FIRST FIVE-YEAR REVIEW REPORT FOR

SOUTHWEST JEFFERSON COUNTY MINING SUPERFUND SITE

JEFFERSON COUNTY, MISSOURI

Prepared by

U.S. Environmental Protection Agency
Region 7
Lenexa, Kansas

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LIST OF ABBREVIATIONS & ACRONYMS

bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Contaminant of Concern
EBL	Elevated Blood Lead
EPA	U.S. Environmental Protection Agency
FYR	Five-Year Review
ICs	Institutional Controls
IEUBK	Integrated Exposure Uptake Biokinetic Model
ISA	Integrated Science Assessment
µg/dL	micrograms per deciliter
MDHSS	Missouri Department of Health and Senior Services
MDNR	Missouri Department of Natural Resources
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
NTP	National Toxicology Program
OLEM	Office of Land and Emergency Management
OU	Operable Unit
PHA	Public Health Assessment
ppm	parts per million
RAO	Remedial Action Objective
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
TBC	To be considered
UU/UE	Unlimited Use and Unrestricted Exposure
XRF	X-Ray Fluorecence Spectrometer

I. INTRODUCTION

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy in order to determine whether the remedy is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in FYR reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency is preparing this FYR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP) (40 CFR Section 300.430(f)(4)(ii)) and considering EPA policy.

This is the first FYR for the Southwest Jefferson County Mining Superfund Site (Site). The triggering action for this statutory review is the on-site construction start date of the remedial actions for the Operable Units (OUs): 1 – Historical Mining – OU1-Residential Soils ; 2 – OU2-Luebbers - Residential Soils; and 3 – OU3-Stewart - Residential Soils. The FYR has been prepared because hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The Site consists of eight OUs. OU1, OU2 and OU3 consist of the ongoing and completed remediation of residential properties and high child exposure areas greater than or equal to 400 parts per million (ppm) lead in Jefferson County. The Big River and Floodplain, OU4, focuses on non-residential soil, surface water, and sediment and floodplain soils within the Site and is in the Remedial Investigation/ Feasibility Study (RI/FS) phase. Residential Groundwater, OU5, encompasses contaminated groundwater in private residential wells impacted from mining-related activities and is in the RI/FS phase. Valles Mines, OU6, involves the distinct boundaries of the Valles Mines Lead Mining Site located in southern Jefferson County. Rail Lines, OU7, includes abandoned and historic railroads used to transport lead concentrate and other milled metals. Mine Waste Piles, OU8, encompasses the remaining mining waste and tailings piles found sporadically throughout the southwest portion of the county and is in the RI/FS phase.

Five OUs not addressed in this FYR and the associated reasons include:

- OU4 – Remains in the RI/FS phase without a Record of Decision (ROD), scheduled for completion in 2021.
- OU5 – Remains in the RI/FS phase without a ROD, scheduled for completion in 2021.
- OU6 – Pending RI/FS start and remains without a ROD.
- OU7 – Pending RI/FS start and remains without a ROD.
- OU8 – Remains in the RI/FS phase without a ROD, scheduled for completion in 2021.

This FYR focuses on work completed on residential soils in OU1, OU2 and OU3.

The Southwest Jefferson County Mining Superfund Site Five-Year Review was led by Greg Bach, EPA Remedial Project Manager. Participants included:

- Chinwe Ndubuka, Remedial Project Management Unit Chief, Missouri Department of Natural Resources
- Steven Sanders, EPA Region 7 Office of Regional Counsel

- Elizabeth Kramer, EPA Community Engagement Specialist
- Venessa Madden, EPA Ecological Risk Assessor
- Jessica Kidwell, EPA Hydrogeologist
- Kelly Schumacher, EPA Human Health Risk Assessor

The review began on May 30, 2019.

Site Background

The Southwest Jefferson County Mining Site (EPA ID #: MON000705443) is located in southeastern Missouri and covers all of Jefferson County, except the Herculaneum Lead Smelter site. A site map is included in Appendix B. The Site includes any media impacted by heavy metals related to historical mining, milling and smelting activities.

The Site is within the Old Lead Belt, where heavy metal mining has occurred since the early 1700s and industrial mining has occurred since the 1800s. This area is one of the world's largest lead mining districts, having produced more than nine million tons of pig lead. It is estimated that some 250 million tons of mill waste tailings and chat were produced in the Old Lead Belt from ore milling and beneficiation processes. The chat has been used extensively as aggregate for ballast in railroads, aggregate in concrete and asphalt, and construction fill. Tailings have been used as agricultural amendments due to the lime content.

