrations	McDonald <i>et al.</i> , 2000	Probable effect concentrations (PECs) are screening level concentrations of metals in fresh water sediments above which adverse effects may be expected to occur. PECs identified by McDonald <i>et al.</i> (2000) include 4.98 mg/kg for Cd; 128 mg/kg for Pb; and 459 mg/kg for Zn. However, these PECs are TBCs, as there are no applicable or relevant and appropriate criteria for sediments.		X
Equilibrium-Partitioning Sediment Guidelines (ESGs)	EPA Draft November 10, 1999 "Draft Metal Mixtures ESG Document"	Equilibrium-Partitioning Sediment Guidelines (ESGs) are EPA's best estimate of the concentration of the mixture of cadmium, copper, lead, nickel, silver and/or zinc that is protective of the presence of benthic organisms.		X

**Table 5 Federal and State Chemical-Specific ARARs
and Guidance to be Considered**

Standard, Requirement, Criteria, or Limitation	Citation	Description	ARARs	To Be Considered
FEDERAL ARARs				
National Ambient Air Quality Standards (NAAQS)	42 USC Sec. 7401 <i>et seq.</i> 40 CFR Part 250	These regulations establish ambient air quality standards for emissions of lead and particulate matter. Remedial actions taken under any of the alternatives (except no action) are likely to result in release of airborne lead and dust. These regulations are applicable to "major sources" as defined under the Clean Air Act. Although remediation sites in Jasper County are not expected to be major sources, these regulations would be relevant and appropriate for the remedial activities at the Site.	X	
Resource Conservation and Recovery Act (RCRA), Subtitle D, Solid Waste Regulations	42 USC Sec. 6941 40 CFR Part 257, Criteria for Classification of Solid Waste Disposal Facilities and Practices	This section of the RCRA regulations requires the closure of existing solid waste facilities, design of new landfills, and disposal of solid wastes to be in accordance with various standards and criteria. These standards are applicable to solid waste disposal facilities, including mining and mill waste facilities. Among other things, these regulations require that facilities be maintained to prevent wash out of solid wastes and that the public not be allowed uncontrolled access.	X	
RCRA, Subtitle C, Identification and Listing of Hazardous Wastes	RCRA Section 3001(b)(3)(A)(iii), Beville exclusion of mineral extraction and beneficiation wastes. 40 CFR Part 264.2, Definition of solid waste and 40 CFR Part 261.4 (b) (7)	Mill waste within the Site is specifically excluded from regulation as hazardous wastes under the Beville exclusion because they are wastes resulting from mineral extraction and beneficiation. Therefore, the RCRA Subtitle C regulations are not ARARs.	X	
RCRA, Subtitle C, Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities	RCRA Section 3001 <i>et seq.</i> 42 USC Sec. 6921, <i>et seq.</i> 40 CFR Part 264.522, Disposal Of Hazardous Wastes In Designated Corrective Action Management Units (CAMUs). 40 CFS Part 264.554(D)(1)(i) and (ii) Staging Piles	The section defines Corrective Action Management Units (CAMUs) to be used in implementing corrective actions at Superfund Sites. A CAMU is defined as a disposal site used for consolidation or placement of remediation wastes within the contaminated areas of the site. Under these regulations, placement of wastes in a CAMU does not constitute land disposal of hazardous waste and does not constitute creation of a unit subject to the RCRA land disposal restrictions and minimum technology requirements (40 CFR Part 268). This Section of RCRA is not an ARAR because of the Beville exclusion, but certain substantive requirements related to design, operation and closure of disposal sites should be considered.		X

