978571

PROPOSED PLAN

HEGELER ZINC SUPERFUND SITE

OPERABLE UNITS 1 and 2

VERMILION COUNTY, ILLINOIS

EPA SITE ID: IL0000064782

PREPARED BY:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 5

December 2022

ACRYONYMS, ABBREVIATIONS, AND UNITS OF MEASURE

AOC	Administrative Order of Consent
ARAR	Applicable or Relevant and Appropriate Requirements
bgs	Below Ground Surface
BERA	Baseline Ecological Risk Assessment
BHHRA	Baseline Human Health Risk Assessment
BLLs	Blood Lead Levels
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Contaminant(s) of Concern
COEC	Contaminant(s) of Ecological Concern
COPEC	Chemical of Potential Ecological Concern
CSM	Conceptual Site Model
cy	Cubic Yards
EC_{10}	Concentration at which 10% of organisms exhibit statistically significant effects.
ELCR	Excess Lifetime Cancer Risk
EPC	Exposure Point Concentration
ERA	Ecological Risk Assessment
EPA	United States Environmental Protection Agency
FS	Feasibility Study
GMZ	Groundwater Management Zone
GSA	General Services Administration
HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	Hazard Quotient
IAC	Illinois Administrative Code
IC	Institutional Controls
Illinois EPA	Illinois Environmental Protection Agency
KIK	KIK Custom Products
LIDAR	Light Detection and Ranging
LOEC	Lowest Observable Effects Concentration
LTM	Long-Term Monitoring
MCL	Maximum Contaminant Level
mg/kg	Milligrams Per Kilogram
MW	Monitoring Well
µg/L	Micrograms Per Liter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPDES	National Pollution Discharge Elimination System
O&M	Operation and Maintenance
OUs	Operable Units
OU1	Operable Unit One
OU2	Operable Unit Two
OU3	Operable Unit Three
PAHs	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls

$PECQ_{total}$	Total Predicted Environmental Concentration Quotient
PRGs	Preliminary Remediation Goals
PRP	Potentially Responsible Party
RAO	Remedial Action Objectives
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
ROD	Record of Decision
RSL	Regional Screening Level
SLERA	Screening Level Ecological Risk Assessment
SRI	Supplemental Remedial Investigation
SVOC	Semi-Volatile Organic Compounds
Site	Hegeler Zinc Superfund Site
TACO	Tiered Approach to Corrective Action Objectives
TBC	To-Be-Considered
TCLP	Toxicity Characteristic Leaching Procedure
T&E	Threatened and Endangered
UCL	Upper Confidence Limit
VOCs	Volatile Organic Compounds
XRF	X-Ray Fluorescence

Proposed Plan – December 2022
Hegeler Zinc Superfund Site
Vermilion County, Illinois

1. INTRODUCTION

The purpose of this Proposed Plan is to: 1) present background information about the Hegeler Zinc Superfund Site ("Site") in Vermilion County, Illinois; 2) describe the cleanup alternatives considered for addressing the contamination at the Site; 3) identify U.S. Environmental Protection Agency's (EPA's) preferred cleanup alternative and explain the reasons for those preferences; and 4) solicit public review comments on the alternatives evaluated. EPA's Preferred Alternative is intended to address unacceptable risks to human health and the environment.

This document is issued by EPA, the lead agency for Site activities. The Illinois Environmental Protection Agency (Illinois EPA) is the support agency. In developing this Proposed Plan, EPA reviewed and considered information in the Administrative Record, which provides additional detailed information about Site conditions. EPA will select a remedy for the Hegeler Zinc Site after reviewing and considering all information submitted during the 30-day public comment period, which runs from December 1, 2022 through December 30, 2022. EPA may modify the Preferred Alternative or select other remedial alternatives presented in this Proposed Plan based on new information or public comments.

EPA encourages the public to review and comment on all the alternatives presented in this Proposed Plan. EPA placed an announcement in the Danville Commercial News newspaper to notify the public of the availability of this Proposed Plan document and its supporting Administrative Record. EPA will host an in-person meeting on the Proposed Plan on December 7, 2022 at the Danville Area Community College Bremer Conference Center, 2000 E. Main St., Danville, IL 61832. EPA invites you to submit your comments in one of the following ways: 1) at the public meeting on December 7 either verbally or in writing, 2) using the comment form on EPA's webpage at https://www.epa.gov/superfund/hegeler-zinc, 3) submitting a written comment via email at safakas.kirstin@epa.gov, 4) submitting a written comment by mail to: U.S. EPA Region 5, Attention Kirstin Safakas, 77 W. Jackson Blvd, (Mail Code: EC-19J), Chicago, IL 60604-3590, or 5) leave a confidential voicemail at (312) 919-4621. Comments must be received or postmarked by the last day of the public comment period, which is December 30, 2022, to be part of the official public record.

EPA is proposing **Alternative 3** as the recommended alternative to remediate the contamination at the Site. The proposed remediation measures focus on metals as the primary contaminant of concern (COC), but also address exposure risks associated with pesticides found in sediment. Alternative 3 includes the removal of sediment above ecological and human health Preliminary Remedial Goals (PRGs), which is a common element in each of the proposed remedial alternatives. In addition, the following major components that are unique to Alternative 3 include: 1) excavation of surface soil with COC concentrations above human health PRGs (up to

2 feet below ground surface (bgs)), 2) excavation of surface soil with COC concentrations above ecological PRGs (0.5 ft bgs) in areas that do not overlap with the human health PRG excavation footprint, 3) covering of the slag pile consolidation area, 4) utilization of Institutional Controls (ICs), and 5) implementation of Long-Term Monitoring (LTM). Until a final groundwater remedy is selected, the proposed remedy includes interim groundwater and surface water remedies to prevent human exposure to the contaminated groundwater and surface water.

EPA is issuing this Proposed Plan as part of its public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and under Section 300.430(f)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This Proposed Plan summarizes information in the Supplemental Remedial Investigation (SRI) and Feasibility Study (FS) Reports and other documents contained in the Administrative Record file for this Site. EPA and Illinois EPA encourage the public to review these documents to gain a more comprehensive understanding of the Site and Superfund activities conducted at the Site to date. Supporting documents related to the proposed cleanup activities in this Proposed Plan can be found at any of the following locations, or online at: https://www.epa.gov/superfund/hegeler-zinc.

Danville Public Library
319 N. Vermilion St.
Danville, IL 61832
(217) 477-5228

EPA Region 5 Records Center
77 W. Jackson Blvd. (SRC-7J)
Chicago, IL 60604
(312) 353-1063 - *Call for appointment*

2. SITE BACKGROUND

Site Description

The Site is located west of the village of Hegeler in Vermilion County, Illinois approximately 6 miles south of Danville, Illinois. (Figures 1 and 2). The Site encompasses approximately 149 acres which were primarily used for zinc smelting and sulfuric acid operations. The Site is located in a rural area surrounded by mixed land uses including commercial, agricultural, and residential. The village of Hegeler, the nearest residential area, is directly east of the Site.

The Site encompasses the former zinc smelter facility (149 acres) and approximately 4,000 feet of creek and unnamed tributary to Grape Creek. The Site features include the 7.3-acre slag pile, contaminated soils, settling ponds, impacted areas of the adjacent Resource Conservation and Recovery Act (RCRA) facility property, the KIK Custom Products (KIK) Culvert, and a creek starting from the RCRA property extending upstream to, and including, the unnamed tributary to Grape Creek (Figures 2, 3 and 4).

Site History

Hegeler Zinc began operations in 1906 under the name of Hegeler Brothers and became known as Hegeler Zinc in 1913. During its years of operation, Hegeler Zinc produced various grades of zinc slab and rolled zinc products, as well as sulfuric acid and cadmium. The sulfuric acid was produced from sulfur gas collected from the zinc ore before smelting. Around the time Hegeler Zinc operations began, three residential neighborhoods – Hegeler, East Hegeler, and Tilton –

were developed to the east and north of Hegeler Zinc, and residential dwellings were built there in the early 1900s.

In 1942, during World War II, the Defense Plant Corporation, a U.S. Government Services Agency (GSA), built onsite cadmium capacity and rented the cadmium units to Hegeler Zinc. The cadmium process was added to the roasters to collect and pass fumes through electrical precipitation units where cadmium collected as dust. Following collection, the cadmium dust was sent offsite to cadmium smelters. The company also operated its own local coal mine to charge its smelting furnaces.

Zinc smelting operations were shut down in November 1947. During the time of operations (from 1906 until 1947), process stacks emitted gases and particles. Particulate smelter emissions typically contain the following metals derived primarily from ore: arsenic, cadmium, copper, lead and zinc. Windblown emissions are believed to have deposited particulates to surface soils. The smelting operation also resulted in large amounts of slag stored in piles onsite. Slag is a waste residue produced by the smelting process and is often associated with cinders and incombustible pieces of coal (clinkers) used to create heat for the smelting process. After the slag piles had grown very large, a zinc oxide plant was built that used electrolysis to reprocess the slag and recover more metal. The slag material contains unburned residues and metals such as lead, arsenic, cadmium and zinc. The reprocessed slag pile that currently remains onsite occupies 7.3 acres and is 53 feet above grade. The slag pile also contains wood, brick, and concrete debris that appear to be from building demolitions.

Zinc rolling and sulfuric acid production operations continued until at least 1954. In August 1954, Hegeler Zinc dissolved and quitclaim-deeded the operations to its sole stockholder, National Distillers and Chemical Corporation. The following year, National Distillers sold the zinc rolling mill operations to Peterson Filling and Packaging. The facility was then used to package insecticides, shaving products, and other items. In 1956, Illinois Fireworks Company purchased the remaining National Distillers property for the manufacturing of fireworks until 1987. Temporary small wooden huts and inoperable tractor trailers positioned throughout the Site were utilized to store fireworks. Many of these buildings and trailers still remain onsite. National Distillers later became Quantum Chemical Corporation, which then became Millennium Petrochemicals in 1997.

In 2005, the Hegeler Zinc Superfund Site was listed on the National Priority List.

History of Remedial Activities

This section of the Proposed Plan provides the history of the Site and a brief discussion of the various remedial activities and associated investigations that have been conducted at the Site by EPA and the potentially responsible parties (PRPs).

Previous Investigations

Initial investigations were conducted by Illinois EPA as part of a CERCLA integrated assessment at the Site in May 2001. The objective of the integrated assessment was to develop a preliminary determination of nature and extent of contamination to serve as a baseline or basis

for subsequent investigations. Soil, sediment, waste (slag pile), and residential soil samples were collected using x-ray fluorescence (XRF) and analysis by a laboratory. The following summarizes the previous investigations and reporting completed by Illinois EPA:

- Illinois EPA Pre-Comprehensive Environmental Remediation, Compensation, and Liability Information System Assessment (September 2000)
- Illinois EPA Integrated Assessment (September 2001)
- Illinois EPA Expanded Site Inspection (May 2002)

In 2003, EPA completed the Integrated Site Assessment Report (Weston 2003) at the Site. In May 2003, EPA installed a six-foot-high chain link fence around the former zinc smelting area, including signage, to prevent trespassers from coming into contact with the contaminated soil and waste material. During the initial Integrated Assessment, samples were collected from soil, slag, sediment, surface water and groundwater and analyzed for volatile organic compounds, semi-volatile organic compounds, pesticides, polychlorinated biphenyls, metals, and perchlorate. Perchlorate was investigated due to historical fireworks manufacturing operations.

EPA conducted Remedial Investigation (RI) fieldwork at the Site between April and May 2006, with additional sampling in November 2006. EPA completed the RI for the Site in 2007 (Weston 2007). The RI included a Baseline Human Health Risk Assessment (BHHRA) and a Screening Level Ecological Risk Assessment (SLERA). The objective of the RI was to characterize the nature and extent of contamination at the former Hegeler Zinc smelter facility. At this time, the Site had not yet been divided into separate Operable Units (OUs). Based on the RI findings and conclusions, EPA determined that a Supplemental Remedial Investigation (SRI) was needed to address data gaps associated with the former Hegeler Zinc property before preparing a Feasibility Study (FS).

Enforcement Activities

After completion of the 2007 RI, EPA conducted negotiations with the PRPs for completion of the next steps in the Superfund process. In 2009 EPA and the PRPs divided the Site into three separate OUs (Figure 4[1])

- OU1 includes: soil, slag, surface water, sediment and groundwater impacted by the former Hegeler Zinc operations within the facility footprint.
- OU2 is site-impacted streams (surface water and sediments) exiting the EPA-constructed fence around OU1, including the unnamed tributary to Grape Creek and Grape Creek. OU2 also includes water and sediment associated with discharge waters exiting the RCRA facility, referred to as the "KIK Culvert."
- OU3 is the residential area referred to as the village of Hegeler located east of the former Hegeler Zinc property.

[1] The OU boundaries defined in the 2009 AOC have changed based on the data collected during the SRI. Refer to Site Characteristics Section, for the discussion on how EPA's current understanding of the site boundaries has evolved.

In July 2009, an Administrative Order on Consent (AOC) was signed by EPA, KIK Custom Products, Inc. (KIK), General Services Administration (GSA), and the current Site property owner. The AOC required the PRPs to prepare a Baseline Ecological Risk Assessment (BERA) and FS report for OU2. The OU2 AOC addressed the KIK Culvert, the creek exiting the RCRA property extending upstream to, and including, the unnamed tributary to Grape Creek and Grape Creek, with a focus on metals and pesticide impacted sediment and surface water. Voyant Beauty is the current owner of the RCRA facility, formerly owned by KIK Custom Products.

EPA had also negotiated a second AOC with GSA and Millennium (a subsidiary of Lyondell) for an SRI and FS at OU1 and OU3, but Millennium filed for bankruptcy under Chapter 11 in January 2009, before the AOC was finalized. In August 2009, EPA initiated the work Millennium would have performed at OU1 and OU3. A bankruptcy settlement with Lyondell was approved in April 2010. As part of the bankruptcy settlement, the United States received partial payment by Millennium for claims relating to the anticipated cleanup costs for the Site.

The OU3 residential area east of the former zinc smelter facility was addressed by a September 2014 Record of Decision (ROD), resulting in the cleanup of thirty-nine (39) properties exceeding cleanup levels for either arsenic or lead in the village of Hegeler. This remediation work was completed in 2016 (Figure 3). Contaminated material from the residential properties was stockpiled within the fenced property. The stockpile will be addressed as part of the final remedy and its proposed cleanup plan is in this Proposed Plan (see Figure 5 for location of stockpile).

Supplemental Remedial Investigation/Feasibility Study (SRI/FS)

Between 2009 and 2021, EPA conducted various supplemental investigations in and around the footprint of the former zinc smelter facility including collection of soil, groundwater, surface water and sediment data. The following are OU1 investigations, reference documents and relevant OU2 reports used in the development of the OU1 FS:

- KIK OU2 Initial Site Characterization Report (Shield 2009)
- KIK Field Investigation Report – November through December 2017 (AECOM 2018)
- OU1 Baseline Ecological Risk Assessment (BERA) – August 2019 (CH2M 2019c)
- KIK Ecological Risk Assessment (ERA) Technological Memorandum – October 2019 (CH2M 2019d)
- OU1 Human Health Risk Assessment (HHRA) – September 2019 (CH2M 2019e)
- HHRA for KIK Property – September 2019 (CH2M 2019f)
- SRI Report – October 2019 (CH2M 2019a)
- OU1 FS Report – January 2021 (CH2M 2021)

The PRPs conducted the OU2 SRI and FS to determine the nature and extend of metals and pesticides contamination in the KIK Culvert, unnamed tributary to Grape Creek and Grape Creek and refine the sediment remediation footprint (Figure 2). The following are reports associated with OU2 investigations, reference documents and relevant OU1 reports used in the development of the OU2 FS:

- KIK OU2 Initial Site Characterization Report – (Shield 2009)
- KIK Field Investigation Report – November through December 2017 (AECOM 2018)

- BERA Report – (AECOM 2012)
- FS Work Plan (AECOM 2016)
- HHRA finalized in May 2014 and re-evaluated in 2020 (AECOM 2020)
- OU2 FS (approved by EPA in Oct 2021) – (AECOM 2021)

The significant findings and conclusions from the characterization activities completed during the RI and SRI and the remedial alternatives considered in the OU1 and OU2 FS Reports are summarized in this Proposed Plan. Additional details are contained in the Final RI and SRI Reports and FS Reports and other documents in the Site's Administrative Record.

3. SITE CHARACTERISTICS

The results of RI and subsequent OU1 and OU2 SRI Reports defined the nature and extent of contamination related to the former Hegeler Zinc smelter facility operations. This section of the Proposed Plan summarizes physical characteristics and the nature and extent of contamination in each media. The significant findings and conclusions from the characterization activities completed during the investigations are summarized below.

Site Topography

The topographic relief in Vermilion County is low to moderate. There is minimal topographic gradient on the Site, except for the manmade slag pile, which is approximately 53 feet above grade at its highest point (Figure 5). The Site's topography has been altered by past industrial activity, storage of slag, and creation of drying beds and settling ponds.

Geology

Generally, geology at the Site is composed of unconsolidated manmade or reworked geological materials (fill) overlaying Quaternary-aged deposits, which is underlain by Pennsylvanian-aged bedrock (Kosanke et al. 1960). Fill of varying thickness covers the majority of OU1 and includes material deposited or reworked by human activities since the zinc smelter facility operated in the early 1900s. Fill consisting of unconsolidated slag, construction debris, and reworked geological materials generally ranges from 1 to 3 feet thick. Deeper deposits of fill, extending up to 11.5 feet below ground surface (bgs), are located east of the slag pile, along the creek, and along roads where slag was used for construction.

Regional Hydrology and Groundwater

Hydrogeology is composed of two water-bearing zones at the Site, Zone 1 and Zone 2. The uppermost, unconsolidated fill and quaternary deposits (Upper Zone 1) within the underlying weathered bedrock (Lower Zone 1) make up Zone 1. Upper Zone 1 is found within 5 to 28 feet bgs and Lower Zone 1 is found from 28 to 80 feet bgs. Zone 2 is defined as the unweathered bedrock water-bearing unit from 80 to 170 feet bgs where water flows primarily through coal seams. Geochemical data and hydraulic data collected as part of the Phase 3 SRI indicate that Upper and Lower Zone 1 are hydraulically connected and that little to no hydraulic communication occurs between Lower Zone 1 and Zone 2.

The State of Illinois classifies groundwater based on potential use and assigns different cleanup standards to aquifers based on this classification. During the RI, EPA collected data to assess the classification of the shallow aquifer in accordance with the requirements of Illinois Administrative Code (IAC) Title 35, Part 620. Based on the SRI, EPA found that Zone 1 and Zone 2 meet the requirements of Class I Potable Resource Groundwater (35 IAC 620.210 Subpart B). Therefore, EPA evaluated the shallow aquifer as a Class I potable resource groundwater aquifer for the interim groundwater remedy. The Class I classification may be re-evaluated during the remedial design or during the decision-making process for a final groundwater remedy.

The Site includes various surface water bodies (Figures 2 and 5) including the settling ponds, fire water pond, Lake Harry and the creek (unnamed tributary to Grape Creek). In general, the creek channels are straight and appear to have been created to drain surface water runoff from the Site and surrounding farm fields. The creek that transects near the slag pile originates from the North Branch, which originates 1 mile north of the Site, and the South Branch, which originates 1 mile south of the Site. The South Branch joins the North Branch just north of the slag pile, and then the creek flows northeast. In the central portion of the Site, the KIK culvert (located on the RCRA operating facility) discharges to the creek that transects through the former smelter facility before flowing to the northeast.

- The settling ponds cover approximately 3.34 acres and are ephemeral, only containing water after rain events. Based upon site topography, there is the potential for surface water runoff to the settling ponds from the slag pile to the north.
- The fire water pond spans approximately 1.5 acres and was built in approximately 1920 as a place to store coal from the Hegeler Mine to prevent spontaneous combustion from igniting coal. The fire water pond is approximately 20 feet deep and has steep embankments with an approximate 10-foot elevation change to the water's surface. The bottom of the fire water pond is approximately 30 feet below the surrounding ground surface elevation. The fire water pond is not connected to other Site surface water features. Due to the depth and shallow water table, it is assumed groundwater is discharging to the fire water pond. Based upon Site topography, there is potential for surface water runoff to the fire water pond from the northeast, east, south, and southwest.
- Lake Harry, located in the southwest portion of RCRA facility, is a manmade lake created by KIK in 1989. Clay and soil were excavated from the location of Lake Harry to use as cover material for the RCRA surface impoundment on the RCRA property (Figure 5). Lake Harry is approximately 15 feet deep and is not connected to other Site surface water features. Based upon Site topography, there is potential for surface water runoff to Lake Harry from immediately adjacent areas including from the heavily vegetated area to the north, the closed RCRA surface impoundment to the northeast, and the farmlands to the south and east. As shown in Figure 5, the drainage ditch to the south of, and immediately adjacent to, the settling ponds intercepts surface water runoff from the slag pile.
- The KIK Culvert is an approximately 700 foot long ditch with shallow water and minimal northwesterly flow on the northwestern portion of the former KIK property. The width of the stream within the culvert varies from 4 to 16 feet and the banks of the culvert are vegetated with grasses, saplings, and trees. Source water from the KIK Culvert includes reverse osmosis backwash and stormwater discharged from KIK Custom Products under

National Pollution Discharge Elimination System (NPDES) permit IL0004162 at outfall 001 and an upstream stormwater basin at outfall 002. Water from outfall 001 is free of process wastewater and is monitored for flow rate, pH, total residual chlorine, total suspended solids, and chloride. The two outfalls discharge an average of 0.035 million gallons of water into the KIK Culvert each day.

- The unnamed creek exiting the EPA-constructed fence (Figures 2 and 10) is a 4,000 feet long portion of the Grape Creek tributary that flows through agricultural and residential areas to the confluence with Grape Creek. This stretch of the tributary is largely channelized and features some deeper pooled areas, vegetated sand bars, and depositional point bars. The tributary channel is approximately 10 to 15 feet wide in agricultural and residential areas. The banks of the tributary are vegetated throughout and strewn with debris in some areas. Tile drains discharge surface water from the eastern farm fields in two locations and a secondary channel discharges into the stream approximately 200 feet downstream of the railroad crossing.

Nature and Extent of Contamination

The 2007 RI and subsequent SRI determined that the primary sources of metals contamination are associated with the contaminated slag and soils from the former Hegeler Zinc smelter facility operation.

Soil

Ninety-nine surface soil (0-2 feet bgs) and 77 subsurface soil samples (greater than 2 feet bgs) were collected during the RI and SRI between 2006 and 2017. The primary contaminants frequently found exceeding EPA industrial screening levels in soils were lead and mercury (Table 1). Arsenic exceeded Illinois EPA's Tiered Approach to Corrective Action Objectives (TACO) criteria (Table 1).

Table 1 - Summary of Maximum Concentrations of Metals in Soil

Contaminant	# Samples collected during RI and SRI (2006 -2017)	Maximum Concentrations (mg/kg)	EPA Industrial Regional Screening Level (mg/kg) unless noted
Arsenic	176	113	11.3*
Lead	176	40,200	800
Mercury	141	297	46

*Illinois EPA Background TACO

Metals concentration are the highest in the slag pile and within the EPA constructed fence as well as portions of the adjacent RCRA property. Metals concentrations were generally less than screening criteria in the adjacent farm fields/tree areas and in the eastern portions of the RCRA facility property. Volatile Organic Compounds (VOCs), Semi-Volatile Organic Compounds (SVOCs) and Polycyclic Aromatic Hydrocarbons (PAHs) concentrations were generally less than industrial screening levels. Perchlorate was not detected.