In the early 1880s, mining activities began in southern Jefferson County. By 1855, three smelters and numerous mines had been established and over three million pounds of lead were shipped from the county annually. Chat, tailings, and other wastes from mining, milling and smelting activities have contaminated soil, sediment, surface water, and groundwater with lead and other heavy metals at levels that pose a threat to human health and the environment. Residential properties and child high-impact areas within the site boundaries have been impacted by past mining practices and the migration of the resulting mine waste.

Mine waste contains elevated levels of lead and other heavy metals which pose a threat to human health and the environment. Erosion of these deposits from mined areas has resulted in contaminated soil, sediment, surface water, and groundwater through transport by wind and water erosion. The contaminated soil has been manually relocated to other areas throughout the county. Additionally, contaminated floodplain soils have been used extensively in residential areas as fill and top soil. Mine waste products have also been used on residential properties for fill material and private driveways, used as aggregate for road construction, and placed on public roads to control snow and ice in the winter. These practices collectively spread lead contamination throughout Jefferson County.

The EPA is the lead agency and the Missouri Department of Natural Resources (MDNR) is the support agency. The source of the cleanup monies is the Superfund trust fund.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Southwest Jefferson County Mining Superfund Site		
EPA ID: MON000705443		
Region: 7	**State:** MO	**City/County:** Jefferson County

SITE STATUS	
NPL Status: Final	
Multiple OUs? Yes	**Has the site achieved construction completion?** No

REVIEW STATUS
Lead agency: EPA
Author name (Federal or State Project Manager): Greg Bach
Author affiliation: EPA Region 7
Review period: 5/30/2019 – 6/30/2020
Date of site inspection: Regular Inspections from May, 2019 – September, 2019
Type of review: Statutory
Review number: 1
Triggering action date: 6/30/2015
Due date *(five years after triggering action date)*: 6/30/2020

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

In December 2008, the EPA completed a Site Inspection (SI) on the Southwest Jefferson County Mining Site. The SI identified elevated lead concentrations in residential soils and groundwater that appeared to be attributable to past mining activities. Limited surface water and sediment samples collected in the southwest portion of the county suggested a release to the Big River from upstream mining sites.

The SI provided analytical data on soil, tailings, sediment, surface water, and groundwater on and near mine waste piles. Geographically, the site investigation was limited to the southwest portion of the county. A limited number of samples were collected from mine waste (barite ponds), groundwater, sediment, and soil, and were analyzed for heavy metals. Overall, the results indicated elevated concentrations of heavy metals in samples of mine waste, groundwater, sediment, and soil.

The Missouri Department of Health and Senior Services (MDHSS) prepared a Public Health Assessment (PHA) in 2012 for Jefferson County that reported blood lead testing in children under 72 months of age in three separate years. The number of children tested in this age category ranged from

2% in 1996 to 12.3% in 2010. At the time the report was prepared, blood lead levels were considered elevated at 10 micrograms per deciliter (µg/dL). Of the children tested, elevated blood lead (EBL) was found from 1% in 2010 to 8% in 1996. The PHA concluded that ingesting and inhaling lead-contaminated materials for a year or longer may harm individuals' health, especially children less than 72 months of age; and that additional data is needed to assess exposure to lead through air, sediment, floodplain soils, surface water, fish and edible plants throughout the Site.

In general, the EPA determined that the principal threat from OU1, OU2 and OU3 was the unacceptable human health risk posed by exposure to residential soil and from OU5 groundwater containing contaminants of concern (COCs) in concentrations exceeding screening levels. Based on site data and evaluations of potential risk, lead was identified as the primary COC for OU1, OU2 and OU3. The primary threat to human health from residential property soils at the Site is through ingestion (by mouth) of lead-contaminated soil.

Response Actions

History of Investigations and Residential Actions

MDNR began investigating the Valles Mines portion of the Site in 2004, while the EPA began a wider area investigation in 2007. These investigations focused on evaluating Hazard Ranking System (HRS) scoring factors based on review of available information and analytical data from limited sampling in the area. This work ultimately resulted in EPA removal actions beginning in 2007, and the Site being included on the National Priorities List (NPL) in 2009. 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.

EPA Removal Actions

Under the September 27, 2007 Action Memorandum, the EPA has conducted removal actions, including time-critical actions, on 396 residential properties with soil lead levels exceeding 1,200 ppm and child care facility soils exceeding 400 ppm. The EPA Removal Program is also currently providing bottled water to private residential well owners with groundwater exceeding 15 parts per billion (ppb) lead as part of the OU5 work.

Through the June 29, 2015 Action Memorandum, the EPA completed a Time-Critical Removal Action to stabilize the Rockford Beach Dam as part of the OU4 work. This action prevented the failure of the dam and the release of lead-contaminated sediments farther downstream on the Big River.