**Table 5 Federal and State Chemical-Specific ARARs
and Guidance to be Considered**

Standard, Requirement, Criteria, or Limitation	Citation	Description	ARARs	To Be Considered
Toxic Substances Control Act – Strategy for Reducing Lead Exposures	EPA, February 21, 1991	Presents strategies for reducing the amount of lead in the environment, as well as reducing blood lead levels, especially in children.		X
Surface Mining Control and Reclamation Act (SMCRA)	30 USC Secs. 1201-1328 30 CFR Part 816	SMCRA regulations govern coal exploration and active coal mining. Hence, these regulations are not applicable to remedial actions taken under OU-1 of the Jasper County Site. Nevertheless, some of the surface mining standards found in 30 CFR Part 816 should be considered because they address Circumstances similar to those at the Jasper County Site. Part 816 provides requirements for sediment control, grading requirements; and revegetation.		X
DOT Hazardous Materials Transportation Regulations	49 CFR Parts 107,171-177	Regulates transportation of hazardous materials. Would be relevant and appropriate for the transport of excavated materials within the site.	X	
Clean Water Act Dredge or Fill Requirements (Section 404)	33 USC Secs. 1251-1376 40 CFR Parts 230, 231	Regulates discharge of dredged or fill material into navigable waters.	X	
Clean Water Act Effluent Discharge Standards	40 CFR Sec.125.100 40 CFR Sec. 122.41	Requires that best management practices be maintained by the operator of a facility that discharges pollutants directly into the environment and requires that point source discharges be monitored to assure compliance with effluent discharge limits.	X	
Clean Water Act - Discharge of Storm Water	40 CFR Sec. 122.21 40 CFR Sec. 122.26	Regulates point and non-point storm water discharges associated with industrial activity and construction activities; includes requirements for best management practices and for pollution prevention plans. Industrial activity includes active and inactive mining areas.	X	
Safe Drinking Water Act – Underground Injection Control Program	42 USC Secs. 300f – 300j 40 CFR Part 144 – 148	Regulates disposal of wastes in underground injection wells to ensure protection of drinking water sources.	X	
Federal Sewage Sludge Management Program – Land Application Regulations	40 CFR, Chapter I, Subchapter O, Part 503	This subpart contains the applicable requirements for persons who prepare sewage sludge for land application and who applies sludge to land. These regulations include performance standards for pathogen reduction and criteria for metals concentrations in the sludge and soils where the sludge is applied as a means of protecting human health. Rules for applying sludge near surface water bodies are also included to prevent pollution of streams, rivers, and lakes.	X	

**Table 5 Federal and State Chemical-Specific ARARs
and Guidance to be Considered**

Standard, Requirement, Criteria, or Limitation	Citation	Description	ARARs	To Be Considered
EPA Mine Waste	EPA Region 7 Fact Sheet, February 2003	Provides public guidance on mine waste usage in the states of Missouri and Kansas. Provides a list of uses for mine waste what is not likely to present a threat to human health or the environment.		X
EPA's EE/CA for Removal Actions for the Highway 249 Project	EPA, 2000a	Provides site-specific guidance for excavation and disposal of mill wastes, including guidance on identification of ARARs.		X
STATE REQUIREMENTS			X	
Missouri Fugitive Particulate Matter Regulations	10 CSR 10-6.170	The Missouri fugitive particulate matter regulations contain restrictions on the release of particulate matter to ambient air. These regulations are applicable to any dust emissions that occur as a result of remedial actions taken at the site.	X	
Missouri Clean Water Law– Effluent Regulations	RSMo 644.006 – 564 10 CSR 20-7.015	Regulates the discharge of constituents from any point source, including storm water, into waters of the state. Provides for maintenance and protection of public health and aquatic life uses of surface water and groundwater. State permits would not be required under CERCLA, but the substantive provisions would be applicable.	X	
Missouri Clean Water Law– Construction and Operating Permits	10 CSR 20-6.010	Requires permits for discharges from point sources of water contamination. Although permits are not required for remedial actions conducted under CERCLA, these regulations may be relevant and appropriate to corrective actions taken at the site.	X	
Missouri Clean Water Law– Storm Water Regulations	10 CSR 20-6.200	Requires permits for metal and non-metal mining facilities and land uses or disturbances that create point source discharges of storm water. These regulations define Best Management Practices for land disturbances, including practices or procedures that would reduce the amount of metals in soils and sediments available for transport to waters of the state. Permits would not be required for actions taken under CERCLA, but the substantive provisions of these regulations would be applicable.	X	
Missouri Clean Water Law– TMDL Regulations	MOU between EPA and MDNR regarding the state's implementation of Section 303(d) of the federal Clean Water Act and 10 CSR 20-7	Requires the state to designate beneficial uses for waters of the state and to takes steps to determine if the uses are attainable and what the total maximum daily loads (TMDLs) should be to protect the designated uses. The TMDLs would be applicable to point discharges from abandoned mined lands, as well as active chat quarrying operations.	X	