Agricultural Fields

Agricultural surface soil data was collected to assess if agricultural fields adjacent to OU1 have been contaminated by Site activities by either windborne particle deposition or track out of contaminated materials. A total of twenty-two surface soil samples were analyzed with an x-ray fluorescence gun for concentrations of lead and eight soil samples were analyzed at a laboratory for total metals. Samples were collected from 0 to 0.25 feet bgs within a 200 feet radius from the Site perimeter during the RI. None of the soil samples collected during the RI contained metals exceeding Illinois EPA's TACO industrial/commercial screening levels. The BHHRA identified no human health risk drivers in the agricultural fields, removing them from further investigations.

Settling Ponds

The settling ponds are frequently dry; therefore, the laboratory analytical results of the settling pond samples were compared to both soil and sediment screening levels. Eight soil samples were collected from 0 feet bgs to the water table in the settling ponds. None of the samples collected from the settling ponds during the RI exceeded the lead industrial regional screening level (RSL). The samples were also below the adjusted noncarcinogenic hazard quotient of 1 for additive effects of the hematological system for antimony and zinc. Six sediment samples and one soil sample were collected from 0 to 0.5 feet bgs in the settling ponds and compared to ecological screening levels. Ecological screening levels were exceeded in all samples with analytical results indicating maximum concentrations of cadmium (108 mg/kg), lead (729 mg/kg), manganese (381 mg/kg) and zinc (17,800 mg/kg).

Sediment

During the RI and SRI sediment samples were collected upgradient and downgradient of Site waterways to determine vertical extent of contaminant concentrations. Sediment samples were also collected from the settling ponds, fire water pond, KIK Culvert, and the unnamed tributary to Grape Creek.

- Fourteen sediment samples were collected from OU1 and compared to human health screening criteria. Analytical results indicate that the cadmium screening criteria was exceeded in two samples with concentrations ranging from 0.73 mg/kg to 834 mg/kg.
- Twenty-eight samples were collected from OU1 and compared to ecological screening criteria. Analytical results indicate that the cadmium screening criteria was exceeded in sixteen samples with concentrations ranging from 0.53 mg/kg to 834 mg/kg; lead screening criteria was exceeded in eleven samples with concentrations ranging from 13.8 mg/kg to 729 mg/kg; and zinc was exceeded in seventeen samples with concentrations ranging from 100 mg/kg to 44,000 mg/kg. Sediment samples were analyzed for metals, VOCs, SVOCs, Polychlorinated Biphenyls (PCBs), pesticides, and perchlorate.
- Of the eighty-four sediment samples collected downstream of the former zinc smelter facility (unnamed tributary) sixty-three contained metals at concentrations above screening levels, indicating impact from material produced at the Site. Antimony, arsenic, cadmium, copper, iron, lead, manganese, mercury, nickel, silver, and zinc exceeded

screening criteria. Cadmium, silver, and zinc exceeded criteria most frequently in the unnamed tributary.

- Elevated concentrations of SVOCs, pesticides, and metals were detected in sediment samples collected from the KIK culvert and are summarized in Table 2. Pesticides exceeding screening criteria include: 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Aldrin, alpha-Chlordane, Dieldrin, Endosulfan I, Endrin, Heptachlor, Heptachlor Epoxide, and Methyoxyclor. Detected concentrations of pesticides were highest in the KIK Culvert and decreased downstream with distance from the culvert. VOCs and perchlorate were not detected. The extent of pesticide contamination from the KIK culvert and downgradient of the Site are addressed in the OU2 BERA/FS.

Table 2 - Summary of Maximum Concentrations of Metals and Pesticides in Sediment

Contaminant	# Samples collected during RI and SRI (2006 -2017)	Minimum Concentrations (mg/kg)	Maximum Concentrations (mg/kg)
Cadmium	60	0.13	834
Silver	60	0.023	12
Zinc	60	41	44,000
4,4- DDD	24	0.0017	130
4,4-DDE	24	0.0017	8.7
4,4-DDT	24	0.0005	41

Groundwater

Groundwater at the Site has been characterized as two separate water-bearing units: Zone 1 (Upper Zone 1 and Lower Zone 1) and Zone 2. Upper Zone 1 maximum concentrations of total metals in groundwater are summarized in Table 3. Upper Zone 1 maximum concentrations of dissolved metals in groundwater are summarized in Table 4.

- In Upper Zone 1 (5–28 ft bgs), dissolved metals exceeding screening criteria included aluminum, arsenic, beryllium, cadmium, chromium, iron, lead, manganese, nickel, thallium, vanadium, and zinc. During the SRI, sixty-six groundwater samples were collected from thirty-four Upper Zone 1 monitoring wells. The highest metals concentrations in Upper Zone 1 were consistently located in the central and northeastern portions of the Site (slag pile extending to the RCRA property).
- In Lower Zone 1 (28-80 ft bgs), dissolved metals exceeding screening criteria included antimony, arsenic, iron, lead, manganese, selenium, and thallium. Other than iron and manganese, exceedances of screening criteria were infrequent. Iron and manganese impact the most monitoring wells, but these metals are associated with weathered shale bedrock, the geology in which the Lower Zone 1 wells are screened.
- Perchlorate was detected in groundwater monitoring well 6 during the SRI at 5.81 µg/L, which is below the maximum contaminant level (MCL) of 15 µg/L.
- In Zone 2 (80-170 ft bgs), dissolved metals exceeding screening criteria included arsenic, barium, cadmium, iron, lead, manganese, and thallium. Based upon hydraulic and geochemical data collected during the SRI, the concentration of metals detected in Zone 2 groundwater monitoring wells are due to naturally occurring contamination from

coal deposits and/or local mine-workings and not Site-related (Phase 3 Groundwater Data Results-OU1 of the Hegeler Zinc Superfund Site, Danville, Illinois [CH2M 2011]). The elevated barium concentrations detected in the Zone 2 monitoring wells are not present in the Zone 1 groundwater samples and groundwater derived from coal layers may also contain naturally occurring concentrations of manganese, as a result of oxidation of sulfide minerals in coal (Stone and Snoeberger 1978; Banasczak 1980).

Table 3 - Summary of Maximum Concentrations of Total Metals in Groundwater from Upper Zone 1

Contaminant	# Samples collected during RI and SRI (2006 -2017)	Minimum Concentrations (mg/kg)	Maximum Concentrations (mg/kg)
Aluminum	104	13.2	442000
Antimony	104	2.4	14.3
Arsenic	104	0.27	188
Barium	104	7.5	15000
Beryllium	104	0.089	40.3
Cadmium	104	0.02	629
Chromium	104	0.29	4660
Cobalt	104	0.14	595
Copper	104	0.66	14300
Iron	104	34.4	981000
Lead	104	0.16	2990
Manganese	104	1.8	25700
Vanadium	104	0.15	610
Zinc	104	2.1	58300

Table 4 - Summary of Maximum Concentrations of Dissolved Metals in Groundwater from Upper Zone 1

Contaminant	# Samples collected during RI and SRI (2006 -2017)	Minimum Concentrations (mg/kg)	Maximum Concentrations (mg/kg)
Aluminum	104	2.7	448000
Antimony	104	2.5	10.6
Arsenic	104	0.21	19.1
Barium	104	9.6	14500
Beryllium	104	0.35	38.2
Cadmium	104	0.058	589
Chromium	104	0.067	248
Cobalt	104	0.08	160
Copper	104	0.084	254
Iron	104	131	192000
Lead	104	0.12	33.8
Manganese	104	2.2	912000
Vanadium	104	0.05	293
Zinc	104	0.49	46000

Surface Water

Surface water samples were analyzed for metals, VOCs, and perchlorate. Detected concentrations of the following dissolved or total metals exceeded screening levels in surface water: aluminum, beryllium, cadmium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, silver, and zinc. Aluminum cadmium, manganese, and zinc exceeded criteria most frequently. Highest metals concentrations were found in the settling ponds and creek adjacent to the settling ponds.

- Ten surface water samples were collected, analyzed, and compared to human health screening criteria. Analytical results indicate that the cadmium screening criteria was exceeded in four samples and that concentrations ranged from 0.14 mg/kg to 465 mg/kg for total cadmium and 0.14 mg/kg to 510 mg/kg for dissolved.
- Nineteen surface water samples were collected, analyzed, and compared to ecological screening criteria. Analytical results indicate that aluminum screening criteria was exceeded in 3 samples and concentrations ranged from 13.1 mg/kg to 367000 mg/kg. Cadmium screening criteria was exceeded in 4 samples and concentrations ranged from 0.14 mg/kg to 510 mg/kg. Lead screening criteria was exceeded in 1 sample and concentrations ranged from 1.3 mg/kg to 24.7 mg/kg. Manganese screening criteria was exceeded in 2 samples and concentrations ranged from 1.4 mg/kg to 11500 mg/kg. Zinc was exceeded in 5 samples and concentrations ranged from 6.1 mg/kg to 64,600 mg/kg. Metals in the upgradient creek (North and South branches), and Lake Harry were generally below screening levels. Pesticides were detected above screening levels in the KIK Culvert and the unnamed creek. Perchlorate was not detected in surface water.

Based on the above findings, the OU1 boundary as defined in the 2009 AOC was expanded beyond the EPA-constructed fence. The footprint of the contamination related to the former zinc smelter activities includes portions of the adjacent RCRA facility, the fire water pond, and other areas needing soil remediation (Figure 5).

Land Use

The vicinity around the Site consists of mixed land uses, including commercial/industrial, agricultural and residential. The former Hegeler Zinc property is bordered by agricultural properties to the north, west and south. The RCRA property is location on historic Hegeler Zinc smelter facility operations footprint. The village of Hegeler is east of the Site. Based on the presence of the large-scale slag pile and extensive amount waste materials present, EPA concluded that residential land use in OU1 is not reasonably foreseeable. The RCRA facility would also not be reasonably foreseeable as residential or recreational, based upon the presence of active industry and the RCRA impoundment. Therefore, residential, and recreational land uses were not evaluated.

The reasonability anticipated potential future land use is industrial. The Hegeler and Tilton neighborhoods are served by public water supply corporation Aqua Illinois, which obtains drinking water from Lake Vermilion. Five residential wells were identified within the 1-mile buffer south and southeast of the Site. Due to the extent of the existing groundwater well network, limited information is available about the regional flow of groundwater. Therefore, EPA will conduct further groundwater investigations to determine if the five wells are located upgradient or downgradient of the Site.

Conceptual Site Model

A Conceptual Site Model (CSM) has been developed as a result of the RI and SRI investigations and is based on integrating technical information from a variety of sources, including physical characteristics of the site, nature and extent of contamination, and contaminant fate and transport pathways. The CSM tells the story of how and where contamination moved and what impacts such movement may have had. The CSM is depicted in Figure 6.

The primary sources of metals contamination are associated with contaminated slag from the former smelting operations, stored in piles. Physical transport of the soils/slag and chemical leaching of contaminated soil and slag, and infiltration are the most significant potential transport mechanisms. Particulates from resuspension of fines from the slag piles, contaminated soils, and emissions from the former smelter stacks are believed to have been transported by the wind and deposited to the ground surface.

Metals in surface soil tend to be immobile. The contaminants are strongly sorbed to soil, are relatively insoluble in water, and are nonvolatile. However, they can be transported with the soil by erosion, surface water runoff and leaching to groundwater. Metals can be released from the soil through infiltration into groundwater, groundwater discharges to the fire pond and the creek, impacting surface water and sediments too. The uncovered slag pile and other surface soil exceedance areas associated with former industrial areas, present a primary exposure pathway via runoff to the adjacent creek and its contributing branches, resulting in contamination of

sediment and surface water. Figure 7 displays potential migration routes for metals. Pesticides are also a COEC in sediment. The potential mechanisms for pesticide migration include erosion and/or runoff from soils or any undocumented spill or release as well as wind-blown particles deposited directly in the waterways or on surface soil that could be eroded and runoff into the waterways.

Principal Threat Waste

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP Section 300.430(a)(1)(iii)(A)). The "principal threat" concept is applied to the characterization of "source material" at a Superfund site. Source material includes or contains hazardous substances, pollutants or contaminants that act as a reservoir for migration of contaminants to ground water, surface water or air, or acts as a source for direct exposure. EPA has defined principal threat wastes as those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur. Low-level threat wastes are those source materials that generally can be reliably contained and would present only a low risk in the event of release. Low-level threat wastes include source materials that exhibit low toxicity, low mobility in the environment, or are near health-based levels.

EPA has not identified any principal threat wastes at the Hegeler Zinc Site. Although some of the waste materials at the Site exceed TCLP levels and are therefore considered characteristically hazardous, the waste materials at the Site have impacted groundwater only at low levels, and groundwater contamination appears to be limited to the Former Smelter Property. Currently, none of the contaminated process wastes at the Former Smelter Property are contained or covered. As the impact to groundwater is low, even under these uncontrolled conditions, EPA believes that the wastes can be reliably contained.

4. SCOPE AND ROLE OF RESPONSE ACTION

On September 26, 2014, EPA issued a ROD to address OU3 residential soils associated with the Site in the Hegeler residential area located east of the former Hegeler Zinc property. In July 2016, EPA completed the cleanup of thirty-nine properties with soil concentrations above the selected cleanup levels for lead (400 mg/kg) and arsenic (35 mg/kg). All contaminated soils excavated from the residential area were characterized as non-hazardous and stockpiled for consolidation on the former zinc smelter property inside the EPA-constructed fence (Figure 5). The stockpile was dormant-seeded and covered with an erosion control blanket and will be addressed in this Proposed Plan.

EPA's overall strategy for cleaning up the Site, as reflected in this Proposed Plan, is to first address the contaminated soil, slag and sediment associated with the Site to bring risk to human health and the environment down to protective levels, before selecting a final remedy for groundwater and surface water. The proposed remedy includes an interim groundwater remedy to prevent human exposure to contaminated groundwater and an interim surface water remedy to reduce migration of contaminants to surface water that contribute to surface water exceedances. EPA considers the surface water remedy interim based on groundwater/surface water interaction. These interim remedies give EPA time to evaluate the impact of the proposed source-control

remedy on contaminant concentrations in groundwater and surface water before selecting a final remedy.

5. SUMMARY OF SITE RISKS

Human Health Risks

The potential risk to human health by contaminants detected in media (soil, slag, sediment, surface water, and groundwater) was evaluated in two OU1 HHRAs to determine the current and future risks to human health from contamination associated with the former zinc smelter operations. The potential risk posed to human health by contaminants (metals and pesticides) detected in sediment associated with the OU2 SRI and OU2 HHRA are also summarize below.

For purposes of conducting the OU1 HHRAs, the Site was subdivided into exposure areas as shown on Figure 8. This was done to facilitate risk-based decisions for portions of the Site where different exposure patterns may occur, by current or future receptors, and where different levels of contaminants are present.

Exposure Area 1—The areas at the northwestern and northeastern edges of the Site, where relatively little industrial activities historically occurred.

Exposure Area 2—The heavy industrial areas of the former zinc smelter activities, including the area to the south of the main slag pile where the settling ponds are present. This area does not include the RCRA property.

Exposure Area 3—The main slag pile.

Exposure Area 4—The RCRA property

Based on the current and reasonably foreseeable future Site conditions, the following potential current and future human receptors were identified and evaluated for Exposure Areas 1, 2, and 3.

- Current Onsite Trespassers—Adolescent trespassers (ages 6 to 16) who may contact surface soil (0-2 feet bgs) in Exposure Areas 1-3, and sediment in the creek in Exposure Areas 1 and 2 and surface water in settling ponds and the creek in Exposure Areas 1 and 2.
- Future Onsite Industrial Workers—Industrial workers who may contact onsite total soil (0-10 feet bgs) in Exposure Areas 1-3; sediment in the creek in Exposure Areas 1 and 2; surface water in settling ponds and the creek in Exposure Areas 1 and 2; and sitewide groundwater (for potable use, including a showering/water vapor inhalation scenario).
- Future Onsite Construction Workers—Construction workers who may contact total soil (0-10 feet bgs) in Exposure Areas 1-3, sediment in the creek in Exposure Areas 1 and 2, and surface water in settling ponds and the creek in Exposure Areas 1 and 2 during future site redevelopment/construction activities.

The following potential current and future human receptors were identified in Exposure Area 4 (RCRA property).

- Current/Future Trespassers—Adolescents (ages 6 to 16) who may occasionally trespass onsite (outside of the fenced/secured portion of the RCRA facility) and contact surface soil (0-2 feet bgs) around Lake Harry (a small manmade lake at the periphery of the RCRA property), as well as sediment and surface water in Lake Harry.
- Current/Future Onsite Industrial Workers—Industrial workers (within the fenced portion of the exposure area) who may currently contact surface soil (0-2 feet bgs) or who may contact total soil (0-10 feet bgs) in the future; contact with sediment and surface water in the fire water pond; and groundwater contact (assuming future potable use, including showering [although no potable use wells are installed in the exposure area] and current/future vapor intrusion from groundwater to indoor air).
- Future Onsite Construction Workers—Construction workers who may contact total soil (0-10 feet bgs) across the entire exposure area (within and outside of the fenced facility area) during future construction activities. Construction worker contact with sediments and surface water in the fire water pond (within the fenced area) and Lake Harry (outside of the fenced area) is expected to be infrequent and not significant.
- Current/Future Offsite Residents—Adult and child residents who may contact groundwater through potable household use (including showering/bathing) from offsite wells, and vapor intrusion from groundwater to indoor air (assuming that offsite groundwater may be impacted by migration of site groundwater).

EPA's acceptable risk range

In general, COCs are identified when the potential excess lifetime cancer risk (ELCR) for a receptor group exceeds EPA threshold values (a total ELCR of $1x10^{-4}$ or a target organ-specific hazard index (HI) of 1). If a medium-specific ELCR or target organ-specific HI exceeds EPA threshold values, individual chemicals contributing an ELCR $>1x10^{-6}$ or hazard quotient (HQ) >0.1 to the target organ HI are identified as COCs for that exposure medium. Therefore, a contaminant was carried through risk assessment as a COC if it posed an excess lifetime cancer risk (ELCR) greater than EPA's acceptable risk range for cancer risks. Additionally, lead is identified as a COC on an industrial property if there is a 5% probability that a fetus' blood lead level will exceed a 5 µg/dL blood lead target level, as predicted in pregnant onsite workers via the Adult Lead Model.

Table 5 - Summary of Media and Associated COCs for each Exposure Area.

Media	COCs
Total Soil (0-10 feet bgs)	Lead—Exposure Areas 2, 3, and 4 Antimony and zinc—Exposure Area 3
Sediment (0-1 feet bgs)	Cadmium – Exposure Areas 1 and 2 waterways
Surface Water	Cadmium – Exposure Area 2 waterways and settling ponds
Groundwater	Aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, vanadium, and zinc– Exposure Areas 1, 2, and 3 Antimony, arsenic, cadmium, chromium, lead, and zinc – Exposure 4

Table 5 above summarizes the media and associated COCs for each exposure area. Please note, there is no soil COCs identified in Exposure Area 1 (surrounding agricultural land). Table 1 attached to this Proposed Plan provides further details and summarizes affected media (soil, slag, sediment, groundwater and surface water), receptors (current/future construction worker or industrial worker), pathways and COCs based upon the results of the OU1 human health and ecological risk assessments.

It should be noted that Illinois EPA uses an approach for estimating construction worker exposures that differs from the approach used by EPA. Either approach may result in risks to construction workers being over- or underestimated. In accordance with EPA's risk assessment guidance, EPA generally uses the 95 percent upper confidence limit (UCL) of the arithmetic mean, as calculated by ProUCL statistical software, as the exposure point concentration (EPC). In accordance with 35 IAC Part 742.225(b)(3), Illinois EPA does not allow averaging sample concentrations for the construction worker population, nor does it allow other representations of the mean to be used as the EPC for construction workers. Instead, Illinois EPA uses the maximum detected concentration as the construction worker EPC. However, due to the ubiquity and prevalence of contamination at the Site, either approach generally results in the same COCs and areas with elevated risks for the construction worker.

Lake Harry is a manmade surface water feature located on the RCRA facility and is not connected to other surface water features. It was neither constructed for nor intentionally stocked or maintained for recreational fishing and is unlikely habitat for species commonly consumed by human receptors. Therefore, a consumption receptor at Lake Harry was not included in the conceptual site model for the HHRA.

In 2017, EPA collected soil, sediment, and groundwater samples from the adjacent RCRA facility, and the 2019 ecological technical memorandum concluded that all COECs identified in the 2012 OU1 BERA and displayed in Table 1, attached to this Proposed Plan, should also be considered for the RCRA property during the feasibility process.

Arsenic and Chromium Considerations

It should be noted that Illinois EPA uses a different (lower) ELCR threshold than EPA when identifying COCs; Illinois EPA's ELCR threshold is $1x10^{-6}$. If Illinois EPA's threshold had been used for the selection of COCs, arsenic would be a COC in soil for Exposure Area 1 through 4 and chromium a COC in surface water (settling ponds) in Exposure Area 2.

Summary of OU2 Human Health Risk Assessment

The potential risk posed to human health by contaminants detected in the sediment associated with the KIK Culvert, unnamed tributary to Grape Creek, and Grape Creek was evaluated in the 2014 OU2 HHRA and in the 2020 OU2 HHRA technical memorandum.

- KIK Culvert is within the secured area of the facility, there are no current recreational exposures, and limited current worker exposures to the surface water and sediment to the culvert.

The tributary and much of Grape Creek are remote or inaccessible, but recreational exposures are possible. A small portion of Grape Creek runs through a residential area. For the purpose of conducting the HHRA, the tributary and Grape Creek were divided into exposure areas as follows and also depicted in different colors in Figure 9.

- Tributary – remote/inaccessible/undesirable – depicted in blue
- Grape Creek runs through residential areas – depicted as purple
- Grape Creek runs through commercial areas – depicted as orange
- Grape Creek less developed area – depicted in yellow

The risk evaluation indicated that potential human health risks due to exposure to metals and pesticides from both sediment and surface water were within acceptable levels for both the recreational adolescent and industrial worker in all exposure areas. There were no unacceptable cancer risks or noncancer hazards in surface water or sediment associated with the OU2 investigation.

ECOLOGICAL RISKS

In 2007, EPA conducted a SLERA as part of the OU1 RI, which indicated site-related contamination poses potential risks to ecological receptors. In 2012 EPA performed a baseline ecological risk assessment (BERA) to evaluate the potential effects of soil-associated chemicals on terrestrial and aquatic habitat receptors inhabiting the Site. The BERA field investigation included the following:

- Collecting surface soil, sediment, and surface water samples for physical/chemical analysis.
- Collecting terrestrial plants, soil invertebrates, and resident fish samples from some of the soil and sediment sample locations for tissue sample chemical analysis.

- Submitting representative solid media samples for toxicity testing. Some soil samples were subjected to rye grass and earthworm bioassays, while some sediment samples were tested using two benthic macroinvertebrates (midge fly larvae and amphipods).

Based on the weight-of-evidence evaluation, eight COECs were identified across all assessment endpoints for terrestrial and aquatic habitat receptor exposure scenarios. Table 1 attached to this Proposed Plan summarizes affected media, receptors, pathways, and COCs based upon the results of ecological risk assessments.