Remedial Investigation/Feasibility Study

In 2010, the EPA began a RI/FS, characterizing the nature and extent of risk posed by the mining-related contamination throughout OU1, OU2 and OU3. The RI was completed in 2012 and identified lead as the primary COC, with an action level for soil equal to or greater than 400 ppm. The RI also identified arsenic and chromium as COCs with soil action levels of 22 ppm and 29 ppm, respectively. The arsenic and chromium were found to be collocated with the lead contamination. The RI determined that remediation of the residential properties with lead greater than or equal to 400 ppm would reduce exposure to these other COCs. The FS was completed in 2012 and developed alternatives for the remedial actions for the OU1, OU2 and OU3 residential properties.

Remedial Action Objective(s)

The primary cause of unacceptable human health risk from exposure to residential property soils (OU1, OU2, and OU3) at the Site is through ingestion (by mouth). The RAO for the residential property soils at the Site is to:

> Reduce the risk of exposure of young children (children 0 to 84 months) to lead such that an individual child or group of similarly exposed children have no greater than a 5 percent chance of exceeding a blood lead level of 10 µg/dL.
>
> Reduce the risk of exposure to soils containing arsenic and chromium such that levels do not exceed the carcinogenic risk of 1 x $l0^{-4}$ and a non-cancer hazard index of 1.

Site-specific information was incorporated into the EPA's Integrated Exposure Uptake Biokinetic (IEUBK) model to predict that a young child residing at the Site would have greater than a 5% chance of having a blood lead level exceeding 10 µg/dL if the lead soil concentrations to which he or she is exposed are above 400 ppm lead under the assumed exposure conditions. Thus, 400 ppm lead in soil was selected as the cleanup level for the remedial action. No properties were identified with arsenic and chromium at levels of concern that did not also include soil lead contamination above 400 ppm. Due to the collocated nature of the other mining-related metals, the chromium and arsenic risk will be addressed through remedies addressing lead.

Remedy Selection

Separate RODs for OU1, OU2, and OU3 were signed on September 12, 2012. The Selected Remedy for each OU includes the excavation of residential soil until lead concentrations are below 400 ppm or to a maximum depth of 12 inches below ground surface (bgs), transportation of excavated contaminated soil to an EPA-approved disposal facility, replacement of contaminated soil with clean backfill and vegetative cover, and institutional controls (ICs). An exception is garden areas, where the maximum depth of excavation is 24 inches bgs. Any properties with lead levels remaining above 1,200 ppm at depth would be subject to ICs. At properties where contamination is left at depth, a highly visible, orange plastic warning barrier has been placed at the base of the excavations to alert anyone accessing the subsurface of contamination beneath the clean backfill.

Additionally, the Selected Remedy includes collaborating with the local health department to raise public awareness, provide health education along with exposure prevention information and coordination with local physicians, among other activities, to help protect local citizens from the health risks of heavy metal exposure at the Site.

Status of Implementation

The selected remedy for OU1 is ongoing. The remediation of OU2 and OU3 properties was completed in 2015. As of February 24, 2020, a total of 4,796 residential properties have been sampled throughout the Site. A Site Map is included in Appendix B. Each property is sampled following the guidance in the Lead Handbook (EPA, 2003). All samples are analyzed with a field portable XRF with 10% of the samples sent to a certified laboratory for confirmation and instrument-to-lab correlation.

Of the 4,796 properties sampled to date, a total of 1,672 properties (35%) qualified for remediation with 1,008 of these remediated. This includes 767 properties remediated under the remedial action for OU1,

84 properties remediated for OU2, and 157 properties remediated for OU3. Excavated soils are transported to a repository available at the Big River Mine Tailings Site for disposal. At 188 properties (19% of those remediated) across OUs 1, 2 and 3 where soil lead concentration remains greater than or equal to 1,200 ppm at 12 inches bgs, a highly visible, orange plastic warning barrier has been placed at the base of the excavations to alert anyone accessing the subsurface of the remaining presence of contamination beneath the clean backfill. The EPA continues to develop the ICs for residential properties where contamination remains at depth.

Starting in 2020, the EPA will begin remediating approximately 600 more residential properties while continuing to sample residential yards throughout the Site. The anticipated completion date of all residential yard remediation is 2030.