**Table 5 Federal and State Chemical-Specific ARARs
and Guidance to be Considered**

Standard, Requirement, Criteria, or Limitation	Citation	Description	ARARs	To Be Considered
Missouri Clean Water Law– Underground Injection Control Program	Class I: RSMo 577.155 Class III: 10 CSR 20.6.090	Class I wells used to inject hazardous wastes or dispose of industrial and municipal fluids beneath the lowest underground source of drinking water are banned in Missouri by RSMo 577.155. Class III wells are used to inject fluids to extract minerals and are regulated under 10 CSR 20-6.090 and permitted under the authority of RSMo 644. The UIC regulations would be ARARs if disposal sites meet the definition of a well.	X	
Missouri Well Drillers' Law	RSMo 256.600 – 640 10 CSR 23	Sets fees and standards to be followed in installing, maintaining, and abandoning water wells and monitoring wells. Covers well plugging and proper isolation of possible sources of contamination from existing wells.	X	
Missouri Solid Waste Disposal Law	RSMo 260.200 – 345 10 CSR 80	Regulates facilities used for the disposal nonhazardous industrial, commercial, agricultural, infectious, and domestic wastes. Does not apply to the disposal of overburden, rock, tailings, matte, slag, or other waste material resulting from mining, milling, or smelting. However, the regulations are considered relevant and appropriate.	X	
Missouri Hazardous Waste Management Law	RSMo 260.350 – 434 10 CSR 25	Regulates the generation, identification, treatment and disposal of hazardous wastes. These regulations are not applicable, relevant or appropriate to mining and beneficiation wastes. However, certain requirements related to design, operation and closure of disposal sites should be considered.		X
Missouri Metallic Minerals Waste Management Act	RSMo 444.350 – 380 10CSR 45	Regulates disposal of waste from active metallic mineral mining, beneficiation, and processing. The regulations also contain technical guidelines, permitting, and closure requirements. Because these regulations contain closure standards for active metal mines, they are not ARARs but may be reviewed and considered during the design of removal actions. They are considered TBCs.		X
Missouri Land Reclamation Act - Industrial Mineral Law	RSMo 444.760 – 790 10 CSR 40.010	This law and regulations contain permitting and performance requirements for non-metal mining, surface and underground coal mining, in-stream sand and gravel, industrial mineral open pit mining, limestone, clay, etc. However, the law and implementing regulations are not applicable to chat recycling operations because chat piles are not natural formations. However, some of the surface mining standards are relevant and appropriate requirements because they address circumstances that are similar to those at chat recycling and quarrying operations in the Jasper County Site.	X	

**Table 5 Federal and State Chemical-Specific ARARs
and Guidance to be Considered**

Standard, Requirement, Criteria, or Limitation	Citation	Description	ARARs	To Be Considered
Missouri Clean Water Act – Chapter 8 – Design Guides – Regulations on Handling and Disposal of Municipal Sewage Sludge, Land Application	10 CSR 20-8.170, Section (9) Municipal Sludge Disposal on Land	These regulations contain Missouri's guidelines and requirements for disposing of municipal sewage sludge on land. The State's guidelines and requirements are less stringent and less comprehensive than the Federal regulations cited above (40 CFR Part 503) and are, therefore, likely not applicable. However, these regulations are considered relevant and appropriate requirements.	X	