In 2017, EPA collected soil, sediment, and groundwater samples from the adjacent RCRA facility, and the 2019 ecological technical memorandum concluded that all COECs identified in the 2012 OU1 BERA and displayed in Table 1, attached to this Proposed Plan, should also be considered for the RCRA property during the feasibility process.

Summary of OU2 Ecological Risks

In 2012, the PRPs (KIK Custom Products, Inc. and GSA) conducted a BERA, which evaluated potential risks to community-level receptors (e.g., fish, benthic invertebrates) and higher trophic level receptors. For purposes of conducting the ecological risk assessment, the sediment areas were divided into three areas, as discussed below and depicted on Figure 2 (KIK Culvert, unnamed tributary exiting from fence to the confluence of Grape Creek, and Grape Creek).

The data collected for the BERA came from several sources and include sediment, surface water, pore water, and fish tissue analytical chemistry, as well as sediment toxicity testing results. Analytical chemistry results were compared against medium-specific screening values to assess the potential ecological risks to community-level receptors and were incorporated in the food web models to assess potential risks to wildlife.

KIK Culvert

The results of the sediment toxicity tests conducted in the KIK Culvert indicate the potential for impact to the benthic community. The most likely ecological risk drivers and at-risk receptors consist of the following Chemical of Potential Ecological Concern (COPEC)/receptor combination with Lowest Observable Effects Concentration (LOEC)-based HQs above 1.

- Belted kingfisher – copper, lead, zinc, 4,4’-DDD, 4,4’-DDE, 4,4’-DDT, and endrin
- Mink – 4,4’-DDD, 4,4’-DDE, and 4,4’-DDT
- Muskrat – copper and zinc
- Bullfrog – 4,4’-DDD, 4,4’-DDE, and 4,4’-DDT
- Northern water snake - 4,4’-DDD, 4,4’-DDE, and 4,4’-DDT

Unnamed Tributary

The results of the BERA for the unnamed tributary show the highest potential for risk to ecological receptors is closest to the EPA-constructed fence and generally decrease with distance up to the confluence with Grape Creek. Ecological risks are low in Grape Creek: thus, no

remedial response is anticipated for Grape Creek. Table 6 summarizes the media and associated COCs for each exposure area in OU2.

Table 6 - Summary of Media and Associated COCs for each OU2 Exposure Area.

Media	**COECs**
Sediment	*Metals*: cadmium, copper, lead, mercury, and zinc *Pesticides*: 4,4'-DDD, 4,4-DDE, 4,4-DDT, alpha-chlordane, dieldrin, edosulfan I, endrin, gamma-chlordane
Surface Water	*Metals*: cadmium, copper, and zinc *Pesticides:* 4,4'-DDD, 4,4-DDE, Aldrin, alpha- chlordane, gamma-chlordane, hepatchlor epoxide

Basis for Taking Action

It is EPA's current judgement that the Preferred Alternative identified in this Proposed Plan, or one of the other active measures considered in the Proposed Plan, are necessary to protect public health or welfare or the environment from actual or threatened release of hazardous substances into the environment.

6. REMEDIAL ACTION OBJECTIVES

Remedial Action Objectives (RAOs) are goals for protecting human health and the environment. RAOs are developed to address the contaminant levels and exposure pathways presenting unacceptable current or potential future risk to human health and the environment. RAOs were developed with consideration to the contaminant levels and exposure pathways found to present potentially unacceptable risk to human health and environment as during the RI and SRI and identified under the risk assessment section of this Proposed Plan.

Future industrial worker, trespasser, construction worker, offsite residential receptors (groundwater only), and aquatic and terrestrial habitats are the human and ecological receptors used to develop the Site RAOs. The media with unacceptable human and ecological risks include the slag pile, sediment (creek, settling ponds), surface soil and subsurface soil, groundwater and surface water.

The following are the RAOs for the soil and sediment final remedy and the groundwater and surface water interim remedy.

Slag and Soil

- Protect trespassers and construction and industrial workers from direct contact, ingestion, and inhalation of slag and soil with concentrations of COCs exceeding human health PRGs (0 feet bgs to the water table [approximately 5 to 10 feet bgs]).
- Reduce unacceptable risk to terrestrial receptors from surface soil (0 to 2 feet bgs) with concentrations of COECs exceeding ecological PRGs.

- Minimize migration of COCs to groundwater from slag and soil that may cause the groundwater to exceed the PRGs.
- Prevent migration of COCs from slag and soil to sediment and surface water that may result in exceedance of sediment or surface water PRGs.

Sediment

- Protect trespassers and construction workers from direct contact, ingestion, and inhalation of sediment (0 to 1 foot bgs) with concentrations of COCs exceeding human health PRGs.
- Protect aquatic ecological receptors from exposure to concentrations of COECs that exceed PRGs in sediment (0 to 0.5 feet bgs).
- Reduce risk to acceptable levels (i.e., below the applicable PRGs) in the benthic invertebrate community due to exposure to sediment related COECs.
- Reduce risk to acceptable levels (i.e., below the applicable PRGs) to fish and wildlife receptors due to exposure to sediment related COECs.
- Reduce the potential downstream migration of sediment related COECs.
- Prevent the migration of COCs from sediment to surface water.

Groundwater

- Prevent human exposure to contaminated groundwater at the Former Smelter Property and adjacent areas.
- Minimize the migration of COCs in groundwater to sediment or surface water above acceptable levels.

Preliminary Remedial Goals (PRGs)

PRGs are risk-based or Applicable or Relevant and Appropriate Requirements (ARAR) based chemical-specific concentrations which further define the RAOs. PRGs are developed during the RI/FS and are considered "preliminary" remediation goals until a remedy is selected in a ROD. The ROD establishes the final remedial goals and/or cleanup levels.

EPA developed the PRGs for soil, sediment, groundwater, and surface water based on protective risk-based concentration associated with current and reasonably anticipated land uses and review of potential federal and state ARARs. The potential ARARs are provided in Table 2, attached to this Proposed Plan, and include ARARs presented in the OU1 and OU2 FS documents. The current and reasonably anticipated future land uses are anticipated to be commercial/industrial for the former zinc smelter operations area. PRGs are used to define the extent of contaminated media requiring remedial action.

There are promulgated chemical-specific ARARs for groundwater and surface water that were considered along with risk.

Soil

Human Health PRGs for Soil

As displayed in Table 7 below, EPA is using the PRG of 98 mg/kg for antimony and 33,000 mg/kg for zinc, which would apply to Exposure Area 3. EPA is also using a PRG of 800 mg/kg for lead in soil, which would apply to Exposure Areas 2, 3 and 4. All proposed PRGs would be protective for either future industrial or construction workers. Because no ELCR is applicable for antimony and zinc, PRGs for these COCs would be selected based on adjusted noncarcinogenic HI of 1. The lead PRG is the industrial RSL.

Table 7 - PRGs in Surface and Subsurface Soil

COC	Receptor	Exposure Area	Target Organ HI = 1 (mg/kg)	Background (mg/kg)	Proposed PRG (mg/kg)	Basis
Antimony	Construction workers	Exposure Area 3	142	3.3	98	HI = 0.7 for construction worker
Zinc	Construction workers	Exposure Area 3	106,182	60.2	33,000	HI = 0.3 for construction worker
Lead	Construction workers	Exposure Areas 2, 3, and 4	800	20.9	800	Lead industrial RSL
Lead	Industrial workers	Exposure Area 3	800			

Ecological PRGs for Surface Soil

Table 8 below lists the ecological PRGs for the six COECs (aluminum, antimony, lead, mercury, vanadium, and zinc) in surface soil (0 to 2 feet bgs) and are based on the lowest conservative ecological screening levels presented in the OU1 BERA. The PRG for vanadium is the TACO background level for counties outside metropolitan statistical areas in Illinois. No screening level for aluminum is applicable; therefore, no numeric ecological PRG is proposed because aluminum is not bioavailable (available for uptake) to ecological receptors under most natural pH conditions (pH 5.5 – 8). Slag present in surface soil has resulted in acidic pH conditions (pH < 5.5) at some sample locations; therefore, it is assumed that the risk from potentially bioavailable aluminum at these locations will be addressed by addressing risk for the other slag-related metals. The ecological PRGs for soil are proposed to apply to the Site including the adjacent RCRA facility property.

Table 8 - Ecological PRGs in Surface Soil

COEC	Screening Level Terrestrial Plant (mg/kg)	Screening Level Soil Invertebrate (mg/kg)	Background (mg/kg)	Proposed PRG (mg/kg)	Basis
Aluminum	NA	NA	9,200	NA	Assuming risk will be addressed by addressing other metals (same approach as OU3)
Antimony	5	78	3.3	5	Lowest screening level
Lead	120	1,700	20.9	120	Lowest screening level
Mercury	0.3	0.1	0.05	0.1	Lowest screening level
Vanadium	2.0	42	25	25	Background
Zinc	160	120	60.2	120	Lowest screening level

Surface Water and Sediment

Human Health PRGs for Surface Water

OU1 surface water human health PRG exceedances are limited to the settling ponds and the creek (exposure area 2) located immediately adjacent to the settling ponds (see Table 9 below).

No unacceptable human health risks were identified by the HHRA for the current/future recreational adolescent exposed to OU2 surface water, or the future industrial worker or the future recreational adolescent exposed to KIK Culvert sediment and surface water. Therefore, human health based PRGs are not warranted for OU2.

Table 9 - Human Health PRGs for OU1 Surface Water

COC	Receptor	Exposure Area	Target Organ HI = 1[2] (µg/L)	Illinois General Use Standards[3]	Proposed PRG (µg/L)	Basis
Cadmium	Trespassers	Exposure Area 2 (Settling ponds and creek)	31	NA	16	HI = 1 for constructi on worker
Cadmium	Construction worker	Exposure Area 2 (Settling ponds and creek)	16			
Cadmium	Industrial worker	Exposure Area 2 (Settling ponds and creek)	135			

Human Health PRGs for Sediment

Cadmium was identified as a contaminant of concern for trespassers and construction workers that would be exposed to OU1 creek sediment (see Table 10 below).

No unacceptable human health risks were identified by the HHRA for the current/future recreational adolescent exposed to OU2 sediment, or the future industrial worker or the future recreational adolescent exposed to KIK Culvert sediment and surface water. Therefore, human health based PRGs are not warranted for OU2.

Table 10 - Human Health PRGs for OU1 Sediment (0-1 ft bgs)

COC	Receptor	Exposure Area	Target Organ HI = 1[4] (mg/kg)	Proposed PRG (mg/kg)	Basis
Cadmium	Trespassers	Exposure Area 1 (creek)	270	83	HI = 1 for construction worker
Cadmium	Construction workers	Exposure Areas 1 & 2 (creek)	83		

Developing a Common Set of Site-Specific Ecological PRGs for Surface Water and Sediment

The Site was broken up into three OUs by the PRPs in 2009. During the FS process, a different ecological PRG for sediment was developed for OU1 (sediment on former smelter property) and OU2 (KIK culvert and creek outside the OU1 property). It is important to note that the distinction between the portions of the creek (sediment, surface water and aquatic habitat) were administrative rather than ecological. Aquatic receptors within the "creek" are mobile and likely use waters in both OUs. Additionally, because of the proximity of the two OUs, the same aquatic

[2] Surface water PRGs are based upon risks calculated in the 2019 OU1 HHRA. There were not cancer-based risks in surface water at the Site, therefore developing PRGs based on a Target ELCR is not appropriate.
[3] IAC Title 35, Subtitle C, Chapter I, Part 302, Illinois Water Quality Standards General Use – Subpart B, Section 302.208; Human Health Standards
[4] Sediment PRGs are based upon risks calculated in the 2019 OU1 HHRA. There were not cancer based risks in sediment at the Site, therefore developing PRGs based on a Target ELCR is not appropriate.

receptors are anticipated to be present in both OUs. Due to the chemical and physical similarities in the two OU data sets, EPA developed a common set of site-specific PRGs for surface water and sediment using the combined data set applicable to the creek (sediment and surface water) documented in the January 15, 2021, Final Ecological Risk Preliminary Remedial Goals for the Hegeler Zinc site Tech memorandum. Refer to sediment remediation area footprint in Figure 10.

Surface Water – Ecological PRG

The following surface water PRGs were based on promulgated chronic water quality standards and would be protective of aquatic life in the waterways.

- Aluminum (dissolved) – 400 µg/L
- Cadmium (dissolved) – 1.4 µg/L
- Lead (dissolved) – 25 µg/L
- Manganese (dissolved) – 2,431 µg/L
- Zinc (dissolved) – 45 µg/L

Sediment – Ecological PRG

The common set of PRGs for sediment were developed by refining the data set, identify relations between chemical data and toxicity data, and performing concentration-response modeling. Table 3, attached to this Proposed Plan, compares the COECs and PRGs in sediment developed in the OU1 and OU2 feasibility studies. The analysis of the data sets determined that pesticides and metals are co-mingled within the sediment. The co-occurring nature of the COECs in sediment, allows for the application of a single PRG to represent metals risk and another single PRG for pesticides risk.

Sediment PRGs were based on site-specific sediment toxicity testing. The PRGs developed will be protective of the benthic invertebrate community against toxic effects from pesticides and metals, as discussed in more detail in Section 5 of this Proposed Plan. The following PRGs, based on the EC10, are for sediment:

- Total DDx (as the sum of 4,4'-DDT, 4,4'-DDD, 4,4'-DDE) – 0.96 milligrams per kilogram
- $PECQ_{total}$ (as the sum of $PECQ_{Cd}$, $PECQ_{Cu}$, $PECQ_{Zn}$) – 5.7 (unitless[5])

Table 11 - Sediment Ecological PRGs

Pesticides	**Total DDx**	**0.96 mg/kg**
Metals	$PECQ_{total}$	5.7 (unitless)

This suggests that the toxic effects from individual metals or pesticides may not fully separate from one another since they co-occur.

[5] The PEC quotient represents a sample concentration divided by a benchmark concentration, and by definition, the resulting quotient is unitless.

Groundwater

Human Health PRGs for Groundwater

For groundwater, PRGs were established for the purpose of defining the extent of contaminated groundwater to which the groundwater RAO would apply assuming the groundwater is Class I. The list of 14 PRGs for groundwater are listed in Table 4, attached to this Proposed Plan. Since Illinois EPA currently classifies the groundwater at the Site as an Illinois Class I potable resource groundwater aquifer, the Illinois Class I standards were compared to the federal MCLs. In general, the Illinois Class I standards were found to be either equal to or more stringent than the MCLs. The more stringent of federal MCLs or Illinois Class I standards are proposed as PRGs for the COCs in groundwater. For aluminum, the proposed PRG is based on EPA RSL for residential tap water with an HI = 1, since neither MCL nor Illinois Class I groundwater standards are available. All of the groundwater PRGs in Table 4, attached to this Proposed Plan, applies to exposure areas 1, 2, and 3; only PRGs for antimony, arsenic, cadmium, lead, and zinc apply to exposure area 4.

There are no COECs for groundwater; therefore, there are no ecological PRGs for groundwater.

7. SUMMARY OF REMEDIAL ALTERNATIVES

The remedial alternatives that were evaluated for the proposed remedial action at the Site are summarized below, and in Table 5 attached to this Proposed Plan. As noted earlier, after the 2007 RI and as a result of negotiations, in 2009 the Site was broken up into three OUs. The 2021 OU1 FS identified unacceptable risk in affected soil, sediment, surface water and groundwater associated with the former smelter operations. As discussed in the Site Characteristics Section of this Proposed Plan (Section 3) the Site boundary requiring cleanup expanded beyond the EPA-constructed fence line and now includes portions of the RCRA facility (soil and sediment). The OU1 FS evaluated five remedial alternatives to address both ecological and human health risk related to the Site. The OU2 FS focused on the creek outside the EPA-constructed fence line and downgradient of the Site and identified unacceptable ecological risk in sediment areas, known as the KIK Culvert and the unnamed tributary to Grape Creek, that will require remediation.

OU2 Remedial Alternatives

The following remedial alternatives were evaluated in the OU2 FS (creek sediment):

- OU2 Alternative 1 – No Action.
- OU2 Alternative 2 – Capping of Sediment, LTM of Cap Integrity, and ICs.
- OU2 Alternative 3 – Excavation of Sediment exceeding Ecological PRGs, Off-site Disposal of Sediment, and LTM.
- OU2 Alternative 4 – Excavation of Sediment exceeding Ecological PRGs, Off-Site Disposal of Sediment, Habitat Restoration and LTM.

The following provides the basis for eliminating the OU2 Alternatives 2 and 4 from further analysis (comparison of alternatives) and discussion in this Proposed Plan. This section also

outlines EPA's rational for ultimately incorporating the OU2 Alternative 3, sediment remediation footprint, into the OU1 evaluation of remedial alternatives.

In accordance with EPA's 1999 ROD guidance, the potential remedial alternatives identified in the OU2 FS were screened against three broad criteria: effectiveness (both short-term and long-term) implementability (including technical and administrative feasibility), and relative cost (including capital and operation and maintenance [O&M] costs). The purpose of the screening evaluation was to reduce the number of alternatives chosen to undergo a more thorough analysis. As a result of this screening process, OU2 Alternatives 2 and 4 listed above were eliminated from further consideration for the following reasons.

EPA found that OU2 Alternative 2, containment (capping) alternative, was difficult to implement due to potential issues with constructability. The identified portions of the stream that require cleanup have high bank heights, steep bank angles, and an average channel width of 13 feet. Installing a sediment cap in these areas would require heavy machinery to operate upon and maneuver around unstable banks. Additionally, maintaining consistent cap thickness and the potential disturbance to impacted sediment caused by placement of the containment materials is of potential concern as channel depth is not uniform and the weight of capping material may exceed the strength of the underlying sediment. These factors pose potential challenges to constructing the cap alternative. In addition, there is a potential that the installed cap may become compromised due to unforeseen disturbances caused by wildlife, people, and or large flood events. As such, Alternative 2 will require long-term monitoring and possibly maintenance for long-term reliability. The cost estimate presented in the OU2 FS anticipates maintenance costs of up to $30,000 in cap repairs. Unexpected costs would be incurred during the long-term monitoring, reporting and maintenance efforts to ensure protectiveness in the event that cumulative repair costs exceed this estimate, introducing variability to the total estimated cost of OU2 Alternative 2.

OU2 Alternative 4, which included excavation of sediment and habitat restoration was eliminated since EPA cannot fund, nor require the PRPs or others to fund certain "betterments" or "enhancements" of a remedy (i.e., habitat restoration). Generally, a prohibited enhancement is an action that is not necessary to support the effectiveness of a remedy in protecting human health and environment. As the excavation of impacted sediment alone would achieve remedial action objectives, the addition of habitat restoration is not necessary to support the effectiveness of the remedy in protecting human health and the environment. Habitat restoration goes above and beyond the requirements of the RAOs and could be considered an enhancement or betterment which cannot be funded nor required by EPA. Alternative 4 and Alternative 3 have the same components: relatively short timeframe of risk elimination, constructability, protectiveness of workers and the community during remedial action, potential for downstream transport of contaminated sediment, magnitude of residual risk, controls, reduction of sediment containing COECs, post-removal confirmation sampling of sediment and surface water, and LTM. Alternative 4 has a higher cost than all other OU2 Alternatives due to the added enhancement provided by habitat restoration. Thus, EPA eliminated OU2 Alternative 4 from further analysis and discussion.

After eliminating OU2 Alternatives 2 and 4, the remaining alternatives are the "no action" alternative (OU2 Alternative 1) and the excavation of sediment, off-site disposal, and LTM

alternative (OU2 Alternative 3). Given that the "no action" alternative does not achieve RAOs, EPA decided that OU2 Alternative 3 (including OU1 sediment remediation of the KIK Culvert and unnamed tributary) would be incorporated as a common element into each of the OU1 remedial alternatives, except the OU1 "no action" alternative. Therefore, the five proposed remedial alternatives presented in the OU1 FS to address soil, sediment, surface water and groundwater contamination at the Site are the only proposed alternatives discussed in detail in the Evaluation of Alternatives Section later in this Proposed Plan.

OU1 Remedial Alternatives

Common Elements

A range of remedial alternatives were developed in the OU1 FS for soil to achieve RAOs. The alternatives are numbered to correspond with the numbers in the OU1 FS Report and additional details about alternatives are available in the FS Reports. Components that are common to all the alternatives except the "no-action" alternative are presented here as a group to limit redundancy in the subsequent discussion of the individual alternatives.

These common components are listed below.

Predesign Investigation

- Additional sampling of site media to delineate and refine excavation boundaries and volumes, and boundaries of PRG exceedance areas.
- Sampling in areas where soils metals data were less than human health PRGs but failed the Toxicity Characteristic Leaching Procedure (TCLP) for cadmium and/or lead.
- Identification of Threatened and Endangered (T&E) species and migratory birds at or near the project site.
- Evaluation of the presence of wetlands.
- Survey areas of the site with slag-dominated surface soils/lack of vegetation, where further remediation would be warranted.
- Evaluate property boundaries and staging pile location.
- Review topographic survey data through light detection and ranging (LIDAR).
- In-person private well survey for 5 wells within 1 mile of the site.
- Baseline sampling of sediment, surface water chemistry, sediment toxicity, and fish tissue.

Pre-Construction Activities

- Preparation of site-specific plans.
- Subcontractor submittals.
- Non environmental permitting (if applicable).
- Community Involvement Plan/Public meetings.

Buildings

- Building survey to assess the presence and extent of asbestos containing materials.

- Site reconnaissance to estimate volume of construction debris.
- Demolition of existing building remnants and the kiln.
- Consolidate debris with slag pile or disposal offsite.

Creek Rerouting

- On-site portions of the creek would be rerouted to the north to create a 100-foot buffer between the creek and the slag pile consolidation area. The future creek path varies by alternative to accommodate the footprint required for the respective consolidation area.
- Backfill of existing creek channel after being rerouted.

Slag Pile Relocation

- Where creek rerouting is not practical to create a 100-foot buffer, slag would be excavated and relocated to another area of the slag pile (4,625 cubic yards [cy]). Details of the relocation of the slag pile would be developed in the remedial design phase.

Sediment

- Figure 10 displays the sediment remediation footprint.
- Excavation of sediment: 0.5 foot of sediment exceeding Ecological PRGs in the creek (525 cy), fire water pond (1,140 cy), and settling ponds (1,551 cy) via dredging or excavation.
- Excavation of sediment: 1 foot of sediment exceeding Human Health PRGs in the creek (276 cy).
- Excavation of sediment exceeding Ecological PRGs in the KIK Culvert and unnamed tributary to Grape Creek (4,016 cy) and off-site disposal.[6]
- Excavated sediment would be dewatered, consolidated with the slag pile, and covered. Where consolidation of excavated sediment is not practical, sediment would be disposed of off-site.
- Collection of remaining sediment samples to verify contamination exceeding the PRGs has been excavated.

Soil

- Excavate OU3 residential soil pile and consolidate with slag pile (7,389 CY), see Figure 5.

Groundwater and Surface Water

EPA evaluated only one groundwater and surface water alternative as a potential interim remedy. Figure 11 shows the location of COC exceedances in groundwater and surface water (former settling ponds), which are localized to the former smelter area. As part of the interim groundwater/surface water alternative, a pre-design investigation would be conducted to

[6] OU1 Alternative 3 – sediment areas, known as the KIK Culvert and unnamed tributary, is incorporated as a component common to all proposed action alternatives.

represent baseline conditions. After the remedy is implemented, groundwater and surface water monitoring would be conducted, and ICs to restrict groundwater/surface water use would be required for any areas where there are exceedances of COCs PRGs. The interim groundwater remedy will be applied to Zone 1 only, as Zone 2 groundwater is contaminated with contaminants from naturally occurring coal seams, and thus is not part of this Site remedy. The interim surface water remedy will be applied to the former settling ponds only.