IC Summary Table

ICs are required on properties greater than or equal to 1,200 ppm lead at 12 inches bgs and in yards were surface contamination was left in place at the direction of the property owner. There are currently 188 properties that have visual barrier placed and are potentially subject to additional ICs. At present, there are no applicable zoning ordinances in Jefferson County for residential properties. The EPA has entered into a Cooperative Agreement with the Missouri Department of Health and Senior Services to provide health education along with the development and implementation of a Voluntary Institutional Control Program through the Jefferson County Health Department. Along with this effort, there are potential additional ICs and other informational tools that could be used. These may include the following:

- Establishing a registry of residential properties with soil lead concentrations greater than 1,200 ppm at 12 inches bgs, with barrier placed, with the Jefferson County Health Department.
- Evaluation of yards subject to the ICs during each FYR to ensure the remedy remains protective.
- Homeowner, builder and developer education programs to establish best management practices, possibly including building permitting, that address proper handling and disposal of heavy metal soil contamination to prevent contamination of clean properties and re-contaminating of remediated properties.
- Per the 2012 Record of Decision for the Site, further evaluation of additional measures such as deed restrictions and notices, restrictive covenants or easements will be considered, if necessary, with collaboration among local citizens, county and state governments/officials.

Table 1: Summary of Planned and/or Implemented ICs

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Soil	Yes	Yes	Residential yards with lead concentrations remaining ≥ 1,200 at 12 inches bgs and/or surface soils remaining ≥ 400	Restrict excavation deeper than 12 inches at impacted parcels and/or manage the handling/ disposal of this soil.	To be determined. The EPA will work with the local governments to establish the preferred ICs.

Operation and Maintenance

Operation and maintenance activities for the OU1, OU2 and OU3 residential property remedy is limited to review and verification of IC effectiveness. Since the ICs are not yet in place, the EPA periodically inspects completed properties to assure that the soil/rock cover remains protective. This is documented in the Property Closeout Letter with the property owner.

III. PROGRESS SINCE LAST FIVE-YEAR REVIEW

This is the first FYR for the Site.

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

An ad was placed in the local newspaper to inform the public about the start of the FYR process. (See Appendix C.)

An additional ad will be placed in the local newspaper to inform the public about the completion of the process. The results of the review and the report will be made available at the site information repository located online at: https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0705443&msspp=med.

No interviews were conducted as part of the FYR.

Data Review

Since the remedy is under construction, environmental data is collected and analyzed to determine if site cleanup levels have been met. Data is evaluated as it is collected from each residential property. A total of 4,796 residential properties (see Site Map in Appendix B) have been sampled to date. Each property is sampled following the guidance in the Lead Handbook (EPA, 2003). All samples are analyzed with a field portable XRF, and 10% of the samples are sent to a certified laboratory for confirmation. To date, 1,672 properties have qualified for the remedial action, or approximately 35% of the sampled properties. Starting in 2007, EPA Removal Actions remediated 396 properties. From 2014 to 2019, the EPA Remedial Actions remediated 612 properties for a total of 1,008 residential properties. At the current planned rate of sampling and cleanup, the EPA anticipates it will take more than 10 years to finish the cleanup of OU1.

Site Inspection

Site inspections are conducted on a weekly basis while there is ongoing remediation. Residential properties are fully vegetated at the time of property closeout and properties with barrier at depth remain undisturbed at this time. The EPA routinely inspects properties after remediation/restoration, and typically waits a minimum of one year after restoration before sending the property owner a letter that officially closes out the property. This letter provides the homeowner verification that the remediation and restoration of their property is complete. All data, including remedial field sheets, are provided to the homeowners upon completion.

V. TECHNICAL ASSESSMENT

QUESTION A: Is the remedy functioning as intended by the decision documents?

Question A Summary:

The OU2 and OU3 remediation activities have been completed and are functioning as intended. OU1 remediation work is ongoing. Of those OU1 properties where work has been completed, the remedy is functioning as intended. The EPA continues to work with the state and local governments to establish the preferred ICs for these OUs.

In Jefferson County, 4,796 residential properties and child high-use areas (e.g., child care facilities, parks, and playgrounds) have been sampled for lead contamination, and 1,008 of these yards have been cleaned up since work began in 2007. This work is ongoing, and the EPA will continue to sample and remediate properties that are greater than 400 ppm of lead in soil, and place institutional controls on any properties with lead levels remaining above 1,200 ppm at depth. As discussed in the response to Question B, acceptable cleanup levels for lead in soil may be reduced if the blood lead level of concern is revised to a value less than 10 µg/dL (EPA, 2020).

The EPA continues to work with the state, land owners, and local governments to determine and implement the best IC vehicle for sites where lead-contaminated soils remain at depth.

The EPA visits all properties to ensure that restoration is complete before signing the property closeout forms. Work completed to date at the Site has potentially reduced exposure to elevated lead concentrations in soil. This work is expected to result in improvements in blood lead level concentrations in target populations.

QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

Question B Summary:

The primary COC identified in residential soil at OU1, OU2, and OU3 of the Southwest Jefferson County Mining Site is lead. Arsenic and chromium were also identified as COCs and the cleanup levels for these compounds remain valid. The cleanup level for lead, 400 ppm, was derived based on the 1994 and 1998 soil lead guidance documents (EPA, 1994, 1998), which identify 10 µg/dL as the blood lead level of concern. However, since those documents were issued, increasing evidence has shown that blood lead levels below 10 µg/dL may also have negative health impacts. As a result, on December 22, 2016, the Office of Land and Emergency Management (OLEM) issued Directive 9200.2-167 (EPA, 2016) stating "the current scientific literature on lead toxicology and epidemiology provides evidence that adverse health effects are associated with blood lead levels less than 10 µg/dL." The directive specifically referenced the 2012 National Toxicology Program's Monograph on Health Effects of Low-Level Lead (NTP, 2012), which found sufficient evidence of effects on cognitive measures and behavior at blood lead levels below 5 µg/dL; and the EPA's 2013 Integrated Science Assessment for Lead (EPA, 2013), which found clear evidence of cognitive function deficits at blood lead levels between 2 and 8 µg/dL. If the EPA revises the blood lead level of concern to a value less than 10 µg/dL, the resulting cleanup level for lead in residential soil at the Southwest Jefferson County

Mining Site, which is based on human health risks to a child receptor, would be lower than the value that is listed in the OU1, OU2, and OU3 Records of Decision.

Changes in Standards and TBCs

For lead in soil, the EPA's Office of Solid Waste and Emergency Response Directives 9355.4-12 (EPA, 1994) and 9200.4-27P (EPA, 1998) were identified as federal chemical-specific To Be Considered guidance documents. However, since 1994 and 1998 when those documents were issued, increasing evidence has shown that blood lead levels below 10 µg/dL may also have negative health impacts. As a result, on December 22, 2016, the OLEM issued Directive 9200.2-167 (EPA, 2016) stating "the current scientific literature on lead toxicology and epidemiology provides evidence that adverse health effects are associated with blood lead levels less than 10 µg/dL." The directive recommends that regions should "consider the current scientific conclusions" when implementing OLEM's soil lead policy, specifically referencing the 2012 National Toxicology Program's Monograph on Health Effects of Low-Level Lead (NTP, 2012) and the EPA's 2013 Integrated Science Assessment for Lead (EPA, 2013). The directive states that the 2013 ISA found clear evidence of cognitive function deficits at blood lead levels between 2 and 8 µg/dL, and that the 2012 NTP's monograph found sufficient evidence of effects on cognitive measures and behavior at blood lead levels below 5 µg/dL.

More specifically, the NTP Monograph concluded, "*In children*, there is *sufficient* evidence that blood Pb levels < 5 µg/dL are associated with increased diagnosis of attention-related behavioral problems, greater incidence of problem behaviors, and decreased cognitive performance as indicated by (1) lower academic achievement, (2) decreased intelligence quotient, and (3) reductions in specific cognitive measures." These neurological effects are significant at both the population and individual level, because lower class rank and lower standardized achievement test scores have been reported in multiple prospective and cross-sectional studies of children with blood Pb levels < 5 µg/dL. Further, the NTP found "*sufficient* evidence that blood Pb levels < 5 µg/dL are associated with antisocial behavioral problems or actual criminal behavior in children from 6 to 15 years of age." For adults, the NTP found "*sufficient* evidence that blood Pb levels < 5 µg/dL are associated with decreased renal function" and "*sufficient* evidence that maternal blood Pb levels < 5 µg/dL are associated with reduced fetal growth." Although the evidence was less strong, the NTP also found associations of blood Pb levels < 5 µg/dL with delayed puberty and decreased kidney function in children and with essential tremor in adults. Overall, the objective of the NTP's monograph was to determine the degree of evidence for adverse health effects at blood lead levels of 5 µg/dL and at 10 µg/dL; as described, they found sufficient evidence of many different types of health effects at both levels that were examined.

The EPA's 2013 Integrated Science Assessment for Lead states, "It is clear that Pb exposure in childhood presents a risk; further, there is no evidence of a threshold below which there are no harmful effects on cognition from Pb exposure." While the ISA reports, "Clear evidence of cognitive function decrements (as measured by Full Scale IQ, academic performance, and executive function) in young children (4 to 11 years old) with mean or group blood Pb levels measured at various life stages and time periods between 2 and 8 µg/dL," it is critical to note that there is not a threshold for toxicity somewhere between blood lead levels of 2 and 8 µg/dL. Rather, a "threshold for cognitive function decrements is not discernable from the available evidence." Although there are a greater number of studies available to support significant effects at 5 µg/dL, significant cognitive function decrements in children have been found at all levels examined, currently down to 2 µg/dL.