**Table 6 Federal and State, and Local Location-Specific ARARs
and Guidance to be Considered**

Standard, Requirement, Criteria, or Limitation	Citation	Description	ARAR	To Be Considered
FEDERAL REQUIREMENTS				
Archaeological and Historic Preservation Act	16 USC Sec. 469 40 CFR Sec. 6.301(c)	Establishes procedures to provide for preservation of historical and archaeological data which might be destroyed through alteration of terrain as a result of a Federally licensed activity or program.	X	
Archaeological Resources Protection Act	16 USC Secs. 470 aa - mm	Requires permits for any excavation or removal of archaeological resources from public or Indian lands. Provides guidance for Federal land managers to protect such resources.		X
National Historic Preservation Act	16 USC Sec. 470 40 CFR Sec. 6.301(b) 36 CFR Part 800 Executive Order 11593, May 3, 1971	Requires Federal agencies to take into account the effect of any Federally assisted undertaking or licensing on any district, site, building, structure, or object that is included in or eligible for Register of Historic Places.	X	
Historic Sites, Buildings, and Antiquities Act	16 USC Secs. 461-467 40 CFR Sec. 6.301(a)	Requires Federal agencies to consider the existence and location of landmarks on the National Registry of Natural Landmarks to avoid undesirable impacts on such landmarks.	X	
Fish and Wildlife Coordination Act	16 USC Secs. 661-666 40 CFR Sec. 6.302(g)	Requires any Federal agency or permitted entity to consult with the U.S. Fish and Wildlife Service and appropriate state agency prior to modification of any stream or other water body. The intent of this requirement is to conserve, improve, or prevent loss of wildlife habitat and resources.	X	
Fish and Wildlife Conservation Act	16 USC Secs. 2901- 2912	Requires Federal agencies to utilize their statutory and administrative authority to conserve and promote conservation of non-game fish and wildlife species.		X
Endangered Species Act	16 USC Secs. 1531-1544 50 CFR Parts 17, 402 40 CFR Sec. 6.302(h)	Requires that Federal agencies insure that any action authorized, funded, or carried out by the agency is not likely to jeopardize the continued existence of any threatened or endangered species or destroy or adversely modify critical habitat.	X	
Federal Migratory Bird Act	16 USC Secs. 703 - 712	Requires remedial actions to conserve habitat and consultation with the Department of Interior if any critical habitat is affected.	X	
Executive Order on Floodplain Management	Executive Order No. 11988 40 CFR Sec. 6.302(b) and Appendix A	Requires Federal agencies to evaluate the potential effects of actions they may take in a floodplain to avoid, to the maximum extent possible, the adverse impacts associated with direct and indirect development of a floodplain.		X
Executive Order on Protection of Wetlands	Executive Order No. 11990 40 CFR Sec. 6.302(a) and Appendix A	Requires Federal agencies to avoid, to the maximum extent possible, the adverse impacts associated with the destruction or loss of wetlands and to avoid new construction in wetlands, if a practicable alternative exists.		X

**Table 6 Federal and State, and Local Location-Specific ARARs
and Guidance to be Considered**

Standard, Requirement, Criteria, or Limitation	Citation	Description	ARAR	To Be Considered
Farmland Protection Policy Act	7 USC Sec. 4201 <i>et. seq.</i> 40 CFR Sec. 6.302 (c)	Protects significant or important agricultural lands from irreversible conversion to uses that result in its loss as an environmental or essential food production resource.		X
RCRA – Location Standards for Hazardous Waste Facilities	42 USC Sec. 6901 40 CFR 264.18	Requires that any hazardous waste facility located within the 100-year floodplain be designed, constructed, operated, and maintained to avoid washout. Also, contains requirements for locating facilities away from seismically active zones.		X
Rivers and Harbors Act	33 CFR Secs. 320 - 330	Requires preapproval of the US Army Corps of Engineers prior to placement of any structures in waterways and restricts the placement of structures in waterways.		X
STATE REQUIREMENTS				
Missouri Wildlife Code	3 CSR Sec.10 – 4.111	Requires a determination of the presence or absence of endangered or threatened species, and provides for regulation of non-game wildlife. Places restrictions on actions affecting protected species.	X	

**Table 7 Comparative Analysis of Remedial Alternatives with Respect to
Long-Term Effectiveness and Permanence
Jasper County, Missouri**