- Pre-design investigation to determine baseline.
- EPA would assist Illinois EPA in establishing a Groundwater Management Zone (GMZ) at the Site pursuant to IAC Title 35, Subtitle F: Public Water Supplies, Chapter 1: Pollution Control Board, Part 620, Groundwater Quality. A GMZ is a three-dimensional region containing groundwater being managed to mitigate impairment caused by the release of contaminants from a site.
- Groundwater and surface water monitoring to determine the effectiveness of the remedy in reducing groundwater contamination and migration.
- Institutional Controls (ICs) to restrict groundwater and/or surface water use in exceedance areas.

Covering and Restoration

- A low-permeability soil cover, also referred to as "covering," would be installed over the slag pile consolidation area to prevent infiltration and provide a direct-contact barrier for potential human and ecological receptors.
- The cover would require a minimum 100 ft separation distance from the creek within the fenced area of the Site.
- Details of the slag pile consolidation area varies by alternative and will be further developed in the remedial design phase.
- The following assumptions were used for the slag pile consolidation area:
    - No bottom liner is necessary because of the presence of clay underneath the source materials.
    - Groundwater data indicates minimal migration of potentially site-related metals into the Lower Zone 1 portion of the aquifer. Additionally, based upon hydraulic data collected during the SRI, the metals detected in Zone 2 monitoring wells do not appear to be associated with contamination from the site.
    - Cover slope: 4 to 6 percent. This slope would be sufficient to maintain positive drainage and minimize erosion potential.
    - The sides of the existing slag pile would be sloped to an assumed 3 horizontal to 1 vertical and stabilized.
    - The perimeter drainage swales would be designed to manage runoff during the peak discharge of 25-year, 24-hour storm event.
    - Temporary stormwater retention ponds would be included as necessary during the construction phase for settlement of fugitive particles and energy dissipation during a 2-year, 24-hour storm event. The existing settling ponds may be used as stormwater retention ponds.
    - Perimeter site access roads would be constructed.
    - Hydroseeding areas with constructed covers and most disturbed areas, to establish vegetative cover.

- Wetland restoration (if required), 0.3 acre of a wetland identified on Site.

Long Term Monitoring

- Quarterly for first two years, annually from years 3 to 5, and once every 5 years as a part of five-year reviews.
- Groundwater, surface water and sediment chemistry samples, sediment toxicity and fish tissue samples to verify effectiveness of the remedy.
- Sampling to assess stream conditions relative to the sediment PRGs and to verify the improvement of conditions of the stream following remedial action.
- The LTM frequency may be refined during preparation of the LTM monitoring plan.

Institutional Controls

- Environmental covenant to prohibit installation of wells and use of surface water from settling ponds.
- ICs through such mechanisms as property deed restrictions or restrictive covenants for areas of groundwater with COC exceedances to restrict groundwater use.
- Soil ICs for affected soil left in place. Soil IC extent varies by alternative (see Figure 12).
- Property restrictions prohibiting future residential use, recreational use, or commercial use as a daycare center.
- Implement ICs for all areas where contamination remains above human health or ecological risk levels or which contain remedy components.
- ICs not anticipated for surface water based on the removal of sediment source materials that should attenuate surface water contamination.

Five-Year Reviews

- Conducted after the selected remedial action is initiated.

Capital costs are those expenditures that are required to construct a remedial alternative. Operation and Maintenance (O&M) are those post-construction costs necessary to ensure or verify the continued effectiveness of a remedial alternative and are estimated on an annual basis. The "present worth" cost is the amount of money which, if invested in the current year, would be sufficient to cover all the costs over time associated with a project. The present worth costs for the remedial alternatives below were calculated using a discount rate of seven percent and a 30-year time interval. Construction time is the time required to construct and implement the alternative and does not include the time required to design the remedy, negotiate performance of the remedy with the responsible parties, or procure contracts for design and construction.

Description of Alternatives

EPA developed a range of remedial alternatives to address potential risks at the Site. EPA is required to evaluate "No Action" as the basis of comparison for the other alternatives. All the other alternatives include "active" measures to remediate the Site. It is important to note that removal of sediment exceeding ecological and human health PRGs, the sediment remediation footprint noted on Figure 10, is a common element in each of proposed "active" remedial

alternatives (Alternatives 2 through 5). In addition, the groundwater and surface water interim remedies, and a covering installed over the slag pile consolidation area is a common element for all proposed "active" remedial alternatives. Details of the slag pile consolidation area varies by alternative, therefore would be further developed in the remedial design phase. Therefore, the proposed remedial alternative presents a range of cleanup alternatives developed for soil to achieve the RAOs.

The groundwater and surface water interim remedies would protect human health and the environment in the short term through the implementation of ICs to restrict groundwater and former settling ponds' surface water use. Groundwater and surface water monitoring would be conducted following implementation of the source control measures provided by the other alternatives, to evaluate the impact of those source control measures on groundwater and surface water concentrations over time.

Alternative 1: No Action

Regulations governing the Superfund program require that the "No Action" alternative be evaluated to establish a baseline for comparison. Under this alternative, EPA would take no action at the Site to prevent exposure to the contamination. The "No Action" alternative would leave affected soil, sediment, surface water, and groundwater contamination. The potential for human and ecological receptors to be exposed to COCs and COECs would not be addressed.

Estimated Capital Cost: $0
Estimated Annual O&M Cost: $0
Estimated Present Worth: $0
Estimated Soil Excavation: 0 cy
Remedial Action Construction Timeframe: None

Alternative 2: Cover of Surface Soil above Human Health PRGs; Excavation of Surface Soil above Ecological PRGs (0.5 ft bgs) outside the Human Health excavation footprint; Cover Slag Pile Consolidation Area; ICs and LTM.

In addition to the common elements described above, the unique components of Alternative 2 are as follows. The sediment and soil remediation areas are displayed on Figure 13 along with the estimated footprint of the slag pile consolation area.

- Surface soil exceeding human health PRGs would be covered with a low-permeability cover, which includes 24 inches of compacted clay and 6 inches of topsoil.
- Surface soil exceeding ecological PRGs in non-vegetated areas located outside of covered human health remediation footprint would be excavated to 0.5 foot bgs and consolidated with the existing slag pile on-site. These areas would be backfilled with 6 inches of topsoil to match original grade.
- Implement ICs for all areas where contamination remains above human health or ecological risk levels or which contain remedy components.

Estimated Capital Cost: $23.4 Million
Estimated Annual O&M Cost: $1.5 Million

Estimated Present Worth Cost: $25.3 Million
Estimated Soil Excavation: 29,027 cy
Estimated Remedial Action Construction Timeframe: 2 years

Alternative 3: Excavation of Surface Soil above Human Health PRGs (up to 2 feet bgs), Excavation of Surface Soil above Ecological PRGs (0.5 foot bgs) outside of the Human Health PRG excavation footprint; Cover Slag Pile Consolidation Area; ICs and LTM (EPA's Preferred Alternative).

In addition to the common elements described above, the unique components of Alternative 3 are as follows. The sediment and soil remediation areas are displayed on Figure 14 along with the estimated footprint of the slag pile consolidation area.

- Surface soil exceeding human health PRGs would be excavated up to 2 feet bgs (49,046 cy) and consolidated with the existing slag pile on-site. Excavated areas will be backfilled with compacted clay and topsoil. The thickness of clay will vary by alternative and is dependent upon whether subsurface soils are present at concentrations above human health PRGs.
- Surface soil exceeding ecological PRGs in non-vegetated areas located outside of the human health remediation footprint would be excavated to 0.5-foot bgs (29,072 cy), consolidated with the existing slag pile on-site and backfilled.
- Implement ICs for all areas where contamination remains above human health or ecological risk levels or which contain remedy components.

Estimated Capital Cost: $27.3 Million
Estimated Annual O&M Cost: $1.6 Million
Estimated Present Worth Cost: $29.3 Million
Estimated Soil Excavation: 78,118 cy
Estimated Remedial Action Construction Timeframe: 3 years

Alternative 4: Excavation of Surface Soil above both Human Health and Ecological PRGs (up to 2 feet bgs); Cover Slag Pile Consolidation Area; ICs and LTM.

In addition to the common elements described above, the unique components of Alternative 4 are as follows. The sediment and soil remediation areas are displayed on Figure 15 along with the estimated footprint of the slag pile consolidation area.

- Surface soil exceeding human health PRGs would be excavated up to 2 feet bgs (49,046 cy) and consolidated with the existing slag pile on-site. Excavated areas will be backfilled with compacted clay and topsoil. The thickness of clay will vary by alternative and is dependent upon whether subsurface soils are present at concentrations above human health PRGs.
- Surface soil exceeding ecological PRGs in non-vegetated areas located outside the human health exceedance areas would be excavated up to 2 feet bgs (302,811 cy), consolidated with the existing slag pile on-site, and backfilled.
- Implement ICs for all areas where contamination remains above human health or ecological risk levels or which contain remedy components.

Estimated Capital Cost: $66.1 Million
Estimated Annual O&M Cost: $6.8 Million
Estimated Present Worth Cost: $72.4 Million
Estimated Soil Excavation: 351,857 cy
Estimated Remedial Action Construction Timeframe: 5 years

Alternative 5 – Excavation of Surface Soil above Ecological PRGs (up to 2 feet bgs); Excavation of Soil above Human Health PRGs inside the Ecological footprint below 2 feet to 10 feet bgs); Cover Slag Pile Consolidation Area; ICs and LTM.

In addition to the common elements described above, the unique components of Alternative 5 are as follows. Sediment and soil remediation areas are displayed on Figure 16 along with the estimated footprint of the slag pile consolidation area.

- Surface soil exceeding human health PRGs and ecological PRGs in non-vegetated areas would be excavated up to 2 feet bgs (351,857 cy) and consolidated with existing slag pile on-site.
- Subsurface soil exceeding human health PRGs would be excavated 2 feet up to 10 feet bgs (73,651 cy) and consolidated with the existing slag pile.
- Implement ICs for all areas where contamination remains above human health or ecological risk levels or which contain remedy components.

Estimated Capital Cost: $72 Million
Estimated Annual O&M Cost: $2.1 Million
Estimated Present Worth Cost: $74.4 Million
Estimated Soil Excavation: 425,508 cy
Estimated Remedial Action Construction Timeframe: 5 years

8. EVALUATION OF ALTERNATIVES

Section 121(b)(1) of CERCLA presents several factors that EPA is required to consider in its assessment of alternatives. Building upon these specific statutory mandates, the NCP articulates nine evaluation criteria to be used in assessing the individual remedial alternatives. The purpose of this evaluation is to promote consistent identification of the relative advantages and disadvantages of each alternative, thereby guiding selection of remedies offering the most effective and efficient means of achieving site cleanup goals. While all nine criteria are important, they are weighed differently in the decision-making process depending on whether they evaluate protection of human health and the environment or compliance with federal and state ARARs (threshold criteria); consider technical or economic merits (primary balancing criteria); or involve the evaluation of non-EPA reviewers that may influence an EPA decision (modifying criteria). These nine criteria are described below.

Explanation of the Nine Evaluation Criteria

Threshold Criteria

1. **Overall Protection of Human Health and the Environment** addresses whether a remedy provides adequate protection of human health and the environment and describes how risks posed by the site are eliminated, reduced, or controlled through treatment, engineering, or institutional controls. This criterion also incorporates an evaluation of climate resilience.
2. **Compliance with Applicable or Relevant and Appropriate Requirements** addresses whether a remedy will meet the applicable or relevant and appropriate federal and state requirements, known as ARARs.

Primary Balancing Criteria

3. **Long-Term Effectiveness and Permanence** refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup levels have been met.
4. **Reduction of Toxicity, Mobility or Volume Through Treatment** addresses the statutory preference for selecting remedial actions that employ treatment technologies that permanently and significantly reduce toxicity, mobility, or volume of the hazardous substances as their principal element. This preference is satisfied when treatment is used to reduce the principal threats at the site through destruction of toxic contaminants, reduction of the total mass of toxic contaminants, irreversible reduction in contaminant mobility, or reduction of total volume of contaminated media.
5. **Short-Term Effectiveness** addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community and the environment during construction of the remedy until cleanup levels are achieved. This criterion also considers the effectiveness of mitigative measures and time until protection is achieved through attainment of the RAOs.
6. **Implementability** addresses the technical and administrative feasibility of a remedy from design through construction, including the availability of services and materials needed to implement a particular option and coordination with other governmental entities.
7. **Cost** includes estimated capital costs, annual O&M costs and total present worth of capital and O&M costs, including long-term monitoring. The total present worth cost is calculated using a discount rate that takes into account the time value of money.

Modifying Criteria

8. **State Agency Acceptance** considers the state's position and key concerns on the Preferred Alternative and other alternatives, as well as comments on the ARARs or proposed use of waivers. This assessment is completed after comments on this Proposed Plan are received.
9. **Community Acceptance** considers the public's support of, reservations about, or opposition to components of the alternatives. This assessment is completed after comments on this Proposed Plan are received.

Each of the nine evaluation criteria are discussed below with respect to the alternatives under consideration for this remedial action.

Comparison of Alternatives

This section of the Proposed Plan evaluates each alternative against the nine criteria. More details regarding this evaluation can be found the Feasibility Reports. Table 6, attached to this Proposed Plan, provides a chart summarizing this evaluation. A narrative of the comparative analysis of alternatives is provided below.

1. Overall Protection of Human Health and the Environment

EPA is required to select remedies that will protect human health and the environment. Alternative 1, No Action, would not provide improvement over current conditions, would not provide risk reduction, and would not be protective of human health or the environment. Thus, it is not eligible to be selected and therefore is not discussed further in this Proposed Plan.

For all remaining alternatives, all the RAOs for soil, slag and sediment would be achieved immediately upon completion of the construction work, and the RAOs for groundwater and surface water would be achieved upon successful implementation of groundwater ICs. Alternatives 2, 3, 4, and 5 would be protective of aquatic ecological receptors with the excavation of sediment in the sediment remediation footprint area. These alternatives include a GMZ and ICs, which would prevent ingestion of contaminated groundwater.

Alternatives 2, 3, 4, and 5 would be protective of human health by preventing direct contact, inhalation, and ingestion of slag and soil exceeding human health PRGs through consolidation backfilling with compacted clay and topsoil. The thickness of clay will vary by alternative and is dependent upon whether subsurface soils are present at concentrations above human health PRGs. The low-permeability cover over soil exceeding human health PRGs reduces infiltration of precipitation through contaminated media, thereby reducing contaminant migration to groundwater and subsequent discharge to surface water.

Although Alternatives 2 and 3 do not physically remove all concentrations of COECs in surface soil with concentrations greater than ecological PRGs, the proposed remedy would result in substantial reductions in surface soil COECs concentrations and backfill of excavated areas. Alternative 4 and 5 would be protective of terrestrial receptors by preventing direct contact with surface soils above human health and ecological PRGs through excavation. The migration and monitoring of Site related COCs is not anticipated to be impacted by any varying climatological factor(s), and, thus, Alternative 2 through Alternative 5 are resilient to climate change.

2. Compliance with ARARs

This criterion assesses whether each alternative complies with federal and state regulatory requirements that are either applicable or relevant and appropriate, known as ARARs. Federal regulatory requirements are selected as ARARs unless a state requirement is more stringent than its associated federal requirement. In addition to ARARs, EPA can also consider other “to-be-considered” (TBC) non-promulgated advisories or guidance issued by the state or federal government, when determining the necessary level of cleanup for protection of human health and the environment.

The primary ARARs for the alternatives under consideration are state and federal regulations

relating to hazardous waste identification, management, and disposal as well as state regulations regarding groundwater quality and institutional controls. Alternatives 2, 3, 4, and 5 would meet all federal and state ARARs.

A few key location specific ARARs include the following: Section 404 of the Clean Water Act, the Fish and Wildlife Coordination Act, the Migratory Bird Treaty Act, and Section 106 of the National Historic Preservation Act. A few key action specific ARARs or TBCs include: the Illinois NDPES General Permit for Stormwater Discharge from Construction Site Activities (Effluent standards 25 IAC Part 304) are applicable if such water is discharged, the General Use Water Quality Standards Subpart B of 35 IAC 3013 would need to be met, 35 IAC 320.210 and Illinois closure and post-closure requirement in 35 IAC 724 as identified in Table 2, attached to this Proposed Plan are relevant and appropriate. Other key State ARARs include Title 35 IAC Part 742 (Illinois Pollution Control Board 2007) and 765 ILCS 122: Illinois Uniform Environmental Covenants Act.

Alternatives 2 through 5 include an interim groundwater and surface water remedies consisting of monitoring and ICs to prevent exposure to contaminated groundwater and surface water. MCLs and/or Illinois Class I groundwater standards have been identified as potential ARARs for the groundwater COCs. However, interim remedies under CERCLA are not required to comply with ARARs as long as the final remedy will achieve them. The proposed interim remedy for groundwater is not expected to achieve the MCLs and/or Illinois Class I groundwater standards. The final groundwater remedy, when selected in the future, is expected to comply with the substantive requirements of the federal and state regulations that are applicable or relevant and appropriate to the final selected remedial action.

3. Long-Term Effectiveness and Permanence

Alternatives 2 through 5 will all require long-term O&M and ICs to maintain the integrity of all covered areas. Since ICs are only required on the slag pile consolidation area and the soils beneath paved areas on the adjacent property in Alternative 5, this alternative has the greatest long-term effectiveness and permanence and most flexibility for potential redevelopment of areas of the site. Future residential land use, recreational land use, and commercial land use as a daycare at the Site would be prohibited in Alternatives 2 through 5.

4. Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment

Alternatives 2 through 5, reduce the mobility of the COCs and COECs through containment under a low-permeability cover. The contaminants at the Site are most prone to migration when exposed to erosion or infiltration through slag. As a result, the isolation of process materials and soil in place through consolidation beneath an engineered cover is expected to effectively address the mobility of contaminants. None of the alternatives contain a treatment component to reduce toxicity, mobility, or volume because the large volume of relatively low-level metal-contaminated soil at the Site does not lend itself to any cost-effective treatment.

5. Short-term Effectiveness

Alternative 2 would pose the lowest short-term risk to the community since it has the shortest construction duration at 2.5 years and smallest imported borrow material quantities for the construction of the cover. Alternative 3 has similar short-term effectiveness with an increased construction duration of 3 years. In addition, traffic impacts under Alternative 3 are similar to Alternative 2, although potential dust generation is increased due to the excavation of surface soils.

Alternatives 4 and 5 would pose the highest short-term risk to the community due the increased construction durations of 5 years and material-handling quantities, which would result in significant traffic impacts to the surrounding community. However, the short-term risk associated with Alternative 5 is slightly higher than Alternative 4 because the excavation quantities are greatest and this increased excavation volumes would potentially result in additional noise, increase traffic, and potential dust-borne releases.

Overall, Alternatives 2 and 3 present the lowest degree of short-term risk to the workers and surrounding community from dust, noise, and traffic due to shorter construction duration. Therefore, Alternatives 2 and 3 have greatest degree of short-term effectiveness.

6. Implementability

Alternatives 2 through 5 are implementable using similar technologies and readily available standard construction equipment. The technologies incorporated into these alternatives are proven remedial options and have been implemented successfully on environmental cleanup projects throughout the county. However, due to the increased quantities of required backfill materials in Alternatives 4 and 5, borrow sources may be located farther from the site in order to obtain sufficient quantities. In addition, Alternative 5 would require the excavation of an additional 73,651 cy of soil compared to Alternative 4 and an additional 347,390 cy of soil comparted to Alternative 3.

7. Cost

This criterion evaluates the capital and annual O&M costs of each alternative and uses the estimated total present value costs of each to compare costs among alternatives with different implementation times. A summary of the estimated cost of each alternative is shown in Table 7, attached to this Proposed Plan.

Alternative 2 is the least expensive action remedial alternative. Alternative 3 is slightly higher because surface soils would be excavated. Alternatives 4 and 5 are the most expensive alternatives with each alternative increasing in cost within the same order of magnitude and are the most expensive alternatives. Both Alternative 4 and Alternative 5 would excavate surface and subsurface soil, Alternative 5, the highest cost would excavate the highest quantity of soil.

The final cost estimates for the Selected Remedy will be developed and refined during the remedial design process.

8. State/Support Agency Acceptance

The State of Illinois' acceptance of the preferred alternative will be evaluated after the public comment period ends and will be described in the ROD.

9. Community Acceptance

EPA, in consultation with Illinois EPA, will evaluate public reaction to the Preferred Alternative after the public comment period ends and will be described in the ROD.

9. EPA's PREFERRED ALTERNATIVE

This section describes EPA's preferred alternative and explains the rationale for that preference.

EPA's Preferred Alternative is Alternative 3: Excavation of Surface Soil above Human Health PRGs (up to 2 feet bgs), Excavation of Surface Soil above Ecological PRGs (0.5 foot) outside of the Human Health PRG excavation footprint; Cover Slag Pile Consolidation Area; ICs and LTM.

Based on the evaluation of the various remedial alternatives summarized in Section 8, *Evaluation of Alternatives*, EPA believes that Alternative 3 is the most appropriate cleanup alternative for the Site.

The details of Alternative 3 are discussed below and displayed on Figure 14.

- Conducting predesign investigations; sampling to delineate and refine excavation boundaries and volumes and baseline sampling to support long-term monitoring, identification of T&E species and migratory birds, evaluation of wetlands, surveys for boundary and well locations.
- Conducting pre-construction activities, survey and demolish buildings within the fenceline.
- Excavating (7,508 cy) of sediment above human health and ecological PRGs.
- Surface soil exceeding human health PRGs would be excavated up to 2 feet bgs (49,046 cy) and consolidated with the existing slag pile on-site. Excavated areas will be backfilled with compacted clay and topsoil, to create a low-permeability cover.
- Surface soil exceeding ecological PRGs in non-vegetated areas located outside of the human health remediation footprint would be excavated to 0.5-foot bgs (29,072 cy), consolidated with the existing slag pile. Excavated areas will be backfilled.
- Installing a low-permeability soil cover over the slag pile consolidation area and hydroseeding areas with constructed cover and most disturbed areas, to establish vegetation. Partial slag pile relocation and creek rerouting.
- Implementing Long Term Monitoring to verify effectiveness of the remedy.
- Implementing an interim groundwater and surface water remedy, which would require baseline sampling and the development of a GMZ.
- Implementing ICs, refer to Figure 12 displaying soil institutional control areas.

The time to complete construction would be approximately 3 years, at an estimated total present worth cost of $29.3 Million.

Alternative 3 is recommended because it is expected to achieve long-term risk reduction through excavation of contaminated soils and isolation by covering the subsurface soil above human health PRGs and an on-site slag pile consolidation area under a low-permeability cover. This action will protect human receptors from direct contact with affected surface soils and subsurface soils with physical controls and will serve to reduce risk to ecological receptors from contact with surface soil. The excavation of sediment remediation footprint will protect human receptors from direct contract with affected sediment and will address ecological concerns.

Alternative 3 will meet all identified ARARs, will achieve RAOs within a reasonable timeframe and at a reasonable cost, and will allow the property to be used for current and reasonably anticipated land use while preventing residential use, recreational use, and commercial use as a daycare center.