The cleanup level for lead in residential soil at OU1, OU2, and OU3 of the Southwest Jefferson County Mining Site was derived based on the 1994 and 1998 soil lead guidance documents, which identify 10 µg/dL as the blood lead level of concern. This conflicts with the latest OLEM Directive, which indicates that adverse health effects are associated with blood lead levels of 5 µg/dL, and possibly as low as 2 µg/dL, in young children. If the EPA revises the blood lead level of concern to a value less than 10 µg/dL, the resulting cleanup level for lead in residential soil at the Southwest Jefferson County Mining Site, which is based on human health risks to a child receptor, would be lower than the value that is listed in the OU1, OU2, and OU3 Records of Decision.

Changes in Toxicity and Other Contaminant Characteristics

Other than lead, for which increasing evidence supports a lower blood lead level of concern than was used at the time of the ROD, toxicity values for the other site COCs, arsenic and chromium, have not changed in a way that could impact remedy protectiveness.

Changes in Risk Assessment Methods

Changes in risk assessment methodology have occurred since the risk assessment was completed in 2012. For example, the EPA now recommends a default relative bioavailability of 60% for arsenic in soil (EPA, 2012d). In addition, the EPA has completed an update of standard default exposure factors (EPA, 2014); thus, many of the exposure assessment input parameters in the original risk assessment are different than values currently recommended. Despite these changes, the cleanup levels selected for the non-lead COCs, arsenic and chromium, remain valid.

Although an ecological risk assessment was not included in the OU1 ROD, the residential soil clean-up level for lead at this Site has been determined to be within the range that is protective of ecological receptors that would utilize residential environments. This conclusion is based on modeled risks to wildlife, which includes sensitive ecological receptors, such the American robin. Robins are common migratory songbirds in residential areas that tend to be highly exposed to contaminated soil due to ingestion of soil invertebrates. Because robins are a sensitive ecological receptor, other wildlife species that are less sensitive should also be protected.

Changes in Exposure Pathways

The EPA is unaware of any changes in land use, routes of human health and ecological exposure, contaminants, toxic byproducts, or physical site conditions.

Expected Progress Towards Meeting RAOs

The remedy is progressing towards meeting the RAO through ongoing remediation of residential properties. Under the remedial action for OU1, OU2 and OU3, 1,008 residential properties have been remediated. The removal of lead in excess of 400 ppm at residential properties reduces the likelihood of lead exposure. This exposure reduction is expected to result in improved blood lead levels for target populations across the Site.

QUESTION C: Has any other information come to light that could call into question the protectiveness of the remedy?

The EPA is currently unaware of any additional information that could impact the protectiveness of the remedy.

VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the Five-Year Review:
None.

Issues and Recommendations Identified in the Five-Year Review:

OU(s): 01, 02 and 03	Issue Category: Institutional Controls			
	Issue: The EPA needs to develop an Institutional Control Plan, and implement ICs as required for properties with residual lead concentrations greater than or equal to 1,200 ppm remaining at 12-inches bgs and for properties where access to sample and remediate cannot be gained during the RA.			
	Recommendation: • Work with the local governments to establish a registry of properties that meet the IC requirement. This will help inform the community leaders of the potential issue if properties are excavated deeper than 12 inches bgs for utility improvements, construction projects, etc. • Develop homeowner, builder and developer education programs, or create new building codes, to address heavy metal soil contamination and best management practices. • Per the 2012 Record of Decision for the Site, further evaluation of additional measures such as deed restrictions and notices, restrictive covenants or easements will be considered, if necessary, with collaboration among local citizens, county and state governments/officials.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	EPA	EPA/State	6/30/2023

VII. PROTECTIVNESS STATEMENT

Protectiveness Statement(s)	
Operable Unit:1	*Protectiveness Determination:* Will be Protective
Protectiveness Statement: The remedy at OU1 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities at residential properties completed to date have adequately addressed the soil exposure pathways that could result in unacceptable risk at the remediated residential properties.	

Protectiveness Statement(s)	
Operable Unit:2	*Protectiveness Determination:* Short-term Protective
Protectiveness Statement: The remedy at OU2 is currently protective of human health and the environment because all properties above the cleanup level have been remediated and barriers are in place clearly identifying lead contamination remaining at depth. In order to be protective in the long term, ICs need to be implemented.	

Protectiveness Statement(s)	
Operable Unit:3	*Protectiveness Determination:* Short-term Protective
Protectiveness Statement: The remedy at OU3 is currently protective of human health and the environment because all properties above the cleanup level have been remediated and barriers are in place clearly identifying lead contamination remaining at depth. In order to be protective in the long term, ICs need to be implemented.	