Criterion	<u>Alternative 1</u> No Further Action	<u>Alternative 2</u> Source Consolidation, In-Place Containment through Revegetation Using Biosolids, and Recycling	<u>Alternative 3</u> Source Consolidation, In-Place Containment Using Simple Soil Covers, Revegetation, and Recycling	<u>Alternative 4</u> Source Removal and Subsidence Pit Disposal	<u>Alternative 5a</u> Source Removal and On-Site Aboveground Disposal	<u>Alternative 5b</u> Source Removal and On-Site Aboveground Disposal and Water Treatment
Magnitude of Residual Risks	<p>Approximately 5,000 acres of land require institutional controls to manage residual human health risks.</p> <p>Residual risks to vermivores are highest under Alternative 1 because large areas of mill waste exceed RBCs. The source material RAO is not achieved. In fact, risks to vermivores may increase over time as more excavated barren chat areas becomes vegetated.</p> <p>Residual risks to aquatic life are highest under Alternative 1 because surface water ARARs are exceeded and the RAOs are not achieved. Residual seepage from mill wastes is highest with a predicted annual site-wide seepage of 240 million CF/year.</p>	<p>At full implementation under Alternative 2, approximately 1,139 acres of land require institutional controls.</p> <p>At full implementation, approximately 180 acres of tailings exceed RBCs. Hence, the source material RAO may not be met, as residual risks to terrestrial vermivores still exist. In fact, risks may be increased in some revegetated source materials compared to other alternatives, if biosolids prove ineffective in reducing metals bioavailability.</p> <p>Surface water RAOs are not fully achieved, as ARARs continue to be exceeded under some conditions posing residual risks to aquatic life.</p> <p>Compared to current conditions (Alternative 1), residual mill waste seepage is reduced by 84% to 39 million CF/year.</p> <p>Full implementation under Alternative 2 requires up to 30 years.</p>	<p>Under Alternative 3, approximately 1,700 acres of land require institutional controls to manage residual human health risks at full implementation.</p> <p>In contrast to Alternatives 1 and 2, the source material RAO is achieved under Alternative 3 because potential exposure pathways are addressed.</p> <p>Surface water RAOs are not fully achieved, as ARARs continue to be exceeded under some conditions posing residual risks to aquatic life.</p> <p>Compared to current conditions (Alternative 1), residual mill waste seepage is reduced by 80% to 48 million CF/year.</p> <p>Full implementation of Alternative 3 requires up to 12 years.</p>	<p>At full implementation, only 710 acres are subject to institutional controls to manage residual human health risks.</p> <p>Source material and surface water RAOs are fully achieved. Residual risks to terrestrial vermivores and aquatic life are negligible.</p> <p>Compared to current conditions (Alternative 1), residual mill waste seepage is reduced by 90% to 24 million CF/year.</p> <p>Full implementation of Alternative 4 can be achieved in 7 years.</p>	<p>Approximately 1,080 acres are subject to institutional controls to manage residual human health risks at full implementation under Alternative 5a.</p> <p>Source material and surface water RAOs are fully achieved. Residual risks to terrestrial vermivores and aquatic life are negligible.</p> <p>Compared to current conditions (Alternative 1), residual mill waste seepage is reduced by 90% to 24 million CF/year.</p> <p>Full implementation of Alternative 5a can be achieved in 7 years.</p>	<p>Only 280 acres are subject to institutional controls to manage residual human health risks at full implementation under Alternative 5b, the lowest of any alternative.</p> <p>Source material and surface water RAOs are fully achieved. Residual risks to terrestrial vermivores and aquatic life are negligible.</p> <p>Residual mill waste seepage is practically eliminated under Alternative 5b.</p> <p>Full implementation of Alternative 5b can be achieved in 5 years.</p>

**Table 7 Comparative Analysis of Remedial Alternatives with Respect to
Long-Term Effectiveness and Permanence
Jasper County, Missouri**