The interim groundwater remedy will comply with those federal and state requirements that are applicable or relevant and appropriate to the limited scope of the action. The interim groundwater remedy includes ICs to prevent exposure to contaminated groundwater until groundwater can be further evaluated and a final remedy selected. Groundwater monitoring would be conducted following implementation of the source control measures provided by the other areas' alternatives, to evaluate the impact of those source control measures on groundwater concentrations over time. The metals detected in Zone 2 groundwater monitoring wells are due to naturally occurring contamination from coal deposits and/or local mine-workings and not Site-related, therefore EPA is not restoring Zone 2 groundwater to its beneficial use due to natural causes as per 35 Illinois Administrative Code (IAC) 620.410(a). The ability to meet the groundwater chemical specific ARARs and will be evaluated by LTM and EPA five-year review.

Summary of Rationale for the Preferred Alternative

Based on the information currently available, EPA believes that the Preferred Alternative, Alternative 3, meets the threshold criteria and provides the best balance of tradeoffs among the alternatives with respect to the balancing and modifying criteria. The interim surface water and groundwater remedy is not required to meet ARARs so long as the final groundwater/surface water remedy will meet ARARs. EPA expects the Preferred Alternative to satisfy the following statutory requirements of CERCLA § 121(b): (1) be protective of human health and the environment; (2) comply with ARARs (or justify a waiver); (3) be cost-effective; (4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and (5) satisfy the preference for treatment as a principal element or explain why the preference for treatment will not be met.

The Preferred Alternative will provide long-term and permanent protection again exposure to Site-related contaminants by the combination of soil and sediment excavation, containment, and cover, coupled with appropriate ICs. The Preferred Alternative does not satisfy the preference for treatment as a principal element because the large volume of relatively low-level metals-contaminated soils at the Site do not lend itself to any cost-effective treatment. EPA has not identified any principal threat wastes at the Site.

Next Steps

EPA, in consultation with Illinois EPA, will evaluate public input on the preferred cleanup alternative during the public comment period before selecting a final cleanup alternative as the remedy. Based on new information or public comments, EPA may modify its preferred alternative or choose another. Therefore, EPA encourages the public to review and comment on all the cleanup alternatives.

EPA will respond in writing to all comments collected during the public comment period in a Responsiveness Summary which is part of the ROD. EPA will announce the selected cleanup alternative in local newspaper notices and on EPA's webpage https://www.epa.gov/superfund/hegeler-zinc and will place a copy of the ROD in the local information repository.

FIGURES

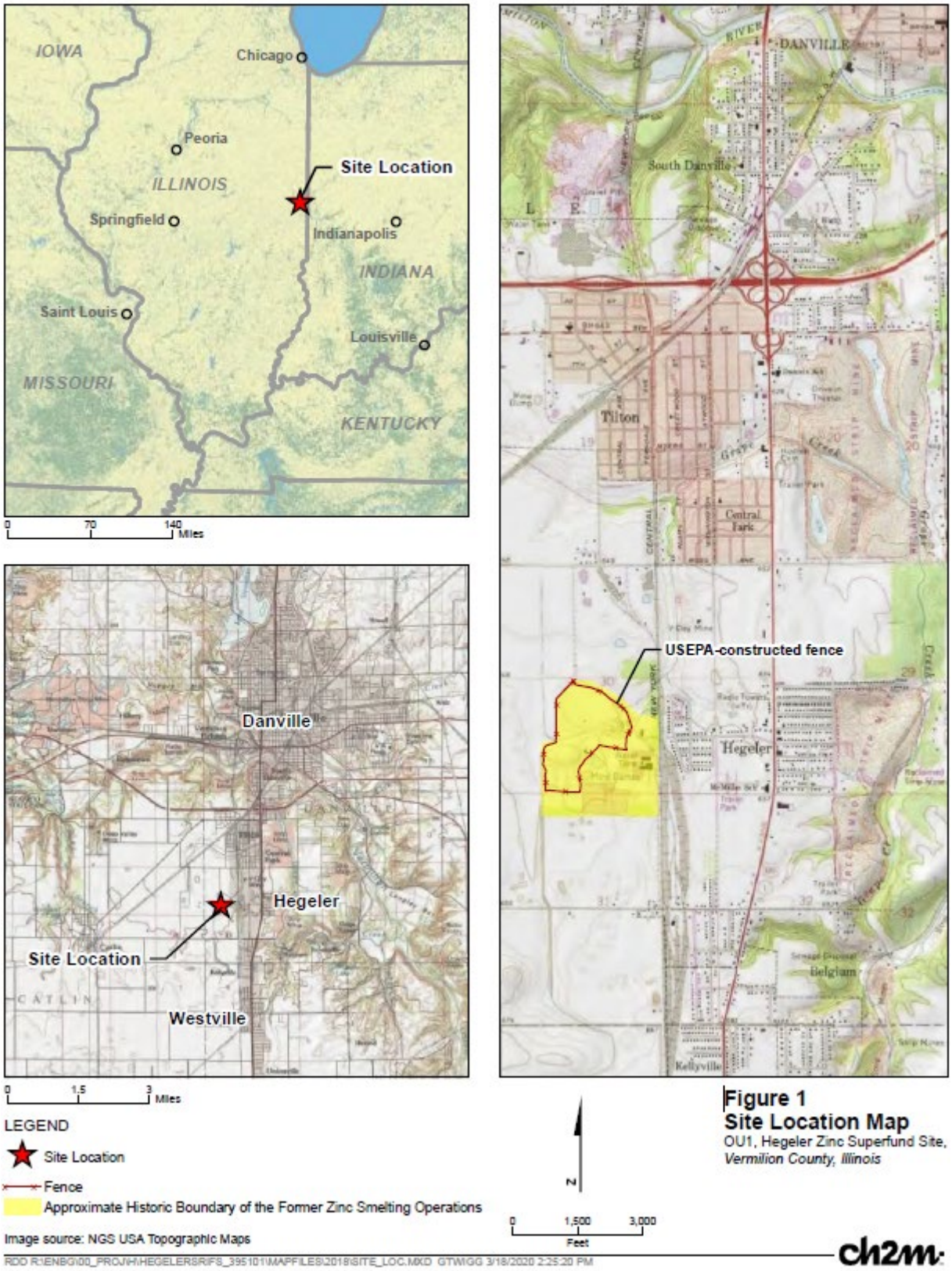

Figure 1
Site Location Map
OU1, Hegeler Zinc Superfund Site,
Vermilion County, Illinois

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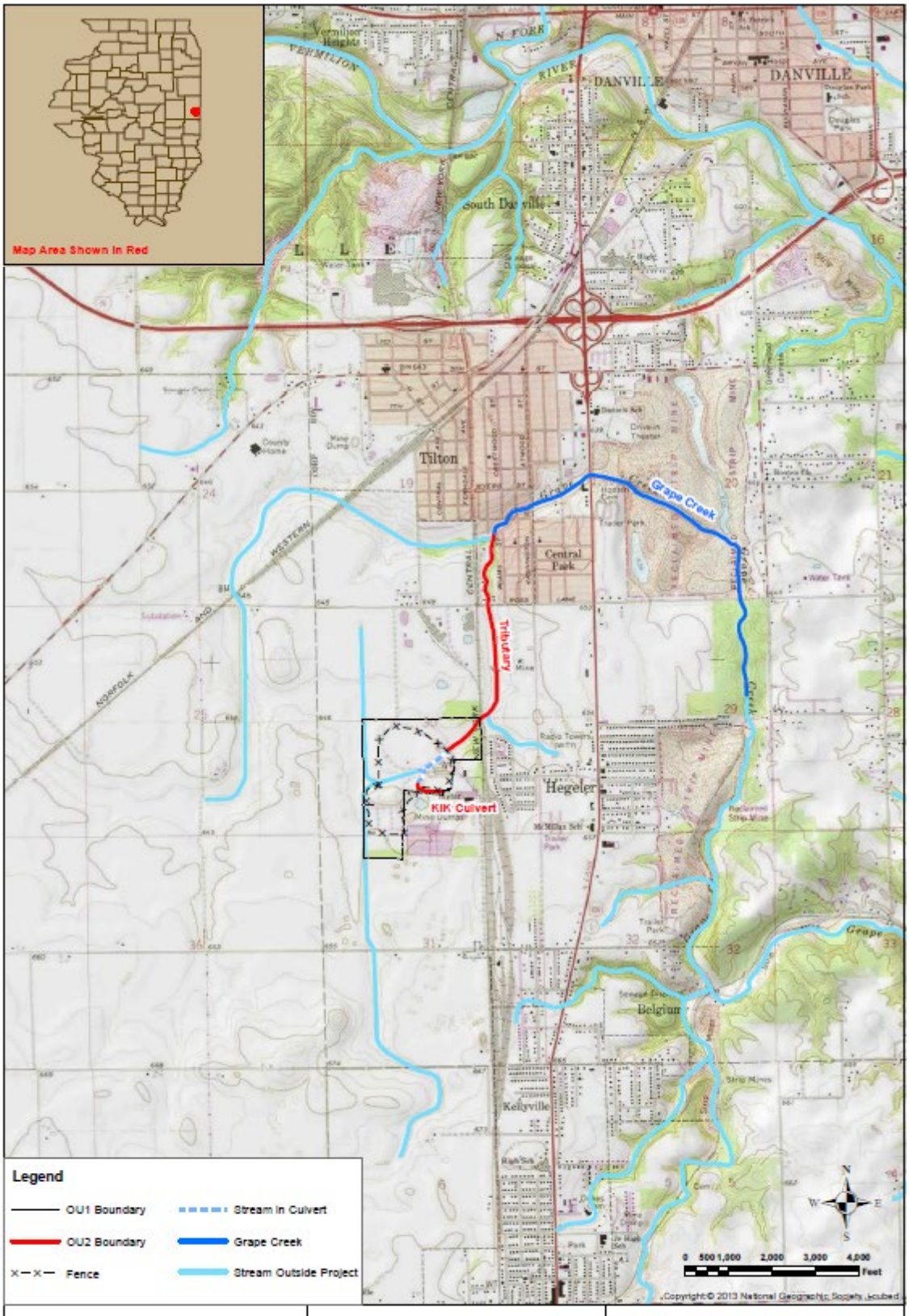


AECOM

OPERABLE UNIT 2
FEASIBILITY STUDY
DANVILLE, IL
60504794

TOPOGRAPHIC LOCATION MAP

Date: 08/2016 | DRAWN: JRM | FIGURE 2

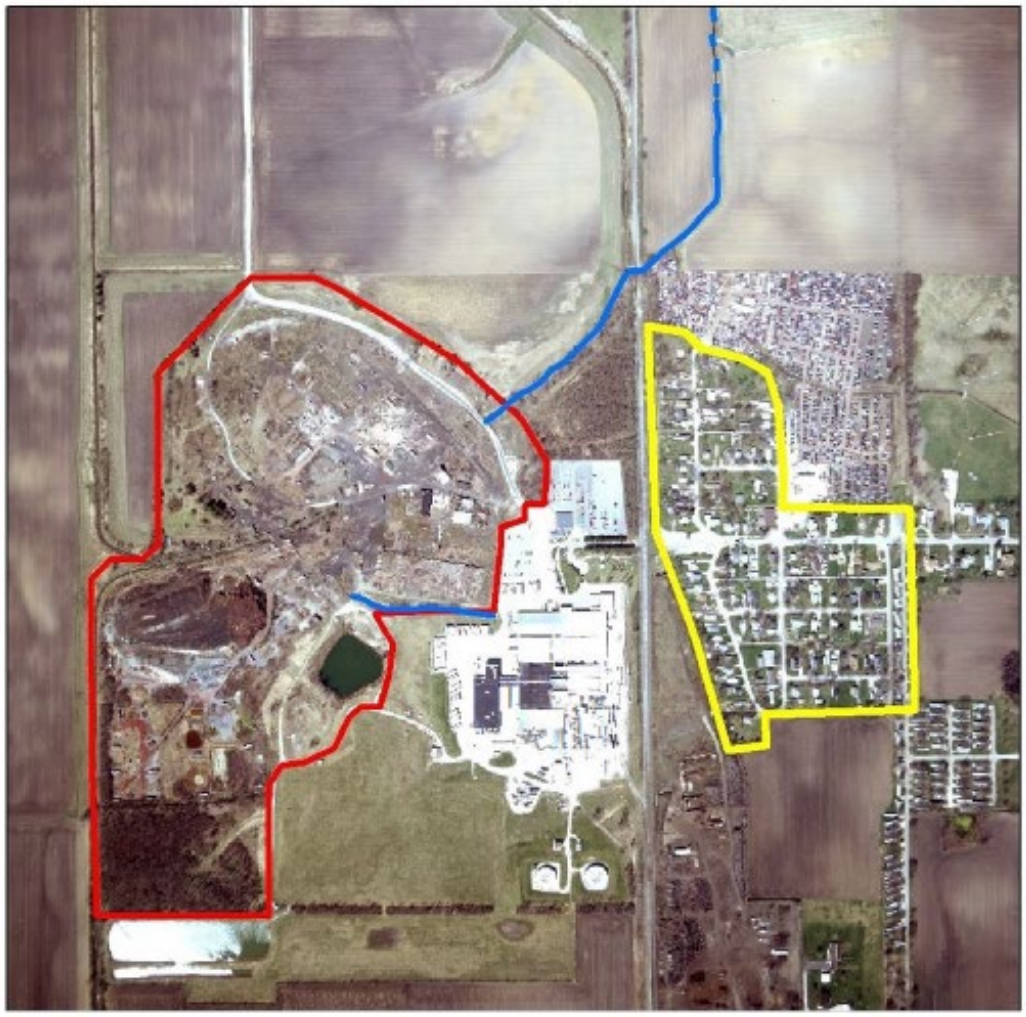
FIGURE 3
HEGELER OU3 FEATURES
OU3 HEGELER ZINC SUPERFUND SITE
DANVILLE, ILLINOIS

CH2MHILL

Figure 4

Hegeler Zinc Superfund Site

Danville, Illinois



State of Illinois

N

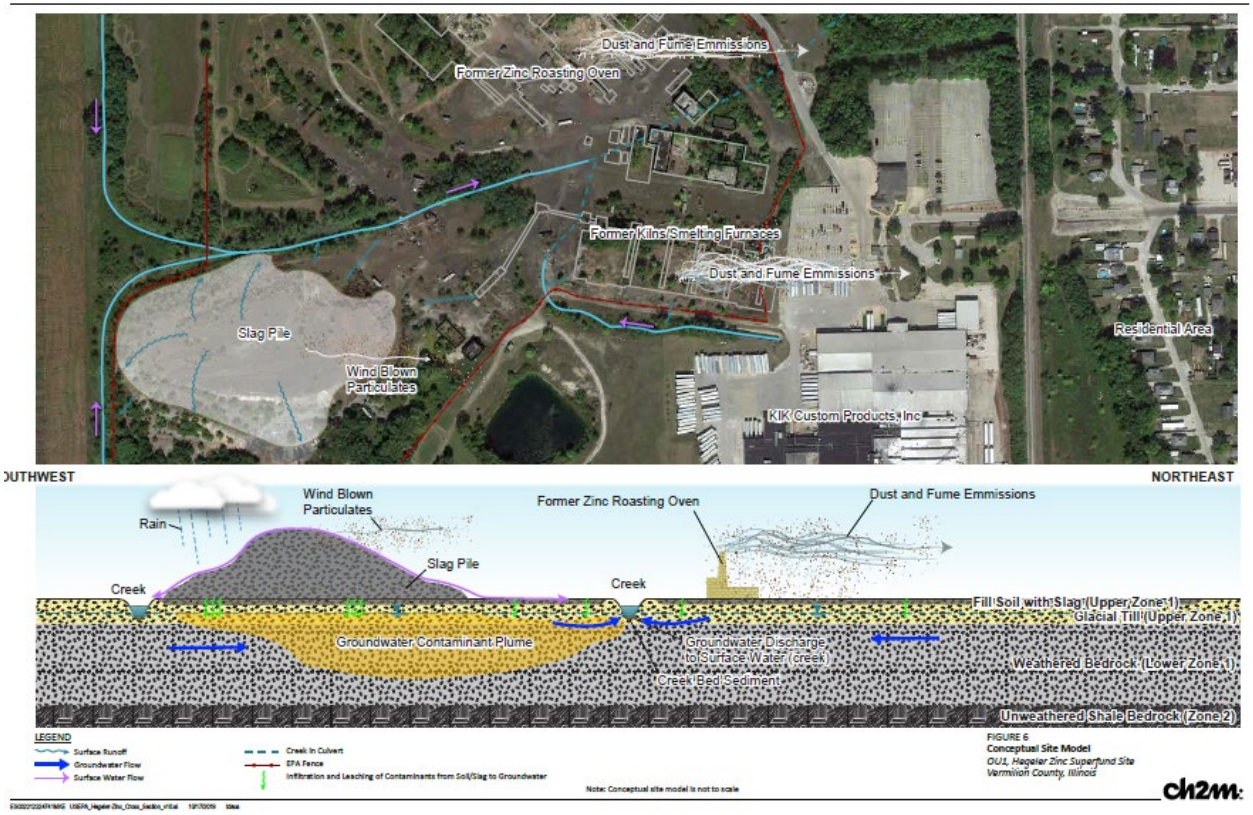
425212.5 0 425 Feet

Legend

- Operable Unit 1 (OU1)
- Operable Unit 2 (OU2) *
- Operable Unit 3 (OU3)

* The downstream extent of OU 2 will be determined at the conclusion of the BERA utilizing all U.S. EPA-approved existing and new data.

Figure 5
Site-specific Features Map
OU1, Hegeler Zinc Superfund Site
Vermilion County, Illinois


Dust and Fume Emmissions
Former Zinc Roasting Oven
Former Kilns/Smelting Furnaces
Dust and Fume Emmissions
Slag Pile
Wind Blown Particulates
Residential Area
KIK Custom Products Inc
OUTHWEST
NORTHEAST
Wind Blown Particulates
Former Zinc Roasting Oven
Dust and Fume Emmissions
Rain
Slag Pile
Creek
Creek
Fill Soil with Slag (Upper Zone 1)
Glacial Till (Upper Zone 1)
Groundwater Contaminant Plume
Groundwater Discharge to Surface Water (creek)
Creek Bed Sediment
Weathered Bedrock (Lower Zone 1)
Unweathered Shale Bedrock (Zone 2)
LEGEND
Surface Runoff
Groundwater Flow
Surface Water Flow
Creek in Culvert
EPA Fence
Infiltration and Leaching of Contaminants from Soil/Slag to Groundwater
Note: Conceptual site model is not to scale
FIGURE 6
Conceptual Site Model
OU1, Hegeler Zinc Superfund Site
Vermilion County, Illinois
ch2m:

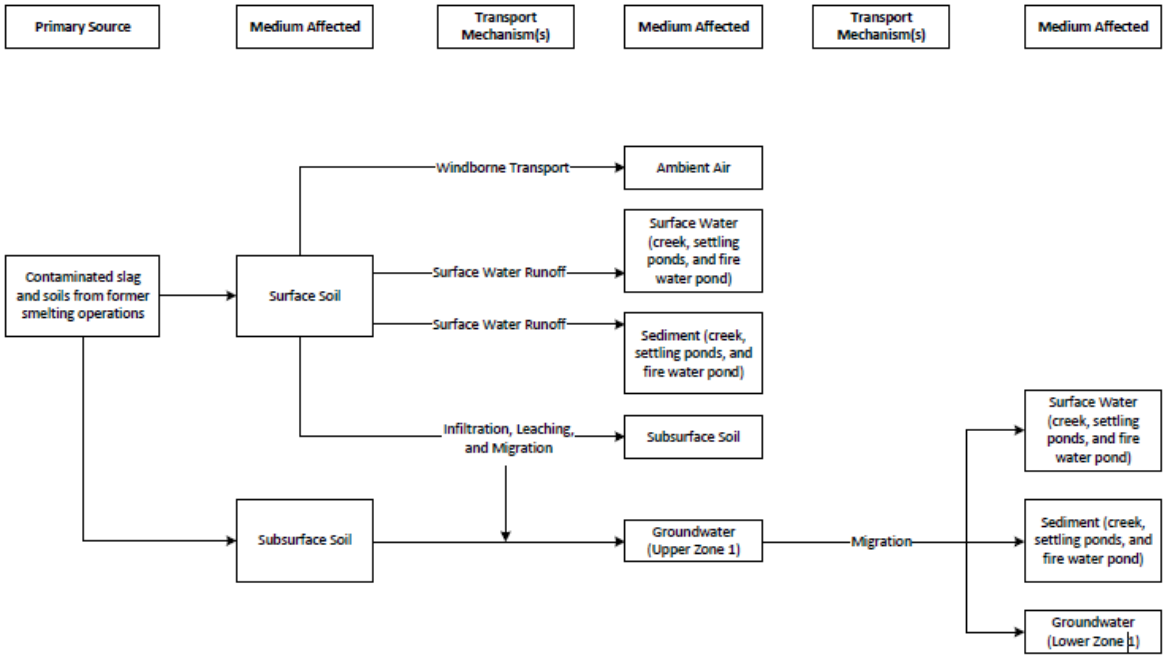


Figure 7
Potential Metals Migration Routes
OU1, Hegeler Zinc Superfund Site
Vermilion County, Illinois

Figure 8
OU1 Human Health Risk Assessment Exposure Areas
OU1, Hegeler Zinc Superfund Site
Vermilion County, Illinois

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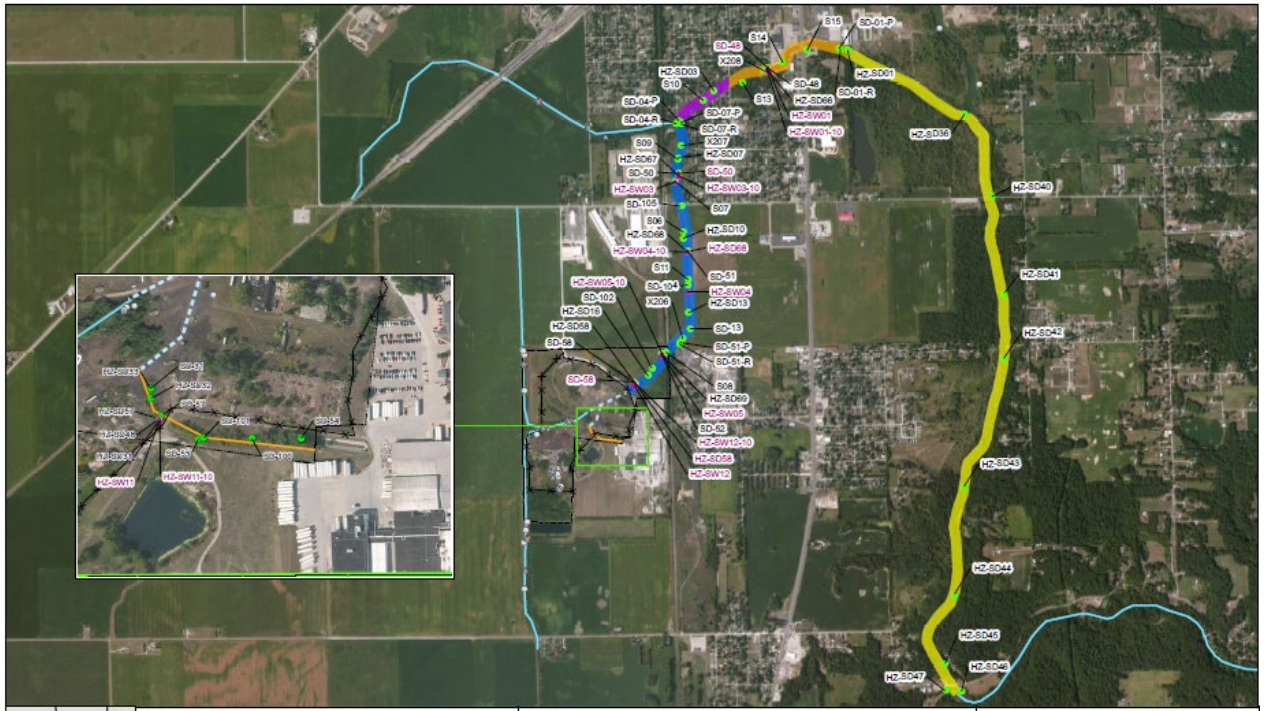