VIII. NEXT REVIEW

The next five-year review report for the Southwest Jefferson County Mining Superfund Site is required five years from the completion date of this review.

APPENDIX A

Reference List

REFERENCE LIST

EPA. 1994. Memorandum: OSWER Directive: Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. Washington, DC. OSWER Directive 9355.4-12. August.

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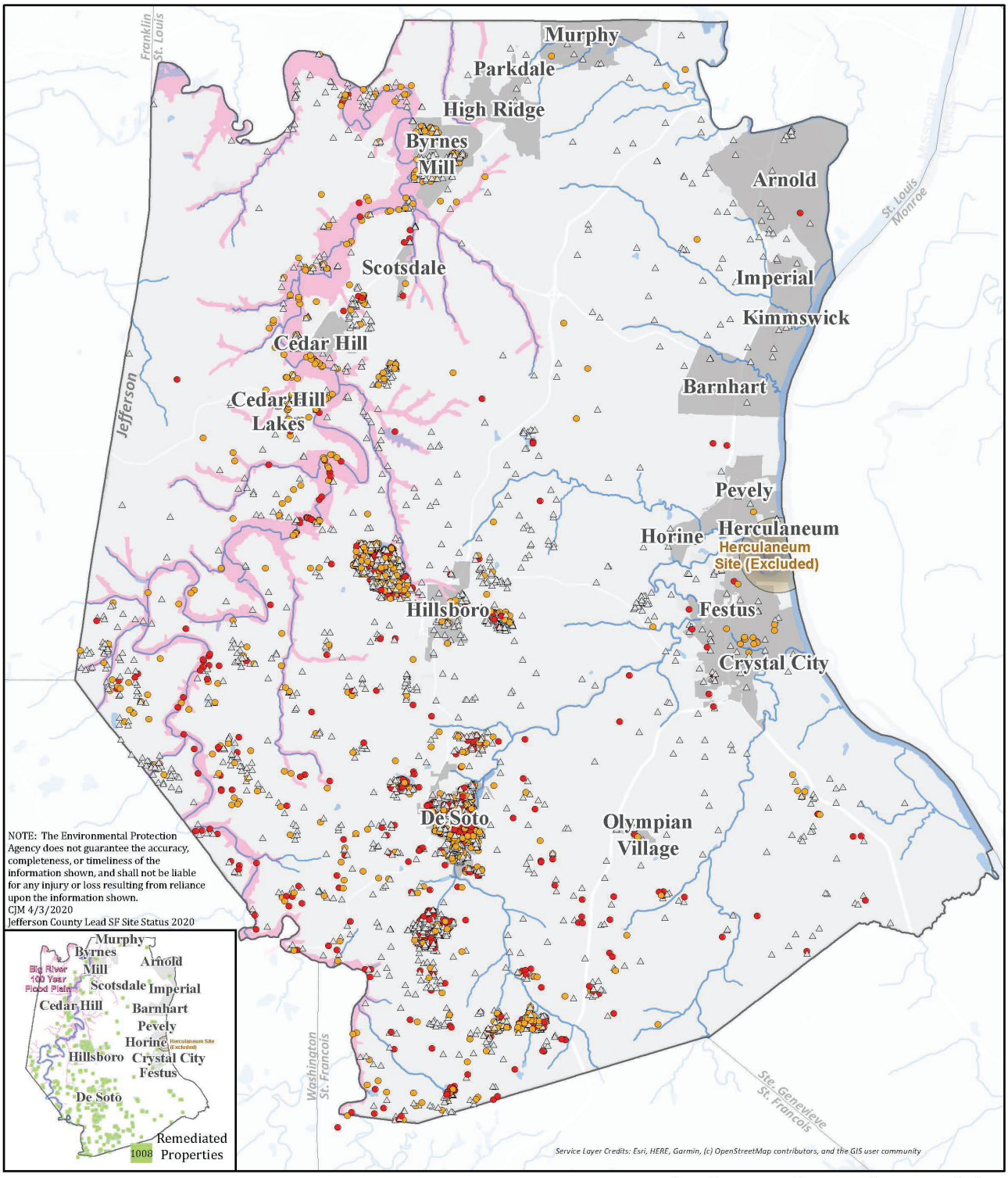
APPENDIX B

Site Map

SITE MAP



Data Sources:
Property Status: EPA 2020
Remediated Status: EPA 2020
Missouri Protected Areas: USGS, 2001
Est, Big River Flood Plain: FEMA, 2016
Herculaneum Site: EPA 2017 (1.5 mile area from Herky Stack)