Criterion	<u>Alternative 1</u> No Further Action	<u>Alternative 2</u> Source Consolidation, In-Place Containment through Revegetation Using Biosolids, and Recycling	<u>Alternative 3</u> Source Consolidation, In-Place Containment Using Simple Soil Covers, Revegetation, and Recycling	<u>Alternative 4</u> Source Removal and Subsidence Pit Disposal	<u>Alternative 5a</u> Source Removal and On-Site Aboveground Disposal	<u>Alternative 5b</u> Source Removal and On-Site Aboveground Disposal and Water Treatment
Adequacy and Reliability of Controls	<p>The extent of environmental risk management under Alternative 1 is inadequate for achieving the RAOs.</p> <p>Alternative 1 affords no enhancement of existing institutional controls implemented under other OUs for the protection of human health.</p> <p>No long-term management or maintenance is required under Alternative 1, but monitoring continues indefinitely.</p>	<p>Infiltration and seepage from mill wastes directly revegetated using biosolids is higher under this alternative than the options prescribed under any other action alternatives.</p> <p>Direct revegetation, as prescribed under Alt. 2 is considered the least permanent cover option of any alternatives. However, chat recycling is considered highly permanent and reliable for reducing the volume of source materials remaining on Site.</p> <p>The adequacy and reliability of the treatment effect of biosolids in reducing bioavailability to terrestrial vermivores is uncertain. However, deep tilling of vegetated chat and transition zone soils is considered adequate for reducing metal concentrations below RBCs, thereby reducing risks to vermivores.</p> <p>Under Alternative 2, interim management of consolidated waste piles may be required up to 30 years</p>	<p>Less infiltration and seepage results from the waste piles capped with simple soil covers under Alt. 3 than the directly revegetated piles under Alt. 2. However, simple soil covers are less effective at preventing infiltration than the geo-composite cover systems prescribed under Alt. 4, 5a, and 5b. Simple soil covers are considered a more permanent, and reliable than Alt. 1 and 2, but less permanent and reliable than subsidence pit disposal or the engineered repositories prescribed under Alt 4, 5a and 5b.</p> <p>Under Alternative 3, interim management of consolidated waste piles is required up to 10 years.</p> <p>No long-term maintenance of capped waste piles, except institutional controls, is required at full implementation.</p>	<p>The geo-composite cover system installed on the filled subsidence pits is the most effective cover option, as it nearly eliminates surface infiltration into the disposed mill wastes. However, the cover system would require maintenance.</p> <p>Subsidence pit disposal, as prescribed under Alternative 4 is considered the most permanent and reliable method available for the long-term management of mill wastes.</p> <p>Long-term management of the capped subsidence pits consists of restricting future land uses an estimated 710 acres.</p>	<p>The geo-composite cover systems nearly eliminate surface infiltration and seepage but would require maintenance, the same as Alternatives 4 and 5b.</p> <p>Since the repositories are aboveground, they are considered somewhat less permanent than subsidence pit disposal.</p> <p>Long-term management of the aboveground repositories consists of restricting future land uses an estimated 1,080 acres.</p>	<p>Same as Alternative 5a. However, maintenance of the repository cover systems is limited to 280 acres.</p> <p>The passive anaerobic treatment systems prescribed under this alternative are innovative and their long-term reliability is not fully tested.</p> <p>Also, the requirements for long-term monitoring and possible replacement of the organic substrate in the anaerobic treatment systems are unique to this alternative.</p>

**Table 8 Comparative Analysis of Remedial Alternatives with
Respect to Short-Term Effectiveness
Jasper County, Missouri**

Criterion	<u>Alternative 1</u> No Further Action	<u>Alternative 2</u> Source Consolidation, In-Place Containment through Revegetation Using Biosolids, and Recycling	<u>Alternative 3</u> Source Consolidation, In-Place Containment Using Simple Soil Covers, Revegetation, and Recycling	<u>Alternative 4</u> Source Removal and Subsidence Pit Disposal	<u>Alternative 5a</u> Source Removal and On-Site Aboveground Disposal	<u>Alternative 5b</u> Source Removal and On-Site Aboveground Disposal and Water Treatment
Protection of the Community During Remedial Actions	Risks to the community are the same as under current conditions.	Potential risks to the community under Alt. 2 are the same as under all other action alternatives. These potential risks are readily mitigated through appropriate traffic safety, dust control, and public involvement measures. Risks to local communities caused by biosolids applications may be negligible, if application complies with EPA regulations. However, public perception of risks may be high.	Same as Alternative 2.	A larger amount of source materials are hauled within DAs than under Alternatives 2 or 3. Truck traffic and dust generation are more intense for a short period (7 years). Potential risks to the local community will be higher during this period than under Alternatives 2 or 3.	Same as Alternative 4.	Same as Alternative 4. However, more materials are hauled longer distances outside the DAs than any other action alternative. Truck traffic and dust generation will be more intense for a short period (5 years). Potential risks to the local community will be higher during this period than under other alternatives.
Protection of Workers During Remedial Actions	No additional risks to workers are experienced under the no further action alternative.	Risks to workers are the same under Alternative 2 as under all other action alternatives, except Alternative 4. These risks can be reduced through appropriate worker health and safety training, design, and planning.	Same as Alternative 2.	Risks to workers are the same under other action alternatives. However, workers are exposed to increased risks due to the physical hazards of filling the subsidence pits. Additional measures to evaluate and mitigate these hazards will be needed that are unique to this alternative.	Same as Alternative 2.	Same as Alternative 2.