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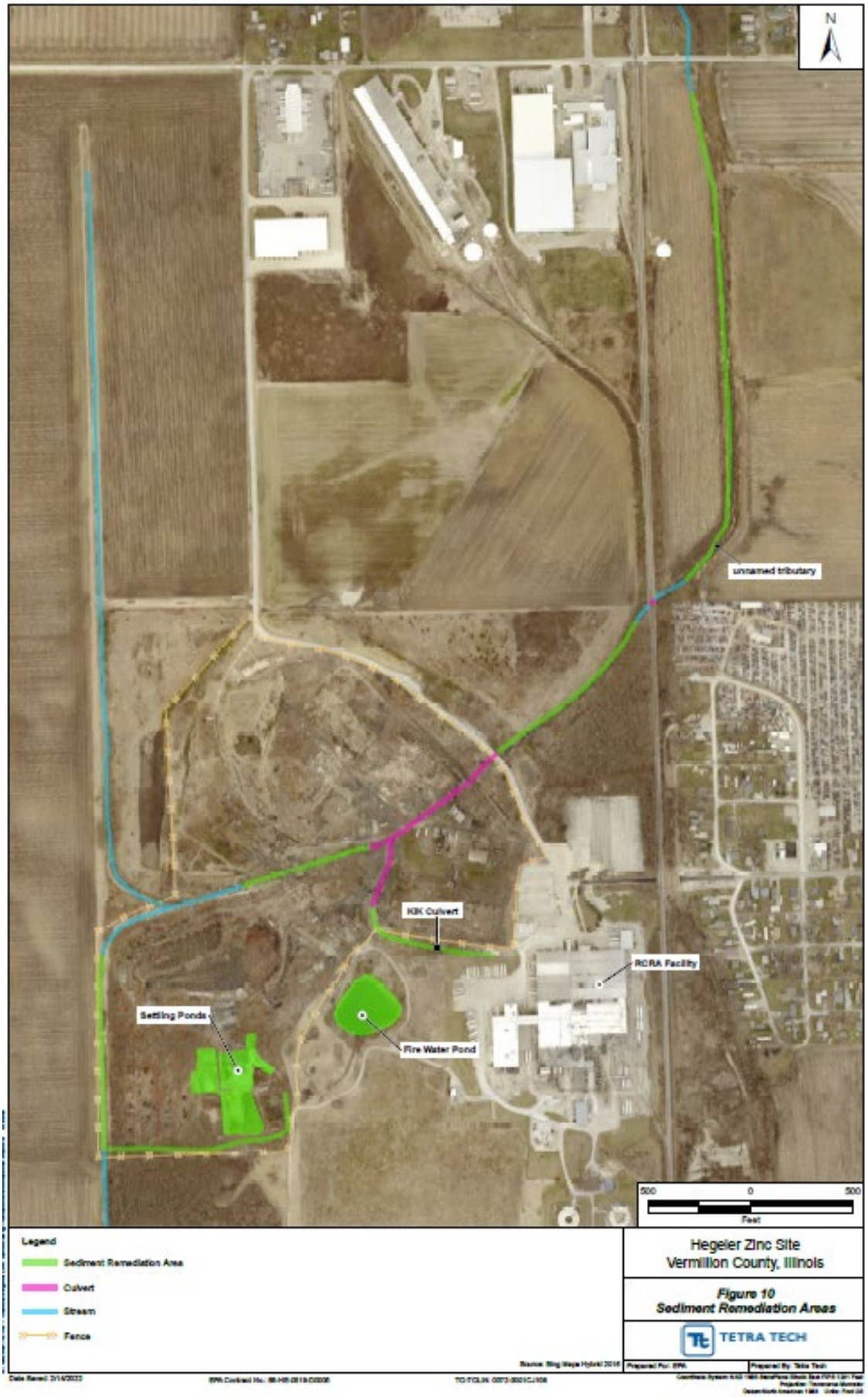
N
unnamed tributary
KIK Culvert
RCRA Facility
Settling Ponds
Fire Water Pond
500
0
500
Feet
Legend
Sediment Remediation Area
Culvert
Stream
Fence
Hegeler Zinc Site
Vermilion County, Illinois
Figure 10
Sediment Remediation Areas
TETRA TECH

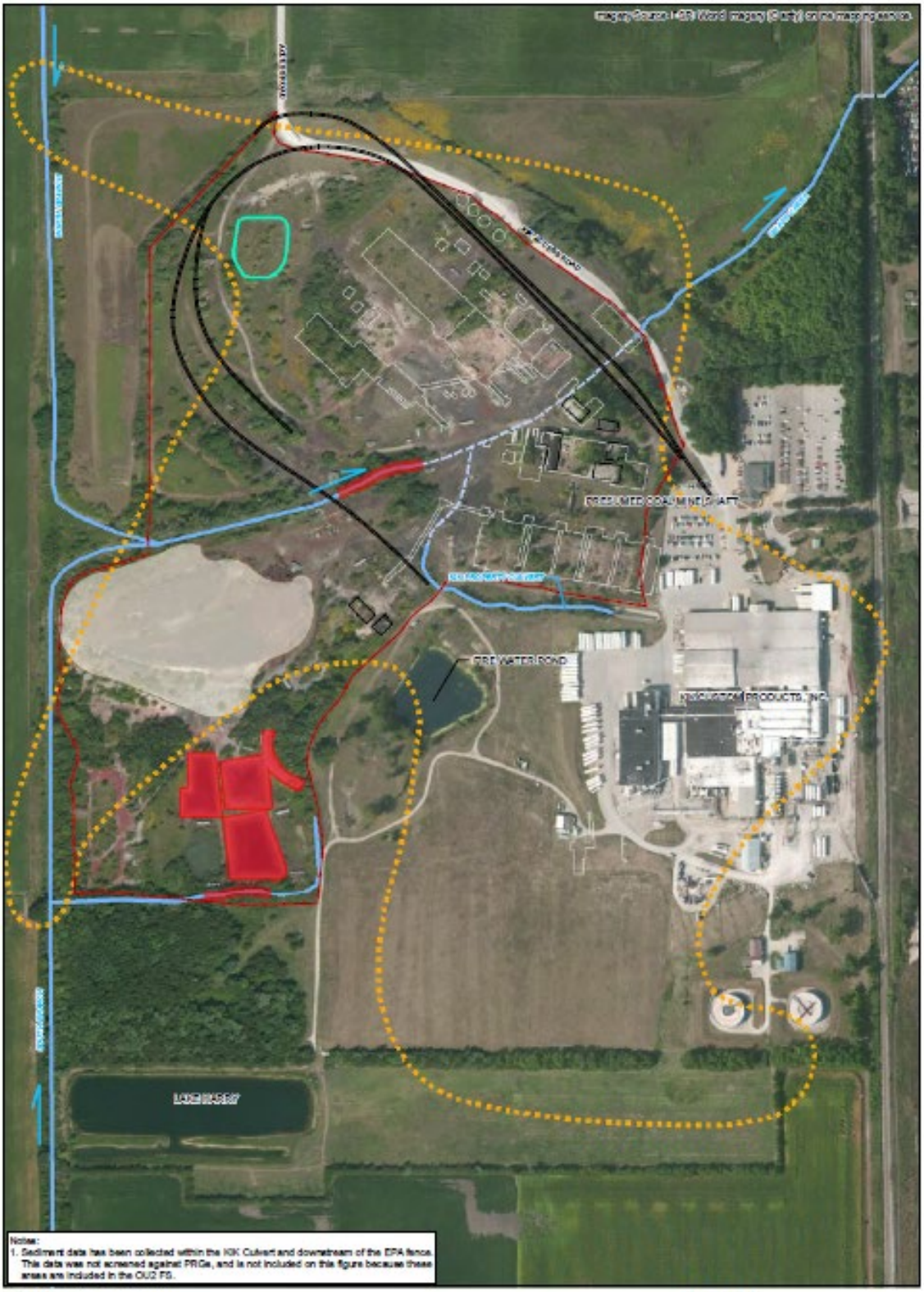

Figure 11
Surface Water and Groundwater Exceedance Areas Conceptual Layout
Hegeler Zinc Superfund Site
Vermilion County, Illinois

ch2m

Figure 12
Areas Requiring Institutional Controls for Soil
Hegeler Zinc Superfund Site
Vermilion County, Illinois

ch2m

Figure 13
OU1 Remedial Alternative 2 Conceptual Layout
Hegeler Zinc Superfund Site
Vermilion County, Illinois

ch2m

Figure 14
OU1 Remedial Alternative 3 Conceptual Layout
Hegeler Zinc Superfund Site
Vermilion County, Illinois

ch2m

Figure 15
OU1 Remedial Alternative 4 Conceptual Layout
Hegeler Zinc Superfund Site
Vermilion County, Illinois

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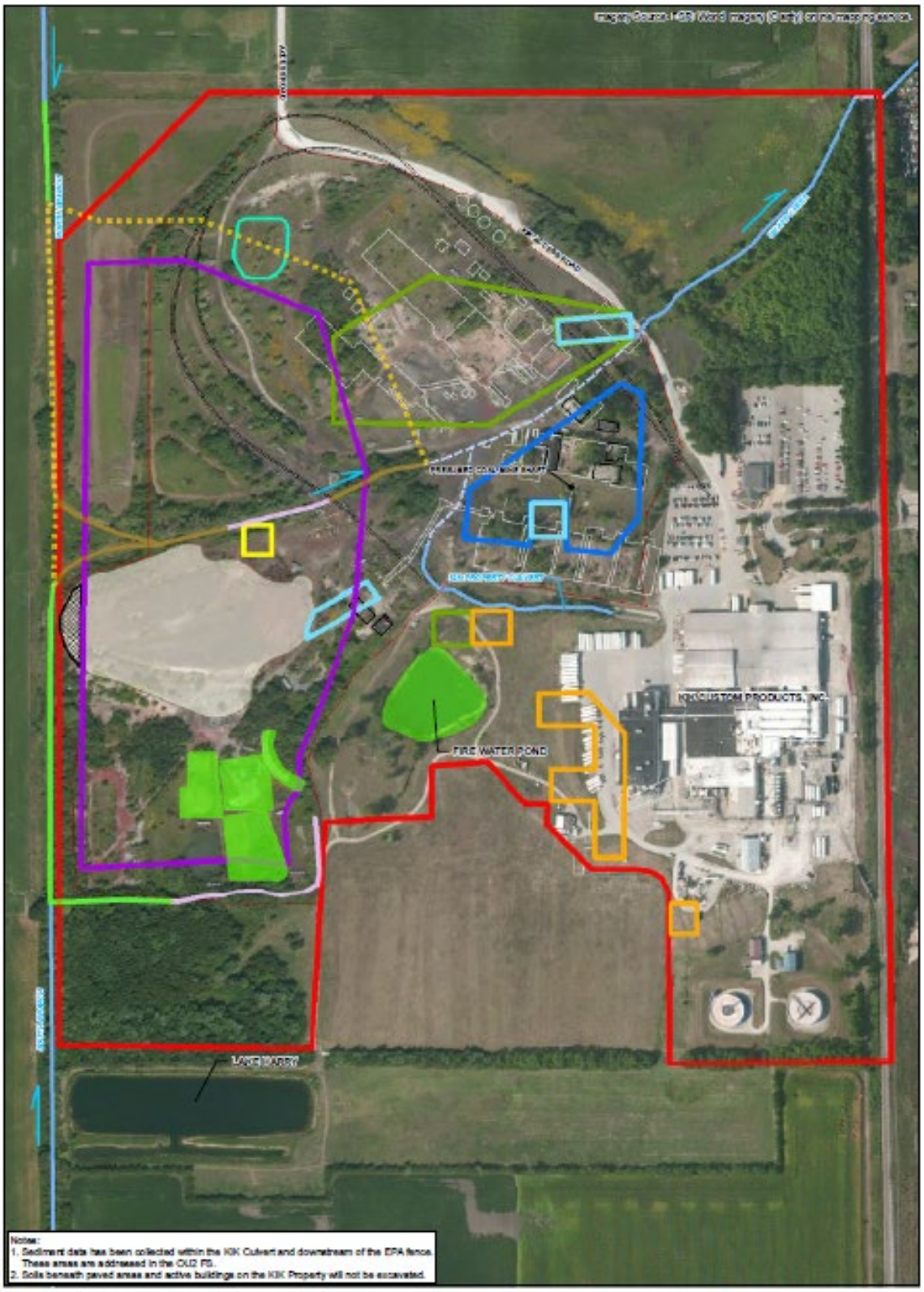

Figure 16
OU1 Remedial Alternative 5
Conceptual Layout
Hegeler Zinc Superfund Site
Vermilion County, Illinois

ch2m

TABLES

Table 1. Summary of Affected Media, Receptors, Pathways, and COCs/COPECs

Feasibility Study Report OU1

Hegeler Zinc Superfund Site, Vermilion County, Illinois

Media	Receptors	Pathways	COCs/COPECs
Soil/Slag	Surface Soil (0-2 ft bgs)[a] and unsaturated subsurface soil (> 2 ft bgs): future construction workers exposure area 3	Human health exposure via dermal contact, ingestion, and inhalation pathways	Antimony and zinc
	Surface Soil (0-2 ft bgs)[a] and unsaturated subsurface soil (> 2 ft bgs): future construction workers and/or industrial workers exposure areas 2, 3, and 4		Lead
	Surface Soil (0-2 ft bgs): terrestrial habitat receptors: plants, soil invertebrates, terrestrial mammals and birds, amphibians and reptiles	Ecological exposure via direct contact or ingestion pathways	Aluminum, antimony, lead, mercury, vanadium, and zinc
Sediment	0-1 foot bgs: trespassers (exposure area 1 creek) and construction workers (exposure areas 1 and 2 creek)	Human health exposure via dermal contact, ingestion, and inhalation	Cadmium
	0-0.5 ft bgs: aquatic habitat receptors: fish and water column biota, benthic invertebrates, semi-aquatic mammals and birds, amphibians and reptiles	Ecological exposure via direct contact or ingestion pathways	Aluminum, cadmium, lead, manganese, and zinc
Groundwater	Onsite industrial worker and offsite residents exposure areas 1, 2, and 3	Human health exposure via drinking water or household use or industrial use inhalation pathways	Total and dissolved metals: aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, vanadium, and zinc
	Onsite industrial worker and offsite residents exposure area 4		Total and dissolved metals: antimony, arsenic, cadmium, chromium, lead, and zinc
Surface Water	Trespassers, construction and industrial workers exposure area 2 settling ponds and creek	Human health exposure via dermal contact, ingestion, and inhalation pathways	Total and dissolved cadmium
	Aquatic habitat receptors: fish and water column biota, benthic invertebrates	Ecological exposure via direct contact or ingestion pathways	Dissolved metals: aluminum, cadmium, lead, manganese, and zinc

Notes:

Shaded rows identify media affected for ecological receptors.

Human Health Exposure Areas are shown on Figure 2-5 of this report.

COC = chemical of concern

COPEC = chemical of potential ecological concern

ft bgs = feet below ground surface

[a] COCs identified in total soil (0-10 feet bgs) for future industrial workers and construction workers were also identified as COC for surface soil (0-2 feet bgs) since surface soil is included within the total soil depth interval.

Table 2

Applicable or Relevant and Appropriate Requirements for the Retained Alternatives
Feasibility Study Report OU3 and OU5
Hegeler Zinc Superfund Site, Vermilion County, Illinois

Regulation	Requirement	ARAR Status	Analysis	Alternatives
Chemical-specific ARARs/TBCs				
Soil and Slag				
IAC Title 35, Part 742, Appendix A, and Appendix B, Table B TACO	TACO establishes a framework for determining soil and groundwater remediation objectives and standards, and for establishing institutional controls. Tier 1 remediation objectives are set at 10^{-6} ELCR and hazard index = 1 values. Section 742.900(d) Tier 3 remediation objectives allows cleanup levels within the ELCR range of 10^{-4} to 10^{-6}.	TBC	TACO is a voluntary program and is not required (Part 742.105 (a)). It provides guidance for development of site-specific soil and groundwater remediation objectives. It may be considered in establishing PRGs.	Alternatives 2, 3, 4, and 5
EPA Regional Screening Level Table for Chemical Contaminants at Superfund Sites - Soil	Screening levels developed using risk assessment guidance from the EPA Superfund program. They are risk-based concentrations derived from standardized equations combining exposure information assumptions with EPA toxicity data. Screening levels are considered to be protective for humans over a lifetime; however, screening levels do not address non-human health endpoints, such as ecological impacts.	TBC	Levels may be considered for use as initial cleanup goal.	Alternatives 2, 3, 4, and 5
CERCLA *Guidance on Land Use in the CERCLA Remedy Selection Process*	Establishes appropriate considerations in defining future land use.	TBC	CERCLA provides guidance to EPA in selecting land use for remedy selection purposes.	Alternatives 2, 3, 4, and 5
Oak Ridge National Laboratory *Toxicological Benchmarks for Screening Contaminants of Potential Concern*	Screening level assessment benchmarks for terrestrial invertebrates and plants.	TBC	Levels may be used for developing PRGs for soil ecological risk.	Alternatives 2, 3, 4, and 5
EPA Ecological Soil Screening Levels	Screening level assessment benchmarks for terrestrial invertebrates, plants, birds, and mammals.	TBC	Levels may be used for developing PRGs for soil ecological risk.	Alternatives 2, 3, 4, and 5
NOAA Screening Quick Reference Tables	Compilation of screening level assessment benchmarks for multiple media types.	TBC	Levels may be used for developing PRGs for soil ecological risk.	Alternatives 2, 3, 4, and 5
Groundwater				
40 CFR Parts 141 and 143 Federal Safe Drinking Water Act, National Primary and Secondary Standards	Establishes MCLs and MCLGs that are health-based standards for public drinking water system. Secondary MCLs and MCLGs are established for aesthetic qualities of the drinking water.	Applicable	Applicable to the Upper and Lower Zone 1 and Zone 2 groundwater. As detailed in the SRI Report (CH2M 2019a), the metals detected in Zone 2 monitoring wells do not appear to be associated with contamination from the site (rather, it is contamination from mine-workings from the various mines in the vicinity of the site). Therefore, the RAOs and PRGs for groundwater may apply only to Zone 1.	Alternatives 2, 3, 4, and 5
IAC Title 35, Part 620.210; 620.410; IWQS Class I: Potable Resource Groundwater	Applicable to groundwater compatible for use as a potable water supply.	Applicable	Applicable to the Upper and Lower Zone 1 and Zone 2 groundwater. As detailed in the SRI Report (CH2M 2019a), the metals detected in Zone 2 monitoring wells do not appear to be associated with contamination from the site (rather, it is contamination from mine-workings from the various mines in the vicinity of the site). Therefore, the RAOs and PRGs for groundwater may apply only to Zone 1.	Alternatives 2, 3, 4, and 5
EPA Regional Screening Level Table for Chemical Contaminants at Superfund Sites – Tap Water	Screening levels developed using risk assessment guidance from the EPA Superfund program. They are risk-based concentrations derived from standardized equations combining exposure information assumptions with EPA toxicity data. Screening levels are considered to be protective for humans over a lifetime; however, screening levels do not address non-human health endpoints, such as ecological impacts.	TBC	Levels may be considered for use as initial cleanup goal.	Alternatives 2, 3, 4, and 5
IAC Title 35, Part 620.450(a), Alternative Groundwater Quality Standards—Groundwater Quality Restoration Standards	Applies to groundwater within a groundwater management zone pursuant to 35 IAC 620.250. May allow concentrations higher than designated use after remediation.	Applicable	Applicable if a groundwater management zone is used.	Alternatives 2, 3, 4, and 5
Surface Water				
IAC Title 35, Subtitle C, Chapter I, Part 302, Illinois Water Quality Standards General Use—Subpart B, Section 302.208 and Section 302.210	Part 302.208 provides procedures to derive acute general use water quality criteria for toxic substances without numerical standards, to restore, maintain, and enhance purity of the water of the state. Narrative standards in Illinois Pollution Control Board regulations at 35 IAC 302.210 allow the Illinois EPA to derive numeric water quality criteria values for any substance that does not already have a numeric standard in the Illinois Pollution Control Board regulations. Criteria that have been derived serve to protect aquatic life and human health.	Applicable	The site contains an unnamed creek that flows into Grape Creek, which is a tributary to the Vermillion River and is a water of the state. Subpart B applies to Illinois surface waters that do not have a specific use category, such as Grape Creek.	Alternatives 2, 3, 4, and 5

Applicable or Relevant and Appropriate Requirements for the Retained Alternatives
Feasibility Study Report OU3 and OU5
Hegeler Zinc Superfund Site, Vermilion County, Illinois