United States Environmental Protection Agency

Highest Non-Drip Lead Result (ppm)
4,796 Sampled Properties

- < 400
- 400 - 1200
- > 1200
- Herculaneum Site (Excluded)
- Est. Big River Flood Plain

0 2.5 5
Miles

Southwest Jefferson County Mining National Priorities List Superfund Site
Jefferson County, Mo
April, 2020

APPENDIX C

Public Notices

NEWSPAPER ADS

PUBLIC NOTICE

FIRST FIVE-YEAR REVIEW STARTED

Southwest Jefferson County Mining NPL Superfund Site

Jefferson County, Missouri

September 2019

EPA Region 7: Iowa, Kansas, Missouri, Nebraska, and Nine Tribal Nations

The U.S. Environmental Protection Agency (EPA) Region 7 has started the First Five-Year Review for the Southwest Jefferson County Mining National Priorities List (NPL) Superfund Site. Five-Year Reviews are required by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) when hazardous substances remain on site above levels that permit unrestricted use and unlimited exposure. Five-Year Reviews provide an opportunity to evaluate the site remedy to determine whether it remains protective of human health and the environment. Lead is the main contaminant of concern at this site. This Five-Year Review should be completed in June 2020.

EPA has assessed the ability of the public to access site information through an internet-based repository and has determined that the local community has this ability. As a result, the Five-Year Review and Administrative Records for this site will be available through this website, once completed:
www.epa.gov/superfund/southwestjeffersoncountymining

EPA encourages community members to ask questions and report any concerns about this site. Questions or requests for site information and/or the Five-Year Review process can be submitted to:

Elizabeth Kramer
U.S. EPA Community Engagement Specialist
Email: kramer.elizabeth@epa.gov

U.S. Environmental Protection Agency, Region 7
11201 Renner Boulevard, Lenexa, KS 66219
Toll-free: 1-800-223-0425

PUBLIC NOTICE

FIRST FIVE-YEAR REVIEW COMPLETED

Southwest Jefferson County Mining NPL Superfund Site

Jefferson County, Missouri – June 2020

EPA Region 7: Iowa, Kansas, Missouri, Nebraska, and Nine Tribal Nations

The U.S. Environmental Protection Agency (EPA) Region 7 has completed the First Five-Year Review (FYR) for the Southwest Jefferson County Mining National Priorities List (NPL) Superfund Site (site), located in Jefferson County, Missouri. Statutory FYRs are required by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), commonly known as the Superfund Law, when hazardous substances remain on-site above levels that permit unrestricted use and unlimited exposure. FYRs provide an opportunity to evaluate the site remedy to determine whether it remains protective of human health and the environment. The remedy evaluated under this FYR focuses on Operable Units 1, 2 and 3 (OU-1, OU-2, and OU-3) – Residential Yards, the only OUs currently with a remedy for this site.

The contaminant of concern at the site is lead, which was extracted by mining activities in the Old Lead Belt beginning in the late 1700s. This FYR included an examination of relevant site documents and a site inspection. The assessment of this FYR found that the remedy is being constructed in accordance with the requirements of the Record of Decision and is functioning as designed. The results of this review indicate that the remedy at OU-1 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities at residential properties completed to date have adequately addressed all exposure pathways that could result in unacceptable risk at the remediated residential properties. The remedy at OU-2 and OU-3 is currently protective of human health and the environment, because all properties above the cleanup level have been remediated and barriers are in place clearly identifying lead contamination remaining at depth. In order to be protective in the long-term, Institutional Controls need to be implemented. The First FYR was signed [*add date*], 2020. The Second FYR will begin in June 2024.

EPA has assessed the ability of the public to access this FYR through an internet-based repository and has determined that the local community has this ability. As a result, the First FYR Report, Administrative Records, and additional information may be found through this website: www.epa.gov/superfund/southwestjeffersoncountymining (see Site Documents & Data).

This FYR report is also available at the EPA Region 7 Records Center, 11201 Renner Boulevard, Lenexa, KS 66219. Fact Sheets for the site are available online at: www.epa.gov/mo/missouri-cleanups. EPA encourages community members to ask questions and report any concerns about this site. Questions or requests for site information and/or the FYR process can be submitted to:

Elizabeth Kramer
U.S. EPA Community Involvement Coordinator
Email: kramer.elizabeth@epa.gov
Phone: 913-551-7186

Greg Bach
U.S. EPA Remedial Project Manager
Email: bach.greg@epa.gov
Phone: 913-551-7291

U.S. Environmental Protection Agency, Region 7
11201 Renner Boulevard, Lenexa, KS 66201
Toll-free: 1-800-223-0425