**Table 8 Comparative Analysis of Remedial Alternatives with
Respect to Short-Term Effectiveness
Jasper County, Missouri**

Criterion	<u>Alternative 1</u> No Further Action	<u>Alternative 2</u> Source Consolidation, In-Place Containment through Re vegetation Using Biosolids, and Recycling	<u>Alternative 3</u> Source Consolidation, In-Place Containment Using Simple Soil Covers, Revegetation, and Recycling	<u>Alternative 4</u> Source Removal and Subsidence Pit Disposal	<u>Alternative 5a</u> Source Removal and On-Site Aboveground Disposal	<u>Alternative 5b</u> Source Removal and On-Site Aboveground Disposal and Water Treatment
Potential Environmental Impacts Caused by the Remedial Actions	Risks to the environment are the same as under current conditions.	<p>Potential environmental impacts caused by excavating mill wastes and sediments from riparian areas and wetlands are the same under this alternative as under all other alternatives.</p> <p>Excessive nutrient loading to surface waters is a potential impact unique to Alts. 2 and 3. This potential impact can be mitigated by composting, multiple applications, and avoiding applications near surface water bodies.</p> <p>Alt. 2 remediates an estimated 2,100 acres of land to usable condition by consolidating and recycling source materials.</p>	<p>Same as Alternative 2.</p> <p>Soil loss due to extensive construction of soil covers impacts the environment by depleting non-renewable soil resources. Alternative 3 results in the greatest amount of soil depletion (>2 million) CY than any other action alternative.</p> <p>Alternative 3 remediates an estimated 1,500 acres of land to usable condition by consolidating and recycling source materials.</p>	<p>A short-term release of metals to groundwater unique to Alt. 4 occurs when mill wastes are placed in subsidence pits. These metals releases localized, and have no affect on surface water quality or on groundwater quality distant from the mine workings.</p> <p>Aquatic habitat may be lost by placing wastes in subsidence pits. Habitat loss is minimized by selecting disposal sites with low value habitat.</p> <p>Loss of non-renewable soil resources is significantly less under this alternative than under Alt. 3, as the amount of borrow soil used is minimal by comparison.</p> <p>Alt. 4 remediates an estimated 2,500 acres of land to usable condition by disposing of source materials in pits.</p>	<p>More soil (>1 million CY) is used under this alternative than under Alternative 4. However, the loss of non-renewable soil resources is half that of Alternative 3.</p> <p>Alternative 5a remediates an estimated 1,500 acres land to usable condition by disposing of source materials in on- site repositories.</p>	<p>Same as Alternative 5a, but less borrow soil (670,000 CY) is needed to implement Alternative 5b because of the greater level of repository centralization.</p> <p>Alternative 5b remediates the greatest amount (an estimated 3,000 acres) of land to usable condition than any other action alternative.</p>

**Table 8 Comparative Analysis of Remedial Alternatives with
Respect to Short-Term Effectiveness
Jasper County, Missouri**

Criterion	<u>Alternative 1</u> No Further Action	<u>Alternative 2</u> Source Consolidation, In-Place Containment through Revegetation Using Biosolids, and Recycling	<u>Alternative 3</u> Source Consolidation, In-Place Containment Using Simple Soil Covers, Revegetation, and Recycling	<u>Alternative 4</u> Source Removal and Subsidence Pit Disposal	<u>Alternative 5a</u> Source Removal and On-Site Aboveground Disposal	<u>Alternative 5b</u> Source Removal and On-Site Aboveground Disposal and Water Treatment
Time Until RAOs Are Achieved	RAOs are not achieved under Alternative 1.	Initial response actions are completed within 5 years. Full implementation is achieved within 30 years. However, source material and surface water RAOs may not be fully achieved at full implementation.	Initial response actions are completed within 5 years. Full implementation is achieved within 12 years. However, surface water RAOs may not be fully achieved at full implementation.	All RAOs are achieved within 7 years of the start of remedial actions.	All RAOs are achieved within 7 years of the start of remedial actions.	All RAOs are achieved within 5 years of the start of remedial actions.