Regulation	Requirement	ARAR Status	Analysis	Alternatives
EPA National Recommended Water Quality Criteria	Numeric water quality criteria for the protection of aquatic life.	TBC	Aquatic life criteria for surface waters. To be considered in the absence of applicable Illinois EPA criteria.	Alternatives 2, 3, 4, and 5
Sediment				
EPA Regional Screening Level Table for Chemical Contaminants at Superfund Sites – Soil	Screening levels developed using risk assessment guidance from the EPA Superfund program. They are risk-based concentrations derived from standardized equations combining exposure information assumptions with EPA toxicity data. Screening levels are considered to be protective for humans over a lifetime; however, screening levels do not address non-human health endpoints, such as ecological impacts.	TBC	Levels may be considered for use as initial cleanup goal.	Alternatives 2, 3, 4, and 5
EPA Region 5 RCRA Ecological Screening Levels	Presents screening values for freshwater sediments.	TBC	Levels may be used for developing PRGs for soil ecological risk.	Alternatives 2, 3, 4, and 5
Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems. MacDonald D.D., C. G. Ingersoll, T. A. Berger	Presents sediment quality guidelines for freshwater ecosystems.	TBC	Site-specific sediment cleanup objectives are being developed for the site in accordance with the CERCLA process and as described in the report.	Alternatives 2, 3, 4, and 5
NOAA Screening Quick Reference Tables	Compilation of screening level assessment benchmarks for multiple media types.	TBC	Levels may be used for developing PRGs for soil ecological risk.	Alternatives 2, 3, 4, and 5
Location-specific ARARs/TBCs				
Federal				
Section 404 of the CWA, 33 USC § 1344 - Permits for Dredged or Fill Material 40 CFR Parts 122, 129, 230, 401, 403, and 404 and 33 CFR Part 330 Nationwide Permit #38 Cleanup of Hazardous and Toxic Waste	Authorizes the discharge of dredged or fill material into waters (including wetlands) of the United States by establishing performance standards and conditions to protect the aquatic environment. USACE and EPA regard the use of mechanized earth-moving equipment in waters of the United States as resulting in a discharge of dredged material unless project-specific evidence shows that the activity results in only incidental fallback. No discharge of dredged or fill material may be permitted if: (1) a practicable alternative exists that is less damaging to the aquatic environment, or (2) the nation's waters would be significantly degraded. Requires that steps be taken to avoid, to the extent practicable, adverse effects, especially on aquatic ecosystems and to provide compensation for any remaining unavoidable impacts. Consultation regarding threatened and endangered species also may occur. Establishes site-specific constituent limitations designed to protect surface water quality. Types of discharges regulated under CWA include discharge to surface water or ocean, indirect discharge to POTW, and discharge of dredged or fill material into Waters of the United States. Establishes performance standards and water quality standards for the discharge of dredged or fill material into U.S. waters that may impact habitat and adversely affect the biological productivity of wetlands/aquatic ecosystems by smothering, by dewatering, by permanently flooding, or by altering substrate elevation or periodicity of water movement	Applicable	The Grape Creek, the Unnamed Creek (Tributary), and KIK Culvert are considered to be waters of the United States due to the connection to the Vermillion River. A riparian zone and wetlands may exist along the unnamed creek and/or near the settling ponds, Lake Harry, and the fire water pond. Per USACE Regulatory Guidance Letter 86-07, the EPA will be the lead agency at this CERCLA site in determining was water bodies are regulated, and if so, what measures are appropriate for compliance with the regulations. If regulated, substantive requirements are likely to include measures to minimize resuspension of sediments and erosion of sediments during excavation of sediments or creek realignment. Mitigation measures may be also be required for regulated wetlands, if present, or for the pond, if altered.	Alternatives 2, 3, 4, and 5
Endangered Species Act of 1973 16 USC Chapter 35	Rules requiring determination as to whether such species and its habitat reside within an area where an activity under review by a governmental authority may take place.	Relevant and Appropriate	Construction activities performed during the implementation of remedies will affect drainageways, streams, ponds, and wetlands and may also adversely affect protected species or habitats. The USFWS database will be searched and results evaluated during the remedial design to determine whether protected areas or species are potentially present on the site and whether the alternatives have a potential to affect such species. If there is a potential to effect, the USFWS will be consulted and work will adhere to this regulation.	Alternatives 2, 3, 4, and 5
Migratory Bird Treaty Act of 1972 16 USC §703-712	Establishes federal responsibility for the protection of the international migratory bird resources. Taking, killing, or possessing migratory birds is unlawful without authorization.	Applicable	The potential presence of migratory birds and their habitat will be evaluated. The remedial action may be implemented during the nesting season; therefore, the remedial design will incorporate measures to avoid or minimize disturbance to the extent practicable, compliance with state or federal guidelines, and if appropriate, consultation with USFWS.	Alternatives 2, 3, 4, and 5

Applicable or Relevant and Appropriate Requirements for the Retained Alternatives
Feasibility Study Report OU3 and OU7
Hegeler Zinc Superfund Site, Vermilion County, Illinois

Regulation	Requirement	ARAR Status	Analysis	Alternatives
Fish and Wildlife Coordination Act 16 USC § 661 et seq.	The Act provides protection and consultation with USFWS and state counterpart for actions that would affect streams, wetlands, other water bodies, or protected habitats. Action taken should protect fish or wildlife, and measures should be developed to prevent, mitigate, or compensate for project-related losses to fish and wildlife.	Applicable	Construction activities performed during the implementation of remedies will affect drainageways, streams, ponds, and wetlands and may also adversely affect protected species or habitats. The USFWS database will be searched and results evaluated during the remedial design to determine whether protected areas or species are potentially present on the site and whether the alternatives have a potential to affect such species. If there is a potential to effect, the USFWS will be consulted.	Alternatives 2, 3, 4, and 5
National Historic Preservation Act, Section 106 54 USC § 306108	Requires federal agencies to consider the effects of federally funded projects on historic properties and to afford the Advisory Council on Historic Preservation an opportunity to comment on such projects prior to the expenditure of any Federal funds on the undertaking.	Applicable	The presence of historic resources, including archeological sites, was evaluated during the remedial design. The Illinois Historic Preservation Agency was consulted and concurred that no historic properties within OU1 will be affected. The SHPO has required that a survey be conducted of any borrow areas once they are identified (Appendix B).	Alternatives 2, 3, 4, and 5
Executive Order 11988 – Floodplain Management of May 24, 1977, appearing at 42 FR 26951, 3 CFR, 1977 Comp., p. 117	Requires actions to avoid or minimize long- and short-term adverse impacts associated with the occupancy and modification of floodplains.	Applicable	As allowed by law, agencies shall issue or amend their existing procedures in order to comply with this Order	Alternatives 2, 3, 4, and 5
Executive Order 11990 – Protection of Wetlands of May 24, 1977, appearing at 42 FR 26961, 3 CFR, 1977 Comp., p. 121	Requires actions to avoid or minimize long- and short-term adverse impacts associated with the destruction or modification of wetlands.	TBC	As allowed by law, agencies shall issue or amend their existing procedures in order to comply with this Order	Alternatives 2, 3, 4, and 5
State				
Illinois Endangered Species Protection Act IAC Title 17 Part 1075, Endangered Species	Prohibits actions that are likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat. If remediation is within critical habitat or buffer zones surrounding threatened or endangered species, mitigation measures must be taken to protect the resource.	Potentially Applicable	Based on a review performed in 2011, no threatened or endangered species or their habitats were observed onsite. An updated threatened and endangered species review will be conducted during the remedial design. If threatened or endangered species are identified as potentially present in areas where remedial actions will occur, measures will be specified to confirm the presence, and avoid or mitigate the adverse effects.	Alternatives 2, 3, 4, and 5
765 ILCS 122: Illinois Uniform Environmental Covenants Act	The purpose of an environmental covenant is to ensure that land use restrictions and engineering controls designed to control the potential environmental risk of residual contamination will be recorded in the land records and enforced over time, perpetually if necessary, while allowing that real estate to be conveyed from one person to another subject to those controls.	Applicable	Applicable to groundwater while levels exceed acceptable risk. Applicable to the slag pile consolidation area. May also be applicable to other areas of the site if residual contamination remains onsite at levels that do not allow for unlimited use and unrestricted exposure after cleanup.	Alternatives 2, 3, 4, and 5
The Illinois Interagency Wetland Policy Act of 1989, Chapter 20 Executive Branch, Department of Natural Resources	Directs that State agencies preserve, enhance, and create wetlands where possible and avoid adverse impacts to wetlands from various state-managed or funded activities.	TBC	The site is not state funded or managed. However, the state's goal for overall no net loss of wetlands can be considered. Refer to CWA Section 404 above.	Alternatives 2, 3, 4, and 5
Illinois Stream Mitigation Guidance - Stream Mitigation Method for Processing Section 404 CWA Permit Applications in the State of Illinois	USACE guidance addresses typical impacts and mitigation methods in the context of compliance with CWA Section 404 and in support of Section 401 water quality certifications.	TBC	Technical and substantive aspects of the guidance will be considered for alternatives that include stream or surface water body modification or relocation.	Alternatives 2, 3, 4, and 5
Action-specific ARARs/TBC				
Federal				
Federal Water Pollution Control Act as amended by the CWA of 1977, Section 401 Water Quality Certification	Requires compliance with discharge limitations for discharge to waters, including water quality effluent limits and water quality standards.	Applicable	Compliance with CWA Section 401 requirements is mandatory for all projects regulated under Section 404, and substantive requirements are applicable for actions involving rerouting of the stream and disturbances such as excavation or dredging of sediment.	Alternatives 2, 3, 4, and 5
40 CFR Parts 121 State Certification	Requires the development and implementation of a stormwater pollution prevention plan. Outlines monitoring and inspection requirement for a variety of activities. IEPA implements the NPDES program and the associated stormwater management requirements.	Applicable	Applicable to runoff from construction activities that disturb more than 1 acre of land. Substantive requirements of NPDES Permit No. ILR10 General Permit for Stormwater Discharges from Construction Site Activities would be met.	Alternatives 2, 3, 4, and 5
EPA Area of Contamination Policy, 1996	Allows wastes within an Area of Contamination to be consolidated and treated in-situ without triggering RCRA land disposal restrictions or minimum technology requirements. An Area of Contamination can be delineated by the areal extent of contiguous waste.	TBC	The entire site is considered a single Area of Contamination. Alternatives that include onsite consolidation, treatment, and covering/capping of soils and sediments that contain hazardous substances will not trigger land disposal restrictions or RCRA Subtitle C minimum technology requirements.	Alternatives 2, 3, 4 and 5

Applicable or Relevant and Appropriate Requirements for the Retained Alternatives
Feasibility Study Report OU3 and OU7
Hegeler Zinc Superfund Site, Vermilion County, Illinois

Regulation	Requirement	ARAR Status	Analysis	Alternatives
RCRA Hazardous Waste Management Regulations 40 CFR Parts 260 – 262	These regulations provide definitions of terms, general standards, and overview information applicable to the hazardous waste management system, identify those solid wastes which are subject to regulation as hazardous wastes and which are subject to the notification requirements of section 3010 of RCRA, and establish standards for generators of hazardous waste as defined by 40 CFR 260.10.	Potentially Applicable	Should Hazardous Waste be generated and not excluded due to being regulated under Section 404 of the Clean Water Act (35 IAC 721 .104(g)), these regulations will provide requirements for subsequent treatment, storage, and disposal of the waste.	Alternatives 2, 3, 4, and 5
State				
Illinois Environmental Protection Act and IAC Title 35, Subtitle C, Chapter I	Along with the Federal Clean Water Act, provides the authority for the Illinois NPDES for Storm Water Discharges from Construction Sites, and General Permit ILR10.	Applicable	Triggered by disturbances of one or more acres. The substantive requirements of the Illinois NPDES General Permit for Stormwater Discharge from Construction Site Activities would be complied with.	Alternatives 2, 3, 4 and 5
IAC Title 35, Part 302, Water Quality Standards	Regulations that establish numerical standards, to restore, maintain, and enhance purity of the water of the state.	Applicable	Point source discharges of water to waters of the state such as to Grape Creek are prohibited from violating water quality standards. Treatment of such water may be necessary to comply.	Alternatives 2, 3, 4 and 5
IAC Title 35, Part 304, Effluent Standards, Subpart A General Effluent Standards	Prescribes the maximum concentrations of various contaminants that may be discharged to the waters of the State. Subpart A contains general effluent limitations.	Applicable	Point source discharges of water to waters of the state such as to Grape Creek are required to comply with general effluent limitations. Treatment of such water may be necessary to comply.	Alternatives 2, 3, 4 and 5
IAC Title 17, Part 3700.60(a) Construction in Floodways of Rivers, Lakes and Streams	Protect the rights, safety, and welfare of private and public landowners by the regulation of floodway development. Construction activities which restrict a stream's capacity to carry flood flows may result in channel instability and increased flood damages to neighboring properties. Applies to construction in the floodway of any stream serving a tributary of 640 acres or more in an urban area, or 6,400 acres or more in a rural area.	Applicable	Site drainage area 4.16 square miles or 2,662.4 acres. The site is industrial with nearby residential, therefore likely is considered urban per regulatory definition, however, most of the drainage area appears to be rural. If triggered, requirements would be incorporated in the design.	Alternatives 2, 3, 4 and 5
IAC Title 17, Part 3706 Construction within Flood Plains	Protect the public health, safety, and general welfare by restricting damageable flood plain improvements and uses which increase flood damage potential elsewhere. Protect adjacent, upstream, and downstream private and public landowners from increases in flood heights and velocities and resulting increases in flood damages. Prevent water pollution, nuisances due to floating structures and debris, and increased sedimentation.	Applicable	Establishes regulations pertaining to construction in a flood plain, including channel modification, fill, and structures including remedial activities.	Alternatives 2, 3, 4 and 5
IAC Title 35, Part 212.301, Fugitive Particulate Matter, 212.304, Storage Piles, 212.315 Covering for Vehicles, 243, Air Quality Standards, and 245, Objectionable Odor Nuisance Determination	Emission standards and operating procedures for fugitive particulate matter and operation of certain vehicles. Establishes air quality standards for particulates, pollutants, and odors.	Applicable	The remedial action may generate fugitive dust. Rules require dust control for storage piles unless emission from the pile do not cross the property line either by wind or re-entrainment. Prohibits the operation of a vehicle of the second division as defined by 625 ILCS 5/1-217 or a semi-trailer as defined by 625 ILCS 5/1-187 without a covering sufficient to prevent the release of particulate matter into the atmosphere, provided that this rule shall not pertain to automotive exhaust emissions.	Alternatives 2, 3, 4, and 5
IAC Title 35 Part 395 – Procedures and Criteria for Certification of Applications for Federal Permits or Licenses for Discharges into Waters of The State	Define the procedures and criteria which the Illinois Environmental Protection Agency will use in certifying, under Section 401 of the Clean Water Act, that activities requiring federal permits of licenses will comply with Sections 301, 302, 303, 306 and 307 of the Clean Water Act.	Applicable	Compliance with CWA Section 401 requirements is mandatory for all projects regulated under Section 404, and substantive requirements are applicable for actions involving disturbances such as excavation or dredging of sediment.	Alternatives 2, 3, 4, and 5
IAC Title 35 Part 722.111 Hazardous Waste Determination	Requires generators of solid waste to determine whether the waste is a hazardous waste, to ensure proper management in accordance with RCRA regulations.	Applicable	Applicable for management of waste generated during building demolition and destined for offsite disposal.	Alternatives 2, 3, 4, and 5
415 ILCS 5/22.48 Non-Special Waste Certification 415 ILCS 5/3.475 Special Waste IAC Title 35, Part 709 Illinois Wastestream Authorizations IAC Title 35, Part 808 Illinois Solid Waste Regulations IAC Title 35, Part 808 Illinois Special Waste Regulations IAC Title 35, Part 809 Illinois Special Waste Hauling Regulations	The ILCS allow certain special wastes to be certified as "non-special," and managed as solid wastes. 35 IAC Part 709 establishes requirements for liquid and solid wastestream definition and land disposal of liquid hazardous wastestreams. 35 IAC Part 807 establishes requirements for management of solid waste. 808 requires generators to classify the waste, manifest special waste, use permitted transporters, and dispose of the special waste at a permitted facility. 35 IAC Part 809 prescribes the procedures for the issuance of permits to special waste transporters; for the inspection and numbering of vehicles; and for proper hauling of special wastes to approved disposal, storage and treatment sites.	Applicable	Liquids generated by the remedial action and disposed offsite would be considered pollution control waste. Onsite requirements include the classification and initiating the manifest. ARARs end at the site boundary; full compliance is required offsite.	Alternatives 2, 3, 4, and 5

Applicable or Relevant and Appropriate Requirements for the Retained Alternatives

Feasibility Study Report OU3 and OU7

Hegeler Zinc Superfund Site, Vermilion County, Illinois

Regulation	Requirement	ARAR Status	Analysis	Alternatives
IAC Title 35, Part 228.141 Asbestos	Requirements to limit asbestos emissions from a variety of sources including demolition.	Applicable	Fifty-nine site structures were evaluated for the presence of ACM in 2006. ACM was identified in several structures and quantities estimated. The remedial design would include proper identification, removal, and handling of ACM.	Alternatives 2, 3, 4, and 5
IAC Title 35, Part 724.211(a) and (b) (Subpart 7G: Closure and Post-Closure Care, Closure Performance Standard)	The owner or operator must close the facility in a manner that does the following: (a) The closure minimizes the need for further maintenance. (b) The closure controls, minimizes, or eliminates, to the extent necessary to adequately protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated run-off, or hazardous decomposition products to the ground or surface waters or to the atmosphere.	Relevant and Appropriate	The substantive requirements of 35 IAC 724.211 (a) and (b) will be met to protect human health and the environment.	Alternatives 2, 3, 4, and 5
IAC Title 35, Part 724.212(a) and (b) (Subpart G: Closure and Post-Closure Care, Closure Plan: Amendment of Plan)	Requires owners of hazardous waste facilities to submit a written closure plan (the approved plan becomes a condition to any RCRA permit). The closure plan describes the steps necessary for final closure. 724.212(a) I (2), 724.212(b) (2), and 724.212(b) (4) are substantive requirements.	Relevant and Appropriate	The substantive requirements of 35 IAC 724.212 (a) and (b) are relevant and appropriate to the conditions at Site, but a formal Closure Plan required for owners of hazardous waste management facilities is not applicable to former landfill sites being addressed through the CERCLA process. The substantive requirements of 35 IAC 724.212 (a) and (b) will be met through the CERCLA process.	Alternatives 2, 3, 4, and 5
IAC Title 35, Part 724.214 (Subpart G: Closure and Post-Closure Care, Disposal or Decontamination of Equipment, Structures, and Soils)	All contaminated equipment, structures, and soils must be properly disposed of or decontaminated.	Relevant and Appropriate	Decontamination would be completed in compliance with this subpart.	Alternatives 2, 3, 4, and 5
IAC Title 35, Part 724.215 (Subpart G: Closure and Post-Closure Care, Certification of Closure)	Owner or operator must submit to the Agency, by registered mail, a certification that the hazardous waste management unit or facility, as applicable, has been closed in accordance with the specifications in the approved closure plan. The certification must be signed by the owner or operator and by an independent registered professional engineer.	Relevant and Appropriate	The substantive requirements of 35 IAC 724.215 will be met by the Remedial Action Completion Report (RACR) completed through the CERCLA process. The 60-day limit is not relevant and appropriate, because it is not appropriate for a CERCLA site.	Alternatives 2, 3, 4, and 5
IAC Title 35, Part 724.216 (Subpart G: Closure and Post-Closure Care, Survey Plat) IAC Title 35, Part 724.409 (Subpart N: Landfills, Surveying and Recordkeeping)	No later than the submission of the certification of closure of each hazardous waste disposal unit, the owner or operator must submit to any local zoning authority or authority with jurisdiction over local land use and to the Agency and record with land titles, a survey plat indicating the location and dimensions of landfill cells or other hazardous waste disposal units with respect to permanently surveyed benchmarks. This plat must be prepared and certified by a professional land surveyor. The plat filed with the local zoning authority or the authority with jurisdiction over local land use must contain a note, prominently displayed, that states the owner's and operator's obligation to restrict disturbance of the hazardous waste disposal unit in accordance with Subpart G of this Part.	Relevant and Appropriate	The substantive requirements of 35 IAC 724.216 and 35 IAC 724.409 will be met by the RACR completed through the CERCLA process. As part of the implementation of any of these alternatives, a survey plat indicating the location and dimensions of the waste area and cover limits will be submitted to the appropriate local authority with jurisdiction over local land use and to Illinois EPA. The plat will be prepared and certified by a professional land surveyor. Along with the survey plat, institutional controls will be established to prohibit disturbance of the cover and to control the land use in the survey area. The timeframe for submission may not be appropriate for a CERCLA site.	Alternatives 2, 3, 4, and 5
IAC Title 35, Part 724.217 (Subpart G: Closure and Post-Closure Care, Post-Closure Care and Use of Property)	Requires a Post-Closure Care Period of at least 30 years after completion of closure for the unit, security requirements, post-closure use of property on or in which hazardous wastes remain after closure must never be allowed to disturb the integrity of the final cover unless the Agency determines it is necessary for reasons listed in the regulations, and all the post-closure care activities must be in accordance with the provisions of the approved post-closure plan as specified in Section 724.218.	Relevant and Appropriate	The substantive requirements of 35 IAC 724.217 for Post-Closure Care and Use of Property will be addressed in the O&M Plan developed through the CERCLA process. The O&M Plan will include descriptions of the long-term O&M, post-closure care, property-use restrictions, and institutional controls. The remedy would also be subjected to the Five-Year Review process under CERCLA. An assessment of the ongoing post-closure/O&M activities would be completed at that time.	Alternatives 2, 3, 4, and 5
IAC Title 35, Part 724.218 (Subpart G: Closure and Post-Closure Care, Post-Closure Care Plan; Amendment of Plan)	The owner must have a written post-closure plan that must identify the activities that will be carried on after closure and the frequency of these activities (including planned monitoring activities and frequencies, planned maintenance activities, and name, address, and phone number of the person or office to contact). The relevant and appropriate requirement in 724.218 is: 724.218(b)(1) and (b)(2) – the post-closure plans must incorporate monitoring and maintenance activities that comply with the substantive requirements of 724 Subparts F and N.	Relevant and Appropriate	The substantive requirements of 35 IAC 724.218 for post-closure care and use of the remediated portions of the site will be addressed in the O&M Plan. The selected remedy will also be subjected to the Five-Year Review. Incorporating monitoring and maintenance activities to comply with Subpart F will be determined if relevant and appropriate in the final groundwater remedy.	Alternatives 2, 3, 4, and 5

Applicable or Relevant and Appropriate Requirements for the Retained Alternatives
Feasibility Study Report OU3 and OU7
Hegeler Zinc Superfund Site, Vermilion County, Illinois

Regulation	Requirement	ARAR Status	Analysis	Alternatives
IAC Title 35, Part 724.219 (Subpart G: Closure and Post-Closure Care, Post-Closure Notices)	Requires certification of closure from the owner or operator of a disposal facility to submit to the Agency, to the County Recorder, and to any local zoning authority or authority, a record of the type, location, and quantity of hazardous wastes disposed (for hazardous wastes disposed of before January 12, 1981, the owner or operator must identify these items to the best of the owner or operator's knowledge and in accordance with any records). In addition, the owner or operator is required to record a notation on the deed to the facility property (or on some other instrument that is normally examined during title search) that will in perpetuity notify any potential purchaser of the property that the land has been used to manage hazardous wastes; its use is restricted; and the survey plat and record of the type, location, and quantity of hazardous wastes disposed, and filed with the Agency, the County Recorder, and any local zoning authority or authority with jurisdiction over local land use.	Relevant and Appropriate	The substantive requirements of 35 IAC 724.219 for post-closure notices will be met by preparing a RACR completed through the CERCLA process. The report will contain information documenting the activities completed and approved deviations/changes implemented. This report will provide surveyed locations of the cover construction, surveyed locations of monitoring wells, and document any waste generated and disposed offsite, as well as all other pertinent remedy related documentation. A description of the institutional controls applied will also be included within the report. A summary of compliance with the substantive requirements of 35 IAC 724.219 indicating that waste will be left in place and the location of that waste from the RACR will be summarized in a deed notation that travels in perpetuity with the land. The deed notation will be recorded in the form of a Uniform Environmental Covenants Act with the appropriate authority and the Agency. The timeframe for submission may not be appropriate for a CERCLA site.	Alternatives 2, 3, 4, and 5
IAC Title 35, Part 724.220 (Subpart G: Closure and Post-Closure Care, Certification of Completion of Post-Closure Care)	After completion of the established post-closure care period for each hazardous waste disposal unit, the owner or operator must submit to the Agency, by registered mail, a certification that the post-closure care period for the hazardous waste disposal unit was performed in accordance with the specifications in the approved post-closure plan.	Relevant and Appropriate	The substantive requirements of 724.220 will be met through the submission of routine O&M reports, as well as Five-Year Remedy Reviews, which will evaluate and document the effectiveness of the remedy and post-closure care. The timeframe for submission may not be appropriate for a CERCLA site.	Alternatives 2, 3, 4, and 5
IAC Title 35, Part 724.410(a)(1-4) (Subpart N Landfills, Closure and Post-Closure Care)	At final closure of the landfill or upon closure of any cell, the owner or operator must cover the landfill or cell with a final cover designed and constructed to do the following: (1) Provide long-term minimization of migration of liquids through the closed landfill. (2) Function with minimum maintenance. (3) Promote drainage and minimize erosion or abrasion of the cover. (4) Accommodate settling and subsidence so that the cover's integrity is maintained.	Relevant and Appropriate	The final cover should comply with regulatory guidance for hazardous waste caps to prevent leachability and the performance criteria identified in 35 IAC 724.410(a)(1-4). Periodic maintenance as described in the O&M Plan would be implemented to correct any settling or subsidence occurrences and to facilitate any needed repairs to the cover. Because this site is inactive, protected by a security fence, and owned by a single land owner, formal institutional controls and cover repair and maintenance, as needed, can be easily implemented and enforced.	Alternatives 2, 3, 4, and 5
IAC Title 35, Part 724.410(b)(1, 4, 5, and 6) (Subpart N Landfills, Closure and Post-Closure Care)	After final closure, the owner or operator must comply with all post-closure requirements contained in Sections 724.217 through 724.220, including maintenance and monitoring throughout the post-closure care period (specified in the permit under Section 724.217). After final closure, the owner or operator must do the following: (1) Maintain the integrity and effectiveness of the final cover, including making repairs to the cap as necessary to correct the effects of settling, subsidence, erosion, or other events. (4) Maintain and monitor the groundwater monitoring system and comply with all other applicable requirements of Subpart F of this Part. (5) Prevent run-on and run-off from eroding or otherwise damaging the final cover. (6) Protect and maintain surveyed benchmarks.	Relevant and Appropriate	The substantive requirements of 35 IAC 724.410 for post-closure care and use would be addressed in the O&M Plan as part of the CERCLA process. The O&M Plan will provide detail on inspection and maintenance of the final cover, groundwater monitoring, and run-on/run-off controls to prevent erosion or damage. The remedy will also be subjected to the Five-Year Review process under CERCLA. An assessment of the ongoing post-closure/O&M activities would be completed at that time and revisions implemented as necessary. Incorporating monitoring and maintenance activities to comply with Subpart F will be determined if relevant and appropriate in the final groundwater remedy.	Alternatives 2, 3, 4, and 5
IAC Title 35, Part 724.195 (Subpart F Releases from Solid Waste Management Units, Point of Compliance (similar to 40 CFR 264.95))	Point of Compliance: The Agency must specify in the facility permit the point of compliance at which the groundwater protection standard of Section 724.192 applies and at which monitoring must be conducted. The point of compliance is a vertical surface located at the hydraulically downgradient limit of the waste management area that extends down into the uppermost aquifer underlying the regulated units.	Relevant and Appropriate	The site was not operated as a permitted hazardous waste landfill. However, the alternatives cap the unlined waste in place, thus creating a landfill situation for the residual slag material and contaminated soils. The data show that characteristically hazardous wastes are present at the site. The listed section establishes standards of control and limitations promulgated under state law, specifically addressing a hazardous substance, pollutant, or contaminant at the site. Therefore, the landfill requirements of 35 IAC 724.195 are relevant and appropriate based on the site conditions. A permit is not required; however, the Agency can identify as part of the CERCLA process, the appropriate standards of control required by 35 IAC 724.195. If followed, the substantive requirements of 35 IAC 724.195 will be met by groundwater alternative.	Alternatives 2, 3, 4, and 5

Applicable or Relevant and Appropriate Requirements for the Retained Alternatives

Feasibility Study Report OU3 and OU7

Hegeler Zinc Superfund Site, Vermilion County, Illinois

Regulation	Requirement	ARAR Status	Analysis	Alternatives
IAC Title 35, Part 724.197 (Subpart F Releases from Solid Waste Management Units, General Groundwater Monitoring Requirements [similar to 40 CFR 264.97])	724.197(a) - The groundwater monitoring system must consist of a sufficient number of wells, installed at appropriate locations and depths to yield groundwater samples from the uppermost aquifer that fulfill the following requirements: (1) They represent the quality of background water, (2) They represent the quality of groundwater passing the point of compliance; and (3) They allow for the detection of hazardous waste or hazardous constituents that have migrated to the uppermost aquifer. 724.197(c) - All monitoring wells must be cased in accordance with this section. 724.197(d) - The groundwater monitoring program must include consistent sampling and analysis to ensure a reliable indication of groundwater quality below the waste management area. The program must include procedures and techniques for the following: (1) Sample collection, (2) Sample preservation and shipment, (3) Analytical procedures, and (4) Chain-of-custody control. 724.197(e) - The groundwater monitoring program must include sampling and analytical methods that are appropriate for groundwater sampling and that accurately measure hazardous constituents in groundwater samples. 724.197(f) - The groundwater monitoring program must include a determination of the groundwater surface elevation each time groundwater is sampled. 724.197 (h) and (i) - Specifies the statistical methods that may be used in evaluating groundwater monitoring data and performance standards for each statistical method.	Relevant and Appropriate	The site was not operated as a permitted hazardous waste landfill. However, the alternatives cap the unlined waste in place, thus creating a landfill situation for the residual slag material and contaminated soils. The data show that characteristically hazardous wastes are present at the site. The listed section establishes standards of control, other substantive requirements, and criteria promulgated under state law, specifically addressing a remedial action at a CERCLA site. Therefore, the landfill requirements of 35 IAC 724.197 are relevant and appropriate based on the site conditions. The substantive requirements of 35 IAC 724.197(a)-(i) will be met by the long-term groundwater monitoring program developed through the CERCLA process for groundwater alternatives by incorporating these requirements.	Alternatives 2, 3, 4, and 5
IAC Title 35, Part 620.250, Establishment of Groundwater Management Zones	The purpose of a GMZ is to manage groundwater while mitigating impairment caused by the release of contaminants from a site. Presents requirements for establishment and evaluation of GMZs while groundwater standards are not being met.	Applicable	A GMZ would be established and maintained until groundwater standards are met.	Alternatives 2, 3, 4, and 5
IAC Title 35, Subtitle G Chapter I Parts 720 – 722	Establishes requirements for hazardous waste generators, transporters, and treatment, storage, and disposal facilities.	Applicable	These regulations would be used to define the appropriate generator category for onsite hazardous waste generation. The onsite management aspects are applicable only to waste that is characteristically hazardous and intended for transport and disposal offsite. Waste that leaves the site boundary must comply in full with both administrative and substantive aspects of the regulations.	Alternatives 2, 3, 4, and 5
IAC Title 35 Part 722 Standards for Generators of Hazardous Waste Subpart A General Subpart C Pre-Transport Requirements	Subpart A includes requirements for obtaining an EPA identification number and electronic reporting. Subpart C includes requirements for packaging, labeling, and marking.	Applicable	The onsite management aspects are applicable only to debris waste that is characteristically hazardous and intended for transport and disposal offsite. Waste that leaves the site boundary must comply in full with both administrative and substantive aspects of the regulations.	Alternatives 2, 3, 4, and 5
IAC Title 92 Part 173 Transportation – Shippers General Requirements	This regulation prescribes the requirements for shipments and packagings used for the transportation of hazardous materials in Illinois.	Applicable	Establishes the requirements for shipments and packaging used for the transportation of hazardous materials.	Alternatives 2, 3, 4, and 5
IAC Title 35, Part 900.102 Noise	Regulations prohibit the emission of sound beyond the property boundaries, so as to cause noise pollution.	Applicable	Noise levels will need to be controlled if noise reaches nuisance levels.	Alternatives 2, 3, 4, and 5
IAC Title 35, Part 703 – RCRA Permit Program	The purpose of this Part is to provide for the issuance of RCRA permits to satisfy the permit requirement of Section 21(f) of the Environmental Protection Act [415 ILCS 5/21(f)]; This Part is adopted in order to obtain final authorization from the United States Environmental Protection Agency (USEPA) for the State of Illinois to participate in permit issuance pursuant to the federal Resource Conservation and Recovery Act (RCRA) (42 USC 6901).	Applicable	Establishes requirements for permitting, handling, storage, treatment, and disposal of hazardous waste.	Alternatives 2, 3, 4, and 5
Illinois Urban Manual	Guidance in the IUM will be followed for erosion control caused by drainage or flow features.	Applicable	Best Management Practices will be implemented during construction activities. This would apply to Alternatives 2, 3, 4, and 5.	Alternatives 2, 3, 4, and 5
Guidance for NPDES Construction Site Stormwater Discharges in the State of Illinois	Guidance related to implementation of the Federal CWA General Construction Permit program in Illinois.	TBC	Guidance for controlling storm water discharges associated with construction. This would apply to Alternatives 2, 3, 4, and 5.	Alternatives 2, 3, 4, and 5

Applicable or Relevant and Appropriate Requirements for the Retained Alternatives
Feasibility Study Report OU3 and OU7
Hegeler Zinc Superfund Site, Vermilion County, Illinois

Regulation	Requirement	ARAR Status	Analysis	Alternatives

Notes:
ACM = asbestos-containing material
ARAR = applicable or relevant and appropriate requirement
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR = *Code of Federal Regulations*
CWA = Clean Water Act
ELCR = excess lifetime cancer risk
EPA = U.S. Environmental Protection Agency
FS = feasibility study
GMZ = groundwater management zone
IEPA = Illinois Environmental Protection Agency
IHPA = Illinois Historic Preservation Agency
ILCS = Illinois Compiled Statutes
IWQS = Illinois water quality standards
MCL = maximum contaminant level
MCLG = maximum contaminant level goal
NOAA = National Oceanic and Atmospheric Administration
NCP = National Oil and Hazardous Substances Pollution Contingency Plan
NPDES = National Pollutant Discharge Elimination Service
NPL = National Priorities List
O&M = operations and maintenance
PRG = Preliminary Remediation Goal
RAO = remedial action objective
RCRA = Resource Conservation and Recovery Act
SRI = supplemental remedial investigation
TACO = Tiered Approach to Corrective Action Objectives
TBC = to be considered
USACE = U.S. Army Corps of Engineers
USC = United States Code
USFWS = U.S. Fish and Wildlife Service

Table 3. Comparison of COPECs and PRGs in Sediment - OU1 versus OU2

Ecological Risk Preliminary Remediation Goals Operable Units 1 and 2

Hegeler Zinc Superfund Site, Vermilion County, Illinois

	Proposed Ecological PRGs Sediment (mg/kg)		
COPEC	OU1 RAS – Sitewide (includes creek, KIK culvert, fire water pond, settling ponds, and Lake Harry)	OU2 FS – KIK Culvert	OU2 FS – OU2 Tributary
Metals			
Aluminum	No PRG value proposed (see note 1)	--	--
Cadmium	4.98	21.3	19
Copper	--	87.9	146
Iron	--	--	No PRG value proposed (see note 2)
Lead	128	60	421
Manganese	1,100	--	No PRG value proposed (see note 2)
Mercury	--	--	4.2
Silver	--	No PRG value proposed (see note 2)	No PRG value proposed (see note 2)
Zinc	459	1,990	3,711
Pesticides			
4,4'-DDD	Pesticides not evaluated in OU1 BERA	0.013	0.57
4,4'-DDE		0.013	0.066
4,4'-DDT		0.0062	0.5
Alpha-Chlordane		0.0024	0.026
Beta-BHC		No PRG value proposed (see note 2)	--
Dieldrin		0.0036	--
Endosulfan I		0.0015	--
Endosulfan II		No PRG value proposed (see note 2)	--
Endrin		0.84	--
Gamma-Chlordane		0.0046	0.028

Notes:

-- : compound not identified as a COPEC in the BERA

Note 1: No screening level for aluminum is available; therefore, no numeric ecological PRG for aluminum was proposed. It is assumed the risk for aluminum will be addressed by addressing risk for the other metals.

Note 2: PRG not derived due to lack of toxicity reference values or lack of correlation between sediment concentration and sediment toxicity test response.

BERA = baseline ecological risk assessment

COPEC = chemical of potential ecological concern

FS = feasibility study

mg/kg = milligrams per kilogram

PRG = preliminary remediation goal

RAS = remedial alternatives screening

Table 4. Preliminary Remediation Goals for Groundwater

Feasibility Study Report OU1

Hegeler Zinc Superfund Site, Vermilion County, Illinois

COCs	Exposure Area [a]	Residential Tapwater RSL *Target ELCR* [b] 10^{-4} (µg/L)	10^{-5} (µg/L)	10^{-6} (µg/L)	Target Organ HI = 1 [b] (µg/L)	Drinking Water MCL [c] (µg/L)	Illinois Class I [d] (µg/L)	Proposed PRG [e] (µg/L)	Basis
Aluminum	Exposure Areas 1, 2, and 3	NA	NA	NA	20,000	NA	NA	20,000	Residential tap water RSL HI = 1
Antimony	Exposure Areas 1, 2, 3, and 4	NA	NA	NA	8	6	6	6	MCL and Illinois Class I
Arsenic	Exposure Areas 1, 2, 3, and 4	5.2	0.52	0.052	6	10	10	10	MCL and Illinois Class I
Barium	Exposure Areas 1, 2, and 3	NA	NA	NA	3,800	2,000	2,000	2,000	MCL and Illinois Class I
Beryllium	Exposure Areas 1, 2, and 3	NA	NA	NA	25	4	4	4	MCL and Illinois Class I
Cadmium	Exposure Areas 1, 2, 3, and 4	NA	NA	NA	9	5	5	5	MCL and Illinois Class I
Chromium	Exposure Areas 1, 2, 3, and 4	NA	NA	NA	NA	100	100	100	MCL and Illinois Class I
Cobalt	Exposure Areas 1, 2, and 3	NA	NA	NA	6	NA	1,000	1,000	Illinois Class I
Copper	Exposure Areas 1, 2, and 3	NA	NA	NA	800	1,300	650	650	Illinois Class I
Iron	Exposure Areas 1, 2, and 3	NA	NA	NA	14,000	NA	5,000	5,000	Illinois Class I
Lead	Exposure Areas 1, 2, 3, and 4	NA	NA	NA	15	15	7.5	7.5	Illinois Class I
Manganese	Exposure Areas 1, 2, and 3	NA	NA	NA	430	NA	150	150	Illinois Class I
Vanadium	Exposure Areas 1, 2, and 3	NA	NA	NA	86	NA	49	49	Illinois Class I
Zinc	Exposure Areas 1, 2, 3, and 4	NA	NA	NA	6,000	NA	5,000	5,000	Illinois Class I

Notes:

COCs are identified in the HHRAs (CH2M 2019e and 2019f).

The groundwater is classified as Class I per the SRI Report (CH2M 2019a).

[a] Exposure Areas are shown on Figure 2-5.

[b] EPA Tapwater RSLs (May 2019). Available on line: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables.

[c] EPA maximum contaminant levels. Available online: https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations.

[d] 35 Illinois Administrative Code (IAC) 620.210 and 35 IAC 620.410 Class I groundwater quality standards.

[e] PRGs are applicable to the onsite and offsite areas.

Definitions:

µg/L = microgram per liter

COC = chemical of concern

ELCR = excess lifetime cancer risk

EPA = U.S. Environmental Protection Agency

HHRA = human health risk assessment

HI = hazard index

MCL = maximum contaminant level

NA = not applicable

PRG = preliminary remediation goal

RSL = regional screening level

Table 5. Summary of Proposed Remedial Alternatives
Feasibility Study Report OU1
Hegeler Zinc Superfund Site, Vermilion County, Illinois

Media	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Existing Structures	No Action	Building demolition, consolidation of brick and concrete with slag pile and offsite disposal for wood, debris, and metal.	Building demolition, consolidation of brick and concrete with slag pile and offsite disposal for wood, debris, and metal.	Building demolition, consolidation of brick and concrete with slag pile and offsite disposal for wood, debris, and metal.	Building demolition, consolidation of brick and concrete with slag pile and offsite disposal for wood, debris, and metal.
Soils/Slag	No Action	Excavate OU3 Residential Soil Pile, consolidate with slag pile.	Excavate OU3 Residential Soil Pile, consolidate with slag pile.	Excavate OU3 Residential Soil Pile, consolidate with slag pile.	Excavate OU3 Residential Soil Pile, consolidate with slag pile.
		Cover surface soil areas with detected concentrations of COCs exceeding human health PRGs in exposure areas 2, 3, and 4 with 2 feet of compacted clay and 6 inches of topsoil. Excavate surface soils in non-vegetated areas with detected concentrations of COPECS exceeding ecological PRGs to 0.5 feet. Consolidate excavated materials with slag pile. Backfill excavated areas with 0.5 feet of topsoil to original grade.	Excavate surface soil areas with detected concentrations of COCs exceeding human health PRGs in exposure areas 2, 3, and 4 to 2 feet. Excavate surface soils in non-vegetated areas with detected concentrations of COPECS exceeding ecological PRGs to 0.5 feet. Consolidate excavated materials with slag pile. Cover subsurface soil areas with detected concentrations of COCs exceeding human health PRGs with 2 feet of compacted clay and 6 inches of topsoil. Remainder of excavated areas will be backfilled to the original grade.	Excavate surface soil areas with detected concentrations of COCs exceeding human health PRGs in exposure areas 2, 3, and 4 and COPECs exceeding ecological PRGs to 2 feet bgs. Consolidate excavated materials with slag pile. Cover subsurface soil areas with detected concentrations of COCs exceeding human health PRGs with 2 feet of compacted clay and 6 inches of topsoil. Backfill remaining excavated areas to the original grade.	Excavate surface soil areas with detected concentrations of COCs exceeding human health PRGs in exposure areas 2, 3, and 4 and COPECs exceeding ecological PRGs to 2 feet bgs. Excavate subsurface soil (> 2 feet bgs) exceeding human health PRGs in exposure areas 2, 3, and 4. Consolidate excavated materials with slag pile. Backfill excavated areas to the original grade.
		A soil IC would be in place for the slag pile consolidation area and areas with soil concentrations above human health PRGs. Because of the land uses evaluated in the human health risk assessments (HHRAs), property restrictions across OU1 are also needed prohibiting future residential land use, future recreational land use, and future commercial use as a daycare center.	A soil IC would be in place for the slag pile consolidation area, areas with subsurface soils above human health PRGs, and the paved areas of the KIK property. Because of the land uses evaluated in the HHRAs, property restrictions across OU1 are also needed prohibiting future residential land use, future recreational land use, and future commercial use as a daycare center.	A soil IC would be in place for the slag pile consolidation area, areas with subsurface soils above human health PRGs, and the paved areas of the KIK property. Because of the land uses evaluated in the HHRAs, property restrictions across OU1 are also needed prohibiting future residential land use, future recreational land use, and future commercial use as a daycare center.	A soil IC would be in place for the slag pile consolidation area and the paved areas of the KIK property. Because of the land uses evaluated in the HHRAs, property restrictions across OU1 are also needed prohibiting future residential land use, future recreational land use, and future commercial use as a daycare center.
		Cover slag pile.	Cover slag pile.	Cover slag pile.	Cover slag pile.
Sediment	No Action	Remove sediment exceeding human health PRGs in the exposure areas 1 and 2 in the creek via dredging or excavation.	Remove sediment exceeding human health PRGs in the exposure areas 1 and 2 in the creek via dredging or excavation.	Remove sediment exceeding human health PRGs in the exposure areas 1 and 2 in the creek via dredging or excavation.	Remove sediment exceeding human health PRGs in the exposure areas 1 and 2 in the creek via dredging or excavation.
		Remove sediment exceeding ecological PRGs in the creek, the fire water pond, and the settling ponds via dredging or excavation.	Remove sediment exceeding ecological PRGs in the creek, the fire water pond, and the settling ponds via dredging or excavation.	Remove sediment exceeding ecological PRGs in the creek, the fire water pond, and the settling ponds via dredging or excavation.	Remove sediment exceeding ecological PRGs in the creek, the fire water pond, and the settling ponds via dredging or excavation.
		Creek rerouting to the north of the slag pile.	Creek rerouting to the north of the slag pile.	Creek rerouting to the north of the slag pile.	Creek rerouting to the north of the slag pile.
		Relocate portions of the slag pile within 100 feet of the south branch of the creek.	Relocate portions of the slag pile within 100 feet of the south branch of the creek.	Relocate portions of the slag pile within 100 feet of the south branch of the creek.	Relocate portions of the slag pile within 100 feet of the south branch of the creek.
		Sediment and fish tissue long-term monitoring.	Sediment and fish tissue long-term monitoring.	Sediment and fish tissue long-term monitoring.	Sediment and fish tissue long-term monitoring.
Groundwater and Surface Water	No Action	Groundwater and surface water long term monitoring and ICs for groundwater.	Groundwater and surface water long term monitoring and ICs for groundwater.	Groundwater and surface water long term monitoring and ICs for groundwater.	Groundwater and surface water long term monitoring and ICs for groundwater.

Notes:
COC = chemicals of concern
COPEC = chemical of potential ecological concern
bgs = below ground surface
IC = institutional control
OU = Operable Unit
PRGs = preliminary remediation goals

Table 6 Chart comparing cleanup options with the Nine Superfund Remedy Selection Criteria

Evaluation Criterion	Alternative 1	Alternative 2	Alternative 3*	Alternative 4	Alternative 5
Overall Protection of Human Health and the Environment	❍	●	●	●	●
Compliance with ARARs	❍	●	●	●	●
Long-term Effectiveness and Permanence	❍	●	●	●	●
Reduction of Toxicity, Mobility, or Volume through Treatment***	❍	⊙	⊙	⊙	⊙
Short-term Effectiveness	❍	●	●	●	●
Implementability	●	●	●	●	●
Alternative Cost	$93,000	$25,286,000	$29,344,000	$72,372,000	$74,398,000
State Acceptance	*State and community acceptance will be evaluated following the public comment period and may be used to modify the selection of the recommended alternative.*				
Community Acceptance					

● Meets criterion ⊙ Partially meets criterion ❍ Does not meet criterion

*EPA's preferred alternatives

** The OU2 Alternative 3 – sediment excavation and off-site disposal alternative [the Capital costs ($` 1,406, 324) and Periodic and 5 year O&M Costs ($ 164,448) and total estimated cost $1,570,772] these estimated costs will be included under each proposed action alternative.

Table 7: Estimated Costs for Alternatives

Alternative	Capital Cost	O&M	Periodic Costs	Present Worth
Alternative 1 – No Action	$0	$0	$120,000	$93,000
Alternative 2- Cover of Surface Soil with HH PRG exceedances; Excavation of Surface Soil 0.5 feet with Ecological exceedances outside the HH excavation footprint, Cover slag pile consolidation area, ICs and LTM	$23,338,000	$1,528,000	$823,000	$25,286,000
Alternative 3- Excavation of Surface Soil above Human Health PRGs (up to 2 feet bgs), Excavation of Surface Soil above Ecological PRGs (0.5 foot) outside of the Human Health PRG excavation footprint; Cover Slag Pile Consolidation Area; ICs and LTM	$27,302,000	$1,645,100	$823,000	$29,344,000
Alternative 4- Excavation of Surface Soil above both Human Health and Ecological PRGs (up to 2 feet bgs); Cover Slag Pile Consolidation Area; ICs and LTM	$66,174,000	$6,836,000	$823,000	$72,372,000
Alternative 5- Excavation of Surface Soil above Ecological PRGs (up to 2 feet bgs); Excavation of Soil above Human Health PRGs inside the Ecological footprint below 2 feet to 10 feet bgs); Cover Slag Pile Consolidation Area; ICs and LTM.	$71,959,000	$2,140,800	$823,000	$74,398,000

EPA's preferred alternative shown shaded.
Each action alternative costs would include OU2 FS sediment remediation cost $1,406,324 and (remediation cost plus baseline and long-term monitoring) for a total estimated cost of $1,570,772.