**Table 9 Comparative Analysis of Remedial Alternatives with Respect to
Reduction of Toxicity, Mobility, or Volume Through Treatment
Jasper County, Missouri**

Criterion	<u>Alternative 1</u> No Further Action	<u>Alternative 2</u> Source Consolidation, In-Place Containment through Revegetation Using Biosolids, and Recycling	<u>Alternative 3</u> Source Consolidation, In-Place Containment Using Simple Soil Covers, Revegetation, and Recycling	<u>Alternative 4</u> Source Removal and Subsidence Pit Disposal	<u>Alternative 5a</u> Source Removal and On-Site Aboveground Disposal	<u>Alternative 5b</u> Source Removal and On-Site Aboveground Disposal and Water Treatment
Treatment Process Used and Materials Treated	Chat recycling may result in treatment, but uncontrolled recycling and use of chat, as currently practiced, is not considered effective or reliable treatment.	Controlled chat recycling under Alternative 2 meets the objectives of treatment by incorporating chat into asphalt or concrete or by chat washing. Chat that is not treated is effectively contained by use as fill materials that prevent exposure or metals transports.	Same as Alternative 2 Alternative 3 does not rely on treatment to reduce mobility and bioavailability of in metals in vermivores, as in Alternative 2.	Subaqueous mill waste disposal results in remineralization of metal oxides as insoluble sulfides. This reduces the mobility of the metals.	On-site aboveground disposal would not result in TMV reductions through treatment.	All chat recycling is precluded under Alternative 5b. Treatment occurs in passive anaerobic treatment systems reducing metals mobility. No biosolids are used under Alternative 5b.
Amount of Materials Treated	None.	None.	None.	Approximately 3.8 million CY are treated by reducing conditions in the capped subsidence pits.	None.	Metal loads addressed by the passive anaerobic treatment systems are minor.
Effectiveness and Irreversibility of Treatment	None.	Reductions in TMV achieved by chat recycling are effective and irreversible. The irreversibility and long-term effectiveness of treatment effects from biosolids additions are currently being investigated.	Same as Alternative 2.	Reductive remineralization is highly effective in reducing metal mobility. However, insoluble sulfide minerals can be reoxidized if exposed to weathering conditions.	Same as Alternative 2.	Remineralization that occurs in passive anaerobic treatment systems is highly effective in reducing metal mobility. However, insoluble sulfide minerals can be re-oxidized if re-exposed to weathering conditions.

**Table 9 Comparative Analysis of Remedial Alternatives with Respect to
Reduction of Toxicity, Mobility, or Volume Through Treatment
Jasper County, Missouri**

Criterion	<u>Alternative 1</u> No Further Action	<u>Alternative 2</u> Source Consolidation, In-Place Containment through Revegetation Using Biosolids, and Recycling	<u>Alternative 3</u> Source Consolidation, In-Place Containment Using Simple Soil Covers, Revegetation, and Recycling	<u>Alternative 4</u> Source Removal and Subsidence Pit Disposal	<u>Alternative 5a</u> Source Removal and On-Site Aboveground Disposal	<u>Alternative 5b</u> Source Removal and On-Site Aboveground Disposal and Water Treatment
Treatment Residuals Generated	No treatment residuals are generated under Alternative 1.	No treatment residuals are generated under Alternative 2.	Same as Alternative 2.	No treatment residuals are generated under Alternative 4.	Same as Alternative 4.	Treatment residuals consist of spent organic substrate from the anaerobic treatment systems. The metals immobilized by the treatment process remain in the substrate. Hence, disposal as a hazardous waste may be required.